



Project: **SEAWave**

Precautionary communication studies

Work Package: WP10
Deliverable: D10.3
Deliverable No.: D37

Abstract

The report provides information on the current state of research regarding precautionary communication (theoretical background). It also explains the methods used to obtain the data of the present studies on the topic within SEAWave. The results are not part of this report. They will be published in a peer-reviewed journal.

Project Details

Project name	SEAWave
Grant number	101057622
Start Date	01 Jun 2022
Duration	36 months
Scientific coordinator	Prof. Th. Samaras, Aristotle University of Thessaloniki (AUTH)

Deliverable Details

Deliverable related number	D10.3
Deliverable No.	D37
Deliverable name	Precautionary communication studies
Work Package number	WP10
Work Package name	Risk Communication
Editors	Marie Eggeling*, Sarah Link*, Ferdinand Abacioglu*, Christoph Böhmert* *IU International University of Applied Sciences
Distribution	Public
Version	1
Draft/final	Final
Keywords	5G, Precautionary communication, EMF

Contents

1	Introduction	6
1.1	Objective	6
1.2	RF-EMF and health	7
1.3	The precautionary principle and RF-EMF	7
2	State of research regarding effects of precautionary information	8
2.1	Effects of precautionary communication on risk perception and trust	8
2.1.1	Effects on risk perception	9
2.1.2	Effects on trust	9
2.1.3	Influences of information framing and individual differences	9
2.2	Measuring risk perception	11
2.2.1	Multidimensional approaches	11
2.2.2	Conditional measures	12
2.2.3	Switching and pervasive risks	12
2.3	Personal relevance	13
2.4	Additional information on precaution	14
3	The present studies: Research questions and hypotheses	15
3.1	Effects of precautionary communication on risk perception (studies 1+2)	15
3.2	Personal relevance (study 1)	16
3.3	Additional text module (study 2)	17
3.4	Additional exploratory questions	18
3.5	Country comparisons	19
4	Methods	19
4.1	Data collection	19
4.2	Participants	20
4.3	Quotas	21
4.4	Procedure of the survey	22
4.5	Study design	23
4.5.1	Conditions in study 1	23
4.5.2	Conditions in study 2	23
4.6	Information texts (independent variables)	23

4.6.1	Basic information text.....	23
4.6.2	Precautionary information as recommendation or neutral information	24
4.6.3	Text module on precaution vs. prevention	26
4.7	Dependent variables and predictors	26
4.7.1	Personal relevance.....	26
4.7.2	Dependent variables that are relevant for the hypotheses	27
4.7.3	Additional measures	27
4.8	Pre-Tests	28
4.9	Quality checks	29
4.10	Translations.....	30
4.11	Data preparation.....	30
4.12	Planned analyses for study 1	30
4.13	Planned analyses for study 2	32
5	Results/Discussion	33
6	References	33
7	Appendix	37
7.1	Participation information and consent form	37
7.2	The questionnaires	38
7.3	Debriefing.....	47
7.4	Quotas.....	48
7.4.1	Interlocking quotas for age and gender	49
7.4.2	Quotas for region.....	49

Figure 1 Power analysis for study 1 and 2	20
Figure 2 Article suggestions for the practical relevance question	21
Figure 3: Sections of the survey.....	22

1 Introduction

The communication of precautionary information to the public is relevant in situations where there are scientific uncertainties if something poses a risk. In this case, public institutions frequently aim to give citizens an informed choice about possible measures to reduce exposure to this potential risk.

There is currently no conclusive evidence regarding adverse health-effects from radiofrequency electromagnetic fields (RF-EMF) used for mobile communications under internationally defined levels of exposure, particularly because some scientific uncertainties remain, e.g., regarding long-term risks for heavy users or effects on children (World Health Organization [WHO], 2010, 2014). Therefore, many national health-organisations inform citizens about precautionary measures (see e.g., Stam, 2017). For individuals, these measures usually refer to reducing personal exposure to RF-EMF when using mobile devices (e.g., use headsets, don't make calls when the reception is poor), as this is something people can personally control.

However, previous research suggests that giving precautionary information can lead to an increased risk perception and a decreased trust in health-protection (see review by Boehmert et al., 2020) among lay recipients. In other studies, such effects were associated with individual difference variables like trait anxiety and gender (e.g., Boehmert et al., 2016; Boehmert et al., 2017). It is relevant to further investigate the effects of precautionary information and possible relations to individual variables in order to understand how to appropriately present information to citizens. This is important for national health-organizations and other risk or science communicators addressing the public.

1.1 Objective

The objective of task 10.4 is to investigate different and novel ways of communicating precaution by means of online experiments. Work on this task began in 2022 with an extensive literature research on the topic of precautionary communication regarding RF-EMF exposure in mobile communications to identify research gaps. During the first half of 2023, specific study ideas were developed and discussed among the SEAWave WP10 project partners. It was decided to conduct two experimental studies to take a closer look at two different research questions. The present studies investigate 1) if personal relevance of the topic “RF-EMF and health¹” influences the effect of precautionary communication on risk perception and trust in state institutions of radiation

¹ In this report, we use the professional terminology, e.g., “RF-EMF”, however in our studies we used language that is more common for laypeople in their respective language, e.g., “Mobilfunkstrahlung” (“mobile phone radiation”).

protection and 2) if explaining the concept of precaution in a novel way in addition to presenting precautionary measures had a different effect on risk perception and trust.

1.2 RF-EMF and health

There has already been a lot of research on the question if RF-EMF (e.g., from mobile communication technology) have negative effects on human health. This research has been reviewed and evaluated by different international organizations. The only biological effect of RF-EMF consistently found has been the thermal effect, specifically the heating of tissue (Foster & Colombi, 2017). Other, possibly indirect effects, that may be detrimental for human health, have not been consistently found (Wood & Karipidis, 2017), neither for older mobile communication standards nor for the latest standard 5G (Udo et al., 2022). Many countries have implemented the exposure standards for health protection recommended by the International Commission for Non-Ionizing Radiation Protection (ICNIRP) or the Institution of Electrical and Electronic Engineers (IEEE) (Missling et al., 2015; Stam, 2017). Most international organizations concluded that by implementing these recommendations, e.g., by restricting the specific absorption rate (SAR), which refers to the amount of energy absorbed by the body (ICNIRP, 1998), citizens are sufficiently protected. However, there are scientific uncertainties that remain, e.g., regarding long-term effects for heavy mobile phone users and effects on children (WHO, 2010, 2014). The International Agency for Research on Cancer (IARC) classified the high-frequency electromagnetic fields emitted by mobile phones as possibly carcinogenic to humans, pointing out that the scientific evidence available to date does not allow to rule out a risk of developing brain tumours for heavy users of mobile phones (IARC, 2013).

1.3 The precautionary principle and RF-EMF

Generally, the precautionary principle is an approach which can be applied when being faced with decisions under uncertainty. It may be used in situations where it is yet unclear if something turns out to be a hazard or not. Compared to primary prevention, which is the earliest form of prevention and addresses to avoid harm from something that has proven to be a risk (e.g., encouraging people to exercise more to prevent obesity, which has been shown to potentially lead to various health problems), precaution takes place even earlier. Basically, it can be understood as a preventive measure that is only relevant if something turns out to be a hazard (Weed, 2004). For example, regarding RF-EMF in mobile communications, precautionary behaviour can mean to reduce personal exposure to RF-EMF, even though there is no scientific evidence that there is a negative impact below the established limits.

It is an ongoing discussion among experts if the precautionary principle should be considered when it comes to RF-EMF in mobile communications and – if yes – what exactly should be the

consequences. There are different positions on this matter. The WHO established the International EMF Project in 1996 with the aim to assess the scientific evidence of possible health effects of EMF. International organizations like ICNIRP and IEEE as well as national authorities (e.g., the Federal Office for Radiation Protection in Germany (BfS)) are advisors for this project. According to the WHO (2012), they can only make recommendations regarding prevention, not regarding precaution, which should be in the hands of national authorities. They argue that precautionary measures need to depend on several factors (e.g., socio-economic reality and preferences) and as there is no evidence for negative health effects, the WHO would not set norms or standards in this area (WHO, 2012). Representatives from the industry usually deny the necessity of precautionary measures (e.g., Dolan & Rowley, 2009) while activists are in favour of them (e.g., Bioinitiative Working Group, 2012).

According to Wiedemann et al. (2001), precautionary measures can be research-related (e.g., conduct further research to reduce scientific uncertainties), process-related (e.g., provide support to reduce exposure and enable informed decision-making), or health-related (e.g., set stricter limits to reduce exposure). Many national health authorities, such as the BfS in Germany, choose to recommend precautionary measures that people can take to reduce their personal exposure to RF-EMF when using mobile devices. This approach enables citizens to make their own informed decisions, at least when it comes to handling their personal devices.

However, research on how precautionary information is perceived by the recipients has shown that it may have some effects that were unexpected to communicators in the beginning.

2 State of research regarding effects of precautionary information

This chapter gives an overview of the current state of research regarding effects of the communication of precautionary information to the public. The state of research presented is based on scientific literature and includes findings from the studies which have already been conducted in the SEAWave project. Detailed information about these studies can be found in Deliverable 10.1 and 10.2 (Link et al., 2023, 2024).

2.1 Effects of precautionary communication on risk perception and trust

Previous studies have shown that the communication of precautionary information can lead to an increase in risk perception and a decrease in the confidence in health protection (e.g., (Wiedemann et al., 2013; Wiedemann et al., 2006).

2.1.1 Effects on risk perception

In a systematic review, Boehmert et al. (2020) analysed research on risk communication regarding RF-EMF in mobile communications. On the effects of precautionary communication, they conducted a meta-analysis with 14 individual studies. In all these studies it was explicitly clarified to participants that no scientific proof exists for harmful effects of RF-EMF in mobile communications. Also, in all studies the participants received a precautionary recommendation. If possible, risk perception regarding mobile phones and regarding mobile phone base stations were analysed separately (three studies), otherwise general RF-EMF risk perception (four studies) was used as dependent variable. The dependent variables to measure risk perception were all single item measurements, but the studies used different wordings for the precautionary information and the measurement items. Overall, the analysis showed that there was a significant increase of risk perception regarding mobile phones and mobile phone base stations (nine studies), but effect sizes were small. Regarding general RF-EMF risk perception, there was no significant effect of precautionary communication.

