Global Sense of Risk: Media Reporting on Scientific Studies and Potential Risks of Mobile Phones

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A high sense of risk is characteristic of modern societies. During recent decades, increasing risk awareness has caused consumers to become more prudent. Consumer policy has become more cautious and governmental security and regulatory institutions function on behalf of citizens. Politically aware non-governmental organisations are ready to take up new risk issues and a vigilant media is monitoring, reporting and even amplifying modern dangers and public fears. Sophisticated risk analyses of menaces to humans are constantly being produced, and reflective individuals are eager to adapt their way of life according to the latest guidelines produced by the government, the media and science. The focus of this paper is the recent worldwide worry over the risks of the low-frequency electric and magnetic fields of mobile phones and their base stations. This study of international media reports on the safety and health issues related to mobile phones (N = 732) indicates that the content of media reports varies between Europe, Asia and North-America, and that the same research results are given different emphases in different newspapers. This paper also examines the complex reciprocal relationships subsisting between the different actors and institutions amplifying and playing down the individual and collective sense of risk.

ACM Classifications: J.4, K.4.

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INTRODUCTION

Due to the rapid increase and development of mobile communication devices and other items of electronic equipment that emit non-ionizing radiation, there is general public awareness of the potential health effects of electromagnetic fields. Although various authorities, such as the World Health Organization (WHO), state that no major public health risks have emerged from several decades of research, uncertainties remain. The potential health effects of exposure to

electromagnetic fields continue to await scientific clarification. For instance, WHO has established an international project to assess the scientific evidence for the possible health effects of electromagnetic fields. It is expected that all the health risk assessments will be completed by the end of 2010 (WHO 2006-2007, 4). It may be argued that economic and cultural globalisation has given rise to a collective sensitivity to risk (Jaeger *et al*, 2001; Boyne, 2003) such that different kinds of claims are admitted to the political agenda. This sensitivity is a generalized awareness of a growing capacity to interfere with nature and an awareness of the fallibility of science, the vulnerability of the human body and the fragility of the biosphere. It is accompanied by a search for epistemological security along with a decrease in public trust in experts, science and technology. Various factors point to this: scientific controversies, for example, are laid bare in the media, those in authority espouse precautionary politics and the layperson's interpretation of risks in relation to moral justice leads to political and judicial struggles.

The preconditions for the current sense of risk are the many profound societal changes that have occurred, e.g. the scientisation of everyday life, the increasing importance of the media, the growth of well-meaning welfare regulation in the name of public health and the rise of the self-regulating individual. Recent debate on the novel character of the risk society can be summarised in various ways. For instance, Furedi (2001) argues that we are living in a culture of fear. Van Loon (2002) stresses that we should speak of an apocalypse culture. Stehr (2001) concludes from his analysis that societies have become more and more fragile. Luhmann (1993) points out that the contemporary obsession with risk thinking indicates that a transformation is taking place in societal systems towards increasing anticipation of future events (Luhman, 1993). Both Beck's (1992) and Giddens' (1990) views on the contemporary world refer to the erosion of modernity (see e.g. Wynne, 1996; Adam, 1996). However, the scope of this article is not to outline the novel character of the risk society, but rather to theorise how the sense of risk is associated with factors such as the media, science and welfare regulation, as well as to study empirically how risk as a universal language is manifested in the world-wide concerns expressed over the low-frequency electric and magnetic fields of mobile phones and their base stations. The first part of the article discusses the prerequisites for a high sense of risk. The second part introduces the background for the empirical media study. The third part deals with the questions of data, methods and analyses. The final section, before the conclusions, reveals the research findings, i.e. how international media is reporting on the risks of mobile phones.

GLOBAL SEARCH FOR EPISTEMOLOGICAL SECURITY: MEDIA, SCIENCE AND RISK

Two characteristics of today's global information flows are that individual risk issues are diffused and dispersed among populations and cultures, and that a fundamental deepening of the relationships between science, politics and the media has taken place. This is the context within which people evaluate risks and where the layperson's risk perception occurs. The human perception of risk is a bidirectional process. On the one hand, individual perceptions are highly dependent on the cultural, social and political interpretations of potential risk issues, and media interpretations are strongly influenced by these elements. On the other hand, individuals are eager to gain true scientifically based facts about potential risk issues, which means first of all cognitive processing of knowledge. For instance, Nowotny *et al* (2002) argue that the vast increase in scientific knowledge, the proliferation and fluidity of information flows, and the rise of the scientifically aware consumer both actively seeking information and having access to different information sources have produced societal changes structuring everyday social choices such as eating habits, medical treatment and life-styles.

The media functions in many ways. It is a forum for debate, a channel for political appeals, a site for disputes between different parties, an active promoter of specific views on risk (see e.g. Burgess, 2004) and sometimes a booster of societal pressure towards or against certain policies. Empirical findings such as the amount of media coverage given to a subject compared to the manifestations of political activity concerning that subject suggest that there is a very close correlation between these two parameters and that the media primarily reflects the political and social processes related to a risk source rather than the 'reality' of an 'objective' risk (Dunwoody and Peters, 1993).

The media is diverse in its content and often is not as biased in its news reporting as is commonly held (Wahlberg and Sjöberg, 2000). Van Loon (2002) states that irrespective of whether one understands risks in a realist or constructionist framework, the mass media and information and communication technology play a major role in the formation of risks, risk sensibilities and risk perceptions. The global economy, world political order and most socio-cultural systems are, according to Van Loon, bound by high-speed and high-frequency information flows which allow no escape from the impact of telecommunications on the processes of decision-making and anticipation. Recent findings suggest that, contrary to the commonly held notion that the media influences risk perception, the media probably is not a strong causal factor in personal risk perception (Wahlberg and Sjöberg, 2000). The 'mechanism' which might mediate risk perception and the media is availability, i.e. more information creates a stronger effect, but this effect is lessened by the impersonal impact of the media (Wahlberg and Sjöberg, 2000). Hill's (2001) analysis of the social amplification of risks provides evidence on how the media, politicians and campaign groups become social amplification stations. These organizations manipulate risk events to control information flows with the aim of creating a 'safer' moral and cultural environment. The term 'concern' is defined e.g. as something that interests you because it is important or affects you. It may also refer to an anxious feeling (caused by something), which in turn, as we have noticed on many occasions, may even trigger political unrest. Therefore, the study of lay concerns and perceptions is important, as societies are becoming increasingly dependent on the functioning of the media and "image politicking" is coming to play a key role in the social amplification and attenuation of risk (Wilkinson, 2001).

