

The effects of presentation and content related factors on persuasion in risk communication

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ABSTRACT

In the last ten years Persuasive Technology and risk communication have become active research areas. For practical usage it is importantly useful in which manner risk information is exchanged persuasively and therefore this research will look at the presentation and content related factors. The main goal is to review some studies and to come up with practical implications for usage. In case of presentation, modalities in the form of graphs and imagery have a greater persuasive effect compared to numbers and texts alone. Graphs are useful for assessing comparisons of the number at risk, while pictures can enhance the perception of negative risk consequences by inducing fear. But in case of content the studies do not provide any conclusive evidence for either narratives or statistics. Complex interactions of different variables play a role here that seems to be case-specific.

Keywords

Persuasion, risk communication, modality type, narratives.

1. INTRODUCTION

Trying to persuade people to change their attitudes and/or behaviour can be found in different domains. Apart from commercial and marketing purposes, persuasion is also used in governmental media campaigns, meant to communicate risk and give prevention to the general public. Examples are campaigns to stop smoking or to look out for hazards at the workplace. In the last few years persuasion has also come up in the technology domain and a new growing research field is Persuasive Technology. One of the leading figures in this field is Dr. B.J. Fogg of Stanford University (USA). He describes Persuasive Technology as “*a computing system, device, or application intentionally designed to change a person's attitude or behaviour in a predetermined way*” [1]. A recent example of Persuasive Technology is a prototype of a virtual coach designed at Delft University of Technology (in The Netherlands), which persuades elderly people to do more exercises by walking [2].

Persuasion is influenced by different kinds of factors and these are roughly categorized here into presentation, linguistic and content related factors. Presentation related factors are concerned with the manner of exchanging information to the user by means of modality type, message order and/or the use of embodied conversational agents. Linguistic related factors are concerned with the manner how information is linguistically formatted. Some of these factors include message type (such as

the use of threat appeal, tailoring and loss or gain framing) and language use (such as the use of powerful arguments and how they are structured). And content related factors are about the type of message content embedded in the information such as the use of narratives or (objective) statistical information.

1.1 Research objectives

The upcoming field of Persuasive Technology brings challenges with it in designing systems that are capable to change someone's behaviour and/or attitudes. Mostly it concerns how messages are delivered effectively to users, and presentation together with content of these messages play a crucial role here. Lots of studies have been conducted looking at people's preferences, comprehension and intentions when assessing the use of varying factors in communication. For practical applications of persuasiveness it is preferable to have an overview of presentation and content related factors that would function as some sort of design guidelines. Or a discussion of the restrictions for the use of certain combinations of factors would be desirable for the application designer. When considering these factors influencing persuasion the most common domain studied together with persuasion is risk communication and prevention, and most of them concern health related issues. This is easy to comprehend, because health risks need to be communicated effectively to people and it also needs to penetrate into people's minds and thoughts.

So the goal of this research is to give an overview of the presentation and content related factors influencing persuasion and to provide a discussion of possible uses in practical applications in risk communication. The main focus will lie on modality type as presentation related factor and the use of narratives as content related factor. To achieve this goal, the main research questions to be answered are as follows:

Is there consistency in scientific literature in the effects of presentation and content related factors influencing persuasion in risk communication?

Can basic guidelines be derived for practical applications?

To answer these main questions, the following sub-questions are used to handle specific cases:

- *Is there any consistency in the findings of studies concerning each of the presentation and content related factors?*
- *In case of consistency, how can the selected factors be combined to reinforce the persuasiveness of content?*
- *In case of inconsistency, what are the underlying aspects that prevent the design of practical guidelines?*

The research questions are concerned with *consistency in studies*. With consistency is meant that the different studies concerning a particular factor return results and findings that support and complement each other.

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1.2 Research approach

In order to answer the research questions a literature study has been carried out and hereby literature is gathered concerning studies where persuasion is considered with one (or more) factor(s) concerning the mentioned presentation or content related factors. After selection of relevant and suitable papers an individual review analysis has been conducted per factor. These analyses resulted in general conclusions for each factor individually about the consistency in findings of the studies. Based on these conclusions a general discussion is given to shed some light on practical implications of the use for persuasion in risk communication.

This paper will first describe the literature search performed to gather papers and which criteria are used for further review. A definition of risk communication and the two factors influencing persuasion is given next. Then a review of the studies concerning the two factors (modality type and the use of narratives) will be handled separately, followed by a discussion of practical implications in usage. Finally some conclusions will be drawn to give an indication what this means in practice and what needs to be done in the future.

2. LITERATURE SEARCH

First relevant literature concerning persuasion in risk communication is searched for in scientific databases. For the two types of factors influencing persuasion a search is performed by taking into account certain keywords and an overview indicated per topic is given in Table 1. The keywords of each of the two factors are combined in various combinations with those concerning the topic of persuasion in risk communication to obtain results per factor.