2.1.2 Effects on trust

Two studies (Wiedemann & Schütz, 2005; Wiedemann et al., 2006) considered trust in public health protection as a dependent variable. While Wiedemann and Schütz (2005) found that precautionary information led to a decrease in trust, Wiedemann et al. (2006) did not find an effect. Boehmert et al. (2016) considered trust in public health protection (regarding mobile phones and mobile phone base stations). They found that mobile phone trust was lower in the precautionary message condition, but that there were no mean differences regarding base station trust. They also investigated interactions with trait anxiety, finding that the effect of the precautionary message was more prevalent in females low in anxiety than in high-anxious females or males.

Knowing the effects of communicating precautionary information on trust is particularly important for health authorities as they are the ones informing about precaution as well as the ones potentially affected by the decrease of trust. They usually have an interest in communicating information without losing their audience's trust.

2.1.3 Influences of information framing and individual differences

Besides the general effect of precautionary recommendations on risk perception, some studies investigated further if the way the information is presented or individual differences between recipients influence how the precautionary information are perceived. Barnett et al. (2007; 2008) varied in a 2x2 design how the precautionary information, which referred to mobile telephony, was framed and what was given as reason to communicate the information. Participants read either a message that mentioned only risks or one that mentioned risks and benefits.

Furthermore, they were either told that the reason for giving them the information was scientific uncertainty, or public concern. The authors found no differences between the experimental groups.

In an experiment with students, (Chandran & Menon, 2004) used a 2x2 design to vary the type of precautionary measures (easy to implement vs. hard to implement) and the framing of the possible health hazard (occurring every day vs. every year). They found that in the “every day framing” risk perception was higher. The type of precautionary measures had no influence on risk perception. In the “every year frame”, participants indicated higher intentions to look for more information about the risk if they had read about precautionary measures that were easy to implement, while in the day frame the type of precautionary measures made no difference.

In a study by Boehmert et al. (2016) it was investigated if framing of precautionary recommendations regarding consistency and effectiveness of the measures influences the effects on risk perception. Regarding consistency, participants either received an explanation about the motives for giving the recommendations or did not receive such an explanation. This additional explanation did not have an influence on risk perception. Regarding effectiveness of the measures, participants were either explained how effective the recommended measures are or did not receive such an explanation. The idea behind this was to clarify the value of individual precautions regarding mobile phone use because laypeople have been consistently found to underestimate the contribution of mobile phone use to their overall exposure (compared to the exposure from base stations, (e.g., Cousin & Siegrist, 2010a, 2010b)). However, risk perception did not decrease in the group of participants who received the effectiveness explanation, but even increased if people were explicitly asked for their risk perception under the condition that no precautionary measures are taken. It needs to be mentioned that in this study, no general effect of precautionary recommendations on risk perception was found.

In some studies, recipient variables were researched regarding their influence on the perception of precautionary information. One potentially important variable is how concerned people are before they receive the precautionary information. After conducting a qualitative focus group study (Timotijevic & Barnett, 2006) the authors concluded that participants who are already concerned about the topic were also more likely to have concerns about the precautions. However, in their study, precautions referred to governmental approaches regarding for example limit values and not to measures someone can take individually. In a study by Wiedemann et al. (2008) there were no differences between participants with low vs. high prior risk perception.

Boehmert and colleagues (Boehmert et al., 2018; Boehmert et al., 2016; Boehmert et al., 2017) found no general effect of precautionary information on risk perception across all participants. However, they found that individual differences regarding the effects of precautionary

information may depend on state-anxiety and gender. In two studies it was shown that for low-anxious people, risk perception increased when they read precautionary information, while it did not increase for high-anxious people. In the first study, this applied only to women (Boehmert et al., 2017) and a more detailed analysis showed that for low-anxious participants reading the precautionary information, the average risk perception was raised to the same level as the one of the high-anxious participants who did not read the precautionary information. One possible explanation for this could be that high-anxious participants may have been already aware of possible risks and worried because of them before, while low-anxious participants may have concluded from the precautionary recommendation that there must be a risk they had not been aware of before. In the second study, the moderating influence of trait anxiety was shown for both genders (Boehmert et al., 2018). Here, risk perception was retrieved conditionally, first under the condition that no precautionary measures are taken and secondly under the condition that precautions are taken. It was found that for high-anxious people, risk perception decreased if they assumed that precautions are taken.

In another study (Boehmert et al., 2018) it was found that prior risk perception was the most important predictor of reporting a “Nocobo” experience (a sham exposure to a WLAN electromagnetic field).

2.2 Measuring risk perception

Risk perception in general describes the subjective evaluation of a (potential) hazard and can therefore differ between individuals. It is influenced by the perceived probability of a hazard occurring and its severity (Sjöberg et al., 2004; Wilson et al., 2019). It is important to think about how to appropriately measure risk perception as this is the main dependent variable of the present research questions.

2.2.1 Multidimensional approaches

In the past, risk perception, as it is described in the psychometric paradigm (e.g., Slovic, 1987), was often assessed globally, for example with an item such as "How dangerous do you think mobile phone radiation is?". In contrast to this, a recent approach views risk perception as being multidimensional, including affective responses, the probability of encountering a potential hazard (exposure), the likelihood of suffering consequences from it, and the severity of the consequences (Walpole & Wilson, 2021; Wilson et al., 2019). While it can be discussed if, for example, exposure perception is a part of risk perception or rather a closely related concept, it makes sense to consider those aspects when investigating risk perception and not only use one general item. Exposure perception in particular was already investigated in depth in the previous studies in WP10 in the SEAWave project (Link et al., 2023, 2024) and is relevant for understanding how laypeople perceive RF-EMF, for example when a new mobile communication standard like

5G is introduced. In the current two studies on precautionary communication, the multidimensionality of risk perception will be considered by assessing not only general and affective risk perception but including exposure perception as well as perception of susceptibility and severity as exploratory measures.

2.2.2 Conditional measures

Additionally, when researching effects of precautionary information on risk perception regarding RF-EMF in mobile communications, it is relevant to consider that participants may assume they either take precautions or assume that they do not take precautions when answering questions like “How dangerous do you think electromagnetic fields from mobile phones are?”. Some people may already implement precautionary measures when using their mobile phone in their daily lives, either because they want to reduce their RF-EMF exposure or for independent reasons, e.g., because making calls with a headset is more convenient than holding the mobile phone to the ear. When asking citizens about RF-EMF risk perception connected to mobile phone use it is therefore important to take this into account and consider on what basis they respond to the questions. To address this problem, Boehmert et al. (2016) used a conditional risk perception measure. Besides an unconditional measure (general risk perception), participants were asked for their risk perception “if precautionary measures are taken” and “if no precautionary measures are taken”. It turned out that participants responded differently to the conditional questions, so such a differentiation may extend the understanding of risk perception. Therefore, it will be considered in our studies.

2.2.3 Switching and pervasive risks

When researching RF-EMF risk perception, it also needs to be considered that for many people, this is not something they think about often in their daily lives. Even though most citizens own a mobile phone and use it regularly, many laypeople lack an understanding of how mobile communications work and what potential health effects could be associated with RF-EMF (Cousin & Siegrist, 2010b). However, they may still express concerns or indicate a high risk perception when participating in studies (e.g., Wiedemann et al., 2017). This may be explained with the concept of “switching risks” (Zwick, 2005). This concept states that there are two types of risks: Those that are permanently perceived as a risk (pervasive risks) and those that are only perceived as a potential risk after an external influence (switching risks). Switching risks are typically irrelevant in people’s everyday life if they are not “switched on”. External influences that turn this switch on can be, for example, news reports. In contrast to pervasive risks, switching risks have only little everyday relevance at the individual level. The assumption that most people think little about RF-EMF regarding their mobile phone use was confirmed in previous studies (e.g., Wiedemann et al., 2017). There are, of course, exceptions, as some people are particularly

interested in technology, concerned about the introduction of new technologies like 5G, or worried about radiation-related topics in general.

2.3 Personal relevance

While previous studies have shown that the communication of precautionary information can lead to an increase in risk perception and a decrease in trust in public health protection, it has not yet been investigated whether the effect of precautionary information may differ depending on the individual relevance of the topic “RF-EMF and health”. Individual characteristics can influence the effects of precautionary communication on risk perception, for example state anxiety and gender (Boehmert, 2018; Boehmert et al., 2017) or previous concerns about the topic (Timotijevic & Barnett, 2006). It is important to understand a possible moderating effect of personal relevance because people who perceive the topic as more relevant are more likely to come in touch with precautionary information in their everyday life.

One theoretical differentiation between risks that is relevant in the context of RF-EMF risk perception is provided by the concept of switching risks (Zwick, 2005), which was explained in chapter 2.2. For many laypeople, RF-EMF play a minor role when thinking about mobile communications if they are not explicitly confronted with the topic (Wiedemann et al., 2017). It is likely that in their everyday lives, mostly people for whom the topic “RF-EMF and health” is personally relevant, come across precautionary information, e.g., when searching the internet or when coming across information on new technological developments, like the introduction of 5G. Furthermore, precautionary information could have differential effects depending on personal relevance. Specifically, lower personal relevance could increase effects on risk perception and trust because those people likely had low risk perception and little engagement in precaution initially and might feel momentarily threatened (Zwick, 2005) when realising that there are uncertainties and that precautionary measures even exist. However, in their everyday lives, these people are unlikely to encounter precautionary information. When participating in a study, risk perception might be “switched on” (Zwick, 2005), even if it does not play a role in participants’ daily lives.

Our aim is thus to investigate whether the effects of precautionary information are present in those who might actually come across the precautionary information in real life (and not only in people who – in real life – probably would never have come across that information). Therefore, in one of the present studies, relevance of the topic is assessed before participants receive either (1) a basic text with general information on the topic of RF-EMF in mobile communications, but without precautionary information, or (2) the same basic text with precautionary information on

reducing personal exposure when using mobile phones. We investigate if personal relevance moderates the effect of precautionary information on risk perception and trust.

2.4 Additional information on precaution

There are several different possibilities to give additional information on precaution or to explain the concept differently, some of which have been tested in previous studies. For example, Boehmert et al. (2016) investigated if explaining the reasons (motives) for communicating precaution made any difference on risk perception. The idea behind that was to reduce the inconsistency which may arise if laypeople are confronted with the information that no harmful effects of RF-EMF are scientifically proven, but still precautionary information are communicated. However, they did not find an effect on risk perception. Boehmert et al. (2016) also tried explaining the effectiveness of the presented precautionary measures. This was based on the knowledge that many laypeople overestimate the RF-EMF exposure from mobile phone base stations and underestimate that of their own mobile phones (Claassen et al., 2014; Cousin & Siegrist, 2010b), so precautionary measures that refer to mobile phone use may be perceived as ineffective if this is not seen as the main exposure source. However, their hypothesis was not confirmed, risk perception under the condition that precautions are taken remained the same and risk perception under the condition that no precautions are taken increased.