Lewenstein (1995), after reviewing studies concentrating on the relationship between science and the media, concludes that instead of conceptualizing scientific communication from the interactive perspective, which reminds us that it is a two-way process between science and audience, a more realistic model is one which recognizes the multiplicity of the variables that affect the acquisition of knowledge. He suggests that a model which recognizes the interactive nature of communication, the multiple contexts in which science communication takes place and the multidirectional activity of science and the media offers opportunities to construct a more profound understanding of science and the media (Lewenstein, 1995). Dunwoody and Peters' (1993) analysis of studies of media reporting on risk topics concluded that no simple or clear-cut answers exist. On the contrary, they problematized seemingly self-evident trivialities and suggested that in the future empirically grounded taxonomies for various types of risk and various journalistic contexts should be used in the analysis of media reporting and its impacts. With these reservations, they summarise their findings as follows: 1) the risk image created by the media is not a result of the popularisation of scientific findings, i.e. the view of experts is at best one perspective among others which has to compete in media coverage with social and political interests; 2) journalists act not only from the point of view of their personal interests, but within the terms of reference for professional norms and organisational factors; 3) the media is not autonomous in its actions; it may seek to impose its

images on the public, but it is dependent on its environment, e.g. the availability of information and the preferences of its readers. Societal processing of risk topics means that the social actors, the public and the media form a feedback-loop without any identifiable first cause; 4) if people feel directly affected by risk problems, they tend to make use of other information channels in addition to the mass media. (Dunwoody and Peters, 1993).

The global search for epistemological security regarding individual risk issues may have its roots in the crisis of materialist or empiricist epistemologies, which do not function well in risk analyses (Adam, 1996). The idea of potential dangers is at the core of the matter, since it goes beyond current material conditions (Litmanen, 2001). The word 'risk' is a label for probability, uncertainty, opportunity, anticipation and alternative trends of development, which are dependent upon multiple choices. Van Loon's (2003) conclusion on this almost non-perceptible virtual object is that risk formation is a deeply political process with ethical implications beyond the reach of technoscience. As soon as we start thinking of or calculating risks, we are anticipating future events and a multitude of material, social and temporal factors, all of which have the possibility to interact with each other with varying intensity (Luhmann, 1993). In order to construct a comprehensive understanding of risk, it is crucial that we understand the deficiency of our senses and of the materialist/ empiricist mode of science. First, in the face of risk, people encounter the cognitive dilemma of how well sensory information processing deals with the cognitive dissonance of knowing, measuring and calculating something which is in a state of constant flux. Second, there is the question of how science with the help of its instruments is able to predict the future, which is both constituted in and constitutive of the temporal flow of scattered, insignificant looking incidents, is able to premeditate all the relevant future events which might interact, producing in turn rather unique implications for the 'real' risk, and is able to construct plausible descriptions of the seemingly indeterminate latent functions of modern reflexive rationality (Adam, 1996; Luhmann, 1993).

Looking at the search for epistemological security from another, more positive perspective, a further ethos of science besides the search for truth has gained popularity. If the search for epistemological security is seen from the viewpoint of scepticism, it can no longer be regarded as symptomatic of a crisis of science but as an important method for testing the validity of knowledge and an immanent feature of the human way of thinking, of the inquiring mind (Williams, 1999; Moser, 1999). Irwin (1995) (see also Wynne, 1995) suggests that we reconsider the traditional way of thinking about science and the public, and treat the latter as scientifically aware, sceptically disposed and critically inclined, instead of trying to conduct a science of/for the public. It is clear that individuals are eager to make bio-political choices and reflect on new, unknown and uncharted risks with the help of science, the media and the authorities (see e.g. Lupton, 1999b; Lupton, 1999a; Fox, 1999).

Although Boyne (2003) suggests that the risks which concern us arise from our culture, knowledge, beliefs and interactions, he also proposes further examination of how modern welfare state regulation is intertwined and how the risk-averse society is formed, bearing in mind the drive towards entrepreneurial governance. In contrast, Burgess (2004) points out that today's societies are characterized by a rising culture of precaution, in which the state is an important actor protecting individuals from risk by providing consumer protection and instituting new regulatory interventions. This general need to regulate risks and protect consumers has taken the form of a political principle: the precautionary principle. This principle is not a scientific theory or hypothesis but a guideline that can act as a governmental tool for these purposes. For instance, the analysis by Kheifets *et al* (2001) (see also Foster, 2002; Balzano and Sheppard, 2002) of the precautionary

principle shows that, far from it being a monolithic entity, precautionary approaches have varied greatly and do not "demand" any particular action. Different approaches that have been taken by governments (over mobile phone power frequency and/or radio frequency fields) include: 1) gather information but take no regulatory action; 2) prudent avoidance; 3) other low-cost "precautionary" measures, e.g. re-locating mobile base stations, whether for aesthetic or health reasons; 4) mandatory exposure limits based on the precautionary principle; e.g. Italy, Slovenia, Switzerland have passed strict limits on human exposure to radio frequency energy on precautionary grounds (Foster, 2002).

BACKGROUND OF THE MEDIA STUDY

Increasing use of mobile phones has radically increased human exposure to radio frequency electromagnetic fields. Juutilainen (2003) points out that although exposure levels are low, the high number of users and some provocative but inconclusive scientific results have raised concerns about the possible adverse health effects of radio frequency exposure from mobile communication. This study of media reporting in different countries on the health risks associated with mobile phones, transmitting towers and other related risk issues had a three-fold origin, based on the findings of the previous project "Finnish perception of the risks of mobile phones". Firstly, the previous project found that the majority of people are not concerned with electromagnetic radiation but are instead very concerned about the risk of using mobile phones while driving (Kuustonen, 2001). Secondly, it was shown that the correlation between using a mobile phone and risk perception is valid (Tanninen, 2003), and that the biggest correlation is between how much people value their mobile phone and how much they use it (Tanninen, 2003). Finally, a statistically significant difference was found between the risk perceptions of men and women (Välikangas, 2003).

After these three findings, our interest turned to the role of the media in amplifying and playing down the risks of mobile phones. We also wanted to keep in mind the fact that there was and still is a scientific dispute over the long-term effects of mobile phone-related electro-magnetic fields. These points, along with a review of the relevant research, convinced us of the importance of a media study. For instance, Van Loon (2004) remarks on the scarcity of media and ICT studies on the formation of risk perception. Moreover, Allan (2002) states that despite the commonly shared view that a mutual relationship between science and the media is crucial for the formation of an audience's images and understanding, the research field is still in a fairly early stage of conceptual and methodological development. This next phase of the project would not have been possible without co-operation with mobile phone manufacturers and operators. The opportunity to utilize the media databank of the Mobile Manufacturer's Forum made it possible to explore in more detail how the international media reports on mobile phone risks, scientific studies of the health effects of electromagnetic fields and other related issues.

Another issue is that the fear of radio frequency electromagnetic fields is internationally diffused and disseminated. For instance, Burgess (2004) states that one motivation for his work on the health concerns of mobile phone use was the variation in reactions and responses between countries. Such concerns are not confined to the United Kingdom, where the media profile and governmental response have been in concert, but similar worries are shared in Australia, in Europe and in an internationally growing number of other countries, as mobile telecommunications are international by nature.