Table 1: Used keywords in search, indicated per topic.

Topic	Keywords
Persuasion in risk communication	persuasion, persuasive, behaviour change, risk (communication)
Modality type	mode, (multi)modality, text(ual), numeric(al), visual, graph(ical), picture, pictorial, audio, audiovisual, video
Narrative	narrative, story, statistical, informational

The search is performed in the databases of Scopus, Web of Science and ScienceDirect. To enhance the search Google Scholar is used as well, but only to complement the main search in the previous mentioned databases. To achieve better search results, this search is also accompanied by looking into references of papers and by which (recent) papers they are cited.

The preliminary selection of suitable papers was based on evaluation of the title, abstract, introduction and discussion and/or conclusion. However during the analysis process when the papers were actually read in its entirety, some of these papers turned out to focus slightly on other aspects and were not used any further. So for the final selection of the papers some additional criteria were provided to narrow down the number of irrelevant papers and hereby the focus was laid on the comparison of different uses of modality types and the comparison of narratives with regard to objective statistical information as variables in the studies (for the two factors respectively). Also the papers need to be focused on the communication of risk in any kind of domain. An overview of the main topics of the found papers to be used in the analysis is given in Table 2. In case of the factor modality type the review

is restricted to the given modalities, since papers concerning other types of modalities (as audio and video) in relation to persuasion in risk communication were either too scarce or not found in the scientific literature.

Table 2: Main topics of papers, indicated per factor.

Factor	Main topic of papers for review
Modality type	Numbers vs. graphs
	Texts vs. images
Narrative	Statistics vs. narratives

3. DEFINITIONS OF RISK & FACTORS

Before the actual analyses are discussed, some definitions will be given for the term risk information and communication, and the two kinds of factors influencing persuasion. These and similar terms used in literature are highlighted and interpreted differently and the most common interpretations will be described here. They provide the basic context to hold on to when encountering these terms.

3.1 Risk information & communication

Risk information mostly concerns the use of probabilistic information about the negative consequences of certain events. This risk information mostly conceptualizes the probability of loss and consequences of loss. It can be given in quantitative form by presenting the actual statistics or in qualitative form by stating it verbally [3, 4]. With the communication of risk the exchange of such information is meant and how, where and what is communicated to a particular targeted audience. Other kinds of information related to risk can be communicated as well, to provide some surrounding issues involved (such as consequences, benefits and preventative measures) [3]. In this study the focus will only lie on the use of one-way risk communication and how this influences the targeted audience. In particular the *how* part of risk communication is partly addressed by looking at the type of presentation and content used to present and exchange the information. The corresponding factors discussed here are modality type and the use of narratives.

3.2 Presentation related factor: modalities

Information can be presented using different (single) modalities, e.g. text, images or audio (speech, sound or music) and in case of multimodalities combinations of these are used together (video is an example that can include each of the mentioned modalities in animation). The current study will focus specifically on the use of numbers and texts on one side against graphs and images on the other. Numbers state the statistical risks while text descriptions state the risks verbally. Both numbers and texts just present the hard facts. Graphs are used to depict numerical data in relation to each other to highlight particular relationships (for example to show the effects over a certain time period) or comparisons of data. Examples of graphs are line graphs, bar graphs and pie charts; also the use of an array of pictograms (such as stick figures and asterisks) to show discrete amounts are considered as graphs. And here when images are mentioned, they refer to (coloured) photographic imagery which mostly depicts a scene that is capable of inducing emotions (but not necessarily).

3.3 Content related factor: narratives

Narratives or storytelling have an immersive effect to people since they tend to transport them into another world of experience. Narratives are capable of producing fewer counter-arguments, evoking (strong) emotions, providing role-models and keeping them in someone's thoughts [5]. When looking into scientific literature about studies concerning narrative content, lots of different terms next to narratives are used such as case histories, anecdotes and (personal) testimonials. The main characteristic of all these forms of content is the description of personal experiences with certain risks from a person's perspective. These stories can either be based on real life experiences or fictitious of nature and they are usually presented with some emotional value. In the review of the studies concerning narrative content, a comparison is made with statistical content. The statistics used can either be stated numerically or textually and commonly a comparison is made with numerical statistical content (in the form of probabilities).

4. INFLUENCE OF MODALITIES

In case of the presentation related factor modality type, studies have been conducted to look at the influence of different modality formats on persuasion of risk communication. Here a division will be made in looking at studies focusing on the influence of numbers versus graphs and the influence of texts versus images. A discussion will follow these reviews to look at the consistency in the findings of the reviewed studies.