One possible explanation for this finding named by the authors is that pointing out the higher RF-EMF exposure by mobile phone use (compared to mobile phone base stations) might lead to an increase in risk perception, because people were not aware of that before. Understanding the idea that experts communicate precautionary measures even though there is no proven risk, i.e. understanding what precaution really means, is likely hard for laypeople. Additionally, in some languages (e.g., German, Greek) the term “precaution” is used colloquially in situations or for measures which experts would refer to as “prevention”. As prevention is used only when there is a proven risk, which may still be avoided (primary prevention) or where consequences may be reduced (secondary prevention), this is probably hard to grasp for laypeople. This problem could be addressed by explicitly explaining what precaution is and what it is not, by comparing it to prevention and differentiating the two concepts from each other.

Therefore, in our second study, participants receive either (1) a basic text with general information on the topic of RF-EMF in mobile communications, but without precautionary information, or (2) the same basic text with precautionary information on reducing personal exposure when using mobile phones, or (3) both texts as well as a text module on precaution vs. prevention.

3 The present studies: Research questions and hypotheses

Based on the theoretical background and discussions with the WP10 work package partners, it was decided to conduct two independent experimental studies that address different aspects of the topic “precautionary information and mobile communications/5G”. In both studies, participants receive information in text form on RF-EMF in mobile communications and (in certain conditions) on precautionary measures. They respond to questionnaires on particularly risk perception and trust in state institutions of radiation protection. In both studies, we investigate if precautionary information regarding RF-EMF exposure during mobile phone use have effects on risk perception and trust in state institutions of radiation protection (Research Question 1, replication). In study 1 we additionally test if personal relevance of the topic “RF-EMF and health” moderates the effect of precautionary information (Research Question 2). In study 2, we examine if precautionary information has a different effect if it is combined with a text module on the difference between precaution and prevention (Research Question 3). Research question 1 is consequently investigated in both studies, research question 2 only in the first study, and research question 3 only in the second study.

3.1 Effects of precautionary communication on risk perception (studies 1+2)

In both studies, it is investigated if reading precautionary information has effects on risk perception and trust in state institutions of radiation protection. The precautionary information refers to decisions regarding mobile phone use (e.g., avoid phone calls when the reception is poor) or measures one can take while using the mobile phone (e.g., use a headset). In the basic text, all participants are informed that there are regulatory limits regarding RF-EMF from mobile phone base stations, but in the precaution texts there are no more information about this, as exposure from mobile phone base stations is much harder to personally control for citizens than exposure from their own mobile phone.

Research Question 1: *Does precautionary information regarding RF-EMF exposure during mobile phone use influence (a) risk perception and (b) trust in state institutions of radiation protection?*

As the effect that precautionary recommendations increase risk perception has been well documented in the literature, hypothesis 1 is intended to be a replication. However, it needs to be kept in mind that this effect was not found in every single study (Boehmert et al., 2016). In our studies, large general population samples that are representative in age and gender are recruited to ensure high-quality data and high informative value of the results and to be able to discover small effects.

Hypothesis 1: *There is a significant influence of information type on risk perception. After reading a text with precautionary information (compared to a text with basic information only),...*

(a) affective risk perception regarding RF-EMF emitted by mobile phones is higher.

(b) affective risk perception regarding RF-EMF emitted by mobile phone base stations is higher.

(c) general risk perception regarding RF-EMF emitted by mobile phones is higher if participants assume that no precautionary measures are taken (CR1).

(d) general risk perception regarding RF-EMF emitted by mobile phones is not higher if participants assume that precautionary measures are regularly taken (CR2).

Conditional risk perception is defined as such:

CR1 = Conditional risk perception assuming that no precautionary measures (measures to reduce EMF-exposure) are taken

CR2 = Conditional risk perception assuming that precautionary measures are regularly taken

The effect of precautionary recommendations on trust in state institutions of radiation protection has not been consistently documented in the literature. As we will be able to discover small effects, in case they exist, we formulate a hypothesis, nevertheless.

Hypothesis 2: *There is a significant influence of information type on trust in state institutions of radiation protection: Trust is lower after reading the text with precautionary information (compared to the basic text).*

3.2 Personal relevance (study 1)

In study 1 the focus is on the question if personal relevance of the topic “RF-EMF and health” moderates the effect of precautionary information on risk perception and trust. This is important because people who find the topic more relevant are more likely to inform themselves about precaution in their daily lives. In previous experimental studies on precautionary information, participants have not yet been asked how relevant the topic is for them personally. If it was found that risk perception increases mainly for people who find the topic less relevant and who are less likely to find precautionary information outside of the study context, this would be an important finding for risk communicators and health agencies trying to understand how the public might react to the provided information.

Research Question 2: *Does personal relevance of the topic “mobile phone radiation and health” moderate the effect of precautionary information on (a) risk perception and (b) trust in state institutions of radiation protection?*

Boehmert and colleagues found that risk perception increased only for people with low trait anxiety and was to some extent lower for people with high trait anxiety (Boehmert et al., 2018; Boehmert et al., 2017). This could indicate that for people who are already more concerned (about the topic or in general), precautionary information may have a different effect than for people who are less concerned. Worries or concerns about the topic are one important reason for people to engage with information on the topic. Other reasons may be general interest in the technology or finding it by coincidence. Therefore, we expect that the influence of precautionary information depends on perceived personal relevance of the topic.

Hypothesis 3: *The influence of information type on the dependent variables (increase of risk perception and decrease of trust) is moderated by the personal relevance of the topic "mobile phone radiation and health": At higher relevance, the influence of precautionary information on risk perception and trust is lower than at lower relevance.*

In the studies used for the meta-analysis by Boehmert et al. (2020) the precautionary information was usually formulated as a recommendation. However, it is also possible to formulate precautionary information more neutral and to point out that the decision to take precautionary measures or not should be an individual's informed choice. This might influence the way precautionary information is perceived, as a recommendation might be more likely to invoke the impression that there must be a risk and therefore lead to higher risk perception. However, this has not been investigated in previous studies, which is why in study 1, we include it as an exploratory question. Half of the participants who read precautionary information receive the information in form of a recommendation, the other half in form of a "neutral" information, while the contents itself don't change.

Exploratory Question 1: *Does the way precautionary information is formulated (as a recommendation vs. as neutral information) influence its effect on risk perception and trust in state institutions of radiation protection?*

3.3 Additional text module (study 2)

Study 2 aims to examine if giving additional information about the concept of precaution influences risk perception and trust in state institutions of radiation protection. There are different ways to do this, and we decided to use a text module with a differentiation of the terms "precaution" and "prevention" (henceforth referred to as "the text module"), including an example of prevention to support understanding precaution.

Research Question 3: *Does precautionary information combined with a text module on the difference between precaution and prevention reduce the effect on (a) risk perception and (b) trust in state institutions of radiation protection?*

As one reason for the increase of risk perception and decrease of trust could be that participants implicitly assume that if precaution is communicated there must be a risk/a hazard, we expect that by helping them understand that this is not necessarily the case, the effects on risk perception and trust are lower or reduced. As it is unclear how exactly the text module influences the perception of participants, no hypotheses regarding a possible difference between the control group (basic text only) and the group with precautionary information plus text module are formulated, only between the groups who receive precautionary information with or without the text module.

Hypothesis 4: *The text module has a significant influence on risk perception: After reading the text with precautionary information plus the text module (compared to the text with precautionary information only), ...*

(a) affective risk perception regarding RF-EMF emitted by mobile phones is lower.

(b) affective risk perception regarding RF-EMF emitted by mobile phone base stations is lower.

(c) general risk perception regarding RF-EMF emitted by mobile phones is lower if participants assume that no precautionary measures are taken (CR1).

(d) general risk perception regarding RF-EMF emitted by mobile phones is the same if participants assume that precautionary measures are regularly taken (CR2).

Hypothesis 5: *The text module has a significant influence on trust in state institutions of radiation protection: Trust in state institutions is higher after reading the text with precautionary information plus text module (compared to the text with precautionary information only).*

3.4 Additional exploratory questions

Besides the research questions and hypotheses already presented, we investigate other questions in an exploratory way, as they may bring additional understanding of the topic but are not based on previous studies that would allow us to formulate hypotheses.

The hypotheses refer to affective and general risk perception regarding mobile phones and mobile phone base stations. However, recent approaches view risk perception as multidimensional, including not only affect, but also variables like exposure perception, susceptibility, and severity of the expected consequences (Walpole & Wilson, 2021; Wilson et al., 2019). To assess possible influences on these aspects which are related to risk perception, we include the following variables regarding mobile phones and base stations: Exposure perception in their daily lives, perceived likelihood that RF-EMF have negative consequences, and severity of these consequences, if applicable.

Furthermore, participants are asked for their self-efficacy regarding precaution, perception of consistency of the texts, and their previous knowledge about and experiences with precautionary measures.

3.5 Country comparisons

Country comparisons are of interest regarding the topic of RF-EMF and precautionary communication because according to the Eurobarometer 2010 (TNS Opinion & Social, 2010) the percentage of citizens concerned about EMF was much higher in Southern Europe (e.g., Greece: 81%) than middle and Northern Europe (e.g., Germany: 24%). By recruiting samples from Germany and Greece we address this difference and allow comparisons between the two countries. We are particularly interested in investigating if the precautionary information has different effects in the two countries.

4 Methods

An ethics application for the studies was submitted in October and assessed favourably in November. Offers were obtained from panel providers and translation agencies, and it was decided to work with the panel provider Bilendi. The questionnaire underwent pre-tests and final revisions in December 2023 as well as January and February 2024. Data collection is conducted in March 2024 and data analysis is in progress when the deliverable will be submitted.

The following chapter describes how the study was designed, how the data is collected and how it will be analysed. In addition, the sampling procedure is described.

4.1 Data collection

Data is collected in Germany and Greece. While the survey is created and maintained on the platform Unipark by the researchers involved in the project, participants are recruited via the panel provider Bilendi. Participants (panel members) are contacted via Bilendi and receive a link to the survey. If one of them is interested in participating, the link takes them to the survey platform (Unipark), where the study is completed.