Thirdly, the question of whether or not mobile phones pose a real health risk remains open. The assumption behind the whole project has been that behind the public fear (see e.g. Burgess, 2004) – despite the multitude of scientific reports – the health effects of the electromagnetic radiation

emitted by mobile phones are imperfectly understood. Some scientists, for example, have found a connection between the prolonged use of mobile phones, brain cancer and leukaemia (Hardell *et al*, 2002; Graham-Growe, 2002). There have also been speculations over electromagnetic radiation causing nausea, headaches, dizziness and insomnia (Hermann and Hossmann, 1997; Harper and Amott, 1999). On the other hand, many scientific reports have been published that deny the negative health effects of using mobile phones (WHO 2000; Lezczynski, 2001; Inskip *et al*, 2001; Auvinen *et al*, 2002). Despite the huge amount of scientific knowledge concerning the potential health risks of EMR mobile phones and the link towers, most scientists admit that much research remains to be done. The health effects are not yet all known, especially the long-term effects (Independent Expert Group on Mobile phones, 2000; Inskip *et al*, 2001; Lezczynski, 2001; Auvinen *et al*, 2002; Lahti, 2003; WHO, 2003).

The main research questions posed in the media study were:

1. What kinds of mobile phone risk issues are reported in the media in different countries and continents?
2. Are there differences in emphasis between different continents?
3. Which groups of social actors are represented in the articles and how much space are they given in the media?
4. What kinds of arguments are used and to what issues do actors appeal in advancing their views?

DATA AND METHODS

The dissection of media articles focused on the statements, arguments, comparisons and metaphors that occurred in the texts. On the grounds of critical evaluation it seemed justifiable to divide the texts into two opposite categories: texts with the risk attitudes and texts with the non-risk attitudes of the social actor groups. Here, the operational definition of risk follows the common understanding that risk is the fear of a negative and unpleasant occurrence or the suspicion of a potential hazard (c.f. Douglas, 1986; Kamppinen *et al*, 1995). In other words, when analysing the media data, the attitude of a particular group of social actors was interpreted as risk perception if the group was worried about the health issues related to mobile phones and masts. The attitudes that were represented in the analyzed media texts were examined firstly by simply dividing them into two opposing categories: those where a representative of a social group associated real risks with mobile phones and those where a representative of a social group associated no risk with mobile phones. Words such as *threat*, *risk*, *hazard*, *suspicion*, *distrust*, *uncertainty* and *precautionary*, in reference to health issues in the mobile phone debate, were very frequent in the articles in which representatives of a certain social group perceived some risks relating to mobile phones.

If a group of social actors simply denied all potential health risks, they were categorized as non-risk. Two levels of non-risk attitudes were found in the texts, which shall be called "moderate non-risk" and "rigorous non-risk". The first level is characterized by the view that as scientific knowledge increases, it is possible that prolonged use of mobile phones will be found to have some health effects, but those effects could not be serious in any way. The second level is characterized by the opinion that all current and future scientific research will only confirm that using mobile phones has no health effects. The representatives of groups who did not have clear opinions on health issues related to mobile phones were categorized as "neutral". The articles that were placed in the neutral category also included the type of texts that were meant to be purely informative – mainly reports of scientific studies where the authors/actors neither admitted nor denied potential health effects.

The data consisted of 750 articles published in 41 countries (see Figure 1) during the period December 2001 to July 2003 (see Figure 2) and on five continents (see Figure 3). The data was
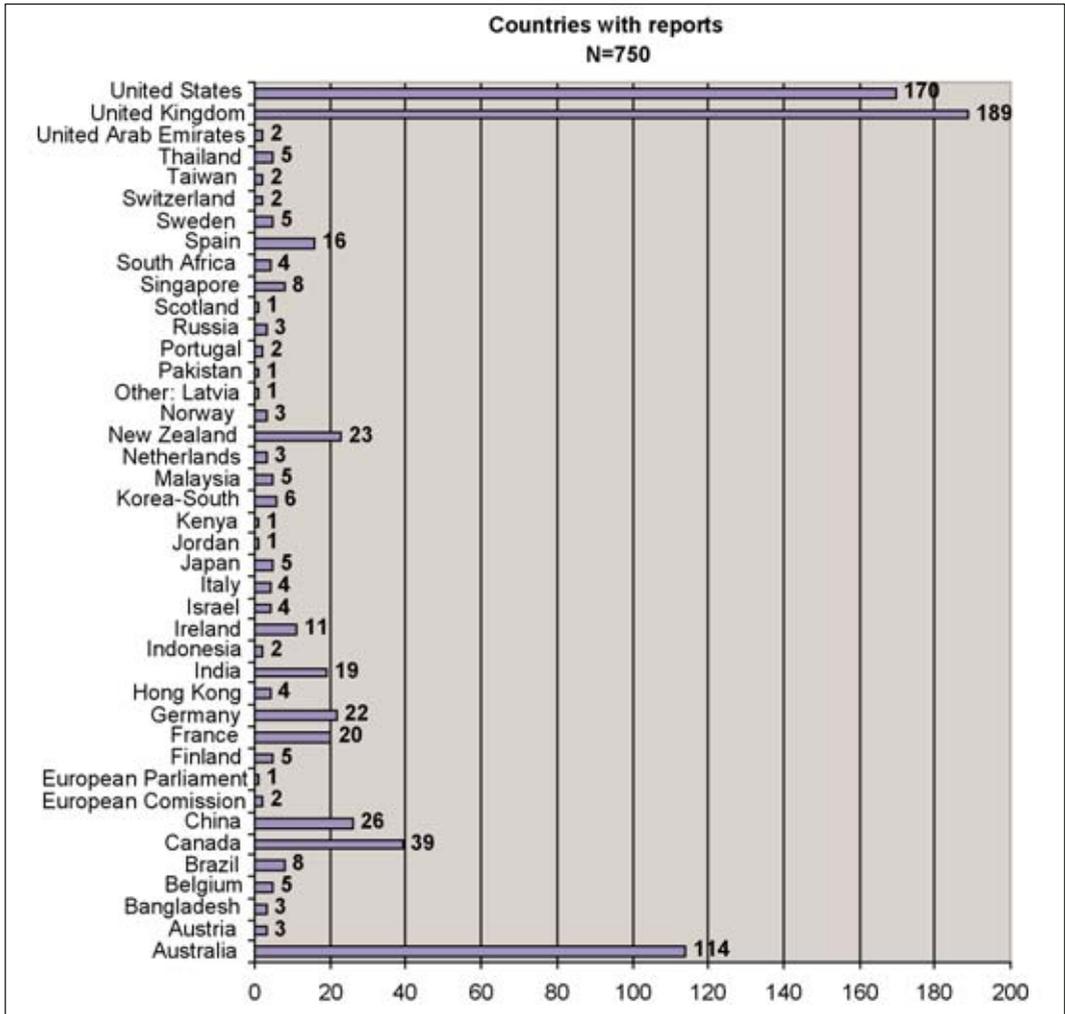
Countries with reports
N=750

Country	Value
United States	170
United Kingdom	189
United Arab Emirates	2
Thailand	5
Taiwan	2
Switzerland	2
Sweden	5
Spain	16
South Africa	4
Singapore	8
Scotland	1
Russia	3
Portugal	2
Pakistan	1
Other: Latvia	1
Norway	3
New Zealand	23
Netherlands	3
Malaysia	5
Korea-South	6
Kenya	1
Jordan	1
Japan	5
Italy	4
Israel	4
Ireland	11
Indonesia	2
India	19
Hong Kong	4
Germany	22
France	20
Finland	5
European Parliament	1
European Comission	2
China	26
Canada	39
Brazil	8
Belgium	5
Bangladesh	3
Austria	3
Australia	114

Figure 1: Countries with reports

collected at the beginning of July 2003 from the Mobile Manufacturers Forum's media databank. The organization compiles the databank from available sources including its member companies' own media monitoring and commercially available media monitoring services. In order to be selected into the databank, the articles must be related to a set of keywords. The Mobile Manufacturers Forum and its member companies use the following eight search terms: 1) mobile phones, radiations, masts 2) mobile phones, health and safety 3) mobile phones and precautionary principle 4) telecommunications, health and safety 5) phone masts and health risks 6) telecommunications and security 7) electromagnetic waves and 8) radiofrequency.

