

# VU Research Portal

## Understanding Perceived Risk

van Dongen, A.

2015

### **document version**

Publisher's PDF, also known as Version of record

[Link to publication in VU Research Portal](#)

### **citation for published version (APA)**

van Dongen, A. (2015). *Understanding Perceived Risk: Perceptions of and responses to mobile phones, base stations, and other sources of electromagnetic fields.*

### **General rights**

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal ?

### **Take down policy**

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

### **E-mail address:**

[vuresearchportal.ub@vu.nl](mailto:vuresearchportal.ub@vu.nl)

## Summary

Although there is no convincing evidence supporting the case for negative health effects caused by electromagnetic field (EMF) sources, like mobile phones, base stations, and high-voltage power lines, there are still concerns among lay people that the EMF emission is linked to cancer and other negative health effects. Moreover, some people attribute somatic reactions such as dizziness and headaches to being exposed to EMF. Understanding perceived risk of EMF of lay people – including their concerns about and symptom attributions to EMF – may help to improve the risk communication by experts and may lead to a better informed public. This thesis aims to provide insight into the determinants of and differences in perceived risk of EMF and concerns of the public, of people with health complaints attributed to EMF, and of occupationally exposed people. In this thesis, aspects associated with the technologies itself (e.g. perceived benefits, perceived control, perceived exposure, perceived health risk), characteristics of the people (e.g. knowledge about the risks, reporting non-specific health complaints, symptom attribution) and social aspects (i.e. trust in authorities, and reactions towards the measures taken by authorities) will be examined.

In this thesis the following questions are addressed.

1. How do people perceive and respond to sources of EMF, i.e. mobile phones, microwave ovens, digital enhanced cordless telecommunications (DECT), MRI scanners, metal detectors, Global System for Mobile Communications (GSM) base station, Universal Mobile Telecommunications System (UMTS) base station and power lines?
  - a. How do people working with sources of EMF perceive and respond to these sources of EMF?
  - b. What are the differences between people with Idiopathic Environmental Intolerance of EMF (IEI-EMF) and the general population (including people with self-reported sensitivity to EMF)?
2. What are the relevant determinants of risk perception and behavioural responses to sources of EMF?
3. What is the effect of information on risk perception and responses?

We collected the data in two steps. First, we developed a questionnaire to learn more about perceived risk and aspects of perceived risk of different EMF sources among the general population (n=1009), different occupational groups (MRI radiographers (n=193) and security officers (n=106)), and people with IEI-EMF (n=116). With this questionnaire we also aimed to determine the prevalence of non-specific symptoms attributed to EMF and responses to risks of EMF. Second, we developed an experiment with a 2x2x4 factorial between subject design (n=527) to investigate the effect of information about risk regulation, distance-exposure relation, and personal control on perceived risk and responses.

In **chapter 2**, we described differences regarding risk perception, feelings towards, and health concerns regarding EMF and (occupational) sources of EMF among three occupational groups, e.g. the general working population, security officers, and MRI radiographers. This study showed that although MRI radiographers work with equipment (MRI scan) emitting EMF levels closer to the exposure limits than the general working population and the security officers, they still perceived EMF and EMF sources as less

hazardous for health. Ratings of the security officers did not differ much from the general working population. We suggest that knowledge of EMF in general and voluntariness of exposure of different EMF sources might be of more importance in predicting the perceived health risk of EMF, than the level of occupation exposure to EMF. It is important to keep this in mind when informing employees about possible risk of EMF on health and not presume that employees are not worried when working with sources far below the exposure limit.

In **chapter 3**, we examined differences in perceptions of health and EMF between people from general population (reporting sensitivity or non-sensitivity to EMF), and people who registered at a nongovernmental organisation (NGO) as being sensitive to EMF. In addition, we examined the relationship between attributing non-specific symptoms (e.g. headaches, dizziness, muscle aches) to EMF and the self-reported intensity of these symptoms. This study showed that people sensitive to EMF and recruited via an internet panel differed from people who registered at a NGO. The latter reported more non-specific symptoms and also suffering at a higher frequency of these symptoms. Furthermore, a positive association was found between attribution of symptoms to EMF and the intensity of the non-specific symptoms: the more the symptoms were attributed to EMF, the more people were suffering of non-specific symptoms.