4.1 Studies about numbers vs. graphs

For the review of studies concerning numbers versus graphs three relevant studies will be discussed.

The three studies found are quite related to each other and they all concern how different modalities (in general numbers versus one or more types of graphs) affect risk avoidance [6–8]. But the differences among them lies in what they want to achieve and two of these studies are actually follow-up studies. The experiments conducted in these studies however, are using the same procedures and risk scenarios that have a low risk probability. The risk scenarios used are concerned with either the injury risk of a tire blow-out or the risk of getting gum disease. The procedure of the experiments was set-up as follows: in case of the tire blow-out scenario the participants of the experiment were presented with the injury risk information of a standard tire and an improved tire, and persuasiveness is assessed by asking them how much they would pay for the improved tire (in relation to the standard tire). A similar case concerning standard and improved toothpaste is used as well where the risk of getting gum disease is presented. In all these studies the foreground risk information was presented in

different modalities. The term foreground risk refers to the actual number of people at harm while background risk refers to the total number of people at risk (so for example when 10 out of 100 people are at risk, then the number 10 refers to foreground risk and 100 to background risk). Furthermore the participants recruited for the experiments in all these studies were students. The modalities and risk scenarios used differ per study and are indicated in Table 3. Here only the most relevant experiments in the studies are given, since some experiments were actually set-up to confirm some hypotheses that were not concerned with the comparison of modalities.

The first study by Stone et al. [6] had as main goal to examine the persuasive effects of numbers versus graphs and whether certain characteristics of graphs increased risk avoidance. Three experiments were conducted and especially the findings resulted from the first two experiments are relevant for this review (the final two experiments were actually conducted to test some hypotheses of the underlying characteristics of different formatted graphs). In both relevant experiments the findings reveal the more persuasive power of risk information presented in graphs compared to risk presented as numbers. But among the different formatted graphs used, there is not one format that jumps out as the most effective in risk avoidance.

The second study by Schirillo and Stone [7] is an extension of the mentioned first study. In the first study the risk reduction of the improved product was 50% in relation to the standard product (for example 15 people at risk with the improved product vs. 30 people with the standard product per population at risk of 5,000,000) and in this second study the researchers wanted to assess different risk ratios ranging from 3% to 97% reduction. Another aim of their research was to find a preliminary explanation underlying the persuasive process in decision-making. In two experiments these goals were assessed, in which the second experiment differed in the number of population at risk (5,000,000 versus 50,000 respectively). It turns out that the same findings occurred in which graphs are more persuasive than numbers and this occurs for the whole risk-reduction ratios range. The researchers also assessed if different psychological processes were responsible for these findings by performing some transformations on them for both modalities. They concluded that for both modalities a common mechanism for decision-making is used that underlies persuasion.

In the final study, Chua et al. [8] conducted another follow-up study of the one by Stone et al. Here two experiments were conducted in which the first experiment focused on the effect of numbers versus graphs with taking into account the use of loss and gain framing.

Table 3: Modality comparisons in studies concerning numbers vs. graphs (only relevant experiments are indicated).

Researchers	Group comparisons of modalities, per experiment	Risk scenario
Stone et al. [6]	1 st : [2 groups] Numbers vs. stick figures	Tire blow-out injury & gum disease
	2 nd : [4 groups] Numbers vs. stick figures, asterisks and bar graph	Tire blow-out injury & gum disease
Schirillo and Stone [7]	1 st : [2 groups] Numbers vs. asterisks, each with range of differing risk-ratios and population at risk is 5,000,000	Tire blow-out injury
	2 nd : [2 groups] Numbers vs. asterisks, each with range of differing risk-ratios and population at risk is 50,000	Tire blow-out injury
Chua et al. [8]	1 st : [4 groups] Numbers (loss or gain) vs. bar graph (loss or gain)	Gum disease
	2 nd : [2 groups] Numbers (loss only) vs. bar graph (loss only)	Tire blow-out injury

With loss framing the risk information is presented negatively as the number (of people) at harm while with gain framing this information is presented positively as the number not at harm (so if 10 out of 100 people are at risk, then with loss framing the risk is presented as 10 out of 100 (at harm) and with gain framing this is presented as 90 out of 100 (not at harm)). The second experiment was conducted to assess the underlying aspects of the persuasive power of graphs by using the attention priority model, which suggests that images trigger particular critical attention mechanisms (cognitive and emotional in nature). From the first experiment the findings show that graphs compared to numbers cause a stronger persuasive effect and it turns out that this was caused by the fact that riskier alternatives were perceived as too risky. Also loss framing was in both modalities more effective than gain framing. With the second experiment a possible answer to these obtained results were found and it turns out that both cognitive as affective components underlie this persuasive effect of graphs. Cognitively the chance of an adverse outcome is considered greater and affectively this impact causes stronger negative associations when graphs are used compared to numbers.