One limitation of the data is a bias towards English-speaking countries and towards English news material. It is impossible to generalise the research findings to cover the whole world, because, for instance, the reports published in Africa, South-America and the Middle-East represented less than three per cent of the data. The data was therefore analysed for the three
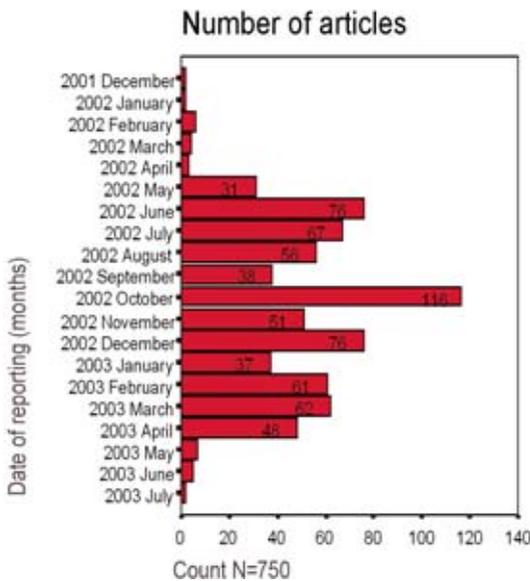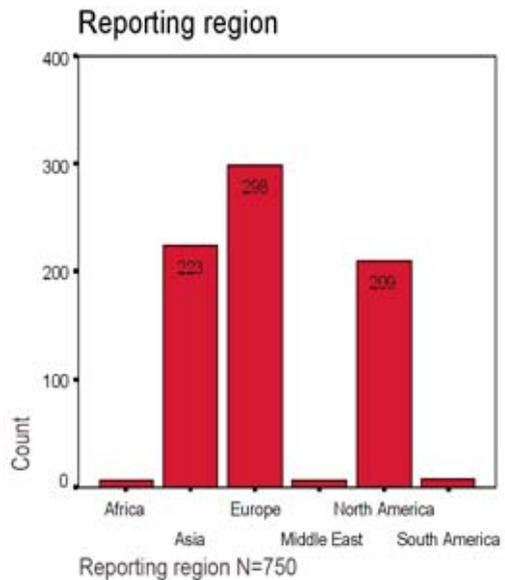
Figure 2: Number of articles

Figure 3: Number of articles by continent

continents where the most of the articles were published, namely Asia (223 articles), Europe (298 articles) and North-America (209 articles). It is also worth mentioning that in the Asian case 50 percent of the articles were published in Australia, in the European case 60 percent of the media coverage were from the United Kingdom, and in Northern America as much as 80 percent of the texts were published in the United States. Another limitation is that the profile of the media sources suggests that they are mostly national or 'top-tier' media outlets and therefore the database does not capture localized media particularly well. We also assume that the articles on science generally tend to highlight studies that have purported to find associations between mobile phones and health risks. However, the media also publishes articles on scientific findings where no associations are found, as they are important in this kind of public risk debate.

The data was analysed quantitatively and qualitatively. In the quantitative analysis, all 750 articles were included. The analysis was performed as a conventional statistical operation where different variables, such as the frequencies of the reporting country, reporting region (continent), reporting time, reporting organisation and reporting topic, and the risk attitude of the social actors, were examined. The main task was to analyse the attitudes to risk that the different groups of social actors held with regard to mobile phone-related health issues. The risk attitudes were evaluated from the point of view of 17 topics extracted from the data (see Table 1.).

The first category of articles dealt with the electromagnetic radiation of base station emissions. This subject caused uncertainty among lay people, especially when the base stations were located near nursery schools, schools or hospitals. People who lived in the neighbourhood of the stations were also worried about their health. The strong opinion of lay people was that they should have the opportunity to choose whether stations are located in their surroundings.

An interesting group of articles were those which concerned the arguments of Gro Harlem Brundtland. Brundtland was the Secretary General of the World Health Organization in 1998-2003

Category of the articles	Main subject of the articles
Base Station Emission	The electromagnetic radiation of base station emissions
Brundtland	The arguments of Gro Harlem Brundtland
Children	Precautionary approach in the case of children
China Standards	China's own mobile phone radiation standards
Driving	Talking on a mobile phone while driving
Electrosmog	Electromagnetic contamination or electromagnetic pollution
Interference	Studies of the electromagnetic interference by mobile phones
Jamming	Mobile phone etiquette
Japanese Study	Using a mobile phone in a railway carriage.
Legal Action	Mobile phone lawsuits
Radiation Shields	Whether mobile phones have health effects or not
Research findings	Studies of the potential health effects of mobile phones
Safety	Safety of mobile phones
SAR values	Specific Absorption Rate or SAR
Standards	Current exposure standards were challenged
Tax	Omitted from this study, written in Spanish
TETRA	Tetra (Terrestrial Trunked Radio)

Table 1: Categories of the data

and took a stand against mobile phones. She held the opinion that mobile phones are a health risk. Brundtland's criticism caused much confusion, particularly among representatives of the mobile phone industry. The WHO is one of those organizations which have largely supported scientific research into the safety of mobile phones, and it has come to the conclusion that there are no serious mobile phone-related health risks.

All the actor groups represented in articles in the category of "Children" had adopted a more or less precautionary approach in the case of children. The authorities particularly recommended that children's use of mobile phones should be restricted. The anxiety was mostly over fear of brain cancer. Scientists pressed the point that children's skulls are softer and thinner than those of adults and that radiation from mobile phones might endanger their health.

Articles included in the "China Standards" category dealt with China's setting of its own mobile phone radiation standards. Its proposal to set the level at half the international norm triggered debates within the industry. China has set its Specific Absorption Rates (SAR) for mobile phones at 1W/kg (one watt per kilogram of tissue), which is half the international standard of 2W/kg as defined by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). The representatives of the mobile phone industry claimed that if China really adopts the draft standard, it would affect both manufacturers and network operators, as it would reduce the power in handsets. It was further mentioned that operators would need among other things to create additional base stations to compensate for the reduced power in handsets. This was seen as a potential health risk for Chinese consumers and increased costs for both operators and consumers. Meanwhile other actors, such as the Chinese authorities, claimed that it should neither be a problem for manufacturers to follow the new standard nor cause a health problem for lay people.

