LEXNET
Low EMF Exposure Future Networks

D 2.5 Risk and exposure perception I & II

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Content

1 RISK AND EXPOSURE PERCEPTION I - REANALYSIS

Executive Summary

Aim

- Analysis of the daily use of RF EMF emitting devices
- Analyze the cognitive link between risk perception and exposure perception of radio frequency electromagnetic fields

Method

- Online survey in 8 European countries, conducted April 13 - February 2014 using the tool Survey Monkey.
- Sample size: 3097 interviewees.

Results

- According to the responses of the interviewees, the dominant RF EMF exposure source in their daily life is the WLAN-connected laptop. Most of them use the Internet on a daily basis.
- Approximately 84% of the respondents use mobile phones in direct contact with their ears, i.e. without headsets. Nearly one quarter of the respondents reported a usage time of 10 to 30 minutes per day. Only 6% use their mobile phones more than 60 minutes per day.
- There is no valid relationship between the use of exposure reduction measures and EMF risk perception.
- Base stations for mobile telephony are seen as the most intensive RF EMF exposure source.
- Base stations on a school roof are seen as a higher risk than all other RF EMF sources.
- People have quite appropriate subjective exposure impact knowledge about exposure characteristics.
- Regression analysis shows: the intuitive knowledge about the relevance of the distance to the exposure source is not a significant predictor of general EMF risk perceptions.

Conclusions

- Risk communication should emphasize that the distance to the EMF-emitting source is a critical parameter in risk assessment.
- Risk communication should help to make the public aware that near-field exposure is usually more important than far-field exposure.
- High amount of unexplained variance in the regression models testing the link between risk and exposure perception raise doubt whether the knowledge about exposure characteristics plays a crucial role in EMF risk perception.

Objectives of the survey

The LEXNET survey "Exposure and Risk Perception" aimed at a comprehensive analysis of the public's view regarding RF EMF exposure (based on our sample) by focusing on four key topics:

- RF EMF exposure situation of the respondents
- Subjective beliefs about parameters influencing the strength of exposure
- Subjective exposure impact knowledge about the relationship between EMF exposure conditions and magnitude of risks
- Social and personal determinants of RF EMF risk perception

The exposure situation should be explored in relation to the various exposure sources to which our interviewees are exposed and the duration of exposure for these exposure sources. Concerning the intuitive RF EMF exposure assessment, the focus is on the perceived exposure strength regarding different RF EMF emitting devices, including both near-field and far-field exposure. The part of subjective exposure impact knowledge concerns mainly the respondents' judgments about the relevance of various exposure characteristics for EMF health risk potentials. Regarding the EMF risk perception two topics are relevant: First the differential risk perceptions with respect to various EMF sources, and second, how people link exposure characteristics to their risk perception.

Method

Sample size and involved countries

The LEXNET survey was conducted from April 2013 to February 2014, using the "Survey Monkey" online tool. Data were gathered in eight countries by LEXNET members (Germany sample n= 652, French sample n= 200, Spanish sample n= 298, Portuguese sample n= 838, Romanian sample n= 83, Serbian sample n= 800, Montenegrin sample n=199 and Belgian sample n= 27), with most respondents being citizens of the country in which the survey was conducted. A total of 4388 interviewees participated. After quality control and reducing Serbia to 800, to avoid overrepresentation, 3097 of the conducted interviews remained for analysis.

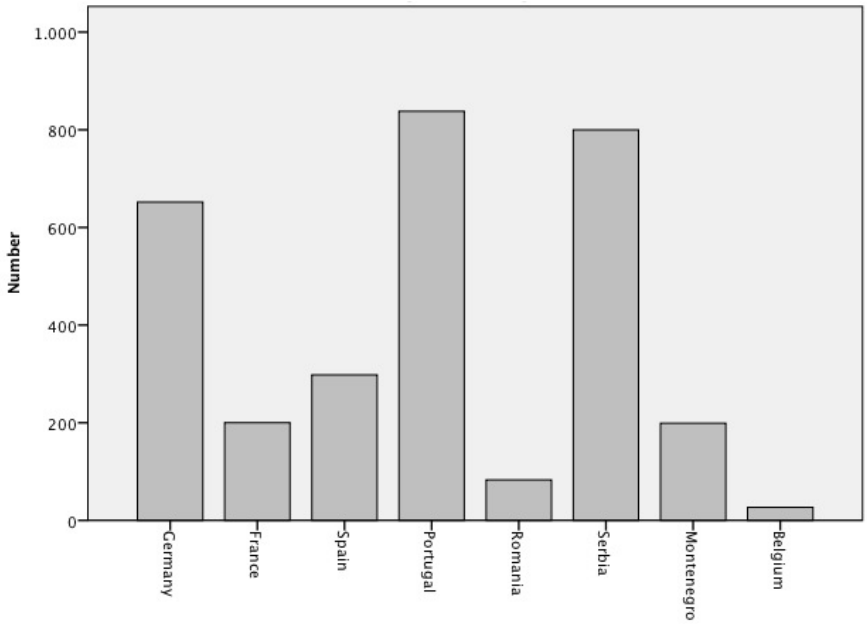

Figure 1: Sample size of the LEXNET survey by country

For the analysis we describe the different parts of Europe as follows: Middle and Western Europe (Germany, France, Belgium; n= 879), Southern Europe (Spain, Portugal; n=1136) and South Eastern Europe (Romania, Serbia, Montenegro; n= 1082).

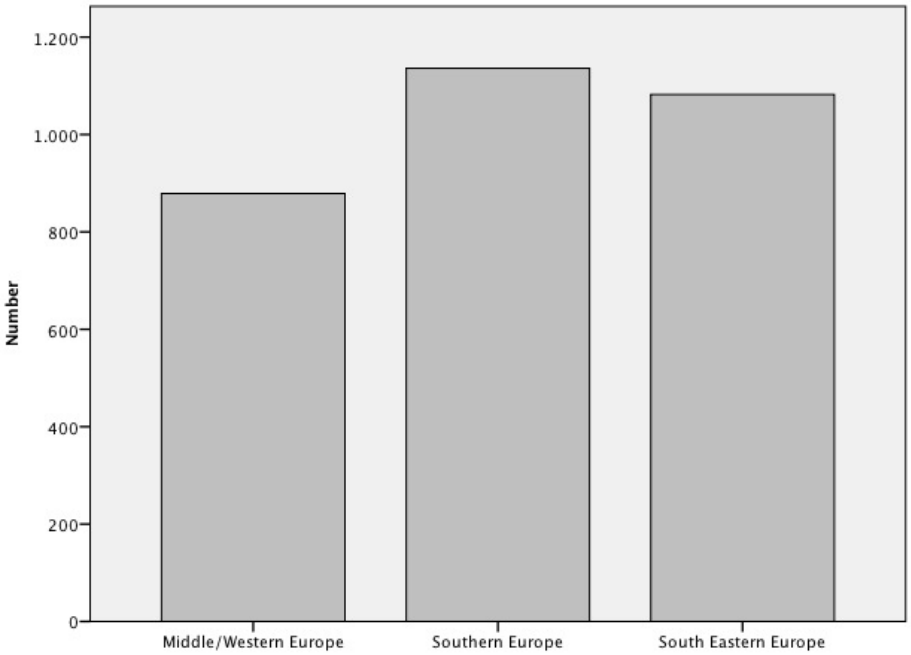

Figure 2: Sample size of the LEXNET survey by parts of Europe

Demographics

The mean age of the participants was 33.7 years, with 60% male and 40% female. The majority of the respondents are well educated, with a mean of 16.7 of education years. Most of them consider themselves as middle classed people (mean 5.32 on a 10 point scale from bottom to top of society). Regarding the respondents' working situation in the last 7 days, the largest group (56.9% of the respondents) are in paid work (employees, self-employed, working for your family business) and 28.9% are in education. Regarding the area in which the respondents are living more than 60% state that they are residents in a big city or in the suburbs, 27.4% say they live in a town or a small city, 8.2% in a country village, and 1.7% on a farm or home in the countryside. The attitude towards technical innovation shows a normal distribution (the respondents were asked to compare themselves with two fictitious characters - Hans and Clara - who "are open to using new technical innovations at home, at work and in their spare time. They have to try everything new."). About 13%, of the respondents consider themselves not at all similar, about 25%, as not really similar, approximately 27 % as neither similar nor dissimilar, nearly 23% as somewhat similar, and about 12% as very similar.

Implementation of the survey

We used an online survey tool called "Survey Monkey". Some of our demographic, political, and belief related questions came from the survey platform called "European Social Survey" (ESS)[1]. The survey consisted of 28 main questions (see appendix 2). The respondents weren't forced to answer all questions. However, they had to confirm their answer with a click on the "Next" button, afterwards there was no chance to change the given answer.

Surveys questions were translated into the languages of the participating countries. Each translation was re-translated into English and checked for consistency with the original English version of the questionnaire.

The sampling was conducted by advertising the survey on websites, by e-mails, and by mouth-to-mouth marketing.

Study limitations

Although our sample is not an exact mirrored image of the whole population[2] we can provide insights into issues of risk perception.

Web surveys are seen as a good alternative to conventional telephone and face-to face interviews when the target group for the survey can be reached (Fricker et al. 2005). For the intuitive exposure assessment and risk perception we are interested in mental models of people who have an opinion on the modern telecommunication systems and have the possibility to use them. In other words, we focus on a segment of the society

[1] http://www.europeansocialsurvey.org/
[2] Our sample has a younger mean age, higher percentage of students, and higher education level compared to the average in the population. See demographics in the appendix.

that dominates the public discussion on potential EMF related health risks.

Nevertheless, it should be taken into account that our survey can not be seen as representative study that delivers insight how the general public in the various countries perceives EMF exposure and related EMF risks. Especially, comparisons across countries are not appropriate. However, our approach can be used to test a model about how exposure perception is connected with risk perception.

Furthermore, our large sample stemming from 8 countries across Europe can be used as a validity check for our model. We are able to test the relationship between intuitive risk and exposure perception independently in subsamples. For that purpose, we clustered the countries to the aforementioned groups (Middle and Western Europe, Southern Europe and South Eastern Europe).

Results

The following section reports the results of our survey. The first section shows data on the exposure situation. We report which EMF-emitting devices are used and how long in minutes per day. The basis is the self-evaluation of our respondents. The second part is on intuitive exposure assessment, meaning the respondents' beliefs about the magnitude of EMF exposure from various EMF sources. Examples of this are making calls with a mobile phone, or using a laptop with WLAN connection. In the third part, we report the risk perception findings. The last part consists of a detailed analysis of factors that influence EMF risk perceptions.

Usage of RF devices and exposure situation

People are exposed to a variety of RF EMF sources. Therefore, it made sense to collect data on the daily RF EMF exposure of the respondents. First, we asked how often the Internet is used at home or at work. Figure 3 presents the answers to this question.

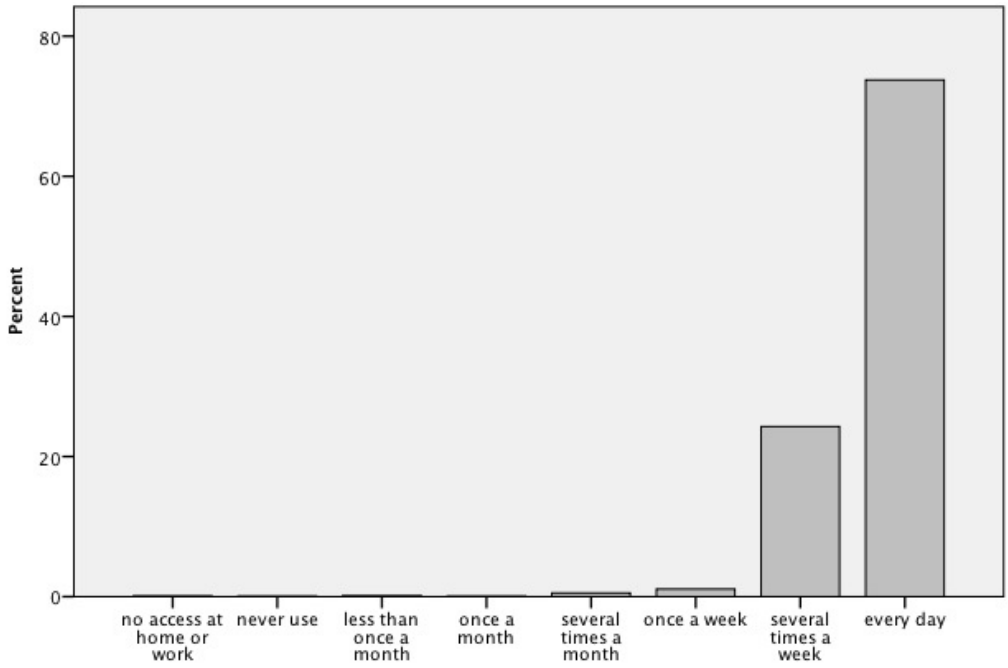

Figure 3: Frequency of internet- and email-usage – total sample - valid responses=2880 (Question: *"How often do you use the World Wide Web or e-mail whether at home or at work for your personal use?")*

Figure 3 indicates that the majority of our respondents are using the Internet on a daily basis. The most common answer was "using the Internet several times a week", with 98.1% of respondents doing so (24.3 % several times a week and 73.8 % every day). Note that 71% of the respondents have WLAN at home, and 73.5% at their workplace.

Across countries, some differences are evident. Based on the modal value[3], the Middle and Western Europeans use the Internet somewhat less frequently (modal value=7, "several times a week") compared with respondents from other two parts of Europe where respondents used the category "every day" (modal value=8) most often in order to characterize the frequency of their Internet use.

Next, we inquired about the time people spent using RF EMF-emitting devices.
As previously mentioned, people received a list of EMF sources. For each source, they indicated how often they used it per day. We asked the respondents to use the last day as a reference point. They indicated how many minutes they used their mobile phone for calling, but also for other uses, such as text messaging and Internet browsing. In addition, we asked about the use of other EMF-emitting devices, such as whether and how often they used a laptop or a camera with WLAN connection.

Table 1 gives an overview on the use of mobile phones for making calls without head-sets.

[3] The modal value is the value that appears most often in a set of data.

Table 1: Usage of mobile phones without headsets, (Question*: "For how many minutes did you use a mobile phone for calls (received, outgoing, voicemail) on your ear yesterday?"*). Scale from 1="no" use to 6="more than 60min".

		Number	Valid percent
Valid	no use	492	16,1
	up to 5min	693	22,6
	more than 5min up to 10min	640	20,9
	more than 10min up to 30 min	741	24,2
	more than 30min up to 60min	310	10,1
	more than 60min	185	6,0
	Total	3061	100,0
Missing		36	
Total		3097	

In our total sample, approximately 84% of the respondents use mobile phones in direct contact with their ears. Nearly one quarter reported a usage time of 10 to 30 minutes per day. Furthermore, only 6% use their mobile phones more often than 60 minutes per day. In terms of the classification system of the Interphone study[4], approximately 16% of our respondents can be considered heavy users, i.e. they use their phones for 30 minutes per day or longer.

Next, we compare the daily usage of various RF-EMF devices. Figure 4 shows average use of RF EMF-emitting devices in minutes per day. We can remark that the most often used device per day is the Laptop with WIFI connection. On average, our respondents used a Laptop with WIFI about 10 to 30 minutes per day. In terms of the frequency of use, making of phone calls and using the phone for text messages reached about 5 to 10 minutes per day. Respondents spend approximately 5 minutes per day using applications on their mobile phones. All other exposure situations are generally not important according to the self-evaluation of our respondents.