4.2 Studies about texts vs. images

Considering modality type another variable used in some studies is looking at the effects of (verbal) texts versus images (with accompanying text description). Here only two relevant studies will be reviewed.

O'Hegarty et al. [9] examined the effects of warning labels on cigarette packages by letting participants view text-only labels versus text-and-picture labels on cigarette packages. The messages used in both modalities are almost identical. The pictures used show a frightening scene of the consequences of smoking and also a more subtle picture is used (showing a baby with the text that tobacco smoke hurts babies). The survey was held online among adolescents that are current or former smokers. The findings show that the use of labels with pictures and accompanying text in relation to text-only labels was generally more persuasive in motivating current smokers to quit smoking and former smokers not to start smoking again. It also revealed that there were some gender differences in the use of certain pictures: some pictures were more effective in persuading men than women and vice versa.

Another study by Thrasher et al. [10] also examined the effects of text-only and text-and-picture warning labels on cigarette packages (with the use of a frightening picture) and the messages in both modalities differ here. The main difference with the former study is the use of another kind of experiment to assess this effect. This study used the auction method to assess the persuasive effect of different label designs. The interesting aspect of this auction is the bid that participants make for both cigarette packages with different label designs separately. The average bid made for each cigarette package gives an indication of the (theoretical) demand for a certain cigarette package, so lower bids would mean lower demand and higher bids for higher demands. The findings show a significant average lower bid for the cigarette package with text-and-picture label versus the text-only label and this means that the use of text-and-picture labels on cigarette packages would result in lower demand. So the findings suggest a persuasive effect of pictorial warnings on demand versus the use of text-only warnings.

4.3 Consistency within modality usage

From the above review one can notice a clear trend resulted from the different studies concerning the use of different modality types. From the studies where numbers were compared to graphs, the graphs seem to enhance the persuasiveness of the risk information towards people. Although no particular type of graph turned out to convey the risk information best, the studies also provided with some underlying aspects that enhanced the persuasiveness of it. It turns out that people do not use different decision-making processes to assess numbers or graphs and both cognitive and emotional components underlie this greater persuasive effect of graphs. And from the studies concerning the comparison of texts versus images, the use of pictures was more capable to persuade people to change their attitudes. The pictures used were not standalone, but were accompanied with texts to explain the consequences depicted. It should also be mentioned that in these studies the main asset to use pictures was their ability to portray fear visually and it was their intention to persuade people by frightening them and this seems to work well.

The general trend noticeable from these two kinds of modality comparisons is the consistency in findings where imagery (with accompanying text) has a greater ability to persuade risk information than text and numbers alone. But one should consider the contexts of usage as well, since graphs perform better in comparing alternatives and images perform better in enhancing the (negative) consequences.

5. INFLUENCE OF CONTENT

After considered the case of the presentation related factor modality type, a number of studies will now be reviewed which focus on the influence of different content types on persuasion in risk communication. In particular, the main focus is on the influence of narrative content versus statistical content in risk communication. Afterwards the consistency in findings among studies will be assessed.

5.1 Studies about statistics vs. narratives

Seven relevant studies have been taken for review concerning the persuasive effects of the use of (objective) statistical content versus narrative content in risk communication.

The reviewed studies have in common that they want to examine the effects of statistical content against one or more content types and use a health-related risk scenario in their experiments [11–17]. An overview of the comparisons and risk scenarios used in the reviewed studies is indicated in Table 4. As shown, most of them consider statistical content versus narrative content and a few of them even look at the combination of statistics and narratives in one message [13, 16] or assessed the effects of loss and gain framing [14]. A majority of the studies use a control group as well to assess if the use of some content type is effective on its own compared to the control group that mostly do not receive any (relevant) information at all. And some studies [11, 12, 15] even examined the effectiveness of the content types over time, where the same participants did a follow-up survey. The time-period varied per study and this ranges from 3 till 10 weeks. And to give an idea of the diversity of these studies in experimental materials and participants used, an overview is provided in Table 5.

An older study from Rook [11] looked how differences in content affected someone to take preventative measures. In this study the risk of getting osteoporosis was communicated

to female participants divided into two groups: women in their premenopausal phase and women in their postmenopausal phase. Researchers also wanted to assess if these two groups of women for whom the risk of getting osteoporosis was either distant or proximal affected their behaviour and attitudes. It was assumed that for younger women (for whom the risks are still far away in the future) the information with narrative content was more persuasive than with statistical content and among older women this would not matter. A second survey was held as well to assess the impact of the information after some time. The findings confirmed the hypotheses, but only after immediate exposure to the message. After some time information with narrative content has still more impact on their perceptions than statistical content, but their intentions to change (as provided by the participants after the first experiment) did not match with their actual behaviour change (after the follow-up survey).