The most frequent topic (30 %) of all the articles concerned whether or not talking on a mobile phone while driving increases the risk of having an accident. It was reported that in many countries the use of hand-held phones while driving was banned. Some actors represented the opinion that it does not matter whether the phone is used hands-free, via an ear piece or whether people are holding the handset to their ear – the phone as a cause of distraction was the major concern. The need for statutory restrictions was seen variously: some actors thought that the use of mobile phones while driving should simply be banned; others did not see any necessity for control.

The "Electrosmog" category concerned the debate on "electromagnetic contamination" or "electromagnetic pollution". The focus in these articles was that many people are concerned that magnetic fields and radiation created by power lines, telecommunications facilities and possibly even mobile phones are harmful to human health.

The media reported on the scientific studies of electromagnetic interference. In several studies electromagnetic interference by mobile phones was seen as real and potentially significant. The evidence indicated that mobile phones can cause medical equipment to malfunction and it had been recommended that mobile phone use be restricted in hospitals. It was also claimed that the risk of electromagnetic interference from mobile phones put the safety of aeroplanes at risk. This had led to bans on using such devices on board aircraft when the engines have started.

"Mobile phone etiquette" has become an issue in recent times with the growing use of phones in public places. The popularity of mobile phones has meant that it is common to see people making and receiving calls in bars, restaurants and on public transport. Some people, however, want to ban or jam mobile phones. The question was mainly one of distinguishing between private and public spaces.

Under the title "Japanese Study", it was reported that a physicist at Tohoku University in Japan had made a discovery after investigating the effect of using a mobile phone in the confined space of a railway carriage. It was claimed that because the walls of trains are made of metal, they reflect some of the radiation, keeping it inside. The resulting electromagnetic field can exceed the maximum level recommended by the International Committee for Non-Ionising Radiation. It was further alleged that the problem may also apply to buses and some types of lift. Other experts took a contrary view, stating that the idea that cell phone radiation is "trapped" in train carriages was based on a simplistic and unrealistic analysis with no direct relevance to the scenario it purported to explore.

At issue in the category "Mobile phone lawsuits" was whether the electromagnetic radiation that phones emit through their antennae poses a significant health risk. At the very heart of this topic was the lawsuit brought by a Baltimore neurologist who claimed that mobile phones gave him brain cancer. Even though his attorney presented scientific evidence to show that analog phones may cause tumours, the court ruled that the evidence was insufficient to establish the relationship between cell phone radiation and cancer. This lawsuit received extensive national attention.

The crux of the discussion on "Radiation shields" was whether or not mobile phones have harmful health effects. Thus, the need for some kind of radiation shield was based on two opposing arguments. On the one hand, it was argued that mobile phone shields can significantly reduce exposure to potentially harmful radiation. On the other hand, the point was pressed that the international scientific consensus was that there is no evidence of any health effects from using mobile phones that would warrant the purchase of a so-called "shield".

Articles within the category "Research findings" contained descriptions of dozens of scientific studies on the potential health effects of mobile phones that have already been carried out. Many scientists have claimed that there is considerable consensual evidence to show that there is no

reason to be worried about the EMR of mobile phones or base stations. This consensus was weakened in many articles by scientific reports alleging that various mobile phone related health effects, even serious effects, can be scientifically proven.

The safety of mobile phones was discussed from many points of view. The heading "Safety" covered a "cross-section" of all the media data. Opinions expressed on safety concerned base station emissions, children, standards, driving, interference, radiation shields and research findings.

The strength of radio waves emission is measured using a standard called the Specific Absorption Rate or SAR. In "SAR values" coverage, the debate was over the safety levels of SAR. Consumer organizations widely demanded that consumers should be better informed about the SAR values of mobile phones before making a purchasing decision.

The questions dealt with under the heading "Standards" were similar to those in the articles on "Safety", "Base Station Emissions", "Scientific Findings" and "Radiation Shields". What united the different opinions was the attitude towards the potential health risk of EMR. If the risk was seen as real then the current exposure standards were challenged.

The media articles under the topic of "Tax" were written in Spanish. They were omitted from this study.

The final category, "TETRA" (Terrestrial Trunked Radio), is the standard operating frequency for police, fire and paramedics. It operates at a frequency of 400 Mh. The lower rate means that Tetra is less vulnerable to interference, which is vital for communications in the emergency services. The system makes it possible to offer complete coverage for the emergency services. In the case of TETRA, there were two basic reasons for anxiety. People who lived near the towers were worried about their health. The other fear was over "interference". It was claimed in some articles that TETRA causes even more interference than mobile phones, which are banned in many hospitals and on aircraft due to the risk of disrupting sensitive electronics.

The largest of these categories were 'talking on the mobile phone while driving' (227 articles) and 'the safety of mobile phones and their base station emission' (126 articles). The category 'research findings' was also rather large (123 articles).
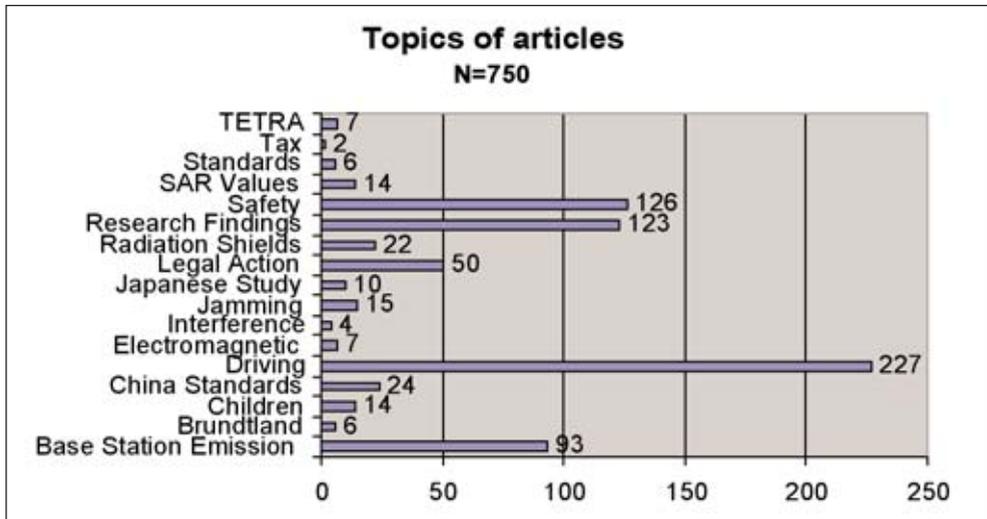