The soft launch starts on March 18, 2024. For this purpose, we aim for approximately 60 completed surveys per study per country. Before full launching the survey, the soft launch data will be checked for plausibility and completeness. Data collection will be completed in March 2024.

4.2 Participants

Participants must be at least 18 years old to take part in the study. They can only take part in one of the two studies, as they are very similar. People who have participated in the previous study in the project (on exposure perception) are not invited to participate. Participants are incentivised by collecting points from the panel provider, which can eventually be converted into rewards.

Power analyses were performed with the tool G-Power to determine the number of participants needed to get meaningful results and to be able to detect small effects. For study 1 (main data analysis by performing a multiple regression with up to six predictors) this resulted in a sample size of $N = 688$, for study 2 (data analysis with analysis of variance and planned comparisons, 1x3 design), a sample size of $N = 969$ assuming a significance level of 0.05, a power of 0.80 and the aim to identifying small effects. As sample losses are to be expected in online studies (e.g. due to low quality data) these sample sizes are rounded up to $N = 700$ (Study 1) and $N = 1000$ (Study 2). This number of participants are recruited in Germany and Greece each.

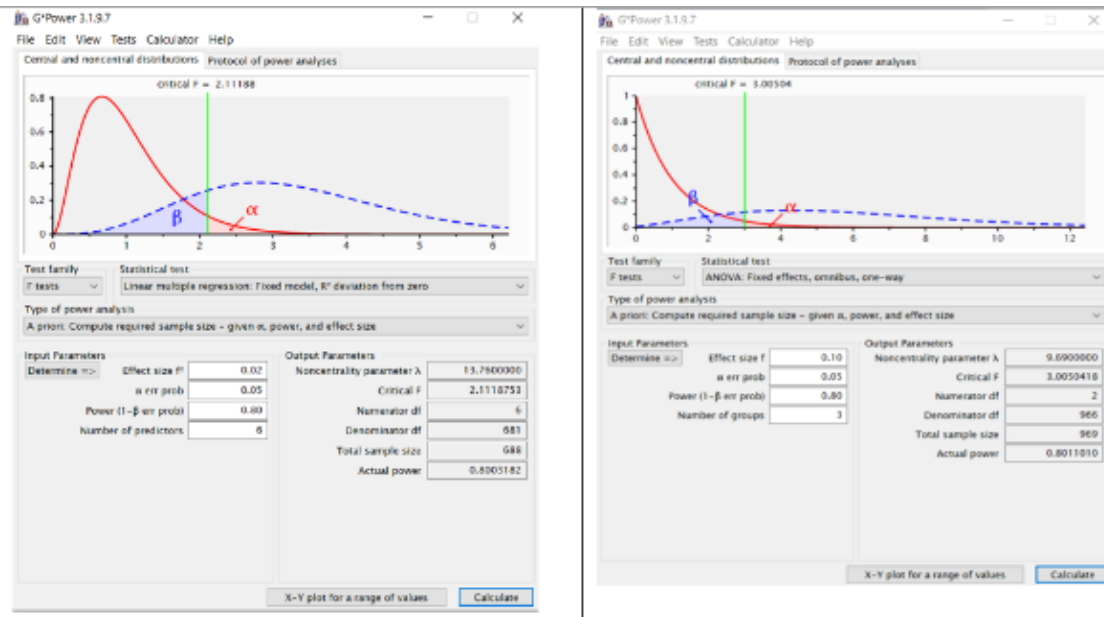
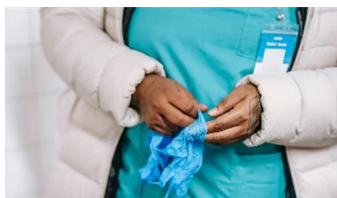


Figure 1 Power analysis for study 1 and 2

4.3 Quotas

In study 1, personal relevance of the topic is used as a quota, to get participants with different levels of relevance. Practical relevance of the topic "RF-EMF and health" is measured by showing participants three different article teasers on health-related topics. One of them concerns the topic "RF-EMF and health" (for participants: "mobile phone radiation and health"), the two unrelated articles are there to make the scenario more realistic and to give a reference. Participants are told that they have enough time to read one or more of the articles and are asked for each of the three how likely they would click on the link to read it (Likert scale from 1-7, 1 being "very unlikely", 7 being "very likely"). The aim is to capture how likely participants would read information regarding the topic "mobile phone radiation and health" in their daily lives. The quota is used to ensure that the distribution is roughly balanced (about 1/7 on each point of the scale, but small deviations are unproblematic). The aim is to get participants with a diverse interest in the topic.



Hospital hygiene

There is hardly a place where hygiene is more important. An expert discusses the risks associated with treatment in hospital and how hygiene can be improved based on the latest findings.



Mobile communication and radiation protection

Almost everyone uses mobile phones, but only a few know how they actually work. An expert discusses the health effects of mobile phone radiation and what the new 5G mobile phone standard has to do with it.



Vitamin pills

They are supposed to promote our health, but sometimes have the exact opposite effect. An expert explains how vitamin supplements work and what you need to bear in mind when taking them.

Figure 2 Article suggestions for the practical relevance question

In both studies, quotas on age and gender (interlocking quotas) are used to recruit a representative sample. To create the interlocking quotas, six age ranges were defined (18-29, 30-39, 40-49, 50-59, 60+) and gender was split into male and female. The proportions of the population mapping to each interlocking quota were based on data from Eurostat, the statistical agency of the EU. In study 2, region was included as a marginal quota. For more and country specific details see Appendix "Quotas".

Highest educational level is not considered in the quotas but asked for in the survey. Thus, representativeness cannot be granted for this characteristic. The questions that are relevant for

the quotas are asked in the first two minutes of the survey, to screen out participants quickly if a quota is already full.

4.4 Procedure of the survey

After participants are informed about the study and give consent to participate (see Appendix “Participant information + consent form”), the survey starts.

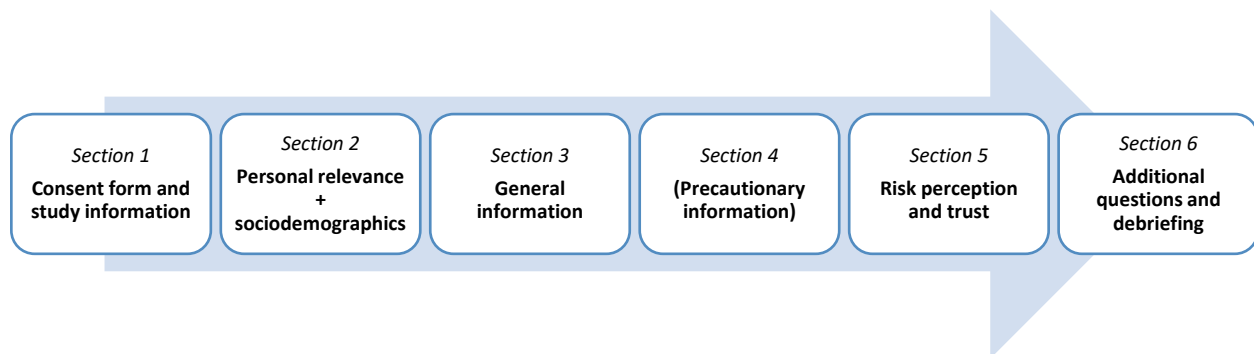


Figure 3: Sections of the survey

The survey consists of six sections (see figure 3), each including questions or texts. In general, all questions are compulsory and cannot be skipped.

In **the first section**, participants read the study information and give their consent to participate in the study.

In **the second section**, participants are asked about their personal relevance of the topic, their age and gender, the region they live in, and their maximum level of education.

In **the third section** all participants read the basic information text which is described in detail in the section on “Information texts”. Due to a timer participants must spend at least 30 seconds on this page before they can continue.

In **the fourth section** only participants from the experimental groups receive precautionary information. In study 1, the information is either formulated as a recommendation or as neutral information. In study 2, the information consists either of just the information regarding precautionary measures or includes the text module on precaution and prevention. Again, Participants see a timer and must spend at least 30 seconds on this page before they can continue.

After reading the texts, participants are asked one attention check question (“which term was abbreviated with “EMF” in the text?”) and afterwards, if applicable, one or two more questions on what the text was about.

In **the fifth section** participants are responding to questions regarding their risk perception and trust in state institutions of radiation protection. The dependent variables and exploratory questions are described in the section on “dependent variables”.

In **the sixth section** the participants are asked some additional questions about their self-efficacy regarding precaution, how consistent they found the texts they had read and if they had known about precautionary measures and/or performed them before participating in the study.

4.5 Study design

In both studies, participants are randomly assigned to different conditions by the survey platform Unipark. Depending on their condition, they read different texts.

4.5.1 Conditions in study 1

In study 1, there are three different conditions. 50% of the participants receive a basic text without precautionary information (control group), 50% of the participants receive a basic text and precautionary information (experimental group). Half the participants in the experimental group (= 25% of the total sample in study 1) read the precautionary information that is formulated as a recommendation, the other half reads the precautionary information that is formulated as a neutral information.

4.5.2 Conditions in study 2

In study 2, there are three conditions: One third of the participants receives a basic text without precautionary information (control group), one third receives a basic text and additionally precautionary information (experimental group 1) and the last third receives a basic text, the precautionary information, and the text module.

4.6 Information texts (independent variables)

All texts on RF-EMF in mobile communications and on precautionary measures are based on information the German Federal Office for Radiation Protection (BfS) presents on its website. They were summarized and adjusted for the purpose of our studies. The Greek agency EEAE communicates similar information on their Greek website.

4.6.1 Basic information text

All participants in both studies receive a basic text on mobile communication and health. In the beginning of the text, they are told that the information is provided by “*the German/Greek radiation protection agency*” and that this agency is “*an independent scientific and technical authority which is responsible for providing information and research regarding radiation protection*”. It is mentioned that “*it is therefore also responsible for the topic of ‘mobile communications and health’, including the topic of 5G*”.

As already mentioned, in the survey, the source for the information texts and for the precautionary information was a fictional radiation protection agency (“the German/Greek radiation protection agency”). We chose not to use an existing radiation protection agency (BfS in Germany, EEAE in Greece) as information source because the information communicated in the study was not exactly the same as the one communicated by BfS/EEAE and to ensure that participants have no prior knowledge or attitude about it and base their trust more on the information they received during the study.