Another older study by Cody and Lee [12] describes a study to examine the effectiveness of content type on skin cancer prevention. The behaviour change of the participants in the experiment was assessed by asking them how willing they are to take skin protective and skin examination actions. Among all three video contents their skin examination behaviour increased and no significant difference was noticed between

videos with statistical and narrative content. Over time their intentions to change decreased and the video with narrative content seems to decrease the skin protective intentions less over time than the other video contents.

The main goal of the study by Ubel et al. [13] is whether people's decisions would change if statistical content was accompanied with narrative content. The researchers wanted to find out if a proportionate or disproportionate number of positive and negative oriented narratives in accordance with the statistical risk ratio would change their decision making. The case study used here was presenting participants the choice of two kinds of treatments against angina and they had to make a decision based on the presented risk information. Of interest here is the experiment where participants were only presented with the statistical risk information with and without any narratives and how this affected decision-making. The findings show that presenting narratives next to statistical risk information changed their attitudes in making the less risky treatment (which is also less effective), regardless of the number and proportion of narratives used. However statistics alone seem to be significantly more effective in persuading people to take the more risky but also more effective treatment.

Table 4: Content comparisons in studies concerning statistics vs. narratives (only relevant experiments are indicated).

Researchers	Group comparisons of contents, per experiment	Risk scenario
Rook [11]	1 st : Statistics vs. narratives °	Osteoporosis
Cody and Lee [12]	1 st : Statistics vs. narratives ** °	Skin cancer
Ubel et al. [13]	2 nd : Statistics vs. combination of statistics & narratives	Comparing 2 treatments against angina
Cox and Cox [14]	Statistics (loss or gain) vs. narratives (loss or gain) *	Benefits of screening for breast cancer
Greene and Brinn [15]	1 st : Statistics vs. narratives * °	Tanning bed use
Mazor et al. [16]	Statistics vs. narratives and combination of both *	Usage of an anticoagulant drug
De Wit et al. [17]	Statistics vs. narratives ***	Infection with Hepatitis B virus

* : Usage of a control group where participants were shown no information at all.

** : Usage of a control group where participants were shown other irrelevant information.

***: Usage of 2 control groups: one group were shown only a risk assertion and another group no information at all.

° : These experiments also assessed content effectiveness over time (with a follow-up survey).

Table 5: Characteristics of experimental materials and participants in studies concerning statistics vs. narratives.

Study by	Mode of delivery	No. of narratives *	Participants
Rook [11]	Print	1	Young women (age 35 – 45) and old women (age 55+)
Cody and Lee [12]	Video	2 ^A	Male and female students (age 17 – 48, mean age of 20)
Ubel et al. [13]	Print	4 + 4 = 8 ^B	Men and women (mean age of 43)
Cox and Cox [14]	Print	1 ^C	Women (age 51 – 89, mean age of 70)
Greene and Brinn [15]	Print	1	Female students (age 19 – 26, mean age of 21)
Mazor et al. [16]	Video	4	Male and female patients (around age of 65)
De Wit et al. [17]	On screen	1	Homosexual men (age 19 – 63, mean age of 38)

*: The narratives are mostly negative oriented, unless otherwise indicated with capital subscript.

^A: One positive and one negative oriented narrative.

^B: The number of narratives given per treatment of angina. The number of positive and negative oriented narratives depends on the type of group (either proportionate or disproportionate to risk ratio) for the combination of statistics and narratives (in Table 4).

^C: The type of group (loss or gain) determines if it concerns a negative or positive oriented narrative.

Cox and Cox [14] try to find in their study an answer how certain message contents can persuade people to use early detection products or services (e.g. screening) and examined this by looking at the framing (loss versus gain) and content type (statistical versus narrative) of advertisement messages of screening. The findings show that statistical messages were not significantly different from the control messages, meaning that framing and statistical information were not effective enough in changing people's attitudes and intentions. Gain framed narratives seem to exhibit more counterproductive evaluations whereby participants turn against the persuasive effect of the presented content. This persuasive effect is more significant compared to the control group. For loss framed narratives the participants were however more persuaded, but this effect was weaker than the counterproductive effect of gain framed narratives. And compared to the control group, loss framed narratives are not significantly more persuasive.

Another study concerning skin cancer by Greene and Brinn [15] examined how differences in content types affected tanning bed use under young women and also looked at the effect of a risk self-assessment (which is not relevant for the current review). The findings report the more significant persuasive effect of statistical content versus narrative content in risk communication, also after a time delay. However narrative content does have effect, but this is not equally or more significant than the use of statistical content.