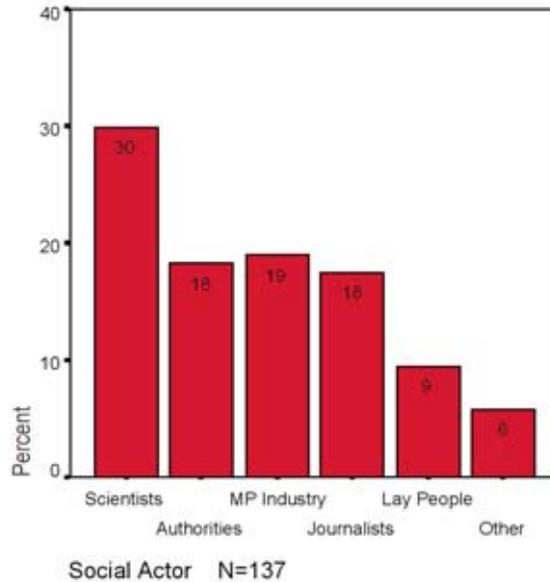
Figure 4: Number of topics in articles

Figure 5: Social actor groups in the articles

From the 17 different topics, the category "Safety" (126 articles) was chosen for the qualitative analysis, where the task was to make primary interpretations following the method of base sentence analysis. In practice, this meant that the researcher read the texts repeatedly. The saturation point was reached at around 50 articles. In other words, after 50 articles no new arguments emerged and the texts seemed to become repetitive. The main ideas of the separate articles were usually written in one, two, three or even four sentences in the texts (all together 137 base sentences). The criterion for choosing a particular segment of text as a base sentence was that the sentence had to refer to essential social actor groups (see Figure 5) and their attitudes concerning the health issues related to mobile phones. It must be admitted that base sentence analysis can be rather indifferent to nuances and rhetorical conflicts within a text, but the main task is to identify the sentences that are essential for the research as a whole (Jokinen, 1997). In base sentence analysis the researcher's interpretation plays a role and the reliability of the research is determined by the consistency of the analysis.

Analyzing the texts separately from the viewpoint of the precautionary principle and the interests of the different groups of social actors was clearly impossible. Just as a society's worldview and moral and ethical values cannot be separated from its risk perceptions, the same social constructions govern the way various groups of actors view the precautionary principle or, vice versa, the way collective opinion governs the individually oriented view of social reality.

INTERNATIONAL MEDIA SENSING THE RISK

During our data collection period 2001-2003, reports on the risks of mobile phones in the media in different countries indicated that the majority of news flows concerned risk rather than non-risk. Figure 6 shows that 60 percent of the articles took the risk attitude. Although the figure was quite high, it was interesting that neutral news reports accounted for 30 percent and the category labelled non-risk attitude for 10 percent. Drawing up a cross table indicated that "Children", "Brundtland", "Electromagnetic Fields", "TETRA" and "Driving" were the topics that were characterised by risk
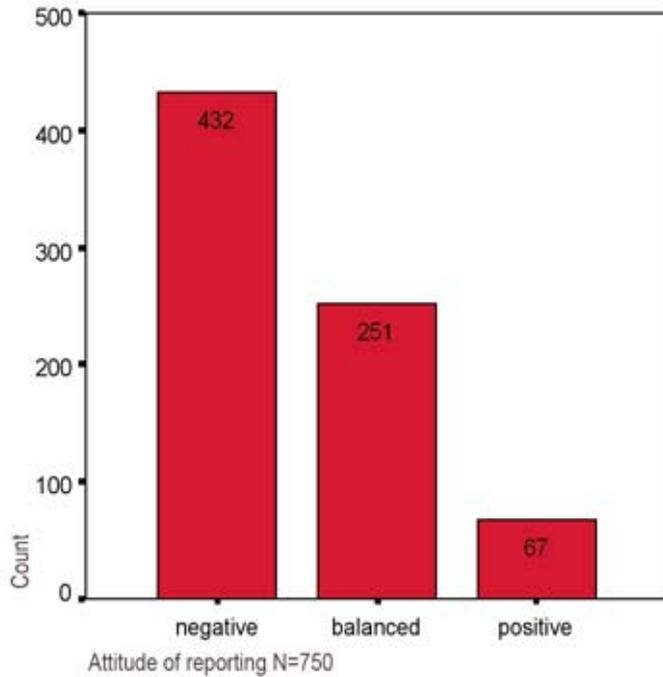
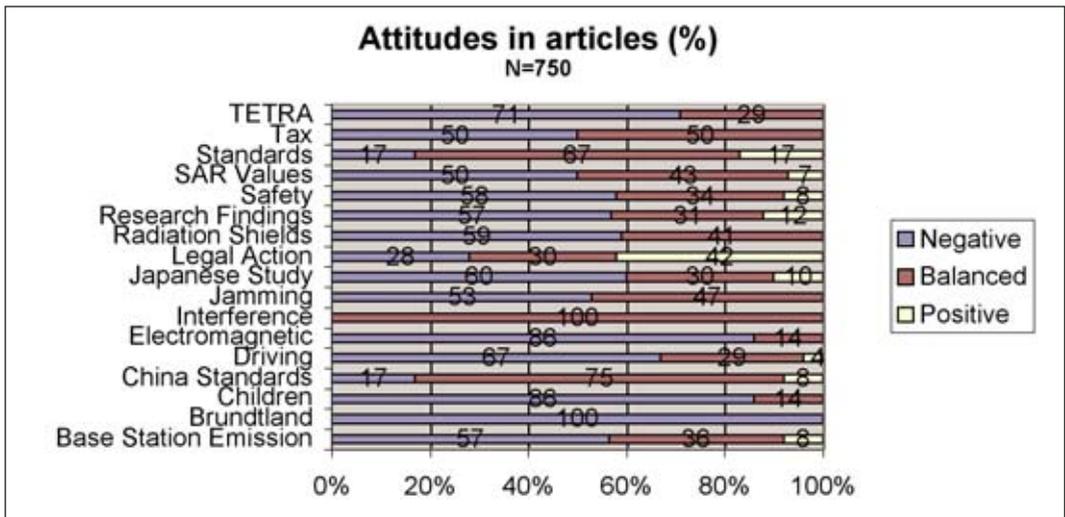**Figure 6: Attitudes in articles**

Figure 7: Attitudes in articles (%)

attitudes. The potential risk of electromagnetic radiation especially was regarded as a long-term hazard. People were also worried about the effects upon children and sick people. In contrast, the perception of risk was least connected to the themes of "Legal Action", "Standards" and "Interference" (see Figure 7).
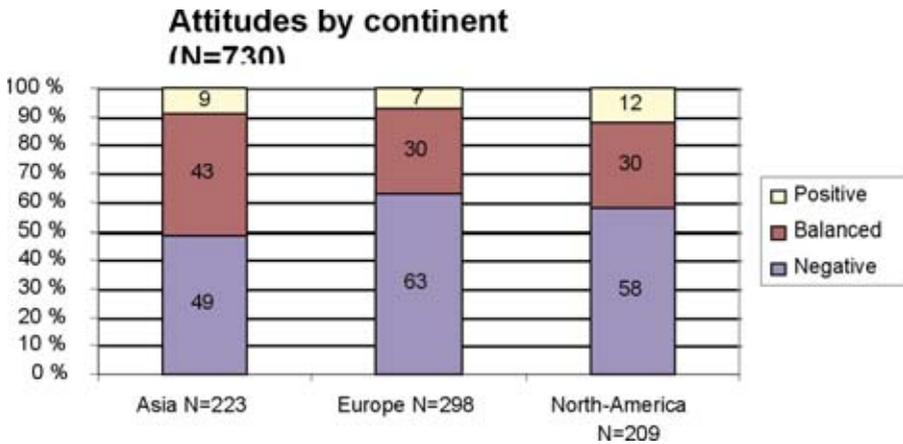
Attitudes by continent (N=730)