Afterwards, the text explains shortly how mobile communications works and what electromagnetic fields are, for example that *“radio waves are used to transmit voice and data to and from mobile phones”* and that *“in technical terms, these radio waves are referred to as **electromagnetic fields**, or **EMF** for short”* while *“colloquially they are also known as “mobile phone radiation”*. Participants are informed that *“when transmitting data, mobile phones and mobile phone base stations (“mobile phone antennas”) interact with each other”* and introduced to mobile communication standards such as 5G, which is *“the successor technology to existing standards such as 2G, 3G, and 4G”*.

Then, participants are informed that *“when using a mobile phone, some of the energy from the electromagnetic fields is absorbed in the head”*, that there are *“statutory limits for mobile phones and mobile phone base stations”* and that *“below these limits there is no evidence of harmful effects of EMF from mobile phones on human health”*. It is explained that *“however, there are still uncertainties in the risk assessment that have not yet been completely eliminated by research”*, specifying that these particularly relate to *“possible health risks when adults are exposed to EMF from mobile phone calls over the long term”*, *“new technological developments, such as the introduction of 5G”* and *“the question of whether children may react more sensitively than adults”*.

4.6.2 Precautionary information as recommendation or neutral information

After reading the basic information text, the control groups continue with an attention check item and the questions on risk perception. The experimental groups however receive another text on precautionary measures before answering the attention check and questions on risk perception.

In study 2 as well as in one part of the experimental group in study 1, participants receive precautionary information in form of recommendations. They are told that *“due to these uncertainties, the German/Greek Radiation Protection Agency **advises** that personal exposure (radiation exposure) to electromagnetic fields when using mobile phones be kept to a minimum as a precautionary measure”*, which *“results in the following **precautionary tips**, which are aimed in particular at users of mobile phones and smartphones”*.

In the other part of the experimental group in study 1, participants receive precautionary information in form of neutral information. They are told that “*due to these uncertainties, the German/Greek Radiation Protection Agency **informs** how the personal exposure (radiation exposure) to electromagnetic fields when using mobile phones can be kept to a minimum as a precautionary measure*” and that “*users of mobile phones and smartphones can decide for themselves if they want to implement these **precautionary measures** or not*”.

Depending on the condition, the precautionary information is the same but formulated differently. While the recommendation addresses participants personally, the neutral information keeps wording unpersonal by just stating facts of possibly actions.

Recommendation	Neutral information
Use the landline phone if you have the choice between landline and mobile phone.	Using the landline phone if there is a choice between landline and mobile phone.
Keep mobile phone calls as short as possible.	Keeping mobile phone calls as short as possible.
If possible, do not make calls when reception is poor, for example in a car without an external aerial.	If possible, making no calls when reception is poor, for example in a car without an external aerial.
Use mobile phones that expose your head to as low fields as possible. The lower the so-called SAR-value (Specific Absorption Rate) of your mobile phone, the lower the electromagnetic field. The manufacturers of mobile phones usually state the SAR-values determined under specified conditions in the instructions for use. You can also find corresponding information on the mobile phone manufacturer’s website.	Using mobile phones that expose the head to as low fields as possible. The lower the so-called SAR-value (Specific Absorption Rate) of the mobile phone, the lower the electromagnetic field. The manufacturers of mobile phones usually state the SAR-values determined under specified conditions in the instructions for use. The corresponding information can also be found on the mobile phone manufacturer’s website.
Use headsets. The intensity of the field decreases rapidly with distance from the phone. By using headsets, the distance between the head and the phone is greatly increased. The head is therefore exposed to lower fields when making phone calls.	Using headsets. The intensity of the field decreases rapidly with distance from the phone. By using headsets, the distance between the head and the phone is greatly increased. The head is therefore exposed to lower fields when making phone calls.

Write text messages. You do not hold the mobile phone to your head when doing so.	Writing text messages. The mobile phone is not held to the head while doing so.
---	---

Table 1 Precautionary information as recommendation or as neutral information

4.6.3 Text module on precaution vs. prevention

In study 2, participants in the third condition receive a text that includes not only precautionary information, but also a text module on the differentiation between “precaution” and “prevention”. Before the “precautionary tips” they are told that *“in order to better understand the concept of precaution, we distinguish it from prevention”*. They then read that *“1. Both concepts have the fundamental aim of preventing or minimising possible future damage or problems”, that “2. Prevention is used in situations where there is a proven risk, but where negative effects can still be avoided or minimised”*. To make this more vivid, it is added that *“For example, it has been proven that regular, heavy alcohol consumption is a health risk. Not drinking alcohol, or drinking only a little, is therefore a preventative measure.”* Furthermore, they are told that *“3. Precaution is used in situations in which it is not yet known whether there is a risk at all, i.e., in which it has not been proven whether something has any negative effects at all”* and that *“it is therefore possible that precautionary measures have no benefit at all, as there may be no risk. EMF is categorised by the German Radiation Protection Agency as a case of precaution and not prevention.”* This is followed by the same precautionary recommendations used in the condition without the text module.

4.7 Dependent variables and predictors

In both studies, after reading the relevant texts, participants answer various questions, particularly on risk perception and trust in state institutions for radiation protection.

4.7.1 Personal relevance

Personal relevance of the topic is assessed as a possible moderator between text type and risk perception/trust. To capture personal relevance, participants are asked two questions. The first one aims to assess *practical relevance*. Participants are told that they must wait a while and go to the internet to pass their time, where three article suggestions are displayed. The articles refer to health-related topics, specifically “hospital hygiene”, “vitamin pills”, and “mobile communication and radiation protection”. In the pretests it has been shown that these three articles were perceived as similarly interesting. One of them concerns the topic “RF-EMF and health”, the two unrelated articles are there to make the scenario more realistic and to give a reference. For each article, a short summary is shown (two sentences). Participants are told that they have enough time to read one or more of the articles and are asked for each of the three how likely they would click on the link to read it (Likert scale from 1-7, 1 being “very unlikely”, 7

being "very likely"). The aim is to capture how likely participants would read information regarding the topic mobile phone radiation and health in their daily lives. The article suggestions are shown in figure 2 (see section 4.3).

The second question aims to assess *thematic relevance* of the topic "RF-EMF and health". This is measured with one item adapted from (Wiedemann et al., 2017): "How often in your daily life do you think about the topic 'mobile phone radiation and health'? (Likert scale from 1-7, 1 being "never", 7 being "very often").

4.7.2 Dependent variables that are relevant for the hypotheses

Affective risk perception is measured regarding mobile phones and mobile phone base stations separately, using three items from the subscale "affective risk perception" by (Walpole & Wilson, 2021). The original scale was adapted to match the research questions. The questions are asked separately for "RF-EMF from mobile phones" and "RF-EMF from base stations". Participants are asked "How ... are you because of the EMF emitted by your mobile phone?" (... = concerned, worried, afraid) and "How ... are you because of EMF emitted by mobile phone base stations?" (on a Likert-scale from 1-7, 1 being "not at all", 7 being "very much").

Afterwards, regarding mobile phones, *general risk perception* is asked *conditionally*. Participants are told that "We are now interested in your opinion on measures you can take to do the following: a) reduce the duration of your mobile phone use (e.g., keep phone calls short) and b) increase the distance from the mobile phone (e.g., use a headset when making calls)." They then respond to two items: "How dangerous do you think the electromagnetic fields (EMF) from mobile phones are while talking on the phone if you do NOT take such measures?" and "How dangerous do you think the electromagnetic fields (EMF) from mobile phones are while talking on the phone if you DO take such measures?".

Trust in state institutions of radiation protection is measured with five items from the scale "trust in the scientific community" by (Nisbet et al., 2015) which were adapted to match our research question. Participants are asked to indicate how strongly they agree with five statements, for example "Information from state institutions, e.g. from the German radiation protection agency is trustworthy" or "State institutions of radiation protection, e.g. the German radiation protection agency, do not tell the public the truth."

4.7.3 Additional measures

In addition to the dependent variables included in the hypotheses, some more variables and items are also measured.

Exposure perception is measured with one item, separately for "RF-EMF from mobile phones" and "RF-EMF from base stations". Participants are asked "To what extent do you feel exposed to

electromagnetic fields (EMF) from your mobile phone/from mobile phone base stations in your everyday life? (on a Likert-scale from 1-7, 1 being "not at all", 7 being "very much").

Susceptibility (perceived likelihood that RF-EMF have negative consequences) and *severity* of these consequences are measured with two items adapted from the scale by (Walpole & Wilson, 2021), separately for "RF-EMF from mobile phones" and "RF-EMF from base stations". Participants are asked "How likely do you consider it that these EMF have negative effects on you?" (on a Likert-scale from 1-7, 1 being "very unlikely", 7 being "very likely") and "If you expect negative effects, how serious do you think they would be?" (on a Likert-scale from 1-7, 1 being "harmless", 7 being "very severe", additional answer option: "I don't expect negative effects").

Self-efficacy regarding precaution is assessed with one item. Participants are asked how strongly they agree with the statement "With my behaviour I can influence the radiation exposure from my own mobile phone (and thus protect myself from EMF)" (Likert scale from 1-7, 1 being "do not agree at all", 7 being "strongly agree").

Perception of consistency (of the text) is also assessed with one item. Participants are asked how consistent they perceived the information text: "The information about the topic "Mobile phone radiation and health" (which you read in the beginning) were consistent" (Likert scale from 1-7, 1 being "do not agree at all", 7 being "strongly agree").

Prior experiences with precautionary measures are asked for in one item at the end of the survey. Participants are asked if they have used measures to reduce their RF-EMF exposure before ("So far, I have taken measures in my everyday life to reduce my exposure to radiation when using my mobile phone." - "yes", "no", "partly").

Knowledge regarding precaution is also assessed at the end of the survey. Only those participants who read a text with precautionary information are asked if they have known these measures before participating in the study. Their answer options are "yes", "no", and "partly".

4.8 Pre-Tests

When the first draft of the questionnaires was ready, they were presented to the work package partners. Their feedback was discussed and, if considered useful, integrated into the questionnaires. Afterwards, German versions of the questionnaires were created and implemented in the survey software Unipark.

Qualitative pretests were conducted at an early stage in Germany ($n=6$), where participants were asked to speak their thoughts aloud while completing the survey. This enabled us to identify and refine unclear formulations and to further increase the usability of the questionnaire. The qualitative pretests were conducted online with the already implemented questionnaires. The

revision of the content of individual questions was followed by quantitative pretests in order to be able to better assess the processing time of the questionnaire. For this purpose, 20 students from the IU International University of Applied Sciences answered the questionnaire and were given course credits. For last revisions, another eight qualitative pretests were conducted with German students from the IU. Finally, pre-tests for the Greek version were completed on the 13th March with four lay users who gave their feedback on the questionnaire.