[4] See http://www.iarc.fr/en/media-centre/pr/2010/pdfs/pr200_E.pdf

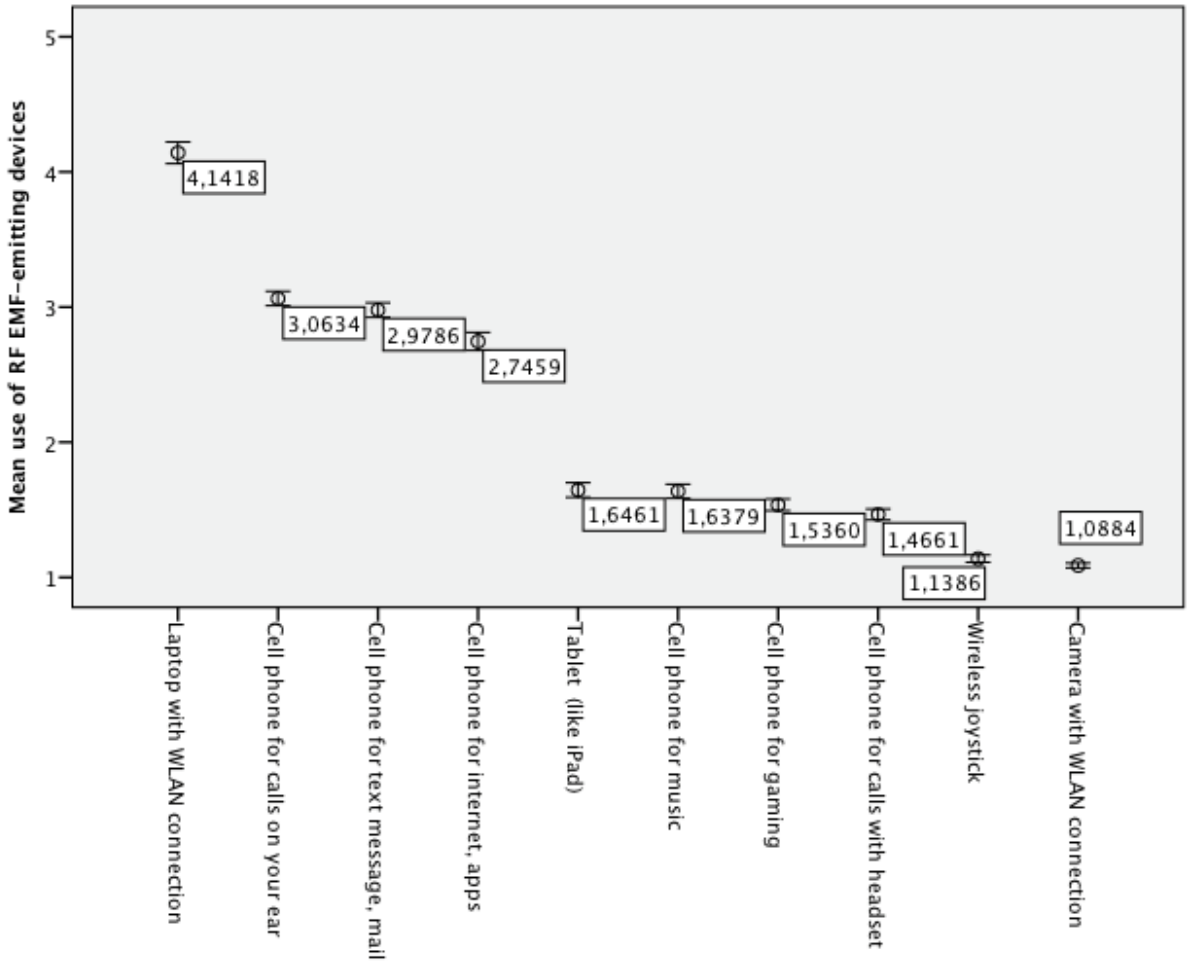

Figure 4: Mean use of RF EMF-emitting devices in minutes (min) per day with error bars (*Question: "For how many minutes did you use the following devices yesterday?"*). Legend: 1= no use, 2= up to 5 min, 3= more than 5 min up to 10 min, 4= more than 10 min up to 30 min, 5= more than 30 min up to 60 min, 6= more than 60 min.

A comparison across countries reveals some interesting details about the mobile phone use (see Figure 5). Taking the median as indicator, the figure shows that the Middle and Western European respondents use their mobile phones less often for making or receiving calls as compared to Southern Europe (median 3) and South Eastern Europe (median 4). With respect to the frequency of use of both Internet applications on the mobile phone and of laptop with WLAN connection, there are only differences between the respondents from Middle and Western Europe and the two other groups.

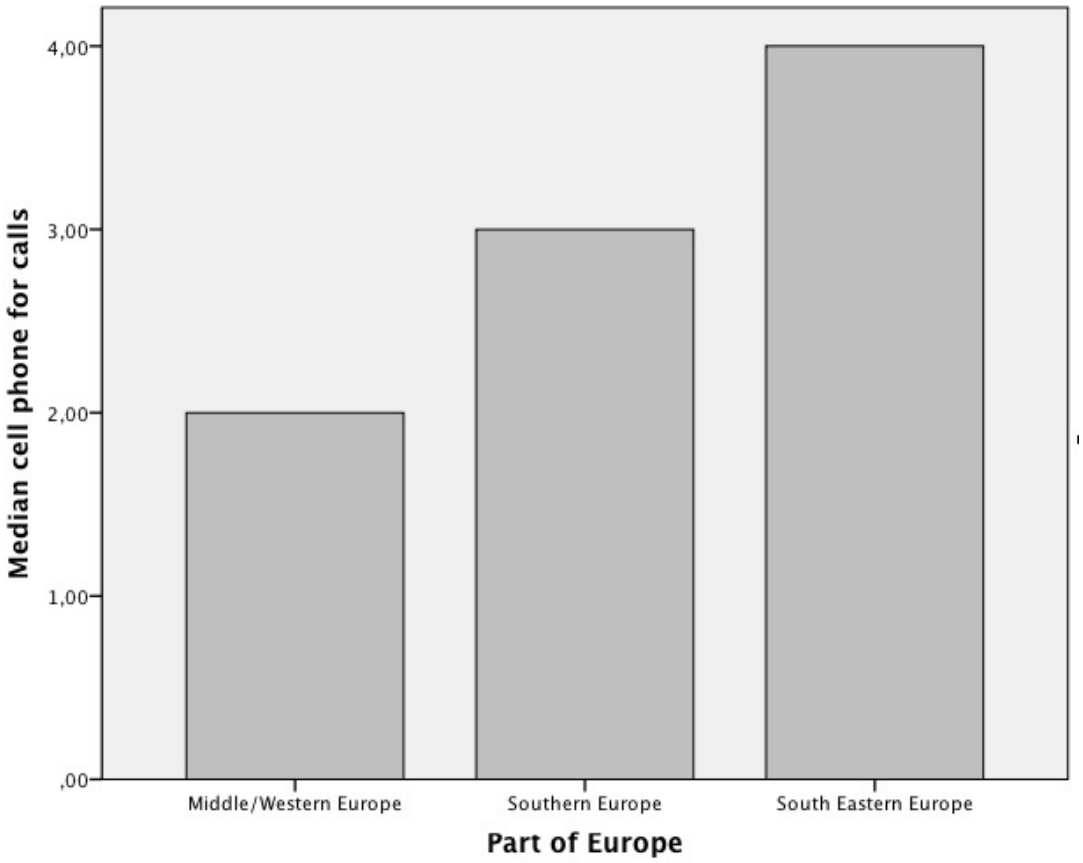

Figure 3: Median of use frequency of mobile phones for making/receiving calls by part of Europe, valid responses=3061. Legend: 1=no use, 2=up to 5min, 3=more than 5min up to 10min, 4=more than 10min up to 30 min, 5=more than 30min up to 60min, 6=more than 60min.

Intuitive exposure assessment

This section analyzes how people evaluate RF EMF exposure situations. Here, we uncover how the respondents perceive the exposure strength of different EMF-emitting devices. Especially interesting is how people evaluate the strength of far-field, in comparison with near-field exposure.

Figure 6 indicates that base stations are seen as the most intensive EMF exposure source. For mobile communication masts, the mean perceived exposure strength (measured on a 5-point-scale) is 3.89; for microwave ovens the mean is 3.34; and for mobile phones the mean is 3.27.

Despite the fact that emissions from mobile phones at the head of people are much stronger, these findings point to subjective dominance of the far-field exposures of mobile communication masts.

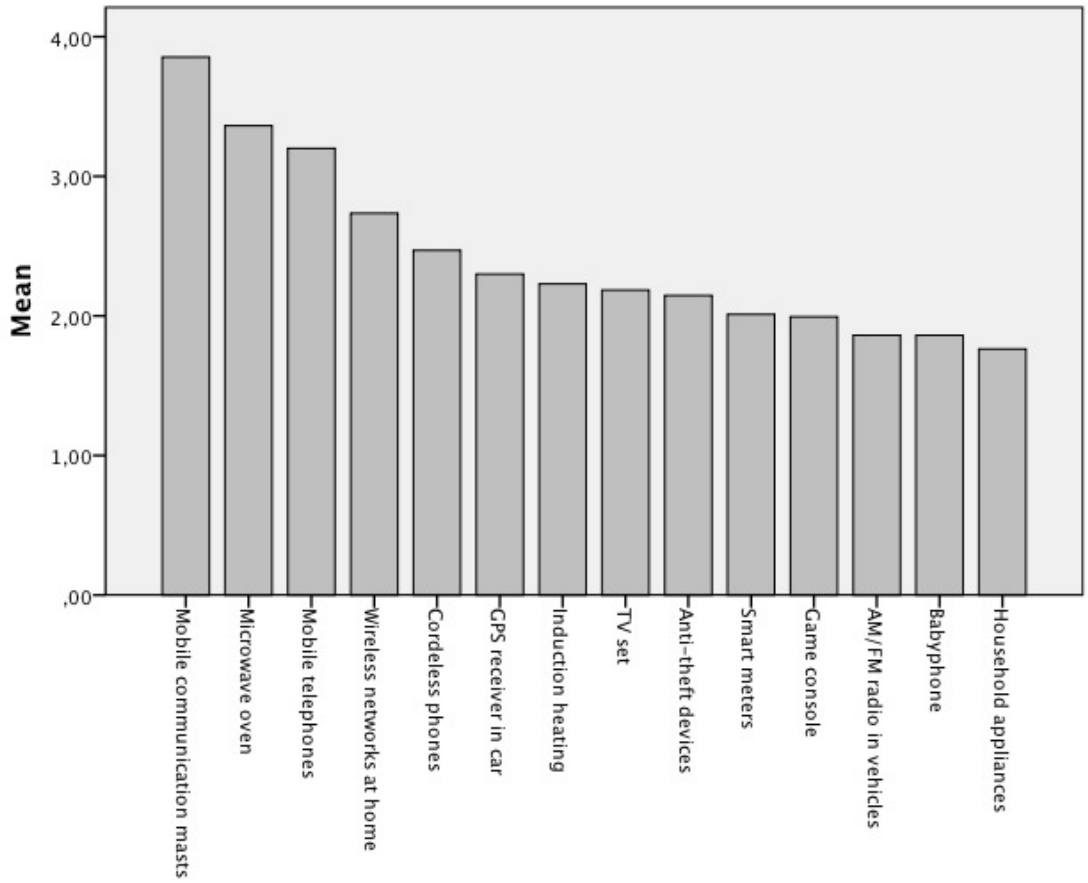

Figure 4: Perceived strength of EMFs by device- total sample (Question: "*In your opinion, how strong are electromagnetic fields from the following devices or technical systems?*"). Measured on a 5-point-Likert scale (1= very low intensity, 5 = very high intensity).

Risk perception

The first question considered the risk perception with regard to EMF exposure from mobile phones. The respondents were asked how concerned they are about the potential health risks of electromagnetic fields from using mobile phones. The results show that within the total sample, about 62% of respondents are not at all or not very concerned.

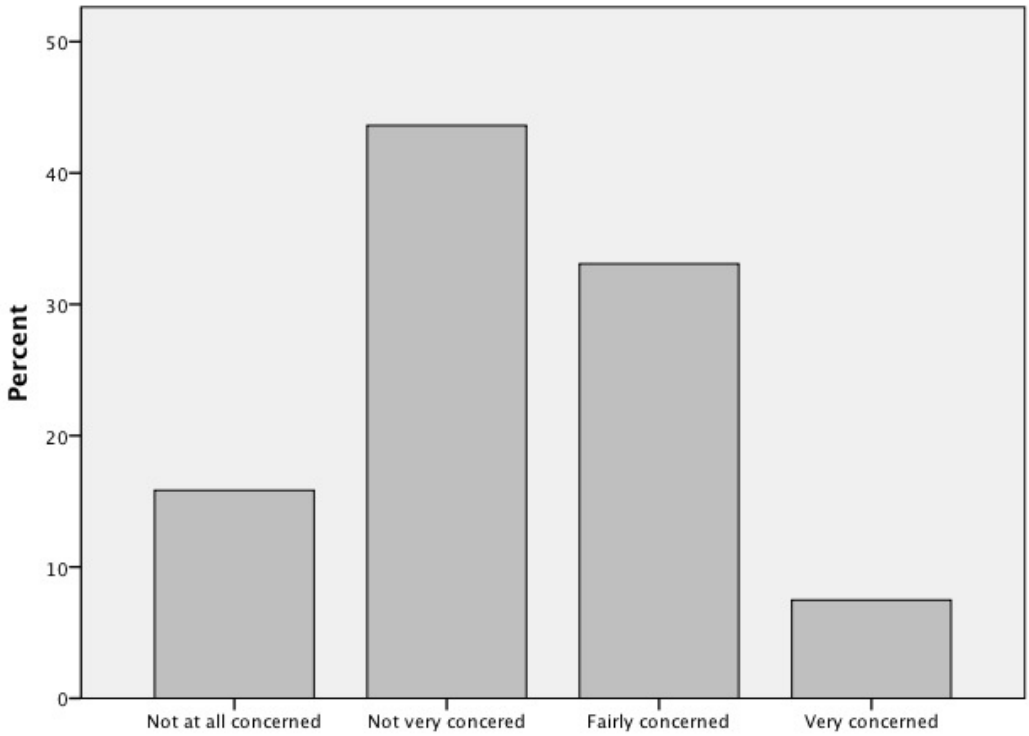

Figure 5: Risk perception for mobile phones- total sample, valid responses=3090 (Question: "How concerned are you about the potential health risks of electromagnetic fields from mobile phones?"), on a 4-point-Likert scale (1= not at all concerned, 4 = very concerned).

On one hand, this indicates that the majority of the respondents does not view EMF risks as a very strong potential health risk. On the other hand, it documents that EMF concerns are still existent and have to be taken into account by risk managers and policy makers.

Regarding radiation protection measures, 37.5 % of the respondents reported, that they are taking radiation protection measures. But the use of any reduction measure has no impact on risk perception of EMF exposure by mobile phones. The means of people who use or do not use EMF reduction measures are nearly identical. The difference between these means is approximately 0.07.

Figure 8 shows the average risk perception for mobile phones in the different parts of Europe. Note that the mobile phone-related risk perception is measured on a 4-point Likert scale (1= not at all concerned, 4= very concerned). It shows that risk perception is higher in the South and South Eastern parts of Europe (mean 2.43 each compared to 2.05 in Middle and Western Europe).

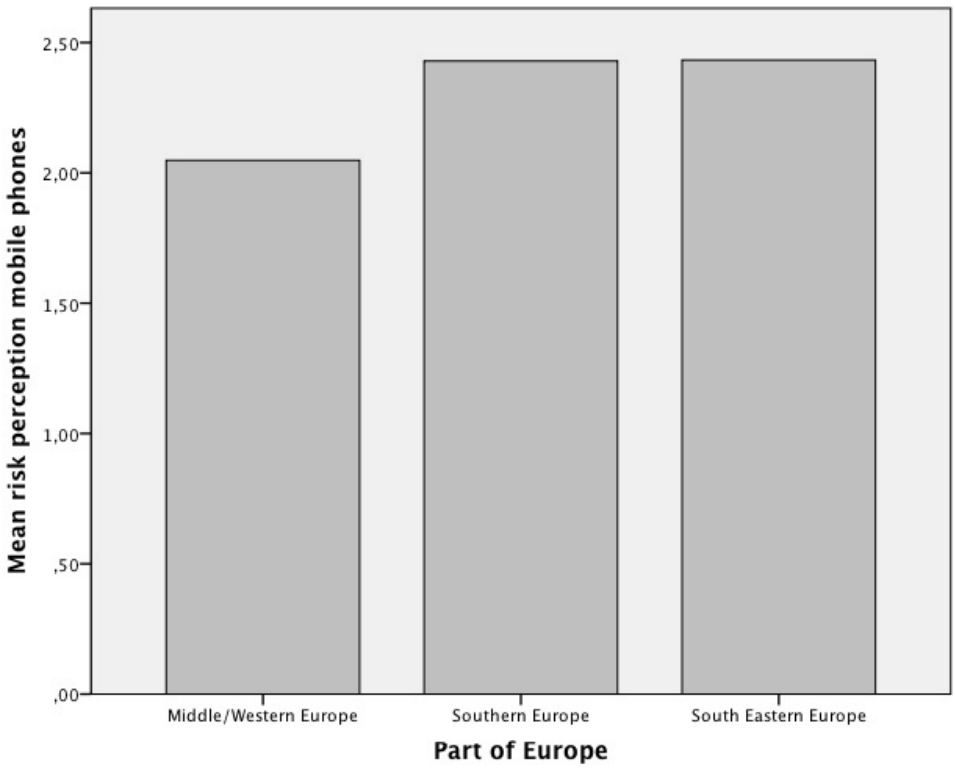

Figure 6: Mean risk perception for mobile phones by Europe, total sample, valid responses: 3090, Question: "How concerned are you about the potential health risks of electromagnetic fields from mobile phones?", measured on a 4-point Likert scale. Legend: 1= Not at all concerned, 2= Not very concerned, 3=Fairly concerned, 4=Very concerned.