Figure 8: Attitudes by continent (%)

Figure 8 indicates that the attitudes across the three continents were rather similar. Most of the texts were concerned with the potential health effects of mobile phones. Only about 10 percent of the texts showed a non-risk attitude. In comparing the topics of the articles that were published on the three continents, it was apparent that the issue was reported in different locations with a different emphasis (see Figures 9-11). In Europe, the potential health risk of base station emissions was one of the most frequent topics. In Asia, social actor groups represented in the media were not worried about these questions, and in the United States, the topic was largely neglected. It is noteworthy that on all three continents, the topic "Safety" was very often discussed.

In the United States, all the groups of social actors in the clippings were anxious about the risk of traffic accidents when people talk on the phone while driving. In the European and Asian media, these worries were also detectable. Unique to the mobile phone discussion in North-America was
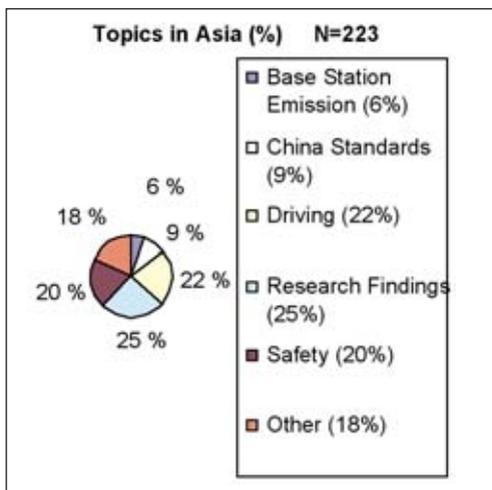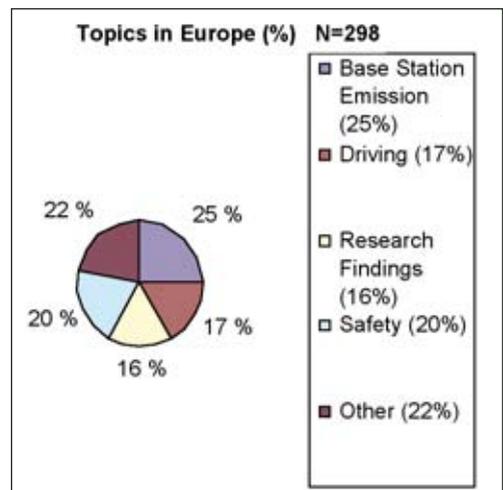
Figure 9: Topics in articles in Asia (%)

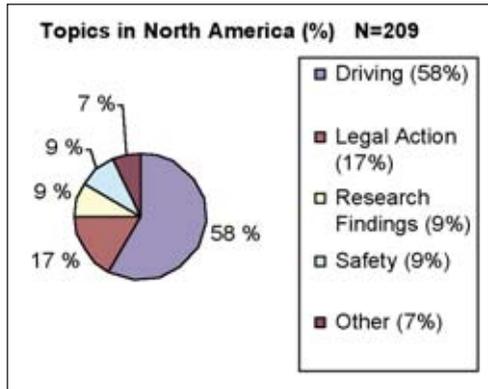Figure 10: Topics in articles in Europe (%)

Figure 11: Topics in articles in North America (%)

the number of reports under the topic "Legal Action". These articles referred to law suits where a group of activists was campaigning to link wireless telephones to cancer. These topics, which were discussed in the United States very often, can be seen as having a certain cultural quality. The status of private car traffic or, by international standards, a relatively low litigation threshold in conflicts was interpreted as a feature of a very individualistic and liberalistic society.

Altogether six groups of social actors were represented in the articles: science, the media, the authorities, lay people, the mobile phone industry and "other" (see Figure 12). Lay people and the authorities were reported as being the most worried about the potential negative health effects of mobile phones, and the representatives of the mobile phone industry were the least concerned (see Figure 12). The reports of arguments expressed by scientists included a message of uncertainty. The typical base sentence for the scientist group was:

"The long-term effects of EMR are unknown." *(Sunday Times, Australia, 94)*

An important aspect to note in the opinions of all the social actor groups was how scientific knowledge was used. Arguments rested on scientific knowledge, but the emphases of the different scientific research findings were very dissimilar. Reporting on the safety of mobile phones was at
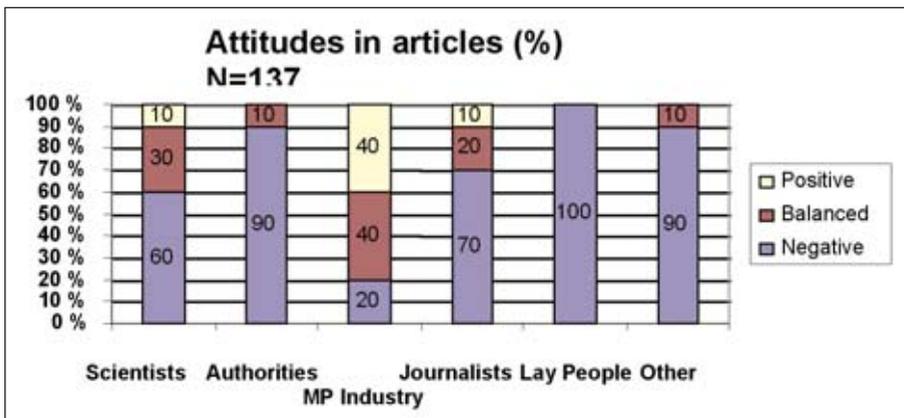

Figure 12: Attitudes in articles by actor group (%)

least conflicting. Evidence was submitted on the one hand that there was a real risk in using cell phones and, on the other hand, that there was no risk at all. The following extracts from media reports illustrate the importance of scientific authorities and institutions in risk communication. In both cases reference is made to the scholars and their institutional background. The samples do not refer to exactly the same issue, but they can be regarded as an illustration of how reporting on the health risks of mobile phones varied from one case to another.

> "Radiation from mobile telephones poses no risk of cancer or genetic damage. This is the opinion of four researchers and experts on radiation risks at the Karolinska Institute and Stockholm University." *(Dagens Nyheter, Sweden, 380)*

> "Research by Dr Alan Preece at Bristol University has supported the claims of those who believe mobile phone radiation is not safe." *(Daily Mail, United Kingdom, 496)*

It was also quite characteristic of the articles – especially the scientific ones – to leave the choice of interpretation ultimately to the reader. For example, the results of the studies by Kjell Mild and Lennart Hardell in March 2003 were reported under the title "Mobile phones do cause brain cancer". Then, it was mentioned that recent research by the National Radiological Protection Board (NRPB) suggested there was no significant link between the use of mobile phones and cancer. At the very end of the article, stress was laid on the statement that "Mobiles are at their most dangerous when you're driving – you are four times more likely to crash."