4.9 Quality checks

Two attention checks are integrated into the survey. The first attention check serves to verify whether the participants have read the previously presented information carefully and accordingly know what "EMF" means. For this purpose, the following question is asked one page after the information texts:

Please answer the following question. Which term was abbreviated with "EMF" in the text?

... Development and Management in Research [in German "Entwicklung und Management in Forschung"]

... Electromagnetic Fields

... Edition Michael Fischer

...European Migration Forum

Due to their spelling in German, all these terms could be abbreviated with "EMF" theoretically. In Greece, the terms were adjusted to make sense in the language.

At a later stage, embedded in the block of questions on the trust in state institutions of radiation protection, the participants are asked to:

Please check the box "strongly agree".

The main purpose of this attention check is to check whether the participants read the questions carefully and answer them thoroughly.

If participants answer one of the attention check questions incorrectly, they are immediately screened out and not included in the sample. Other reasons for screen outs are:

- Full quotas (quota on personal relevance in study 1, interlocking quota on age & gender, marginal quota on region in study 2)
- Very short completion time (less than 3 minutes, speeders)
- Excessively long completion times (of more than 30 minutes)

After the data collection, further cleaning of the data will be carried out by removing people from the data set who showed no variance in their response behaviour (straight liners). To encourage participants to read the texts thoroughly, they could not go to the next page until they had spent at least 30 second on each text page.

4.10 Translations

The questionnaires were translated from German into Greek by a translation agency. The translations were thereafter checked and partially revised by native speakers among SEAWave work package partners.

4.11 Data preparation

Before data analysis begins, the dataset will be processed and cleaned. Only data of participants who have completed the parts of the survey that are relevant for the hypotheses (read the text and responded to the questions about risk perception and trust in state institutions) will be included in the analysis. As all items are forced responses, participants can't complete the survey without answering all questions. Before combining the data into indices, items with different polarity will be recoded.

Descriptive data will be checked for plausibility. Items with different polarity will be recoded and means will be calculated for the variables "affective risk perception" (three items) and "trust in state institutions of radiation protection" (five items) provided that internal consistency (Cronbach's alpha) allows it. Then, assumptions for the statistical models (ANOVA, multiple regression analysis) will be checked. It will also be checked if the experimental groups significantly differ from each other regarding distribution of sociodemographic variables. In case of relevant differences, the variable can then be included as a control.

We will calculate p-values (level of significance 0.05) and effect sizes.

The data from Germany and Greece is first analysed separately, later country comparisons are performed exploratory.

4.12 Planned analyses for study 1

For data analysis in study 1, we will use linear multiple regression analysis (LMR). To test the first two hypotheses (possible differences between the basic text and the precautionary text group), we will conduct LMR analyses with the text group (basic text vs. precautionary text, dummy-coded) as predictors. For this analysis, no difference will be made between the precautionary information framed as recommendation or as neutral information.

To test the third hypothesis (moderating effect of personal relevance), LMR analyses will be performed. The continuous independent variables will be z-standardized prior to LMR analyses. Predictors will be text group (basic text vs. precautionary text, dummy-coded) and personal relevance as well as the interaction term between text and relevance.

Before performing the multiple regression analysis, it will be checked if the measures for "practical relevance" (response to the question "How likely would you click on the article to read it?") and "thematic relevance" (response to the item "How often do you think about the topic (...) in your daily life?") correlate high enough (.7) to be summarized to a single relevance-measure. If yes, the mean of those two items will be calculated. If not, they will be considered separately.

For the measures regarding risk perception, the dependent variables are "affective risk perception regarding RF-EMF emitted by mobile phones/mobile phone base stations", and "general risk perception regarding RF-EMF emitted by mobile phones assuming that (no) precautionary measures are taken". For the measures regarding trust, the dependent variable is "trust in state institutions of radiation protection". Analyses will be conducted separately for the dependent variables. Simple slope analyses will be conducted as recommended by Aiken and West (1991), see also Boehmert et al. (2017).

Group differences regarding age and gender will be analysed, in case of differences the variables will be included as controls. We will also include gender as an exploratory predictor in the analyses.

As an exploratory question we will analyse if there are differences regarding the precautionary information framed as recommendation and the one framed as neutral information. Immediately after reading the texts, participants are asked if the text said nothing about precaution, advised for precaution, informed neutrally about precaution, or advised against precaution. This question serves as a check if the recommendation/neutral information is recognized by the participants. Furthermore, an independent-sample t-test for mean difference will be conducted to analyse differences between the two groups regarding the dependent variables.

In addition to the dependent variables mentioned above we measure 1) exposure perception, 2) perceived likelihood that RF-EMF have negative consequences, and 3) severity of these consequences. We also ask participants for their 4) self-efficacy regarding precaution and their 5) perceived consistency of the texts. As exploratory analyses, we will conduct LMR analyses with condition (basic text vs. precaution text) as independent variable and 1-5 as dependent variables. Regarding (3) severity, participants who "don't expect negative effects" are excluded from the

analysis. If group differences are found, the same multiple regression model as described above is run for those variables.

Participants are also asked if they have used measures to reduce their RF-EMF exposure before and – only those who received the precautionary information – if they had known about precautionary measures before the study. Those questions serve as controls because it is possible that participants who have previous experiences or knowledge regarding precautionary measures react differently to the information presented in our studies. We may run additional analyses considering these variables, especially if they turn out to be unevenly distributed between the groups.

4.13 Planned analyses for study 2

For data analysis of study 2, will use a 1x3 ANOVA and planned comparisons (t-tests) to investigate differences between the three conditions (basic text only, precautionary information, precautionary information plus text module on precaution vs. prevention) and test our hypotheses.

To test the hypotheses 1 and 2 (possible differences between the basic text and the precautionary text group), we will conduct planned comparisons (t-tests) between the "basic text only" and the "basic text + precautionary information" groups. To test hypotheses 3 and 4 (possible differences between precautionary text group and the precautionary information + text module group), we will perform planned comparisons between the "basic text + precautionary information" and the "basic text + precautionary information + text module" groups.

For the hypotheses regarding risk perception, the dependent variables are again "affective risk perception regarding RF-EMF emitted by mobile phones/mobile phone base stations", and "general risk perception regarding RF-EMF emitted by mobile phones assuming that (no) precautionary measures are taken". For the hypotheses regarding trust, the dependent variable is "trust in state institutions of radiation protection".

Again, group differences regarding age and gender will be analysed, in case of differences the variables will be included as controls.

In addition to the dependent variables mentioned above we again measure 1) exposure perception, 2) perceived likelihood that RF-EMF have negative consequences, and 3) severity of these consequences. We also ask participants for their 4) self-efficacy regarding precaution and their 5) perceived consistency of the texts. As exploratory analyses, we will conduct a 1x3 ANOVA with condition (basic text vs. precaution text vs. precaution text plus text module) as independent variable and 1-5 as dependent variables. Regarding (3) severity, participants who "don't expect

negative effects" are excluded from the analysis. If group differences are found, the same analyses as described above are run for those variables.

As in study 1, participants are also asked if they have used measures to reduce their RF-EMF exposure before and – only those who received the precautionary information – if they had known about precautionary measures before the study. We may run additional analyses considering these variables, especially if they turn out to be unevenly distributed between the groups.

5 Results/Discussion

The results will be made available to the public and published in peer-reviewed journals. Once the results are published, we will also provide an updated version of this report including references to the published findings.

Hypotheses including analysis methods and exploratory analyses were preregistered in the Open Science Framework (OSF). These can be accessed via the following links:

Study 1 on personal relevance: osf.io/hsre7

Study 2 on additional information with the text module: osf.io/p9whn

6 References

- Aiken, L., & West, S. G. (1991). *Multiple Regression: Testing and Interpreting Interactions*. SAGE Publications Inc.
- Barnett, J., Timotijevic, L., Shepherd, R., & Senior, V. (2007). Public responses to precautionary information from the Department of Health (UK) about possible health risks from mobile phones. *Health Policy (Amsterdam, Netherlands)*, 82(2), 240–250. <https://doi.org/10.1016/j.healthpol.2006.10.002>
- Barnett, J., Timotijevic, L., Vassallo, M., & Shepherd, R. (2008). Precautionary advice about mobile phones: public understandings and intended responses. *Journal of Risk Research*, 11(4), 525–540. <https://doi.org/10.1080/13669870802086430>
- Bioinitiative Working Group. (2012). *Bioinitiative 2012: A Rationale for Biologically based Exposure Standards for Low-Intensity Electromagnetic Radiation*. <http://www.bioinitiative.org/>
- Boehmert, C. (2018). *The Public's Reactions to Precaution: On the Effects of Health Recommendations Regarding Wireless Communication Technologies* [Dissertation]. Karlsruhe Institute of Technology (KIT).

- Boehmert, C., Freudenstein, F., & Wiedemann, P. M. (2020). A systematic review of health risk communication about EMFs from wireless technologies. *Journal of Risk Research*, 23(5), 571–597. <https://doi.org/10.1080/13669877.2019.1592211>
- Boehmert, C., Verrinder, A., Pauli, M., & Wiedemann, P. (2018). Does precautionary information about electromagnetic fields trigger nocebo responses? An experimental risk communication study. *Environmental Health*, 17(1), 36. <https://doi.org/10.1186/s12940-018-0377-y>
- Boehmert, C., Wiedemann, P. M., & Croft, R. J. (2016). Improving Precautionary Communication in the EMF Field? Effects of Making Messages Consistent and Explaining the Effectiveness of Precautions. *International Journal of Environmental Research and Public Health*, Article 992. Advance online publication. <https://doi.org/10.3390/ijerph13100992>
- Boehmert, C., Wiedemann, P. M., Pye, J., & Croft, R. J. (2017). The Effects of Precautionary Messages about Electromagnetic Fields from Mobile Phones and Base Stations Revisited: The Role of Recipient Characteristics. *Risk Analysis*, 37(3), 583–597. <https://doi.org/10.1111/risa.12634>
- Chandran, S., & Menon, G. (2004). When a Day Means More than a Year: Effects of Temporal Framing on Judgments of Health Risk. *Journal of Consumer Research*, 31(2), 375–389. <https://doi.org/10.1086/422116>
- Claassen, L., Bostrom, A., & Timmermans, D. R. (2014). Focal points for improving communications about electromagnetic fields and health: A mental models approach. *Journal of Risk Research*, 19(2). <https://doi.org/10.1080/13669877.2014.961519>
- Cousin, M.-E., & Siegrist, M. (2010a). The public's knowledge of mobile communication and its influence on base station siting preferences. *Health, Risk & Society*, 12(3), 231–250. <https://doi.org/10.1080/13698571003710332>
- Cousin, M.-E., & Siegrist, M. (2010b). Risk perception of mobile communication: A mental models approach. *Journal of Risk Research*, 13(5), 599–620. <https://doi.org/10.1080/13669870903236751>
- Dolan, M., & Rowley, J. (2009). The Precautionary Principle in the Context of Mobile Phone and Base Station Radiofrequency Exposures. *Environmental Health Perspectives*, 117(9), 1329–1332. <https://doi.org/10.1289/ehp.0900727>
- Foster, K., & Colombi, D. (2017). Thermal response of tissue to RF exposure from canonical dipoles at frequencies for future mobile communication systems. *Electronic Letters*, 53(5), 360–362.
- IARC. (2013). *Non-ionizing Radiation, Part 2: Radiofrequency Electromagnetic Fields: IARC Monographs on the Evaluation of Carcinogenic Risks to Humans: Vol. 102*. IARC Press.
- ICNIRP (1998). Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields. *Health Physics*, 74, 494–522.