Furthermore, if we consider only the percentage of respondents who are *fairly or very concerned* about the potential health risk of EMF from mobile phones, differences between countries appear to be even more important (see Figure 9). The respondents from Middle and Western Europe are less concerned, only 22.8 % are concerned compared with 46.9% in Southern Europe and 48.4 % in South Eastern Europe

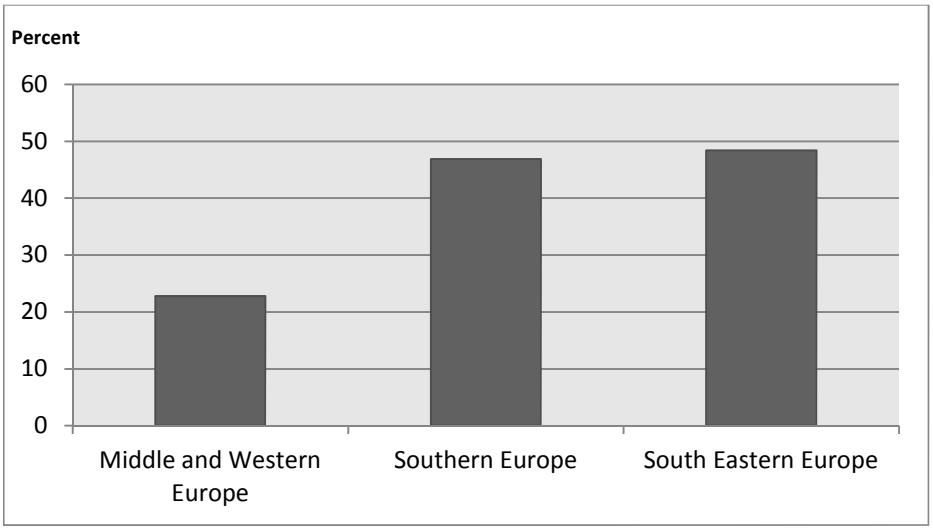

Figure 7: Percentage of people, by part of Europe, who are *fairly* or *very concerned* about the potential health risk of EMF from mobile phones (scale point 3 and 4 on a 4-point Likert scale), n=1253.

In addition, we analyzed the risk perception for various other exposure sources, such as mobile communication mast on school roofs, being exposed by another person's mobile phone use, being exposed by WLAN router in distant and in a close position, making mobile phone calls, surfing with a mobile phone, using laptop on the lap, connecting a laptop with the internet via smartphone, and watching television. Risk perception was measured on a 5-point Likert scale (1= not dangerous, 5= very dangerous).

Figure 10 shows that a base station on a school roof is perceived as the biggest risk, followed by making mobile phone calls. The mean risk perception score for base station is 3.35. Using mobile phones for calls is perceived as less dangerous, reaching a mean of 2.93 on the 5-point Likert scale. A somewhat lower score characterizes the laptop usage on the lap. Here, the mean risk perception is 2.81. The perceived health risks from all other sources are lower.

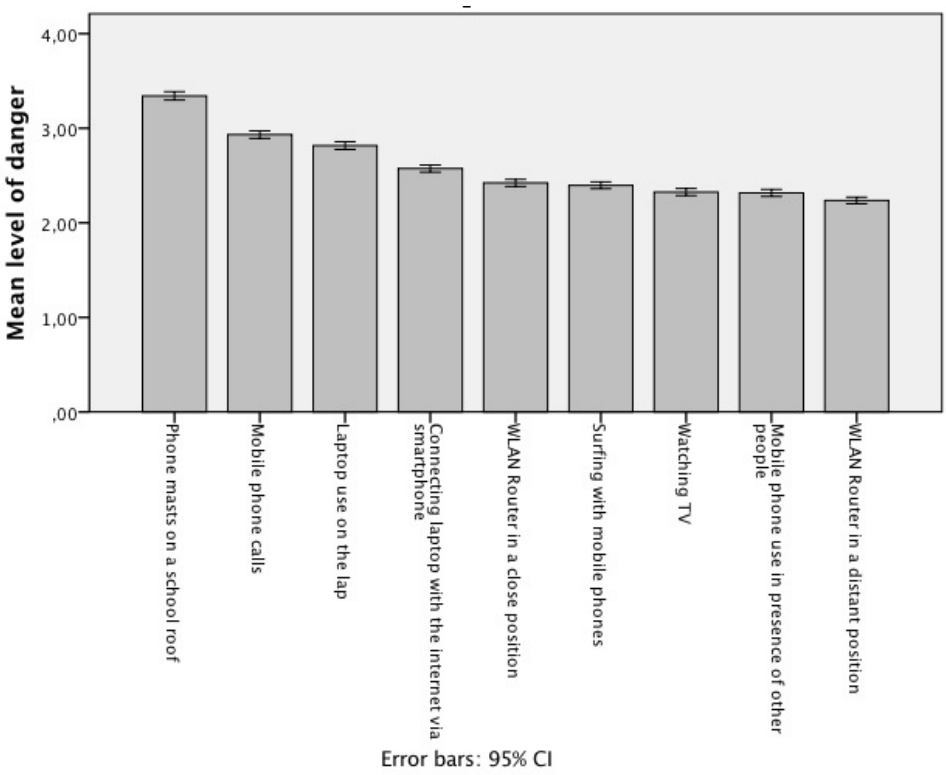

Figure 8: Mean risk perception of various EMF sources with error bars, measured on a 5-point Likert scale: 1=not dangerous, 2=not really dangerous, 3=either nor, 4=rather dangerous, 5=very dangerous (Question: *"How dangerous are the following situations to health?").*

A hierarchical cluster analysis reveals some interesting details (see Figure 11). This procedure is looking for similarities among the perceived riskiness of the various exposure sources. It demonstrates that the base station antenna on a school roof (Q15) is seen as a unique exposure situation. Similarly, watching television (Q16) is also viewed as a special exposure situation. A relatively homogeneous cluster is formed by "Surfing with mobile phones" (Q07), "Connecting laptop with the internet via smartphone" (Q12), WLAN Router in a close position (Q09), and WLAN Router in a distant position (Q10). Mobile phone calls (Q08) and laptop use on the lap (Q13) are rather different, evaluated in relation to both mobile communication masts and WLAN routers.

Thus, it seems that EMF health risk perceptions differ in relation to proximity of the source. The far-field source is seen as a unique and particularly dangerous exposure source.

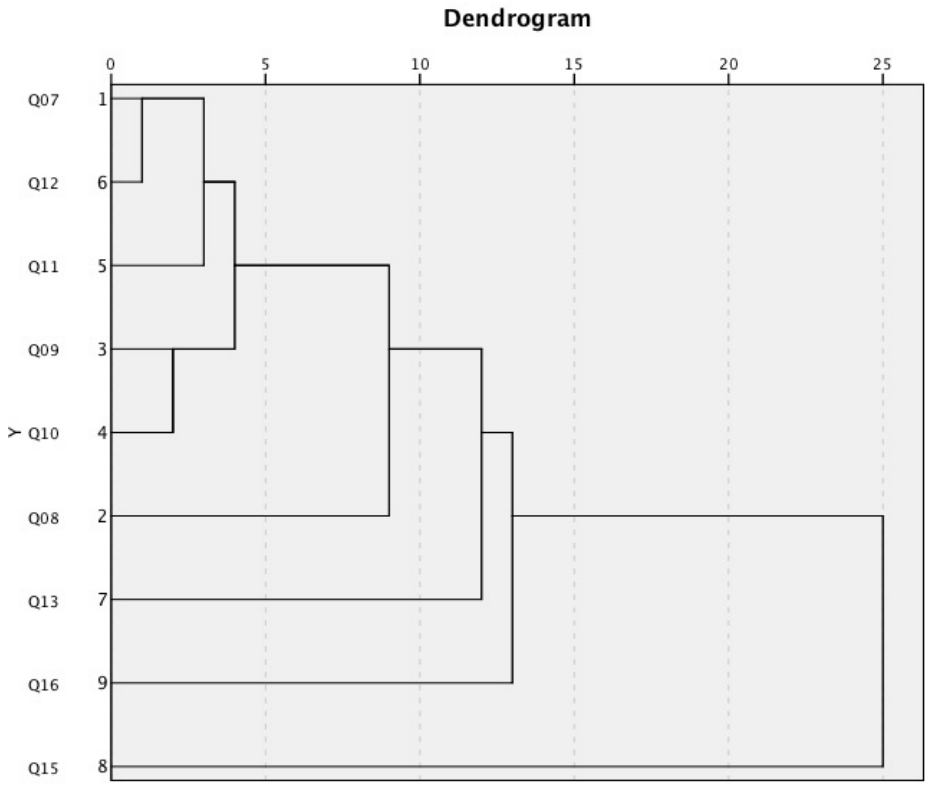

Figure 9: Hierarchical cluster analysis of the perceived risks of various exposure situations.

Subjective exposure impact knowledge

In the view of the respondents, not all exposure characteristics are important when they consider potential EMF heath risks. Their subjective exposure impact knowledge reveals some peculiar findings (see Figure 12).

The results show that the following respondents' judgments about the relevance of various exposure characteristics for EMF health risk potentials: (1) the strength of exposure (mean=4.47), (2) how long you are exposed (mean=4.47), (3) the distance (mean=4.38), (4) the frequency of exposure (mean= 4.28), and (5) the number of exposure sources (mean = 4.05). They are the most relevant criteria. The physical size of the exposure source as well as the time of the day of exposure, are less relevant. These findings point to a fairly adequate subjective impact model. However, as shown below, there are some biases in our respondents´ assessment when we examine the correlations between risk perception and exposure factors in a stringent way.

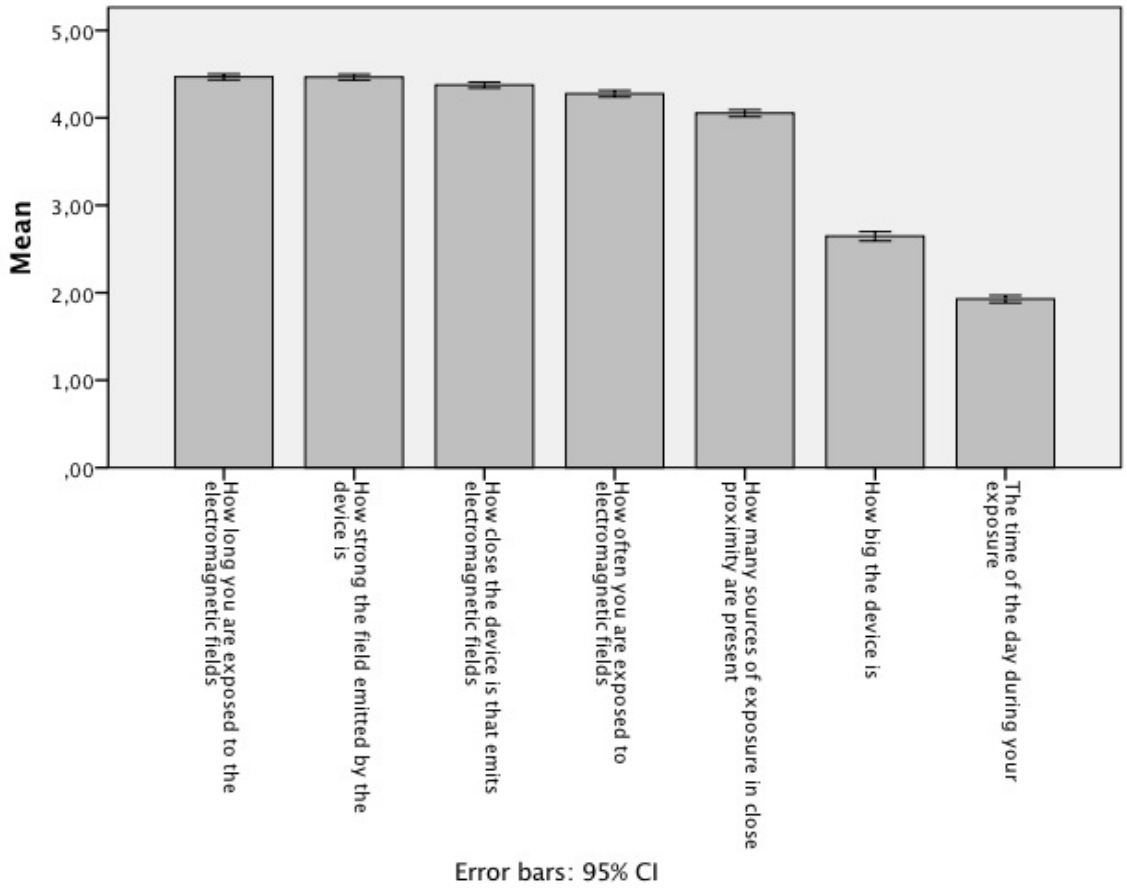

Figure 10: Subjective exposure impact knowledge of various exposure characteristics on EMF heath risk - total sample, 5-point Likert scale 1=Disagree totally, 2=Disagree to a certain amount, 3=Either nor, 4=Agree to a certain amount, 5=Agree totally (*Question: "What do the potential health risks of electromagnetic fields from exposure sources like mobile phones, mobile communication masts, or other devices depend on?").*

In order to conduct such a stringent analysis we built a new indicator for EMF risk perception by averaging the perceived potential risks across all presented EMF exposure sources for each respondent (for presented sources see Figure 10).

A correlation indicates that the general risk perception is in line with the respondent's view on the risk perception for mobile phones (r=.560; p=.000).

Figure 13 shows the findings for this new variable, called general EMF risk perception.

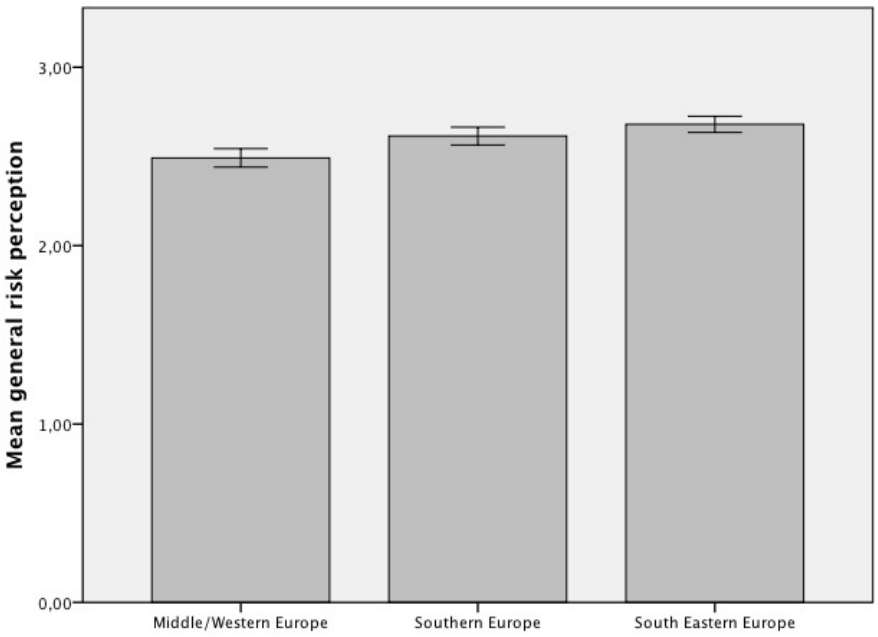

Figure 11: Mean of general EMF risk perception part of Europe, valid responses=2983. 5-point-Likert scale: 1=not dangerous, 2=not really dangerous, 3=either nor, 4=rather dangerous, 5=very dangerous.