The study conducted by Mazor et al. [16] discusses a survey under patients who are taking an anticoagulant drug as medication and the researchers wanted to assess which type of information content was more effective on educating patients about the risks of the use of this drug. Hereby patients were approached to take part in a survey to view a video of a conversation between a doctor and a patient with statistical content, narrative content or both. From the findings the conclusion was drawn that there was some support for the fact that the use of narratives can be effective to change patient's beliefs, but no significant difference compared to video with statistical content was found on intentions to change their behaviours. Furthermore there was no significant difference between the use of both statistical and narrative content versus the use of only narrative content in a video in effectiveness and persuasiveness. Overall the suggestion is given that the use of narratives can be effective in some areas of risk communication.

And De Wit et al. [17] performed in their study an online survey to examine how a specific group of people assess risk information about the dangers of getting infected with Hepatitis B. Persuasiveness was assessed by asking participants how they perceived the risk and if they were (more) intended to get a vaccination against this disease. The findings show significant support for the fact that narrative content was more effective and persuasive than statistical evidence. The researchers indicated that statistical content gives factual reality, while narrative content enhances the realism of this fact.

5.2 Inconsistency within content usage

After the given review of numerous studies concerning the influence of statistical versus narrative content on persuasion in risk communication, the findings of all these studies show quite some inconsistency. The study by Greene and Brinn [15] resulted in the more persuasive effect of statistical content in risk communication, while studies by Rook [11] and De Wit et al. [17] show a greater (immediate) persuasive effect of narrative versus statistical content. The rest of the studies were

not very conclusive in their findings as well. Either the use of narrative content is more persuasive than statistical content in risk communication, but this is not proven significantly more effective than the use of statistical content. Or both statistical and narrative content are almost equivalently persuasive and effective in risk perceptions. Also the use of both statistical and narrative content together in one message seems inconclusive according to [13] and [16]. In case temporal effects were analyzed as well, it seems like that narrative content could hold someone's attention better [11, 12], but this does not hold when statistical content had already been declared as most effective [15]. Still there is one common characteristic that all these studies concluded from their experiments (based on user reactions and feedback): narrative content gives a more involved and realistic impression to people, while statistical content is considered as more truthfully and closer to fact based reality.

6. IMPLICATIONS FOR PRACTICE

The reviews given in the previous two sections give a basic insight into discovered findings in the scientific field concerning two kinds of factors influencing persuasion in risk communication. As noticed before, studies examining the persuasive effect of the presentation related factor modality type seem to show consistency in their findings, while this does not hold for studies focusing on the content related factor narratives. So what are their implications for practical usage in persuading risk information?

6.1 Use of modalities

6.1.1 Discussion of modality usage

Some points regarding both formats should be taken into account to attain the desired effect.

The risks used in the reviewed studies were low-probability risks and it seems that such risks are quite difficult to get across to people. When dealing with such numerical risk information, this can be put into a graph-like representation and it is necessary to account for fore- and background risk information. Although not explicitly mentioned in section 4, it turns out that persuasion was caused by the fact that foreground risk information was presented with graphs and thereby enhancing the significance of this information in relation to the background risk information, which was still given textually [8]. Displaying background risk information next to foreground risk information in one graph is not practical for low-probability risks, since the foreground risk information would not attract much attention. Also in this case it should concern the presentation of at least two alternatives with their risk information depicted in graphs, because in the discussed studies alternatives with their risk information was always provided next to each other and the presented difference causes the more persuasive impact. What is not clear from these studies is which type of graph should be used and there is no conclusive evidence for one particular format as favourite. In the studies the graphs used, were relatively easy to comprehend and used standalone without any other explanatory description accompanied with it. This gives the suggestion to provide comprehensible and legible graphs, which do not require much cognitive load to read it, such as bar graphs and arrays of pictograms.

In the case when dealing with mostly textual (verbal) risk information, persuasion is enhanced by including a picture of the (negative) consequences. The main asset of the studies mentioned in section 4 is the use of pictures that induce strong emotions to the ones who see it and mostly fear appeal is used

here. Furthermore it turns out from the findings that there are differences between associated effectiveness under men and women: the impact on women is mostly higher than for men and it depends on the kind of frightening scene used as well. The use of such pictures with accompanying text is especially useful in changing people's attitudes and behaviour either to take preventative measures or to stop current bad behaviour (as is the case with smoking). Although the findings were related to smoking habits, a review paper [18] also mentioned such persuasive effects in a study concerning risk communication of skin cancer.

6.1.2 Overview of modality recommendations

For the presentation related factor modality type, the main recommendatory points to consider for usage are mentioned in Table 6 and Table 7. Most aspects are derived from earlier discussions and some aspects are taken from careful analysis of the used materials in the experiments of the studies.