- Link, S., Eggeling, M., Abacioglu, F., & Boehmert, C. (2023). *Qualitative exposure perception studies*. IU International University of Applied Sciences. <https://seawave-project.eu/seawave-dissemination/seawave-public-deliverables/>
- Link, S., Eggeling, M., Abacioglu, F., & Boehmert, C. (2024). *Quantitative exposure perception studies*. IU International University of Applied Sciences. <https://seawave-project.eu/seawave-dissemination/seawave-public-deliverables/>
- Missling, S., Riel, A., Wuschek, M., Reidenbach, H.-D., & Weiskopf, D. (2015). *Ressortforschungsberichte zur kerntechnischen Sicherheit und zum Strahlenschutz: Internationaler Vergleich der rechtlichen Regelungen im nicht-ionisierenden Bereich*.
- Nisbet, E. C., Cooper, K. E., & Garrett, R. K. (2015). The Partisan Brain: How Dissonant Science Messages Lead Conservatives and Liberals to (Dis)Trust Science. *The ANNALS of the American Academy of Political and Social Science*, 658(1), 36–66. <https://doi.org/10.1177/0002716214555474>
- Sjöberg, L., Moen, B.-E., & Rundmo, T. (2004). *Explaining risk perception*. https://www.researchgate.net/profile/ingo-riess/post/can_anyone_recommend_a_suitable_and_validated_tool_to_measure_a_persons_risk_perception_and_safety_values/attachment/59d6392d79197b807799663f/as%3a400743224889344%401472556038267/download/2004_risk-perception.pdf
- Slovic, P. (1987). Perception of risk. *Science*, 236(4799), 280–285. <https://doi.org/10.1126/science.3563507>
- Stam, R. (2017). *Comparison of international policies on electromagnetic fields: (power frequency and radiofrequency fields)*. <https://rivm.openrepository.com/bitstream/handle/10029/623629/2018998.pdf?sequence=1>
- Timotijevic, L., & Barnett, J. (2006). Managing the possible health risks of mobile telecommunications: Public understandings of precautionary action and advice. *Health, Risk and Society*, 8(2), 143–164. <https://doi.org/10.1080/13698570600677324>
- TNS Opinion & Social. (2010). *Special Eurobarometer 347: Electromagnetic Fields.: Report*.
- Udo, E. U., Aru, O. E., Okey, D. O., & Agwu, E. O. (2022). Investigating the Health Hazards Associated with 5G Network: A Review. *Journal of Science and Technology Research*, 4(1), 66–77.
- Walpole, H. D., & Wilson, R. S. (2021). A Yardstick for Danger: Developing a Flexible and Sensitive Measure of Risk Perception. *Risk Analysis*, 41(11), 2031–2045. <https://doi.org/10.1111/risa.13704>
- Weed, D. L. (2004). Precaution, prevention, and public health ethics. *The Journal of Medicine and Philosophy*, 29(3), 313–332. <https://doi.org/10.1080/03605310490500527>
- Wiedemann, P. M., Freudenstein, F., Böhmert, C., Wiart, J., & Croft, R. J. (2017). Rf EMF Risk Perception Revisited: Is the Focus on Concern Sufficient for Risk Perception Studies? *International Journal of Environmental Research and Public Health*, 14, Article 620. <https://doi.org/10.3390/ijerph14060620>

- Wiedemann, P. M., Mertens, J., Schütz, H., Hennings, W., & Kallfass, M. (2001). *Risikopotenziale elektromagnetischer Felder: Bewertungsansätze und Vorsorgeoptionen: Endbericht für das Bayerische Staatsministerium für Landesentwicklung und Umweltfragen*.
https://www.researchgate.net/profile/Peter-Wiedemann/publication/242109997_Risikopotenziale_Elektromagnetischer_Felder_Bewertungsansätze_und_Vorsorgeoptionen/links/0c960528592bbf2116000000/Risikopotenziale-Elektromagnetischer-Felder-Bewertungsansätze-und-Vorsorgeoptionen.pdf
- Wiedemann, P. M., Schuetz, H., Boerner, F., Clauberg, M., Croft, R. J., Shukla, R., Kikkawa, T., Kemp, R., Gutteling, J. M., Villiers, B. de, da Silva Medeiros, F. N., & Barnett, J. (2013). When precaution creates misunderstandings: The unintended effects of precautionary information on perceived risks, the EMF case. *Risk Analysis*, 33(10), 1788–1801.
<https://doi.org/10.1111/risa.12034>
- Wiedemann, P. M., & Schütz, H. (2005). The precautionary principle and risk perception: Experimental studies in the EMF area. *Environmental Health Perspectives*, 113(4), 402–405. <https://doi.org/10.1289/ehp.7538>
- Wiedemann, P. M., Schütz, H., & Clauberg, M. (2008). Influence of information about specific absorption rate (SAR) upon customers' purchase decisions and safety evaluation of mobile phones. *Bioelectromagnetics*, 29(2), 133–144.
<https://doi.org/10.1002/bem.20371>
- Wiedemann, P. M., Thalmann, A. T., Grutsch, M. A., & Schütz, H. (2006). The Impacts of Precautionary Measures and the Disclosure of Scientific Uncertainty on EMF Risk Perception and Trust. *Journal of Risk Research*, 9(4), 361–372.
<https://doi.org/10.1080/13669870600802111>
- Wilson, R. S., Zwickle, A., & Walpole, H. (2019). Developing a Broadly Applicable Measure of Risk Perception. *Risk Analysis*, 39(4), 777–791. <https://doi.org/10.1111/risa.13207>
- Wood, A. W., & Karipidis, K. (Eds.). (2017). *Non-ionizing Radiation Protection: Summary of Research and Policy Options*. Wiley.
- World Health Organization. (2012). *International EMF Project: 17th International Advisory Committee Meeting*. [https://cdn.who.int/media/docs/default-source/radiation-international-advisory-committee-\(iac\)-minutes/17-emf-iac-minutes-2012.pdf?sfvrsn=e97a43c9_2](https://cdn.who.int/media/docs/default-source/radiation-international-advisory-committee-(iac)-minutes/17-emf-iac-minutes-2012.pdf?sfvrsn=e97a43c9_2)
- World Health Organization. (2010). *WHO Research Agenda for Radiofrequency Fields*. WHO Press.
- World Health Organization. (2014). *Electromagnetic fields and public health: mobile phones: Fact Sheet No 193*. <http://www.who.int/mediacentre/factsheets/fs193/en/>
- Zwick, M. M. (2005). Risk as perceived by the German public: pervasive risks and “switching” risks. *Journal of Risk Research*, 8(6), 481–498.
<https://doi.org/10.1080/13669870500064150>

7 Appendix

7.1 Participation information and consent form

Dear participants,

Please read this information carefully before deciding whether or not to participate in the study.

What is the goal of the study?

The aim of the study is to find out how different information on the topic of "health" is perceived. The study is being carried out as part of a project funded by the European Union. The leading institution is the IU International University of Applied Sciences.

What is expected of participants?

The survey should take a maximum of 10 minutes to complete. As researchers, we are interested in your personal opinions and views. We also collect some personal information, such as your age and gender.

Can participants change their mind and cancel the survey?

You can cancel the survey at any time by closing your browser window.

What data or information is collected and how is it used?

All answers you provide in this survey will be treated in strict confidence and used exclusively for scientific purposes. All personal information you provide will be collected and processed anonymously - you cannot be personally identified in any way from the data collected.

Contact

If you have any further questions or concerns about this research, please contact us using the details below:

Lead researcher: Prof. Dr. Christoph Böhmert christoph.boehmert@iu.org

This study has the ethical approval of the IU International University of Applied Sciences.

IU International University Ethics Committee – Chair

Prof. Dr. Stefanie André stefanie.andre@iu.org

Juri-Gagarin-Ring 152, 99084 Erfurt, Germany

Consent form and acceptance of conditions

In order to participate in the survey, you must agree to all of the following:

I acknowledge that:

- I can terminate the survey at any time by closing my browser window.
- The data will be kept secure.
- The results of the project may be published, but my anonymity will be preserved.
- A fully anonymized data set containing my responses can be published on a publicly accessible server after publication of the data in scientific journals.

I acknowledge that:

- My participation in the survey is completely voluntary.
- I am at least 18 years of age.
- I agree to participate in this survey.

Once you clicked "**Continue**", you agree to all the points and will be taken to the first question. If you do not want to participate in the survey, please click "**I do not want to participate**" or close the browser window.

I do not want to participate

Continue

The participant information and consent form were presented to the participants in German or Greek.

7.2 The questionnaires

Imagine that you have to wait a while. To pass the time, you go to the internet and the following article suggestions are displayed.

**Hospital hygiene**

There is hardly a place where hygiene is more important. An expert discusses the risks associated with treatment in hospital and how hygiene can be improved based on the latest findings.

**Mobile communication and radiation protection**

Almost everyone uses mobile phones, but only a few know how they actually work. An expert discusses the health effects of mobile phone radiation and what the new 5G mobile phone standard has to do with it.

**Vitamin pills**

They are supposed to promote our health, but sometimes have the exact opposite effect. An expert explains how vitamin supplements work and what you need to bear in mind when taking them.

How likely would you click on each article to read it?

You have time for as many articles as you like!