Link between risk perception and exposure perception

Based on the variable called *general EMF risk perception,* we computed a linear regression analysis using the different exposure characteristics as regression variables.

The regression analysis demonstrates that the distance to the exposure source is *not* a significant predictor of general EMF risk perceptions (β=.014, p=.0.613). Significant predictors are the number of the exposure sources (β=.148, p=.000), the frequency of exposure (β=.129, p=.000) as well as the time of the day of exposure (β= .136, p=.000) and the physical size of the device (β=.099, p=.000) as shown in Table 2.

In the light of these findings, it seems that the general public has some difficulties properly assessing the impact of various EMF exposure conditions on potential health risks. Particularly, the influence of the distance of the emission source to someone's body is not appropriately considered.

Table 2: Linear regression of various perceived exposure characteristics on general EMF risk perception. Beta values (β) are indicated. β represents the relative importance of the independent variable (various exposure characteristics) in predicting the dependent variable (general EMF risk perception), the maximum β is 1. *=statistically significant (level 0.05). R^2=0.115.

Regression exposure characteristics, general RP	β-value	p
Duration	.066	.028*
Distance	.014	.613
Frequency	.129	.000*
Strength	-.063	.022*
Number of sources close proximity	.148	.000*
The time of the day	.136	.000*
Size	.099	.000*

Figure 14 demonstrates that the regression model only explains a small amount of variance (R^2=0.115). About 90% of the variance remains unexplained. That indicates that other variables might affect EMF risk perceptions to a much greater extent than the knowledge about exposure characteristics.

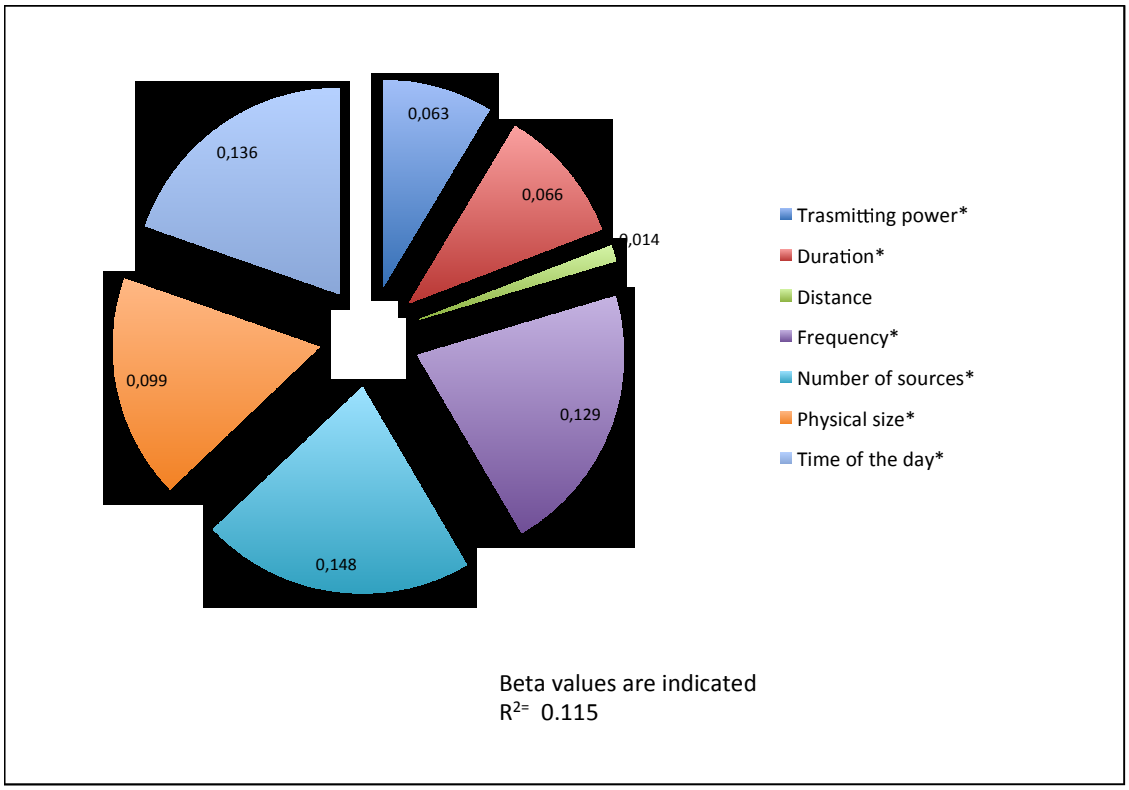

Figure 14: Linear regression of various perceived exposure characteristics on general EMF risk perception. Beta values (β) are indicated. *=statistically significant (level 0.05), R^2=0.115.

Finally, we were interested whether social and personality factors are shaping general EMF risk perceptions. For this, we conducted a regression analysis with the following regression variables: Age, gender, country of the respondents as well as three self-evaluations. The first referred to their openness to new technologies (pioneer), the second to the political orientation (left - right), and the third self-evaluation to the position in the societal hierarchy (top - bottom).

Table 3: Regression of social and personality factors on general EMF health concerns, Beta values (β) are indicated. *=statistically significant (level 0.05) . (Pioneer item: "Hans and Clara are open to using new technical innovations at home, at work and in their spare time. They have to try everything new. How similar are you to both?". 5-point scale: "not at all similar", "not really similar", "either similar nor dissimilar", "somewhat similar" or "very similar".)

Personality factors	β	p
Age	-.053	.025*
Gender	.062	.008*
Pioneer	-.100	.000*
Political orientation	.012	.613
Societal position	.053	.023*
Part of Europe	.103	.000*

As indicated by Table 3, the attitude toward innovation (pioneer) and the region of residence are the most powerful predictors for the strength of EMF health concerns, followed by age and gender. Additionally, people who share a positive attitude towards technical innovation perceive lower EMF health concerns. Furthermore, risk perception decreases with increased age and is higher for females compared with males. Remarkably, the political left vs. right orientation is not a significant factor for EMF heath risk concerns. However, the position in the societal hierarchy was a significant predictor of general EMF health concerns. However, taking the Beta values into account, only two variables have a significant impact on general EMF risk perception: Part of Europe and their openness to technical innovations.

Insights of a model based approach

As mentioned in the limitations, we use our participating countries - clustered in 3 groups of European areas - to test the intuitive models of exposure and risk perception in a model based approach.

Regarding the link between risk perception and exposure perception, a look at Table 4 reveals mixed results concerning the influence of different exposure characteristics. However, overall number of sources (Mid/West: β=.165, p=.000; Southern: β=.147, p=.000; South Eastern: β=.143, p=.002) and time of the day (Mid/West: β =.108, p=.002; Southern: β=.173, p=.000; South Eastern: β=.086, p=.012) are constant significant predictors for the EMF risk perception. Size of the source and frequency of exposure are still significant for two of the subsamples. The distance to the exposure source is not

taken into account by all our three subsamples and enforces the conclusion, that distance is only marginally influencing the risk perception.

Moreover, the role of personality factors could not be confirmed for the different groups, as represented in Table 4. Only gender should be mentioned as possible risk perception influencing personality factor in the model based approach (overall β=.062 and p=.008, and significant for Southern β.149, p=.000 and also high β-value for South Eastern Europe: β=.226 but not significant: p=.056). Comparing the means, female respondents are significant more concerned about EMF health risks than male participants (p=.000, T=4,476).

Table 4: Linear regression of perceived exposure strength of various exposure sources on general EMF risk perception **and** regression of social and personality factors on general EMF health concern by Part of Europe and overall. Beta values indicated, *=significant (level 0.05). Bold numbers suggests stability across at least two subsamples.

Regression exposure characteristics	Mid/ Western	Southern	South Eastern	Overall
Duration	.109*	.079	-.001	.066*
Distance	.044	-.039	.072	.014
Frequency	.078	.146*	.135*	**.129***
Strength	-.028	-.013	-109*	-.063*
Number of sources	.165*	.147*	.143*	**.148***
Time of day	.108*	.173*	.086*	**.139***
Size	.107*	.107*	.063	**.099***
Regression personality factors				
Age	-.029	-.060	.165	-.050*
Gender	-.051	.149*	.226	.062*
Pioneer	-.157*	-.033	.088	-.078*
Political orientation	-.013	.037	.004	.019
Societal position	.025	.061	.118	.054*

Conclusion for risk and exposure communication

Approximately 71% of the respondents have WLAN at home, and 73.5% at their workplace. Therefore, it is nearly self-evident that the most dominant EMF exposure source is the WLAN-connected laptop (regarding self-assessed usage time of our respondents).
About 24.3 % of our respondents claim to be online several times a week, and 73.8 % say that they are online every day. Furthermore, the use of mobile phones has changed. It seems that users tend to use mobile phones more for data communication. The use of text messaging (email, twitter, SMS) and Internet on mobile phones together exceeds voice communication of mobile phones. Therefore, an imperative conclusion is that voice communication via mobile phone as an EMF exposure source is not the most eminent source of EMF exposure, regarding the duration of exposure.

Nearly 40% of our interviewees confirmed that they take measures to reduce EMF exposure. However, with respect to EMF risk perception, it does not make a difference whether radiation reduction measures are taken or not.

Base stations are seen as the most intensive EMF exposure source, followed by microwave ovens and mobile phones. Other exposure sources, like WLAN networks, cordless phones, smart meters, and baby phones, are evaluated as rather minor EMF exposure sources. This finding reveals subjective dominance of the far-field exposition and an underestimation of the importance of near-field exposure. It seems that the public evaluates the importance of exposure sources by other aspects than the factual emissions from an EMF exposure source. A possible explanation of this distortion concerns both the affect and the availability heuristic (Finucane et al., 2000; Melvin et al., 1993). Base stations as well as mobile phones and microwave ovens are mentally more present: Mobile phones and microwave ovens due to their daily use, and base stations due to high media coverage. Furthermore, base stations are more often associated with negative affects. Both heuristics are being used to estimate the exposure strength in absence of any information on the factual exposure situation. However, further research is warranted to substantiate these hypotheses.

A closer look at the subjective exposure impact knowledge of our respondents reveals that they are aware of several conditions that influence the EMF exposure on the human body. In principle, they consider the following as the most relevant exposure conditions: the strength of the exposure source, the distance to the source, the duration, the frequency of exposure, and the number of exposure sources to which they are exposed. However, they have difficulties in applying their models properly.

We were interested in how general RF EMF risk perception is actually affected by the respondents' judgments about the relevance of various exposure characteristics for EMF health risk potentials. Therefore, a regression analysis of the exposure characteristics on EMF risk perception was conducted and the results showed that the time of the day, the number of sources to which they are exposed, the size of the source and the frequency of exposure are of most relevance (verified through the three models). In addition, all other characteristics except the distance are significant exposure characteristics.

In summary, the above results may indicate that the risk perceptions are guided by subjective EMF-impact models, which underestimate near field exposure and overestimate far field exposure. People are more concerned about base stations than about all other RF EMF sources. Furthermore, with respect to their EMF risk perception, they underestimate the role of distance as an important factor of exposure strength.

Besides these source factors, there are some indicators that EMF risk perception is also influenced by demographic and social factors as well as personal attitudes and beliefs. This finding could not be confirmed across the clustered groups except a tendency for gender. In the overall analysis the region of residence and the pioneer role are of most importance.

From these findings, several conclusions for risk communication can be drawn. First, because the part of Europe is decisive for risk perception, communication has to be tackled as a culturally sensitive issue. Risk communicators should take into account the

cultural factors that provide the context in which EMF sources are evaluated. Second, risk communication should focus especially on the intuitive exposure models. It should be emphasized that the distance from the EMF-emitting source is a critical parameter in risk assessment. Furthermore, risk communication should try to correct the erroneous assumptions that risk is related to the physical size of the exposure source and to the time of the day during exposure (referring to the understanding that people think the body is more vulnerable to EMF exposure at night). Third, risk communication should help to make the public aware that near-field exposure is usually more important than far-field exposure.

However, it might be necessary to have a closer look into risk perceptions due to high amount of unexplained variance in the above regression model. Here, the research into intuitive toxicology (Slovic et al., 1995) provides some helpful suggestions. It could be the case that some people´s risk perception does not take into account exposure characteristics. They might instead focus on hazard characteristics and evaluate the hazard by moral-based or mere affective judgments.

Our ongoing research is focusing on this issue. A second survey will be conducted in order to distinguish between affective, moral, and cognitive exposure evaluation and investigate if risk perception of various exposure sources is based on different constructs.

Literature

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2 RISK AND EXPOSURE PERCEPTION II

Executive Summary

Aim

- Evaluate RF EMF risk perception and exposure situation of respondents.
- Study the link between risk perception and exposure perception.
- Analyze the acceptance of RF EMF exposure reduction measures.
- Analyze the understandability and the acceptability of core concepts of the LEXNET project aiming at exposure reduction (e.g. strategies of exposure reduction at the average exposure level of RF EMF and not the peak exposure).

Method

- Online survey in 7 European countries conducted in August and September 2014
- Sample size: 1809 interviewees.

Main Results

- The public overestimates the far-field exposure from base stations compared to near-field exposure of mobile phones. Base stations are also considered as more dangerous than mobile phones.
- Three components of the construct "risk perception" should be differentiated: Concern, thematic relevance, and discursive presence.
- Risk perception is mainly based on exposure perception and to some degree on moral judgments. Affective evaluations play only a minor role.
- Exposure reduction leads to higher acceptance of base stations, but people require distances that exceed the distances at the current standards.
- The majority of our respondents support LEXNET project aims.

Conclusions

- Risk communication should focus on explaining the link between RF EMF exposure and risk and foster people's understanding of how various exposure characteristics of a RF EMF source affect the exposure of humans.
- The public should be better informed about interactions between exposure characteristics, especially how the level of exposure is reduced with increasing distance to the exposure source.
- Risk communication should also help the public to realize the systemic dependencies of downlink and uplink exposure.
- LEXNET main concepts should be translated into a non-technical version and can be communicated to the public.

Objectives of the survey

The LEXNET survey "Exposure and Risk Perception II" allows a closer look into lay people's risk perceptions of radio-frequency electromagnetic fields (RF EMF). The survey was designed to explore the link between exposure perception and risk perception and also how exposure reduction affects acceptance of RF EMF. We are especially interested in the understandability and acceptability of the Exposure Index that was developed by LEXNET project to assess exposure and exposure reductions.

One of the main assumptions of the LEXNET project is that a reduction of the RF EMF exposure will result in better acceptability of wireless communication networks in the public sphere. From a social science perspective, we hypothesize that a reduction of RF EMF will lead to lower risk perception and consequently to better acceptance (see Figure1).

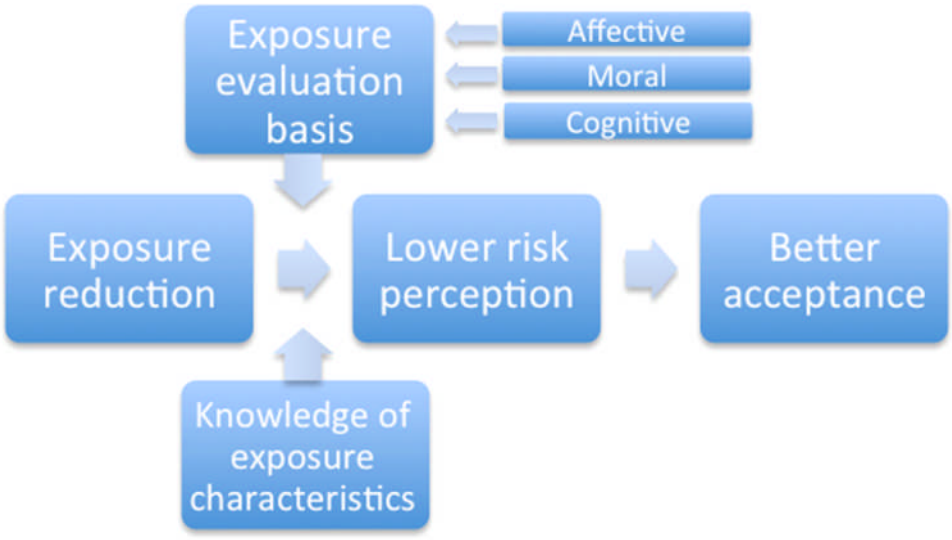

Figure 1: Research approach of social science part of LEXNET project. Explaining different variables influencing risk perception.