Table 6: Recommendations for using graphs.

Risk information presented with graphs	
1.	It should concern low-probability risk information.
2.	Show foreground risk in graphs and provide background risk textually near the graph.
3.	It should concern comparing risk information.
4.	Use graphs that are easy to understand, such as bar graphs and array of pictograms.
5.	Use loss framing to present risk information.

Table 7: Recommendations for using images.

Risk information presented with images	
1.	Only works for enhancing the impact of negative consequences of a risk.
2.	Images should be accompanied with text descriptions.
3.	Use images that are capable of inducing strong (fear-related) emotions.
4.	The persuasive power of certain images differs between men and women, so try to use images which are equally effective for both genders.
5.	Show image at a prominent place.

6.1.3 Examples of modality usage

The recommendations given in the previous section are useful for practice and to give a sense how these recommendations can be used, two examples will be provided for presenting risks with graphs and for presenting it with images, as depicted in Figure 1 and Figure 2. Hereby some risk information is collected from respected sources and depicted using graphs or images to enhance its persuasive effect.¹ The normal representation with numbers and text alone will

¹ Used source for risk information in Figure 1: SWOV – Factsheet, Verkeersveiligheid van kinderen in Nederland, http://www.swov.nl/rapport/Factsheets/NL/Factsheet_Kinderen.pdf (last accessed at 2009, June 10).

Used source for risk information in Figure 2: Knife Crime, Scanna, <http://www.scanna-msc.com/knifecrime.htm> (last accessed at 2009, June 10).

accompany these representations too for comparison of persuasion. In Figure 1 the risk information is presented with numbers and with an array of pictograms (as graph). A bicycle with a twisted front wheel is used as pictogram to represent the unfortunates. In Figure 2 an example is given where risk is shown textually next to the more persuasive mode of images with text. A frightening scene (of a bloody knife) is used here.

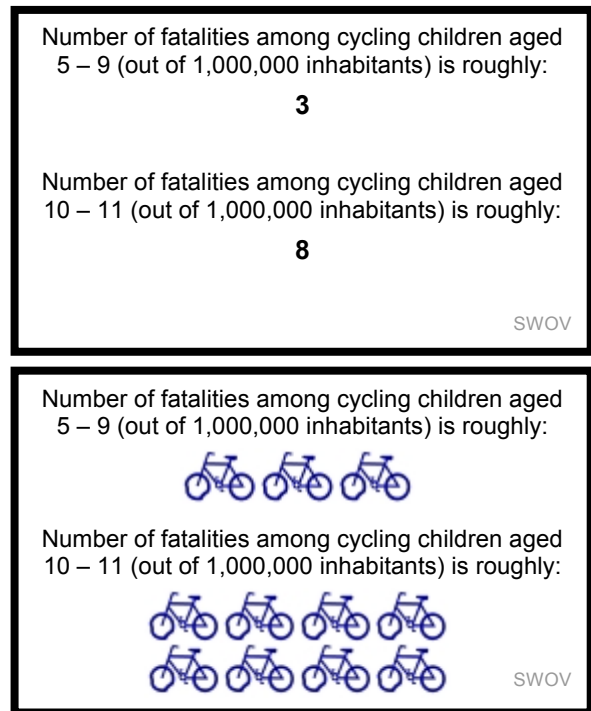


Figure 1: Risks presented using numbers or graphs.

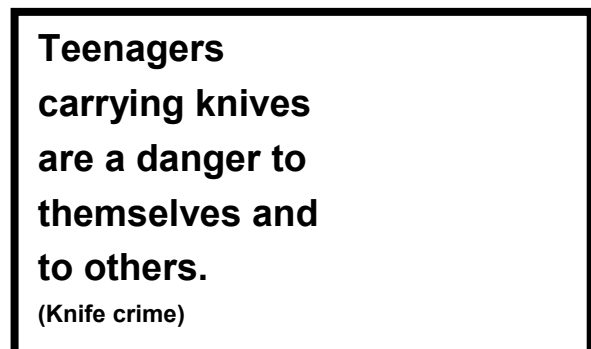


Figure 2: Risks presented using text or images (with text).

6.2 Use of narratives

6.2.1 Discussion of narrative usage

It turns out that the inconsistency among the studies depends on numerous variables and situations (as shown in Table 4 and Table 5) which will be discussed below.

From the studies one can deduce that content type comparisons were assessed for communicating different kinds of specific risk information. Each study concerned other types of cases and therefore attracted particular groups of people to participate in the studies. Some findings were even the result of surveys conducted under one particular gender group [11, 14, 15, 17] and so these findings could not be generalized to both genders.