National authorities stressed in our media data that there should be some system of governmental control over the use of mobile phones. Lay people were reported as expecting more information from the authorities and governments, especially in the case of children. The representatives of the mobile phone industry sought to assure the public that they have faith in the information of scientific research findings and that they are willing to listen to governmental advice and accept control if needed. In contrast, the media as actors stressed the decision-making and responsibility of individuals themselves. In the arguments of the media, no attention was paid to the precautionary principle.

At the beginning of the study it was hypothesized that the representatives of lay people and consumer organisations in news cuttings would strongly maintain the precautionary principle. The following excerpt from the data reveals the prevailing sense of uncertainty, doubt and scepticism, which we call the search for epistemological security. Without solid grounds for epistemological security, the actors were forced to adopt the precautionary principle as the best available approach from the standpoint of public health.

> "But the WHO identified 'gaps in knowledge' and called for more research to assess health risks caused by mobile phones. Until the many current research projects are completed, the advice from organisations including the WHO and the Department of Health is to take a precautionary approach if possible whenever using the phones. The WHO recommends that if people are concerned, they might choose to limit the length of calls they and their children make, or perhaps use hands-free devices to keep the phones away from the head and body."
> *(Belfast News Letter, Ireland, 283)*

Contrary to our hypothesis, the analysis indicated that the precautionary approach was most often used in the risk communication of the national authorities and the representatives of science and the mobile phone industry. Although the aim of this type of risk communication is to convince consumers and lay people of the safety of mobile phones, it is also possible to interpret the message in another way. People may become anxious, and they may believe that the calls for new studies

and continually ongoing scientific endeavours are a signal of real health risks. The following base sentences, which figured most often in the opinions of scientists (first citation) and the mobile phone sector (four other citations), may also be interpreted from the perspective of epistemological uncertainty and risk.

"Despite insisting there was **no proven link** between cell phones and health problems…" *(The Express, United Kingdom, 498)*

"Mobile telephone communication companies are concerned about the risk of mobile phones." *(ABC, Australia, 92)*

"The Mobile Phone Service Providers said they will launch the joint study so as to confirm the safety of mobile phones. The study will be made amid widespread concerns that radiation emitted by mobile phones can cause brain tumours or other cancers." *(Kyodo News, Japan, 294)*

"The industry is committed to addressing community concerns responsibly." *(Dandenong Examiner, Australia, 91)*

"If the government lays down safety guidelines, companies will follow them." *(The Times of India, India, 266)*

CONCLUSIONS

Even if the bio-medical and natural sciences indicated that increased health risks were related to mobile phones, it is still very improbable that the use of mobile phones would dramatically decrease (Burgess, 2004). People are so accustomed to their phones – and pleased with mobile phone services – that they take them for granted in most western societies. According to Slovic (2000), the perception of risk has a strong connection with the familiarity of the phenomenon: the more familiar and well-known a phenomenon, the more acceptable the potential risks. Moreover, when the potential cause of risk can be seen as a normal part of everyday life, it is very rarely perceived as hazardous. This was also shown in our previous analysis of the importance of the mobile phone for its users. According to Tanninen (2003), the "heavy users" of mobile phones did not perceive their use as risk, while those who considered the mobile phone less important in their everyday life reported the greatest fears. When the data (N = 1338) of this preceding project was analysed from the viewpoint of activity and concern, it was discovered, for instance, that a group of people existed who were active mobile phone users but also expressed concerns. According to Välikangas (2003), women especially reported that mobile phones increased their sense of security, but were nevertheless more anxious about the use of the new technology and more eager to obtain new information about the potential health risks of mobile phones than were men. We concluded, therefore, that despite their familiarity with the everyday use of mobile phones, people nevertheless express worries, perceive potential hazards and reflect on new scientific findings and governmental directives relayed by the media.

The media study revealed that the majority of the articles on the risks of mobile phones were written from a worried or concerned perspective (60%). A small number of articles took a neutral stance (30%) and a small proportion adopted a moderate or rigorous non-risk stand point (10 %). The scientific information on the potential health risks related to mobile phones was very conflicting. The news stories showed contradictory and inconsistent evidence, and even results from the very same studies were reported with varying emphases. An interesting finding was the effect of the socio-cultural context of risk reporting. Whereas the European media concentrated on the potential health risks of base station emissions (25 % of articles), the American media covered a great variety of issues such as the risk of using mobile phones in traffic (58 %) and law suits

focusing on the relationship between the use of mobile phones and the appearance of cancer (17 %), and the Asian media was more interested in findings of scientific research (25 %). In addition to the reporting context, we have to take into account the time of reporting. In our case, the data covered one and a half years, from December 2001 to July 2003. Presumably during that time societal and political processing of mobile phone risks in different countries influenced the issues that the media reported and in which journalists were interested. For instance, in Finland since November 2001, new regulations have made it an offence to use a handheld phone or similar device when driving a vehicle. Before the law was passed, the public debate over the issue took place in the national media.

On the basis of the results, a few further questions could be asked: What mechanisms affect information processes in the media? According to Burgess (2004), the public debate over the potential health risks of mobile phones is characterized first by the existence of a small marginal group of people who express anxiety about such risks. In the next phase, the risk enters the public agenda with the help of the media and the national authorities. Our data both verifies and disproves this hypothesis. If risk is conceptualised as a genuine sense of danger (c.f. Kuustonen, 2001), one may conclude that the fear of health risks associated with the mobile phone really concerns only a marginal group. Alternatively, if one looks at the concerns expressed by people in Tanninen's (2003) survey, then the idea of marginality has to be discarded, as 22 percent of the respondents were worried about the health risks of mobile phones and approximately 50 percent were unsure about the effects, including people who were very active users of mobile phones. We are not able to trace the origin of these worries, but in our data the actors whose views were given space in the media were, first of all, scientists, followed by three other quite equally represented groups, i.e. the authorities, the mobile phone industry and journalists. Less room was given to the opinion of lay people and representatives of non-governmental organisations; the publicity was dominated by the representatives of influential institutions. An interesting finding was the eagerness of journalists to express their own views. It was quite high compared, for example, to lay people, who played a marginal role in the public debate over the risks of mobile phones. The analysis of the media data also revealed that the scientific knowledge possessed by the authorities seemed to be inconclusive and vague. On the basis of the analysis, we assume that the role of any one group of actors exists in relation to that of the other actors and, it is important to note, also to the rather powerful institutions in the field. Future research on amplifying and understating the risks should be based on the opinions of the more institutional actors, such as scientists, the authorities, representatives of industry and journalists, who express their views in multiple contexts and whose activities are multidirectional in the context of epistemological uncertainty and globally generalised risk sensitivity.

ACKNOWLEGDEMENTS

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