The effects of any reduction of EMF exposure will depend on the link between exposure perception and risk perception. Therefore, our first survey (Wiedemann & Freudenstein, 2014) focused on the knowledge of exposure characteristics (such as distance or frequency of exposure) and how this knowledge influences risk perception. Our results have shown that people have quite appropriate subjective exposure impact knowledge about exposure characteristics. We have also shown that knowledge about exposure characteristics influences risk perception; there is a tendency for higher risk perception for people with better knowledge (see Freudenstein, Wiedemann & Varsier, 2014). The fact that a high amount of variance remained unexplained in a linear regression analysis of various perceived exposure characteristics on general EMF risk perception leaded to the conclusion that this issue must be analyzed in more details. Concerning the psychological foundation of RF EMF risk perception, people may not take into account the amount of exposure when making risk judgments. Lay people might instead focus on hazard characteristics and evaluate the hazard by a moral or affective framework.

Our study focused therefore on this issue: we intended to analyze how affective, moral, and cognitive aspects influence the perceived riskiness of various RF EMF exposure sources.

As mentioned before, an important issue of the LEXNET project is public acceptance of wireless communication technologies (WCT). Therefore, we investigated whether exposure reductions have an effect on acceptability of WCT. We were particularly interested in the question, how much exposure reduction is required to gain acceptance of base stations in the vicinity of people's homes.

Finally, we were interested in the practical implementation of LEXNET ideas, i.e., the understandability and the public approval of the LEXNET exposure index and related technical solutions for exposure reduction.

To summarize, our study focused on four key topics:

- The exploration of the concept "risk perception".
- The analysis of the link between risk perception and exposure perception and the role of affective, moral and cognitive judgments.
- The measurement of the impact of RF EMF exposure reductions on acceptance.
- The examination of the acceptance and understandability of the core concepts of the LEXNET project.

Method

Sample size and involved countries

The LEXNET survey was conducted in August and September 2014 using the "Survey Monkey" online tool. SSI, a professional provider of surveys, Frankfurt, Germany, gathered data in seven European countries. A total of 2454 interviewees participated. After quality control 1809 respondents remained for analysis. (German sample n= 274, French sample n= 243, Spanish sample n= 241, Portuguese sample n= 290, Romanian sample n= 276, Serbian sample n= 291, and UK sample n= 194; see Figure 2). Most respondents were citizens of the country in which the survey was conducted.

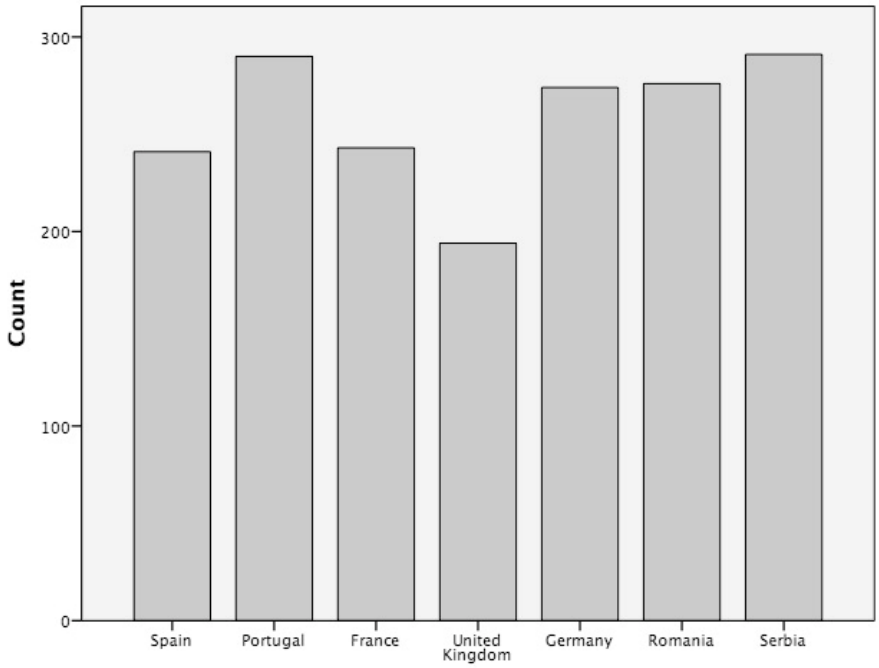

Figure 2: Sample size of presented LEXNET survey "Risk and exposure perception II" by country (n=1809), Germany n= 274, France, n= 243, Spain n= 241, Portugal n= 290, Romania n= 276, Serbia n= 291 and UK n= 194.

Demographics

The mean age of the participants was about 40 years, with 49.1% male and 50.9% female. The mean of respondents' education years was 15.2. Regarding the respondents' working situation in the last 7 days, the largest group (57% of the respondents) was in paid work (employees, self-employed, working for your family business), 11.3% of the respondents were unemployed and actively looking for a job and 9.0% were in education. Regarding the area in which they are living, more than 35% stated that they are residents in a big city and 15.1% in the suburbs of big cities. 34.7% said they live in a town or a small city, 13.4% in a country village, and 1.7% on a farm or home in the countryside.

Data collection

We used an online survey tool called "Survey Monkey". The survey company SSI independently conducted the sampling. Some of our demographic, political, and belief related questions were derived from the "European Social Survey" (2012). Our survey consisted of 33 main questions (see appendix 2). The respondents were not forced to answer all questions. It was possible to skip questions or choose a "don't know" option. An introduction to the survey informed the participants about the main research aims and what participation in the survey involves, including how anonymity of the survey is ensured. Some questions were introduced with additional information, e.g. a technical background. Finally, we provided some background information about the LEXNET project.

Surveys questions were translated into the languages of the participating countries. Each translation was re-translated into English and checked for consistency with the original English version of the questionnaire by at least two persons.

All statistical analyses were performed using IBM® SPSS® Statistics, V20.

Results

RF EMF risk perception and exposure situation

The first section shows data on respondents' RF EMF risk perception and exposure situation. We report which EMF-emitting devices our respondents use and their beliefs regarding their own exposure to RF EMF. The components of "risk perception" are also investigated in this part.

We were interested in people's risk perception of RF EMF in general (on a 5-point Likert scale from 1 "Not at all concerned" to "5 "Very concerned", Question: "How concerned are you about the potential health risk of EMF in general?") and in their position on potential health risks from mobile phones and base stations (ranked on a scale from 0 to 100, Question: "Please rank your position on the potential health risks of EMF from mobile phones and from base stations on a scale from 0 (no risk at all) to 100 (serious health risks for humans)?").

The general risk perception shows that 45% of the respondents are fairly or very concerned and 27.3% are not very or not at all concerned. Base stations are considered as more dangerous than mobile phones (mean risk perception for base stations is 56.15 compared to the mean of 48.03 for mobile phones, t=11.20, p=.000). This result replicates our findings from our first study where base stations (being the only far-field exposure source among several near-field sources) were also seen as the source of highest potential health risk.

Table 1: Risk perception of RF EMF in general (on a 5-point Likert scale from 1 "Not at all concerned – 5 "Very concerned", Question: "How concerned are you about the potential health risk of EMF in general?)

Risk Perception EMF	Frequency	valid %
(1) Not at all concerned	128	7.1
(2) Not very concerned	363	20.2
(3) Neither nor	498	27.7
(4) Fairly concerned	655	36.5
(5) Very concerned	152	8.5
Total	1796	
Missing	13	

Looking at the RF EMF risk perception in terms of its thematic relevance a different result occurs. We asked our respondents how often they think about the topic "potential

health risks of EMF" and how often they actually talk about it (including also online conversation or similar). Table 1 shows that 807 out of 1796 respondents are either fairly or very concerned about RF EMF. Only 231 of the concerned subjects think regularly about potential RF EMF health risks (often and very often, corresponding to rating scales 4 and 5 on a 5-point Likert scale). Finally, merely 101 participants claimed to think about the topic and talk often or very often (4 and 5 on a 5-point Likert scale) about potential health effects of RF EMF, which is 12.5% of the concerned respondents and only 5.6% of all respondents, see Figure 3.

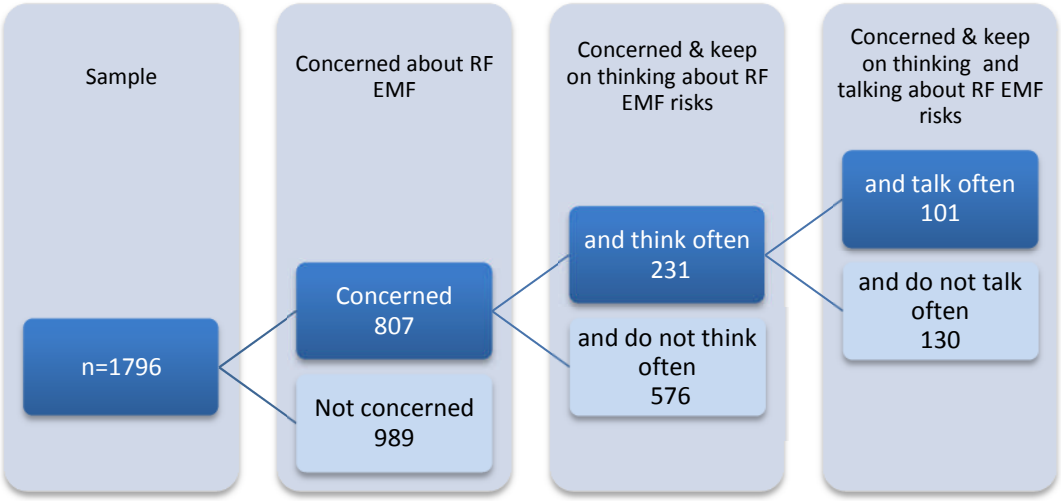

Figure 3: Thematic relevance of the topic potential health risks of RF EMF in general (Questions: "How concerned are you about the potential health risk of EMF in general?, on a 5-point Likert scale from 1 "Not at all concerned – 5 "Very concerned", "How often in your daily life do you think about the topic "potential health effects of electromagnetic fields?" and "How often in your daily life do you talk about potential health effects of EMF with other people (including conversation, via Facebook, twitter, chat, online forum or similar)?", both on a 5-pont Likert scale from 1 = "Never" – 5 = "Very often".).

This differentiated consideration indicates that at least some risk perceptions are not sustainable, i.e. they are restricted to the interview situation and apparently have no thematic relevance in everyday life of the respondents.

Concerning the exposure situation about 93% of the subjects said that they are exposed to a Wi-Fi network, 98% have a smartphone or mobile phone and about half of the respondents use a tablet computer. Interestingly the responses to the question: "Is there a base station close to your home?" options: "Yes", "No", "Don't know") revealed that about 45% of the respondents do not know whether or not they are exposed to a base station ("Yes": 26%, "No": 26%). Regarding the overall daily life exposure to RF EMF about 55% of the respondents believe that they have a high or very high exposure (4 or 5 on a 5-point Likert scale from 1 "Not at all" to 5 "To a very high degree", Question: "Think about your daily life, to which degree do you think you are exposed to electromagnetic fields from electronic devices (like mobile phones, WiFi router) and base stations?"), see Figure 4:

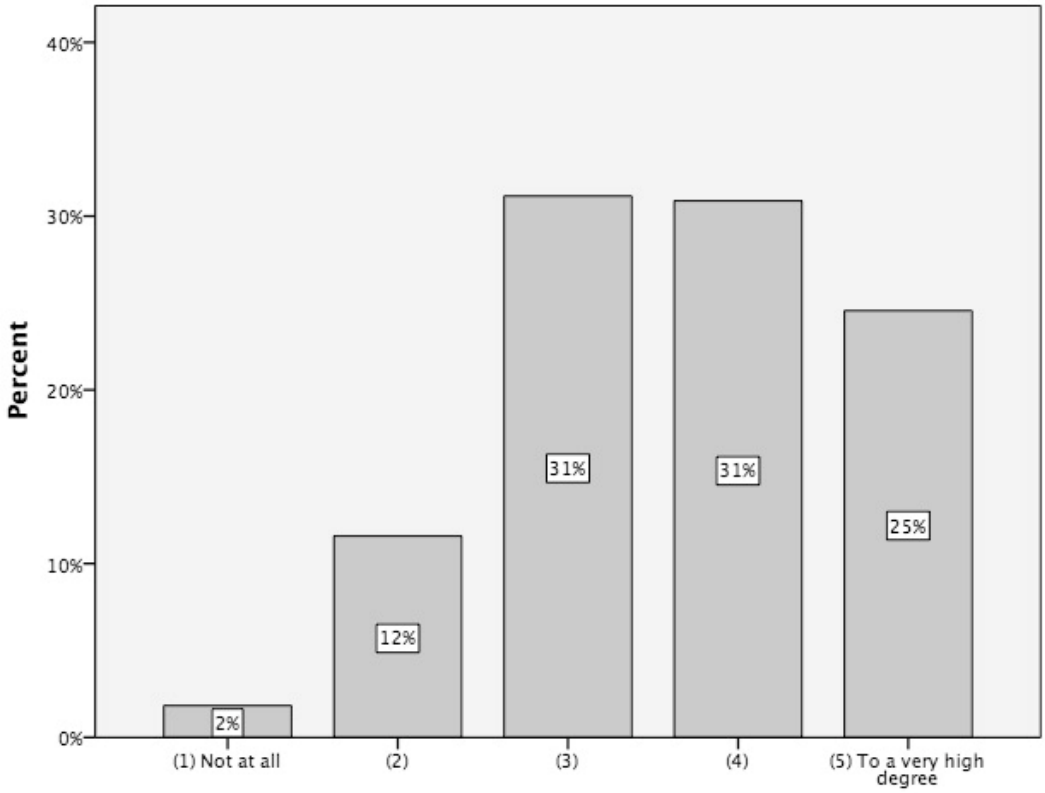

Figure 4: Daily life overall exposure perception of respondents in % (on a 5-point Likert scale from 1 "Not at all" to "5 "To a very high degree", Question: "Think about your daily life, to which degree do you think you are exposed to electromagnetic fields from electronic devices (like mobile phones, WiFi router) and base stations?").

About 30% chose the mid-point of 3, and 14% selected that they have low exposure or are not at all exposed to RF EMF in their daily life.

Link between risk and exposure perception: Affective, moral and cognitive exposure evaluation of various exposure sources

This section analyzes how people evaluate various RF EMF exposure situations. Do people focus only on hazard characteristics (i.e. a moral or affective evaluation) or do they take exposure conditions into account? We used picture-guided scenarios, developed for the survey "Risk and exposure perception I" for eliciting risk perception judgments (e.g. person using a mobile phone). For each scenario we asked the subjects for how dangerous they consider the RF EMF exposure situation as well as for their affective and moral evaluation of the situation, all on a 5-point Likert scale. Furthermore we were interested in respondents' subjective exposure evaluation of the situation (see Table 2).

Table 2: Questions on affective, moral, subjective exposure perception and risk perception of various exposure situations shown in pictures.

Question	Answer option
Affective evaluation: *"Imagine you are the person depicted in the picture, what kind of feelings about exposure would you have in this situation?"*	5-point Likert scale from 1= "Very negative", to 5= "Very positive"
Moral evaluation: *"In your opinion, does the situation depicted by the picture, elicit any moral concerns about exposure?*	5-point Likert scale from 1= "Not at all", to 5= "Yes absolutely"
Subjective exposure perception: *"In your opinion, how strong is the exposure to the person in the above picture [*placeholder describing situation*]?"*	5-point Likert scale from 1= "Low", to 5= "High"
Risk perception: *"How dangerous do you consider this situation to be for the person [*placeholder describing situation*]? Please choose one of the following answers."*	5-point Likert scale from 1= "Not dangerous", to 5= very dangerous"

Based on this procedure we collected data on the following RF EMF exposure situations: mobile phone (MP) for calls, laptop use, WLAN router in a close position, mobile communication masts (base stations) on a roof and mobile phone use in presence of other people (picture showing a person using a mobile phone in public transport), see Table 3. The pictures were randomized in order of presentation.