Other effects causing the different findings could also be accounted for by the fact of using different modes to deliver the contents to the participants. Some studies presented their risk messages by video [12, 16], where risks were communicated by speech and in case of [12] the narratives were communicated emotionally (e.g. by letting affected people tell their own personal stories). In other studies the risk messages need to be read by participants (from paper or screen). Both types of modalities can have contributed differently to persuasiveness, and the use of video does not seem to enhance the persuasive impact stronger than text (as given in the review in section 5).

Also the number of narratives and whether loss or gain framing is used could have attributed to diverse outcomes of the reviewed studies. Mostly loss framing is used to express the negative consequences and risks in messages, but one study combined the use of both loss and gain framed narratives [13]. Although [14] confirmed that gain framed messages are not persuasive, but rather counter-persuasive, the use of both framed messages seem to enhance the persuasive effect in [13]. And the number of narratives used varied in the studies. Some studies used a story of one person to express the equivalent risks found in the statistical messages, while others used a number of narratives where experiences from more than one affected person was mentioned per type of risk (as is the case for [13] and [16]).

6.2.2 Overview of narrative implications

Here no recommendations will be provided for the use of narratives, but implications are given for consideration when attempting to use narratives in stead of statistics. These implications only highlight the issues involved when considering the use of narratives and do not guarantee that narratives will be perceived more persuasive and/or effective. An overview of these implications is shown in Table 8.

7. CONCLUSIONS

The current study has made an attempt to review some presentation and content related factors influencing persuasion in risk communication and to come up with some implications these findings may have on practical usage. From both factors only findings concerning the presentation related factor show conclusive results for practical usage, whereby some guidelines have been provided for correct usage.

The first research question concerned if there was any consistency in the reviewed studies of both factors. In case of the factor modality type the reviewed studies show consistency, in which the use of imagery (of both graphs and pictures) has greater persuasive effect than textual formats alone.

Table 8: Implications for using narratives.

Risk information presented with narratives	
1.	Different types of risk scenarios can attribute differently to the persuasive impact.
2.	Narratives targeted at a particular audience (because of specific risk scenarios) cannot guarantee the same persuasive effect when generalized to a broader public.
3.	The modes in which narratives are delivered can attribute how they are experienced (emotionally).
4.	The number of narratives used in a single message can highlight the experienced risks from more and different perspectives, but how this affect persuasion is not clear.
5.	Loss framed narratives are mostly used to enhance persuasiveness and gain framed narratives (used to show the positive effects) are not necessarily helpful.

But this consistency is not found when reviewing studies concerning the use of narratives as more persuasive content types compared to statistical content.

Regarding the second research question which addressed the practical implications and guidelines for actual usage, only for the presentation related factor modality type some basic rules were defined following the reviewed studies. In case of comparing numerical (low-probability) risk information the use of graphs is suitable. However one should hereby portray foreground risk information and the graphs should be relatively easy to understand. In case of presenting textual negative risks, the text should be accompanied by a (frightening) picture. Here one should take into account different effects that pictures can have on men and women. And for the content related factor narratives, the reviewed studies reveal the complex interactions of numerous variables, such as case-specific risks, gender differences, modes of delivery, number of narratives and loss or gain framing of narratives. These issues give an indication that the persuasive effect of the use of narratives vary per risk scenario case.

8. FUTURE WORK

This paper only presents a preliminary result of some reviewed studies found in scientific literature regarding persuasion in risk communication and some practical recommendations and implications have been mentioned as well. What may have contributed to the current conclusions of consistency may have attributed by the fact of the experiments used in the studies. In case of studies concerning modality type, the set-up of the experiments is mostly equivalent in nature with regard to the used materials. But in case of studies concerning narratives, this differed per study and other variables were also included to assess combined effects of these variables with regard to content type. A further analysis of the persuasiveness of narratives can be performed by categorizing the different studies and review the studies per category. However it still has to be decided which categories will be used.

Furthermore this research has shown that the scientific field in persuasion of risk communication is still in its beginning. In case of the presentation related factor modality type, the reviewed studies are quite related and concern particular risk scenarios. This makes it difficult to draw general conclusions and the presented recommendations should be considered with care for generic risk cases. In this case it would also not

be a surprise if inconsistency would have resulted when more studies have been analysed, but in scientific literature studies concerning modality comparisons of persuasion in risk communication are not very common. And in case of the content related factor narratives, the given overview of implications for using narratives (shown in Table 8) mention some crucial issues that can function as issues for consideration in future research and it is not certain how the research field has assessed these issues so far. The conclusions drawn about inconsistency are consistent with other recent review papers [19, 20] and although different kinds of theories exist to explain the cognitive effects of narratives, no real explanation is given underlying this.

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