In **chapter 4**, we studied the relationship between people's trust in government policy regarding EMF and people's responses to risks of EMF and different EMF sources (i.e. mobile phones, cordless phones, microwave ovens, mobile phone base stations and high voltage power lines). In addition, the effect of perceived risk, perceived benefits, and perceived control on this relationship was examined. This study showed that high trust in government policy was associated with low risk responses, such as protest against the installation of mobile phone base stations and/or less use of mobile phones. Trust was also negatively related to risk perception, which in turn was positively related to risk responses. The relationship between trust and risk responses was weakened by risk perception, which indicates that risk perception might be a mediator for trust and risk responses. For public sources (mobile phone base stations and power lines), perceived control over exposure weakened the negative relationship between trust and perceived risk. We conclude that, especially in people with low perceived control, a lack of trust in government policy may enhance perceptions of health risks, thereby increasing their inclination for risk responses by lowering their exposure to EMF.

In **chapter 5**, we made a comparison between people who are mostly positive, mostly negative, ambivalent or indifferent towards mobile phone base stations on how they perceive the risks and benefits of base stations, and to what extent they would protest against installation of a base station near their house. Also, the relationship between feelings, perceived risk, perceived benefit and protest intentions are examined. More than 40% of the participants had predominantly positive feelings, while only 21% had predominantly negative feelings. A quarter had both strong positive and negative feelings. The data showed that the mix of feelings, i.e. both strong negative and strong positive feelings, is associated with high perceived risk as well as high perceived benefits, which seems to level each other out in relationship to protest intention, leading neither to strong nor weak protest intentions. Therefore, people with mixed feelings show similar levels of risk perception as people with

predominantly negative feelings, but less intention to protest. Having mixed feelings towards mobile phone base stations seemed to be related to having mixed feelings towards other sources of EMF, i.e. mobile phones and high voltage power lines, too.

In **chapter 6**, we examined the effect of providing different formats of information about government policy on risk perception and acceptance of the installation of a mobile phone base station (MPBS) or power lines. In an online study respondents were offered different formats of information on government policy: no information, standard policy information, standard policy information while emphasizing the independence of the government for the industry, and standard policy information with information about the government's economic interest regarding EMF. The results showed that information is not necessarily seen as a cue for risk: providing information about government policy does not raise risk perception or lower acceptance of the installation of a MPBS in the neighbourhood. Furthermore, clarifying government's potential economic gains has more positive effects, such as perceiving a MPBS near a house as lower risk for health, than emphasizing the independence from industry. We conclude that as the government has a duty to inform the public, it is best to be transparent about potential conflicts of interests.

In **chapter 7**, we discussed the effects of three sorts of information - explaining exposure to sources of EMF, about mitigation policy, and about options available to reduce exposure - on lay understanding of exposure, awareness of mitigation policy, perceived control over exposure of EMF, and risk perception. In an online consumer panel, the effects of providing people with information about EMF on lay understanding of exposure and perceptions and responses to risks were tested, using an experimental 2x2x2 design. The data showed that providing people with specific information explaining the distance-exposure relationship, clarifying EMF policy, or specifying personal exposure management options actions, resulted in a better understanding of exposure. Information provision as such, has no effects on concerns about EMF nor on perceived risk of mobile phones but lowered perception of risk of mobile phone base stations and high voltage power lines. In addition, information explaining the distance-exposure relationship in combination with policy information, resulted in reduced self-reported risk aversive responses. Moreover, participants who understood more about exposure in relation to distance to source showed lower perceptions of risk, were less likely to restrict their own exposure, and more likely to accept new installations of public sources of EMF in their neighbourhood. In contrast, awareness that exposure is mainly determined by personal use of EMF sources corresponded with higher perceptions of risk and stronger risk aversive responses.

In the final chapter, **chapter 8**, the findings of the previous studies are discussed, and recommendations for employers, government and for further research are addressed. Overall, we found that EMF risk perceptions and responses vary widely across sources and people. These variations are not explained by technical assessments of risk such as epidemiology and exposure levels, but rather by voluntariness and perceived control over exposure, knowledge of EMF, trust in government policy on risk regulation, perceived benefits of, and general feelings towards EMF technology. In addition, we showed that risk aversive behavioural responses e.g. protest intentions and avoiding use of mobile phones or microwaves, are mainly determined by risk perceptions. Furthermore, perceived risk

## Summary

---

mediates the relationship between trust in government policy and risk responses. Especially in people with low perceived control, a lack of trust in government policy enhances perceptions of health risks, thereby increasing their inclination for risk responses. However, independent of risk perception, negative feelings towards EMF also predicted aversive responses. For the government it seems important to communicate transparently about economic interest and cooperation with industries, since attempts to withhold this information is likely to reduce trust, raise risk perceptions, and reduce acceptance of installation of public EMF sources. Also, providing people with information clarifying the distance-exposure relationship improves understanding of EMF exposure, thereby preventing uninformed concerns and reducing risk-averse behavioural intentions.