Table 3: Means and variance affective, moral evaluation, subjective exposure perception and risk perception of various exposure situations., on 5-point Likert scale from 1= "Very negative", to 5= "Very positive"; 1= "Not at all", to 5= "Yes absolutely"; 1= "Low", to 5= "High"; 1= "Not dangerous", to 5= very dangerous".

Evaluation of various EMF sources	N	Mean	Variance
Mobile phone (MP) calls:			
Affective evaluation	1536	2.96	.862
Moral evaluation	1648	2.81	1.648
Subjective exposure perception	1643	3.34	1.472
Risk perception	1654	3.01	1.268
WLAN close position			
Affective evaluation	1546	3.09	.836
Moral evaluation	1630	2.67	1.411
Subjective exposure perception	1639	2.90	1.359
Risk perception	1627	2.76	1.296
MP in the presence of others			
Affective evaluation	1547	2.94	.893
Moral evaluation	1659	2.59	1.383
Subjective exposure perception	1632	2.55	1.350
Risk perception	1640	2.44	1.231

Laptop use on the lap			
Affective evaluation	1572	3.08	1.025
Moral evaluation	1655	2.69	1.535
Subjective exposure perception	1637	2.91	1.482
Risk perception	1642	2.81	1.448
Base stations			
Affective evaluation	1629	2.40	1.423
Moral evaluation	1672	3.64	1.593
Subjective exposure perception	1657	3.86	1.389
Risk perception	1667	3.76	1.393

To analyze whether peoples' risk perceptions of various EMF sources is based on affective and moral judgments or on cognitive (taking exposure into account) judgments, we computed linear regressions for all scenarios using risk perception in the depicted situation as dependent variable and the affective and moral evaluation as well as the subjective exposure perception as independent variables. Table 4 indicates that the regression model provides a high explanation of the variance across all RF EMF exposure situations (R^2 from .672 for mobile phones to .822 for Laptop use). Having a closer look at the Beta values (β) a robust pattern is emerging. Exposure evaluation seems to influence the risk perception to a high amount (mobile phone calls: β=.584, p=.000; WLAN close position: β=.629, p=.000; mobile phone use in presence of other people: β= .718, p=.000; Laptop use on the lap: β=.670, p=.000 and base station: β= .711, p=.000).

Table 4: Linear regression of affective, moral and exposure evaluation on concerns about various EMF sources (risk perception), Beta values indicated, *=statistically significant (level 0.05).

Dependent variable risk perception of:	β-values of situation evaluation basis			R^2
	Affective	Moral	Exposure	
Mobile phone (MP) calls	-.092*	.302*	.584*	.672
WLAN close position	-.051*	.292*	.629*	.756
MP in presence of others	-.004	.222*	.718*	.790
Laptop use on the lap	-.072*	.269*	.670*	.822
Base station	-.061*	.208*	.711*	.811

Furthermore, as indicated by the linear regressions, the influence of affective evaluation on RF EMF risk perceptions is more or less negligible while the moral evaluation plays a role, (β-value: β=.302, (p=.000) for mobile phones; β=.292, (p=.000) for WLAN close position; β=.222, (p=.000) for the use of a mobile phone in presence of other people; β=.269 (p=.000) for Laptop use on the lap; β= .208, (p=.000) for base stations. The findings point towards a clear relationship. The RF EMF risk perceptions are mainly dependent on subjective exposure perception. The higher the perceived RF EMF exposure, the higher is the perceived risk.

Acceptance of RF EMF exposure reduction

As mentioned before, one of the basic assumptions of the LEXNET project is gaining more acceptances of wireless communication networks in the public by reducing general exposure to RF EMF.

To evaluate this assumption we constructed a hypothetical situation. We referred to a base station, which was ranked as the most dangerous source in LEXNET Survey I. The Survey I indicated that lay people may focus especially on the riskiness of this source, a tendency that was also found in other surveys (Wiedemann et al., 2013, Siegrist et al., 2006). We asked for the acceptance of a base station with regard to several exposure reduction scenarios. Specifically, we asked for the minimal distance (in meters) that they would accept a base station close to their home for four different exposure conditions: (1) exposure level that is in compliance with the current level, (2) exposure is reduced by 30%, (3) exposure is reduced by 50% and (4) exposure is reduced by 70%.

For the analysis we excluded subjects answering a distance higher than 10,000 meters, i.e. people who are in fundamental opposition to base stations (n=70). The comparison between the four exposure situations indicates a clear picture: The higher the exposure reduction the lower is the distance in which a base station in the vicinity of one's home is accepted. While the mean distance for the baseline exposure situation (0=% reduction) is at 1889 meters, the distance decreases to 1532 meters for 30% exposure reduction, to 1278 meters for 50% exposure reduction, and finally to 1052 meters for the highest exposure reduction of 70% (see Figure 5).

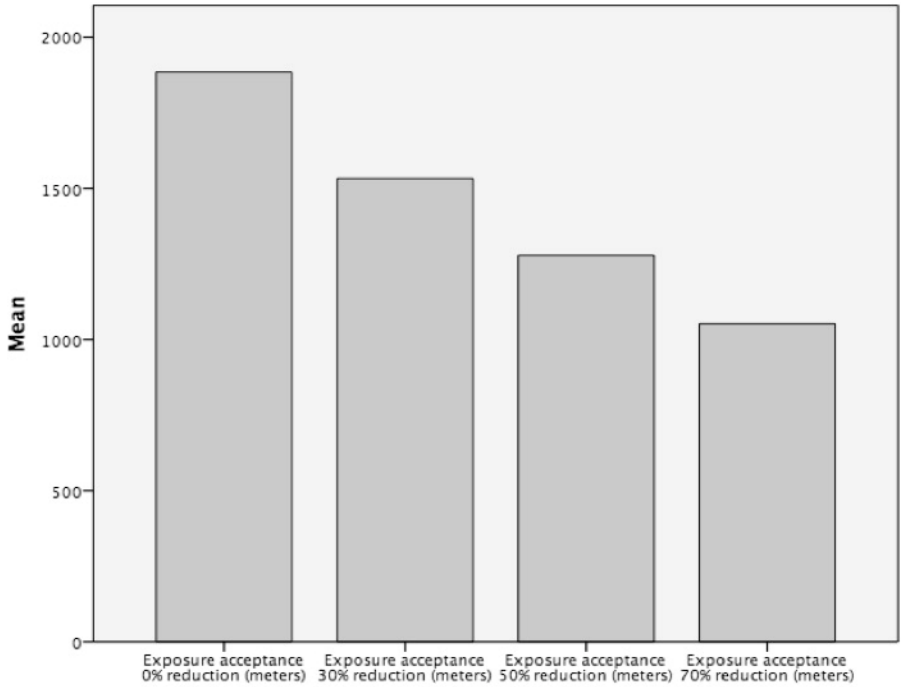

Figure 5: Mean sensitivity to exposure reduction – Acceptance of base stations close to one's home in meter with 0%, 30%, 50% and 70% exposure reduction. For respondents with distance < 10 000 meter (n= 1627). Question: "Roughly at what distance (meters) would you accept a base station close to your home?", "...if the exposure was reduced by 30%?", "...if the exposure was reduced by 50%?", "...if the exposure was reduced by 70%?"

In the following, we analyze the acceptable distance estimations in various living areas. As indicated in Figure 5 the distance estimations vary with the type of the area. Interestingly, the mean distance for big cities and outskirts is slightly higher (n=812; mean 0% reduction=1872 meters, mean 30% reduction=1521 meters, mean 50% reduction=1276 meters, mean 70% reduction=1066 meters) than for small cities (n= 556; mean 0% reduction=1715 meters, mean 30% reduction=1385 meters, mean 50% reduction=1163 meters, mean 70% reduction=960 meters). The highest means for acceptable distances were from people living in country villages and living on the countryside (n=242; mean 0% reduction=2391 meters, mean 30% reduction=1944 meters, mean 50% reduction=1565 meters, mean 70% reduction=1215 meters). Note: For this calculation we limited our sample to n=1610, looking only at distance estimations below 10,000 meters, see Figure 6.

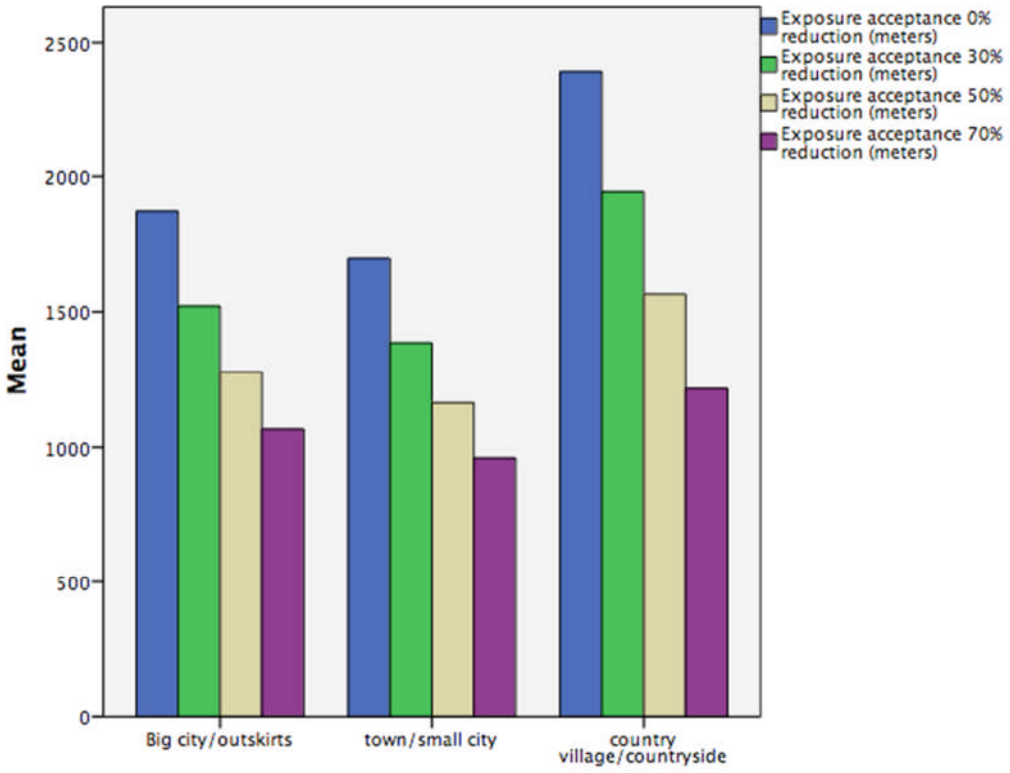

Figure 6: Mean sensitivity to exposure reduction – Acceptance of base stations close to one's home in meter with 0% (blue), 30% (green), 50% (brown) and 70% (violet) exposure reduction by living area. For respondents with distance < 10 000 meter (n= 1610). Question: "Roughly at what distance (meters) would you accept a base station close to your home?", "...if the exposure was reduced by 30%?", "...if the exposure was reduced by 50%?", "…if the exposure was reduced by 70%?"

Acceptance and understandability of LEXNET project aims

For the LEXNET project, it was not only important to explore the psychological mechanisms behind RF EMF risk perceptions and how they are linked to exposure perception and acceptance. It was also important to evaluate whether RF EMF exposure reduction principles and strategies are understood and accepted by the public.

We first asked our respondents if they "think [that] the exposure from personal wireless devices and the exposure from base stations should be added up when evaluating [their] exposure to EMF".

Table 5: Frequencies of combining up- and downlink sources of RF EMF from wireless telecommunication technologies. (Question: "Do you think the exposure from personal wireless devices and the exposure from base stations should be added up when evaluating your exposure to EMF?", on a 5-point Likert scale from 1="Not at all" – "Yes, absolutely").

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	(1) No, not at all	46	2.5	3.0	3.0
	(2)	59	3.3	3.9	6.9
	(3)	248	13.7	16.2	23.1
	(4)	435	24.0	28.4	51.5
	(5) Yes, absolutely	741	41.0	48.5	100.0
	Total	1529	84.6	100.0	
Missing	Don't know	208	11.5		
	System	72	4.0		
	Total	280	15.5		
Total		1809	100.0		

The results indicated that about two thirds of the respondents (24% selected "4" and 41% selected "5" on the 5-point Likert scale; Table 5) seem to agree that it is useful to include both up and down-link RF EMF exposure of wireless telecommunication technologies to get information about their personal exposure.

Furthermore we wanted to know whether people are aware that the displayed signal strength on mobile phones is linked to the distance to a base station (this question was presented with a picture showing a mobile phone display with signal bars).

Table 6: Frequencies of people who agree or disagree to the statement that the signal strength, indicated on a mobile phone, is linked to the distance to a base station (Question: "Do you think the signal strength (as indicated on your mobile phone) is linked to the distance to a base station?", on a 5-point Likert scale from 1="Not at all" – "Yes, absolutely").

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	(1) No, not at all	109	6.0	7.4	7.4
	(2)	124	6.9	8.4	15.8
	(3)	254	14.0	17.2	33.0
	(4)	405	22.4	27.5	60.5
	(5) Yes, absolutely	583	32.2	39.5	100.0
	Total	1475	81.5	100.0	
Missing	Don't know	259	14.3		
	System	75	4.1		
	Total	334	18.5		
Total		1809	100.0		

As indicated in Table 6, the majority agrees (55% chose "4"or "5" on the 5-point Likert scale) that the signal strength as indicated on a mobile phone is related to the distance to the closest base station.

The following questions were implemented to analyze whether people make differences between average and maximum exposure of RE EMF and if they would accept the LEXNET strategies to decrease their exposure by reducing the average exposure and not the peak exposure.

To improve the understanding of the following technical question, we asked in advance: "Think about noise, what would you prefer more: A) a low continuous noise combined with an occasionally reached very loud noise or B) a louder continuous background noise but without the occasionally reached very high peak noise?".

Table 7: Respondents' preferences on network architecture (Question: "Think about electromagnetic fields, what would you prefer: A) a low continuous exposure combined with an occasionally reached high exposure or B) a higher continuous exposure without the occasionally reached high peak exposure?).

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	A)	997	54.1	78.6	78.6
	B)	266	14.7	21.4	100.0
	Total	1245	68.8	100.0	
Missing	Don't know	491	27.1		
	System	73	4.0		
	Total	564	31.2		
Total		1809	100.0		

As Table 7 indicates, about 56% of the subjects preferred answer option (A) "A low continuous exposure combined with an occasionally reached high exposure". The difficulty of the judgment here is reflected in the high amount of the "don't know" answers (27.5%). It seems that some respondents are overstrained or do not have an opinion on this issue.

LEXNET wants to define a global index of exposure, assessing the averaged exposure of the population over space and time. Therefore an important question refers to the issue whether people agree with the statement "it makes sense to characterize [their] day-to-day exposure to EMF by averaging it over time".

Table 8: Agreement averaged exposure over time (Question: "Do you think it makes sense to characterize your day-to-day exposure to EMF by averaging it over time (the exposure can immensely vary over the time)" on a 5-point Likert scale from 1="Not at all" – "Yes, absolutely").

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	(1) No, not at all	121	6.7	8.7	8.7
	(2)	140	7.7	10.1	18.8
	(3)	357	19.7	25.7	44.5
	(4)	451	24.9	32.5	77.0
	(5) Yes, absolutely	319	17.6	23.0	100.0
	Total	1388	76.7	100.0	
Missing	Don't know	328	18.1		

	System	93	5.1
	Total	421	23.3
Total		1809	100.0

About 42% of the respondents agree with the statement that it makes sense to characterize your day-to-day exposure to EMF by averaging it over time (with "4" or "5" on the 5-point Likert scale), as indicated in Table 8.

Another core concept of LEXNET is to average the exposure over space and persons, which was tested in the following question: "Do you think that an individual exposure to EMF can be approximated by measuring the exposure over a large population?" To guarantee better understanding we gave an example: "Let's say you live in Paris 14th district *[exchanged with districts of capitals in all countries]*. The average exposure over the entire population in Paris 14th district is then used as an indicator for your individual exposure to EMF."

Table 9: Agreement averaged exposure over space (Question: "Let's say you live in Paris 14th district [exchanged by districts of the capital in all countries]. The average exposure over the entire population in Paris 14th district is then used as an indicator for your individual exposure to EMF" on a 5-point Likert scale from 1="Not at all" – "Yes, absolutely").

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	(1) No, not at all	204	11.3	13.6	13.6
	(2)	214	11.8	14.3	27.9
	(3)	487	26.9	32.5	60.4
	(4)	356	19.7	23.7	84.1
	(5) Yes, absolutely	238	13.2	15.9	100.0
	Total	1499	82.9	100.0	
Missing	Don't know	226	12.5		
	System	84	4.6		
	Total	310	17.1		
Total		1809	100.0		

About one third of the subjects (33%) agreed with this approach (with "4" or "5" on the 5-point Likert scale). A closer look at the results indicates that there is a high number of undecided respondents, about 44% when taking into account that 26.9% scored with "3", 12.5% with "Don't know" and about 4% skipped the question. The averaging of exposure over space seems to be less accepted than averaging over time.

Another question linked to the acceptance of exposure reduction measures is the issue of trust. We assumed that respondents' trust in information about EMF exposure conditions would vary depending on whether the information came from industry, governmental agencies, scientists from universities or politicians.

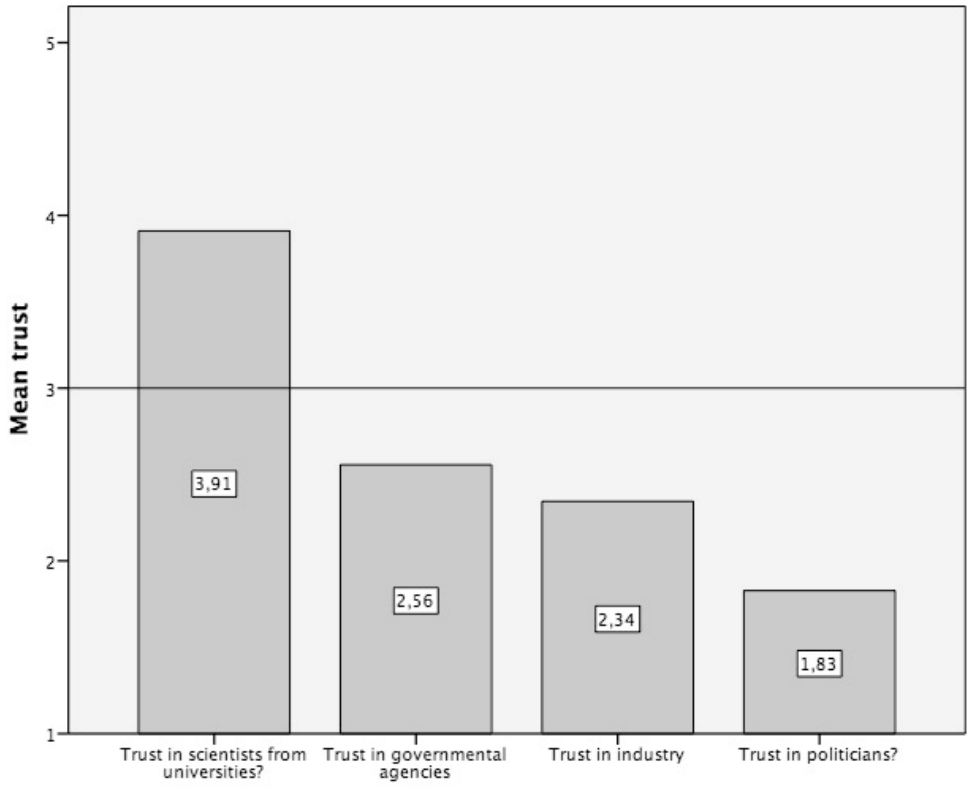

Figure 7: Trust in industry, governmental agencies scientist from universities or politicians, when information about EMF exposure conditions are given (Question: "If you are informed about EMF exposure conditions in your local area would you place trust in such information when it is given by / industry / governmental agencies / scientist from universities or politicians?", each on a on a 5-point Likert scale from 1="Not at all" – "Yes, absolutely").

Figure 7 indicates that there is only trust in scientists from universities, with a mean of 3.91 (on a 5-point Likert scale from 1="Not at all" – "Yes, absolutely"), whereas all other sources of information are below mid-point of 3. Trust in politicians was especially low.

Study limitations

The present study is based on a cross-sectional research design. This design has limitations concerning the interpretation of statistical associations. Causal interpretations are restricted.

Although our sample was community based and represented a diversity of educational backgrounds, extrapolations from our sample to the general population can only be made with reservations. First, the present study is based on an online survey that limits the generalization of the findings. People without Internet access are not taken into account. Second, the country samples are not drawn randomly from the populations. For the same reasons, a cross-cultural analysis would not be prudent to conduct.

Finally, some remarks about the validity of the distance estimations as safety perception measure. A metric distance scale likely has advantages. Distance is more easily differentiated on a metric scale, and the scale is more neutral than verbal statements, which can be biased by the effect of wording. The scale is also more grounded in the

everyday experiences of the respondents, i.e. people intuitively understand distance as 'mean' for safety (Hall, 1966). However, one should be cautious in interpreting the distance estimations. What people say and what they actually do, might be two different things.

Discussion of the findings

Regarding risk perception of base stations, we could replicate our findings from the first study "Risk and exposure perception I". Base stations are evaluated as more dangerous with a mean of 56.15 compared to the mean of 48.03 for mobile phones, which confirms the overestimation of the far field compared to near field exposure. The higher risk perceptions with respect to base stations have also been found in other studies (Wiedemann et al., 2013, Siegrist et al., 2006). This evaluation of base stations contradicts with scientific findings. The typical exposure levels from base stations are generally several orders of magnitude lower than from cell phones (Neubauer et al., 2007, Lauer et al., 2013 and Tesanovic et al., 2013). Therefore, this gap between subjective and objective evaluation of RF EMF requires more and better-tailored risk communication, especially with respect to the dominating RF EMF exposure from personal sources.

Furthermore, the focus on concern hinders a comprehensive understanding of construct "risk perception". Surveys on risk perceptions should not only indicate the level of public concern, but also the presence of these concerns in everyday-thinking of the public (i.e. the thematic relevance of the EMF-risk topic), and surveys should also explore how often the topic is addressed in the everyday conversations of the public (i.e. the discursive relevance of the EMF risk topic). Our findings underline the importance of this conceptual differentiation: When asking people whether they are concerned about RF EMF, a large share of the respondents seems to worry. In our survey, 807 out of 1796 (about 45%) subjects are concerned or very concerned about the potential health effects of EMF. Having a closer look on how these concerns influence the daily lives it becomes clear that only 12% of all respondents think about these concerns and that only 5.6% of all respondents raise the RF EMF topic in their daily conversations.

Concerning the link between risk and exposure perception we tested how affective, moral and cognitive judgments about RF EMF risks affects the risk perceptions of various RF EMF exposure sources. The linear regressions models display a clear picture and explain a high amount of variance (R^2 from .672 for mobile phones to .822 for Laptop use). The most important predictor of RF EMF risk perception is the perceived exposure strength. Moral evaluations affect RF EMF risk perception to some amount, whereas the influence of affective evaluation is negligible. This means that people's evaluation is mainly based on cognitive judgments with regard to risk communication. Therefore, efforts should be increased to communicate appropriate knowledge about different exposure characteristics and their interactions with the public.

Concerning the acceptance of RF EMF exposure reduction, a crucial issue is: "How much reduction is enough for gaining more acceptance of new telecommunication technologies?" To explore this issue we tested the minimal distance at which a base station is accepted in the vicinity of people's home (Question: "Roughly at what distance (meters) would you accept a base station close to your home?") The results indicate a clear tendency that exposure reduction and acceptance are related. Distances decrease when reducing exposure by 30%, 50% and 70%. Interestingly the mean minimal distance in meters changes from about 2000 m to 1000 m (comparing current exposure to 70% reduction). However, we must keep in mind that even the reduced distance is incompatible with the principles of the wireless network architecture, at least in large cities. In densely populated areas, the mean distance to a base station is usually much lower than 1000 m. An interesting fact is that a 50% exposure reduction doesn't lead to an acceptance of base stations which is twice closer (mean 0% reduction=1872, mean 50% reduction=1276 meters). This indicates that there is not a simple theoretic mathematical relation in people's minds in case of exposure reduction and acceptance, which enforces the assumption of a complex mental model of our respondents. Furthermore the living area is crucial. People in rural areas have a quite lower acceptability level and demand more distance to base stations (see Figure 6). Visibility and more awareness of mobile communication masts for of people living in these areas could be a possible explanation for this circumstance.

The understandability and acceptability of LEXNET´s core concepts seems to be promising. The majority of our respondents accept these approaches, this is especially important for the questions aiming on the acceptance of exposure reduction and measurement of RF EMF at the average and not the maximum peak exposure. The question about the acceptance of different network architectures (A: a low continuous exposure combined with an occasionally reached high vs. B: a higher continuous exposure without the occasionally reached high peak exposure, see Table 7) supports the LEXNET aims. It should be emphasized that with regard to this question, the complexity of the issues was revealed in a large number of "don't know" answers (about 30%) from respondents. In addition, the averaging of RF EMF exposure over space and time is sustained by our respondents, it seems that the averaging over areas is less acceptable than averaging over time (Question: "Do you think it makes sense to characterize your day-to-day exposure to EMF by averaging it over time space?", see Table 8; Question: "Let's say you live in Paris 14th district [exchanged by districts of the capital in all countries]. The average exposure over the entire population in Paris 14th district is then used as an indicator for your individual exposure to EMF", see Table 9).

Finally, in risk communication, the source of information concerning EMF exposure seems to be very important. The most trusted communicator is the scientist from a university (Figure 7).

Conclusion

In conclusion, in RF EMF risk communication it is highly recommended to inform the general public about exposure issues. More knowledge about the impact of exposure on potential risks means more risk literacy. An essential target that should be highlighted in

risk communication is the link between exposure and the potential risk of RF EMF. The public should be supported in taking into account the systemic interdependencies of uplink- and downlink-exposure. In this way, it might be possible to correct the overestimation of far field exposure of base station that leads to an amplified risk perception.
The support and understandability of LEXNET project aims allows the conclusion that the core concepts can be communicated to the public. The crucial issue in our ongoing research is the translation of LEXNET strategies and aims into a non-technical version to provide them in an easy-to-understand manner. This approach will be developed and tested in further research.

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Appendix

Appendix 1: Internal Review
Appendix 2: Survey "Risk and Exposure Perception I"
Appendix 3: Survey "Risk and Exposure Perception II"

Appendix 1: Internal Review

	Reviewer 1: Gunter Vermeeren			Reviewer 2: Nadège Varsier		
	Answer	**Comments**	**Type***	**Answer**	**Comments**	**Type***
1. Is the deliverable in accordance with						
(i) the Description of Work?	☒ Yes ☐ No		☐ M ☐ m ☐ a	☒ Yes ☐ No		☐ M ☐ m ☐ a
(ii) the international State of the Art?	☒ Yes ☐ No		☐ M ☐ m ☐ a	☒Yes ☐ No		☐ M ☐ m ☐ a
2. Is the quality of the deliverable in a status						
(i) that allows to send it to EC?	☐ Yes ☒ No	Comments have been provided in a Track Change version.	☐ M ☐ m ☐ a	☐ Yes ☒ No	Results of the second analysis of the 1st LEXNET survey are missing. They should be stored either in D2.5 or in a second version of D2.2.	☐ M ☐ m ☐ a
(ii) that needs improvement of the writing by the editor of the deliverable?	☒ Yes ☐ No		☐ M ☐ m ☐ a	☒ Yes ☐ No	Please see my comments in track change and proposed enhancements The introduction and the conclusion need to be rewritten. Results on the social acceptance of LEXNET EI concepts must be stressed out. More discussion on the "Acceptance and understandability of LEXNET project aims" is needed.	☒ M ☐ m ☐ a
(iii) that needs further work by the partners responsible for the deliverable?	☐ Yes ☒ No		☐ M ☐ m ☐ a	☒ Yes ☐ No	Please see my comments in track change and proposed enhancements. We need to have the results of the second analysis of the first LEXNET survey stored in D2.5 or in a second version of D2.2.	☒ M ☐ m ☐ a

* Type of comments: M = Major comment; m = minor comment; a = advice

Appendix 2: Survey "Risk and Exposure Perception I"

Survey of User Perceptions of Electromagnetic Exposure

Dear participant,

Welcome and thank you very much for your interest in our study!

Due to Internet-enabled mobile phones, tablet computers and the use of social media such as Facebook and Twitter, we have radically changed our ways of communication with other people in the recent years.

In this survey we are interested to hear about your personal use of new wireless communication technologies and your assessment of the related risks.

Among all participants we will give away five Amazon vouchers worth €20 each in a prize draw for those who wish to take part. More detailed information about the prize draw can be found at the end of the survey.

This questionnaire takes approximately 8 minutes to complete. The data is collected anonymously and evaluated only for scientific research. The survey is part of an international research project, Low EMF* Exposure Future Networks (LExNet), which is carried out in 10 European countries. More information about the project can be found at www.lexnet-project.eu.

All Project Partners of LExNet are very grateful for your participation in this study.

*EMF is an acronym for Electromagnetic Field

1. How concerned are you about the potential health risks of electromagnetic fields from mobile phones?

Not at all concerned	Not very concered	Fairly concerned	Very concerned
			

2. Think about what you were doing yesterday.

What day of the week was it:

Mo	Tu	We	Th	Fr	Sa	Su

3. For how many minutes did you use the following devices yesterday?

	no use	up to 5min	more than 5min up to 10min	more than 10min up to 30 min	more than 30min up to 60min	more than 60min
Laptop with WLAN connection						
Cell phone for calls (received, outgoing, voice mail) on your ear						
Cell phone for music						
Cell phone for internet, apps						
Wireless joystick for a game console						
Cell phone for text message, mail						
Camera with WLAN connection						
Tablet (like iPad)						
Cell phone for calls (received, outgoing, voice mail) with headset or hands-free equipment						
Cell phone for gaming						

Was yesterday an usual day for you in terms of using wireless devices?

Yes No

Do you have a WLAN (i.e., a wireless network) at home?

Yes No

Do you have a WLAN at your workplace?

Yes No

Do you take any measures to reduce electromagnetic radiation (e.g., using a headset, switch off devices at night)?

Yes

No

4. Hans and Clara are open to using new technical innovations at home, at work and in their spare time. They have to try everything new. How similar are you to both?

not at all	not really similar	either similar nor dissimilar	somewhat similar	very similar
				

5. In your opinion, how strong are electromagnetic fields from the following devices or technical systems?

	1 very low intensity	2	3	4	5 very high intensity
High voltage power lines					
Wireless networks at home					
Smart meters (recording consumption of electric energy in a household and communicates this information to the utility company)					
AM/FM radio in vehicles					
Mobile telephones					
Cordeless phones					
Induction heating (e.g. cooker, heater)					
Microwave oven					
TV set					
Mobile communication masts					
Anti-theft devices (e.g. motion detectors of alarm systems, security gates/barriers)					
Household appliances (e.g. hair dryer, vacuum cleaner, mixer, refrigerator)					
GPS receiver in car					
Babyphone					
Game console					

6. The potential health risks of electromagnetic fields from exposure sources like mobile phones, mobile communication masts or other devices depends on:

	Disagree totally	Disagree to a certain amount	Either nor	Agree to a certain amount	Agree totally
How long you are exposed to the electromagnetic fields					
How big the device is					
How many sources of exposure in close proximity are present					
How strong the field emitted by the device is					
The time of the day during your exposure					
How close the device is that emits electromagnetic fields					
How often you are exposed to electromagnetic fields					

7.-16. In the following you will see a series of pictures featuring people who are exposed to electromagnetic fields. Please tell as your whether you consider these situations as dangerous to health or not.

Surfing with mobile phones

-- Picture removed --

How dangerous do you consider this situation to be for the person using the cell phone? Please choose one of the following answers.

	not dangerous	not really dangerous	either nor	rather dangerous	very dangerous
Surfing with mobile phones					

Mobile phone calls

-- Picture removed --

How dangerous do you consider this situation to be for the person using the cell phone? Please choose one of the following answers.

	not dangerous	not really dangerous	either nor	rather dangerous	very dangerous
Mobile phone calls					

WLAN Router in a close position

-- Picture removed --

How dangerous do you consider this situation to be for mother and daughter in the foreground of the picture? Please choose one of the following answers.

	not dangerous	not really dangerous	either nor	rather dangerous	very dangerous
WLAN Router in a close position					

WLAN Router in a distant position

-- Picture removed --

How dangerous do you consider this situation to be for the person using the laptop? Please choose one of the following answers.

	not dangerous	not really dangerous	either nor	rather dangerous	very dangerous
WLAN Router in a distant position					

Mobile phone use in the presence of other people

-- Picture removed --

How dangerous do you consider this situation to be for person reading the newspaper? Please choose one of the following answers.

	not dangerous	not really dangerous	either nor	rather dangerous	very dangerous
Mobile phone use in presence of other people					

Connecting a laptop with the internet via smartphone

-- Picture removed --

How dangerous do you consider the situation to be for the person working on the laptop which is connected with the Internet via the smart phone? Please choose one of the following answers.

	not dangerous	not really dangerous	either nor	rather dangerous	very dangerous
Connecting laptop with the internet via smartphone					

Laptop use on the lap

-- Picture removed --

How dangerous do you consider this situation to be for the person using the laptop? Please choose one of the following answers.

	not dangerous	not really dangerous	either nor	rather dangerous	very dangerous
Laptop use on the lap					

Power lines over inhabited areas

-- Picture removed --

How dangerous do you consider this situation to be for the persons living in the buildings? Please choose one of the following answers.

	not dangerous	not really dangerous	either nor	rather dangerous	very dangerous
Power lines over inhabited areas					

Mobile communication masts on a school roof

-- Picture removed --

How dangerous do you consider this situation to be for the children in the school? Please choose one of the following answers.

	not dangerous	not really dangerous	either nor	rather dangerous	very dangerous
Phone masts on a school roof					

Watching TV

-- Picture removed --

How dangerous do you consider this situation to be for the person watching TV? Please choose one of the following answers.

	not dangerous	not really dangerous	either nor	rather dangerous	very dangerous
Watching TV					

17. Your citizenship

I am citizen of...

2nd citizenship (optional)

My second citizenship is...

18. Your state of residence

I live in...

19. Your age

20. Your gender

- male
- female

21. About how many years of education have you completed, whether full-time or part-time? Please report these in full-time equivalents and include compulsory years of schooling

22. Which of the descriptions best describes your situation (in the last 7 days)?

- in paid work (or away temporarily) (employee, self-employed, working for your family business)
- in education, (not paid for by employer) even if on vacation
- unemployed and actively looking for a job
- unemployed, wanting a job but not actively looking for a job
- permanently sick or disabled
- retired
- in community or military service
- doing housework, looking after children or other persons
- Other (please specify)

23. Which phrase best describes the area where you live?

- a big city
- the suburbs or outskirts of a big city
- a town or a small city
- a country village
- a farm or home in the countryside

24. Including yourself, how many people – including children – live regularly in your household?

25. How often do you use the internet, the World Wide Web or e-mail – whether at home or at work – for your personal use?

- no access at home or work
- never use
- less than once a month
- once a month
- several times a month
- once a week
- several times a week
- every day

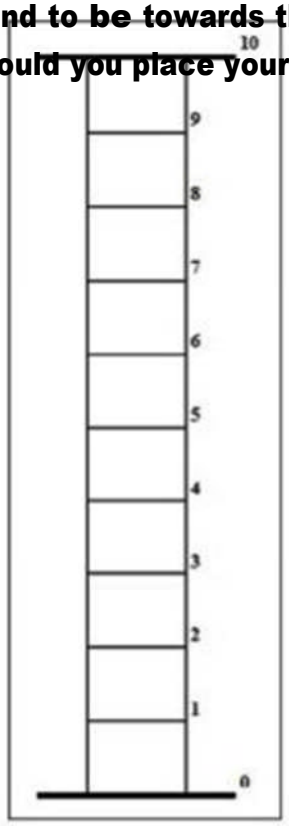
26. How often do you meet socially with friends, relatives or work colleagues?

- never
- less than once a month
- once a month
- several times a month
- once a week
- several times a week
- every day

27. In politics people sometimes talk of “left” and “right”. Where would you place yourself on this scale, where 0 means the left and 10 means the right?

0 left	1	2	3	4	5	6	7	8	9	10 right

28. There are people who tend to be towards the top of our society and people who tend to be towards the bottom. Here is a scale that runs from top to bottom. Where would you place yourself on this scale nowadays?



Society

- 10 Top of our society
- 9
- 8
- 7
- 6
- 5
- 4
- 3
- 2
- 1
- 0 Bottom of our society

To thank you for attending this survey, we are giving away 5 Amazon vouchers worth €20 each to all participants through a prize draw. If you want to participate in the draw, you can enter your email address on the next page. Your email address will be stored separately from your other data and deleted immediately after the draw.The five winners will be notified within the next weeks.

I want to participate in the prize draw.

- yes
- no

Please fill in your e-mail address (I agree that my email address will be saved to the drawing of the winners. My information in this survey will remain anonymous, my e-mail address will not be shared with third parties):

Thank you for
participating! We
appreciate your kind
help!

The background of the survey is the project LExNet: Low EMF* Exposure Future Networks. Seventeen leading telecommunication operators, vendors, research centres and academic institutions from the EU cooperate in LExNet throughout 10 European countries. The reduction of exposure to radio frequency electromagnetic fields is examined and it is analysed technically in the project as well as how this will be acceped by the user. For more detailed background information about the project please visit our website at:
http://www.lexnet-project.eu/

*EMF is an acronym for Electromagnetic Field

Appendix 3: Survey "Risk and Exposure Perception II"

'What are the best ways of reducing radiation from wireless telecommunication systems?'

Welcome to our survey and thank you very much for participating. Please read the following information carefully before starting:

Aim of this research
We want to explore different beliefs about radiation from wireless telecommunication systems and your views about strategies aiming to minimize the population's exposure to electromagnetic fields (EMF).

What does participation in this research involve?
Participation in the study will involve completing a series of questions, which ask you about your beliefs regarding wireless telecommunications technologies. This will take about 15 minutes to complete.

Anonymity
We will not be collecting any information that can identify you in this study.

Background
The background of the survey is the project LExNet: Low EMF Exposure Future Networks. Seventeen leading telecommunication operators, vendors, research centres and academic institutions from the EU cooperate in LExNet throughout 10 European countries. The reduction of exposure to radio frequency electromagnetic fields is examined and it is analysed technically in the project as well as how this will be accepted by the user.

Please start the survey by clicking the 'Next' button.

FOR YOUR INFORMATION: Electromagnetic fields (EMF) are produced and emitted by electrical devices. Mobile phones and base stations use EMF for transmission of voice and data.

Which of the following devices/technologies do you use?

1.1 WiFi router at home or work

1.2 Smart phone or mobile phone

1.2 Tablet computer (Apple iPad ®, SAMSUNG Galaxy Tab ®, or similar)

1.4 Is there a base station close to your home?

1.5 Think about your daily life, to which degree do you think you are exposed to electromagnetic fields from electronic devices (like mobile phones, WiFi router) and base stations?

(1) Not at all (2) (3) (4) (5) To a very

high degree

1.6 How concerned are you about the potential health risks of EMF in general?

(1) Not at all concerned | (2) Not very concerned | (3) Neither nor | (4) Fairly concerned | (5) Very concerned

1.7 Please rank your position on the potential health risks of EMF from mobile phones and from base stations on a scale from 0 (no risk at all) to 100 (serious health risks for humans)?

Mobile phones (0 -100)

Base stations (0 -100)

1.8 How often in your daily life do you think about the topic "potential health effects of electromagnetic fields "?

(1) Never | (2) Rarely | (3) Sometimes | (4) Often | (5) Very often

1.9 How often in your daily life do you talk about potential health effects of EMF with other people (including conversation, via Facebook, twitter, chat, online forum or similar)?

(1) Never | (2) Rarely | (3) Sometimes | (4) Often | (5) Very often

8.2.0 In the following you will see a series of pictures featuring people who are exposed to electromagnetic fields. Please answer the following questions referred to each situation.

Mobile phone calls

-Picture removed-

Imagine you are the person above using the cell phone. What kind of feelings about exposure would you have in this situation?

(1) Very negative | (2) | (3) | (4) | (5) Very positive | Don't know

In your opinion, does the situation depicted by the picture, elicit any moral concerns about exposure?

(1) Not at all | (2) | (3) | (4) | (5) Yes | Don't know

In your opinion, how strong is the exposure to the person in the above picture?

(1) Very low (2) (3) (4) (5) Very high Don't know

How dangerous do you consider this situation to be for the person using the cell phone?

(1) Not dangerous (2) (3) (4) (5) Very dangerous Don't know

WLAN router in close position

-Picture removed-

Imagine you are the person depicted in the picture, what kind of feelings about exposure would you have in this situation?

(1) Very negative (2) (3) (4) (5) Very positive Don't know

In your opinion, does the situation depicted by the picture, elicit any moral concerns about exposure?

(1) Not at all (2) (3) (4) (5) Yes Don't know

In your opinion, how strong is the exposure to the person in the above picture?

(1) Very low (2) (3) (4) (5) Very high Don't know

How dangerous do you consider this situation to be for the person sitting on the sofa? Please choose one of the following answers.

(1) Not dangerous (2) (3) (4) (5) Very dangerous Don't know

Mobile phone use in the presence of other people

-Picture removed-

Imagine you are the person reading the newspaper, what kind of feelings about exposure would you have in this situation?

(1) Very negative (2) (3) (4) (5) Very positive Don't know

In your opinion, does the situation depicted by the picture, elicit any moral concerns about exposure?

(1) Not at all (2) (3) (4) (5) Yes Don't know

In your opinion, how strong is the exposure to the person, reading the newspaper, in the above picture?

(1) Very low (2) (3) (4) (5) Very high Don't know

How dangerous do you consider this situation to be for the person reading the newspaper?

(1) Not dangerous (2) (3) (4) (5) Very dangerous Don't know

Laptop use

-Picture removed-

Imagine you are the person depicted in the picture, what kind of feelings about exposure would you have in this situation?

(1) Very negative (2) (3) (4) (5) Very positive Don't know

In your opinion, does the situation depicted by the picture, elicit any moral concerns about exposure?

(1) Not at all (2) (3) (4) (5) Yes Don't know

In your opinion, how strong is the exposure to the person in the above picture?

(1) Very low (2) (3) (4) (5) Very high Don't know

How dangerous do you consider this situation to be for the person using the laptop?

(1) Not dangerous (2) (3) (4) (5) Very dangerous Don't know

Mobile communication masts

-Picture removed-

Imagine you are living close to the building with the antennas and you can see the antennas from your window, what kind of feelings about exposure would you have?

(1) Very negative (2) (3) (4) (5) Very positive Don't know

In your opinion, does the situation (living close to the building with the antennas) elicit any moral concerns about exposure?

(1) Not at all (2) (3) (4) (5) Yes Don't know

In your opinion, how strong is the exposure for a person living close to the building with antennas in the above picture?

(1) Very low (2) (3) (4) (5) Very high Don't know

How dangerous do you consider living close to the building with the antennas?

(1) Not dangerous (2) (3) (4) (5) Very dangerous Don't know

2.9 The potential health risks of electromagnetic fields from exposure sources like mobile phones, mobile communication masts or other devices depends on:

	(1) Disagree totally	(2) Disagree to a certain amount	(3) Either nor	(4) Agree to a certain amount	(5) Agree totally
The time of the day that you are exposed.					
How close the device is that emits electromagnetic fields.					
The number of wireless devices from other users in close proximity.					
How strong the field emitted by the device is.					
How long you are exposed to the electromagnetic fields.					
How big the device is.					
How many sources of exposure in close proximity are present.					
How many times you are exposed to electromagnetic fields.					

2.10 Please tell us to what extent you agree with the following statements:

	(1) No, not at all	(2)	(3)	(4)	(5) Yes, absolutely
No matter how low the EMF exposure is, there is still a risk due to the fact that even a minimal exposure may result in negative health impacts.					
Man made electromagnetic fields are more dangerous than natural ones.					
The deployment of base stations in residential areas is not a mere technical question, but one that should respect the views of the concerned citizen.					
No matter whether or not I am exposed to EMF radiation, base stations simply scare me.					

Distance in meter

3.1 Roughly at what distance (meters) would you accept a base station close to your home?	
3.2 Roughly at what distance (meters) would you accept a base station close to your home if the exposure was reduced by 30%?	
3.3 Roughly at what distance (meters) would you accept a base station close to your home if the exposure was reduced by 50%?	
3.4 Roughly at what distance (meters) would you accept a base station close to your home if the exposure was reduced by 70%?	

FOR YOUR INFORMATION: Two types of radio frequency (RF) EMF exposure exist. Firstly, the exposure induced by sources close to the users such as personal wireless devices (mobile phones, tablets, laptops) and secondly, the exposure induced by far sources such as base station antennas.

4.1 Do you think the exposure from personal wireless devices and the exposure from base stations should be added up when evaluating your exposure to EMF?

(1) No, not at all	(2)	(3)	(4)	5) Yes, absolutely	Don't know

4.2 Do you think the signal strength (as indicated on your mobile phone) is linked to the distance to a base station?

(1) No, not at all	(2)	(3)	(4)	5) Yes, absolutely	Don't know

-Picture removed-

4.3 Think about noise, what would you prefer more:
A) a low continuous noise combined with an occasionally reached very loud noise or
B) a louder continuous background noise but without the occasionally reached very high peak noise?

4.4 And now think about electromagnetic fields, what would you prefer:
A) a low continuous exposure combined with an occasionally reached high exposure or
B) a higher continuous exposure without the occasionally reached high peak exposure?

4.5 Do you think it makes sense to characterize your day-to-day exposure to EMF by averaging it over time (the exposure can immensely vary over the time).

(1) No, not at all	(2)	(3)	(4)	5) Yes, absolutely	Don't know

4.6 Do you think that an individual exposure to EMF can be approximated by measuring the exposure over a large population?

To give an example, let 's say you live in Paris 14th district. The average exposure over the entire population in Paris 14th district is then used as an indicator for your individual exposure to EMF.

(1) No, not at all	(2)	(3)	(4)	5) Yes, absolutely	Don't know

4.7 If you are informed about EMF exposure conditions in your local area would you place trust in such information when it is given

	(1) No, not at all	(2)	(3)	(4)	(5) Yes, absolutely	Don't know
by industry?						
by governmental agencies?						
by scientists from universities?						
by politicians?						

4.8 For lower average exposure in a residential area, would you accept:

	(1) Not at all acceptable	(2)	(3)	(4)	(5) Absolutely acceptable	Don't know
a) more smaller base stations with lower transmit power						
b) a small base station is installed inside your home						

5.1 Your citizenship

I am citizen of...

5.2 Your state of residence

I live in...

5.3 Your age

5.4 Your gender

Male

Female

5.5 About how many years of education have you completed, whether full -time or part-time? Please report these in full -time equivalents and include compulsory years of schooling.

1

5.6 Which of the descriptions best describes your situation (in the last 7 days)?

5.7 Which phrase best describes the area where you live?

5.8 Including yourself, how many people – including children – live regularly in your household?

5.9 How often do you use the internet, the World Wide Web or e-mail – whether at home or at work – for your personal use?

5.10 How often do you meet socially with friends, relatives or work colleagues?

Thank you for participating!

We appreciate your kind help!

The background of the survey is the project LExNet: Low EMF* Exposure Future Networks. Seventeen leading telecommunication operators, vendors, research centres and academic institutions from the EU cooperate in LExNet throughout 10 European countries. The reduction of exposure to radio frequency electromagnetic fields is examined and it is analysed technically in the project as well as how this will be accepted by the user.

For more detailed background information about the project please visit our website at: http://www.lexnetproject.eu/

*EMF is an acronym for Electromagnetic Field