	1 = Not likely at all	2	3	4	5	6	7 = Very likely
Article A: Hospital hygiene	☐	☐	☐	☐	☐	☐	☐
Article B: Mobile communication and radiation protection	☐	☐	☐	☐	☐	☐	☐
Article C: Vitamin pills	☐	☐	☐	☐	☐	☐	☐

When you think about your everyday life...

	1 = Never	2	3	4	5	6	7 = Very often
...how often do you think about the topic "mobile phone radiation and health"?	☐	☐	☐	☐	☐	☐	☐
...how often do you talk about the topic "mobile phone radiation and health" with other people (e.g., in conversations, via social media, online platforms, etc.)?	☐	☐	☐	☐	☐	☐	☐

Please answer a few questions about yourself.

How old are you? (*note: drop down menu*)

18-29

30-39

40-49

50-59

60+

Which gender do you identify with? *(note: drop down menu)*

Female

Male

Diverse

Other

In which federal state do you live? *(note: drop down menu, country specific categories)*

What is your highest level of education? *(note: drop down menu, country specific categories)*

In the following you will receive various information on the subject of "Mobile communications and health", after which you will be asked questions about them. Please read the texts carefully!

The following information is provided by the German/Greek radiation protection agency. This agency is an independent scientific and technical authority which is responsible for providing information and research regarding radiation protection. It is therefore also responsible for the topic of "mobile communications and health", including the topic of 5G.

Mobile communication, for example using mobile phones (cell phones, smartphones), is now part of everyday life for many people. Radio waves are used to transmit voice and data to and from mobile phones. In technical terms, these radio waves are referred to as **electromagnetic fields**, or **EMF** for short. Colloquially, they are also known as "mobile phone radiation". When transmitting data, mobile phones and **mobile phone base stations** ("mobile phone antennas") interact with each other. Data transmission is constantly being optimised, resulting in new technologies, such as the latest 5G mobile communication standard. 5G is therefore the successor technology to existing mobile phone standards such as 2G, 3G and 4G.

When using a mobile phone, some of the energy from the electromagnetic fields is absorbed in the head. The statutory limits for mobile phones and mobile phone base stations protect against the health effects of electromagnetic fields from mobile communications. Below these limits, there is no evidence of harmful effects of electromagnetic fields from mobile phones on human health. However, there are still uncertainties in the risk assessment that have not yet been completely eliminated by research. These relate in particular to

- Possible health risks when adults are exposed to electromagnetic fields from mobile phone calls over the long term,

- new technological developments, such as the introduction of 5G (the current mobile phone standard) and
- the question of whether children may react more sensitively than adults.

Condition: Precautionary information as recommendation

Due to these uncertainties, the German/Greek Radiation Protection Agency **advises** that personal exposure (radiation exposure) to electromagnetic fields when using mobile phones be kept to a minimum as a precautionary measure. This results in the following **precautionary tips**, which are aimed in particular at users of mobile phones and smartphones:

- Use the landline phone if you have the choice between landline and mobile phone.
- Keep mobile phone calls as short as possible.
- If possible, do not make calls when reception is poor, for example in a car without an external aerial.
- Use mobile phones that expose your head to as low fields as possible. The lower the so-called SAR-value (Specific Absorption Rate) of your mobile phone, the lower the electromagnetic field. The manufacturers of mobile phones usually state the SAR-values determined under specified conditions in the instructions for use. You can also find corresponding information on the mobile phone manufacturer's website.
- Use headsets. The intensity of the field decreases rapidly with distance from the phone. By using headsets, the distance between the head and the phone is greatly increased. The head is therefore exposed to lower fields when making phone calls.
- Write text messages. You do not hold the mobile phone to your head when doing so.

Condition: Precautionary information as neutral information

Due to these uncertainties, the German/Greek Radiation Protection Agency **informs** how the personal exposure (radiation exposure) to electromagnetic fields when using mobile phones can be kept to a minimum as a precautionary measure. Users of mobile phones and smartphones can decide for themselves if they want to implement these **precautionary measures** or not:

- Using the landline phone if there is a choice between landline and mobile phone.
- Keeping mobile phone calls as short as possible.
- If possible, making no calls when reception is poor, for example in a car without an external aerial.
- Using mobile phones that expose the head to as low fields as possible. The lower the so-called SAR-value (Specific Absorption Rate) of the mobile phone, the lower the electromagnetic field. The manufacturers of mobile phones usually state the SAR-values determined under specified conditions in the instructions for use. The corresponding information can also be found on the mobile phone manufacturer's website.

- Using headsets. The intensity of the field decreases rapidly with distance from the phone. By using headsets, the distance between the head and the phone is greatly increased. The head is therefore exposed to lower fields when making phone calls.
- Writing text messages. The mobile phone is not held to the head while doing so.

Condition: Precautionary information and additional text module

Due to these uncertainties, the German/Greek Radiation Protection Agency **advises** that personal exposure (radiation exposure) to electromagnetic fields when using mobile phones be kept to a minimum as a **precautionary measure**.

In order to better understand the concept of precaution, we distinguish it from prevention.

1. Both concepts have the fundamental aim of preventing or minimising possible future damage or problems.
2. Prevention is used in situations where there is a proven risk, but where negative effects can still be avoided or minimised. For example, it has been proven that regular, heavy alcohol consumption is a health risk. Not drinking alcohol, or drinking only a little, is therefore a preventative measure.
3. Precaution is used in situations in which it is not yet known whether there is a risk at all, i.e. in which it has not been proven whether something has any negative effects at all. It is therefore possible that precautionary measures have no benefit at all, as there may be no risk. EMF is categorised by the German/Greek Radiation Protection Agency as a case of precaution and not prevention.

The German/Greek Radiation Protection Agency gives users of mobile phones and smartphones the following **precautionary tips**:

- Use the landline phone if you have the choice between landline and mobile phone.
- Keep mobile phone calls as short as possible.
- If possible, do not make calls when reception is poor, for example in a car without an external aerial.
- Use mobile phones that expose your head to as low fields as possible. The lower the so-called SAR-value (Specific Absorption Rate) of your mobile phone, the lower the electromagnetic field. The manufacturers of mobile phones usually state the SAR-values determined under specified conditions in the instructions for use. You can also find corresponding information on the mobile phone manufacturer's website.
- Use headsets. The intensity of the field decreases rapidly with distance from the phone. By using headsets, the distance between the head and the phone is greatly increased. The head is therefore exposed to lower fields when making phone calls.

- Write text messages. You do not hold the mobile phone to your head when doing so.

Please answer the following question. Which term was abbreviated to “EMF” in the text?

Development and Management in Research

Electromagnetic Fields

Edition Michael Fischer

European Migration Forum

Please select the appropriate answer option. The text... *(note: only if not control condition)*

Said nothing about precautionary measures.

Recommended precautionary measures.

Informed neutrally about precautionary measures.

Advised against precautionary measures.

Please select all appropriate statements (multiple selection possible). According to the text, the following statements are true: *(note: only study 2, condition 3)*

Prevention is exactly the same as precaution.

Both prevention and precaution serve to minimise potential damage.

Prevention is used when there is a proven risk, precaution when this is still unclear.

Precaution is used when there is a proven risk, prevention when this is still unclear.

We are now interested in your opinion on various questions relating to electromagnetic fields (EMF).

Please think about your mobile phone now.

	1 = Not at all	2	3	4	5	6	7 = Very much
To what extent do you feel exposed to electromagnetic fields (EMF) from your mobile phone in your everyday life?	O	O	O	O	O	O	O

How (...) are you because of the EMF emitted by your mobile phone?

	1 = Not at all	2	3	4	5	6	7 = Very much
worried	0	0	0	0	0	0	0
concerned	0	0	0	0	0	0	0
afraid	0	0	0	0	0	0	0

	1 = Very unlikely	2	3	4	5	6	7 = Very likely
How likely do you consider it that these EMF have negative effects on you?	0	0	0	0	0	0	0

	1 = Harmless	2	3	4	5	6	7 = Very severe	I don't expect negative effects
If you expect negative effects, how severe do you think they would be?	0	0	0	0	0	0	0	0

Please think about mobile phone base stations (antennas) now.

	1 = Not at all	2	3	4	5	6	7 = Very much
To what extent do you feel exposed to electromagnetic fields (EMF) from mobile phone base stations in your everyday life?	0	0	0	0	0	0	0

How (...) are you because of the EMF emitted by mobile phone base stations?

	1 = Not at all	2	3	4	5	6	7 = Very much
worried	0	0	0	0	0	0	0
concerned	0	0	0	0	0	0	0
afraid	0	0	0	0	0	0	0

	1 = very unlikely	2	3	4	5	6	7 = Very likely
--	-------------------	---	---	---	---	---	-----------------

How likely do you consider it that these EMF have negative effects on you?	0	0	0	0	0	0	0
--	---	---	---	---	---	---	---

	1 = Harmless	2	3	4	5	6	7 = Very severe	I don't expect negative effects
If you expect negative effects, how severe do you think they would be?	0	0	0	0	0	0	0	0

We are now interested in your opinion on measures you can take to do the following:

- a) reduce the duration of your mobile phone use (e.g., keep phone calls short) and
- b) increase the distance from the mobile phone (e.g., use a headset when making calls).

	1 = Not dangerous at all	2	3	4	5	6	7 = Very dangerous
How dangerous do you think the electromagnetic fields (EMF) from mobile phones are while talking on the phone if you do NOT take such measures?	0	0	0	0	0	0	0
How dangerous do you think the electromagnetic fields (EMF) from mobile phones are while talking on the phone if you DO take such measures?	0	0	0	0	0	0	0

As already mentioned, the German/Greek Radiation Protection Agency is responsible for providing information and research regarding radiation protection in Germany/Greece and is therefore also responsible for the topic of “mobile communications and health”, including the topic of 5G.

How strongly do you agree with the following statements?

	1 = Do not agree at all	2	3	4	5	6	7 = Strongly agree
I have very little confidence in state institutions of radiation protection, e.g. the German/Greek radiation protection agency.	0	0	0	0	0	0	0
Information from state institutions of radiation protection, e.g. the German/Greek radiation protection agency, is trustworthy.	0	0	0	0	0	0	0
Please tick "7 = strongly agree".	0	0	0	0	0	0	0
I trust in state institutions of radiation protection, e.g. the German/Greek radiation protection agency, to do what is right.	0	0	0	0	0	0	0
State institutions of radiation protection, e.g. the German/Greek radiation protection agency, do not tell the public the truth.	0	0	0	0	0	0	0
I am suspicious of state institutions of radiation protection, e.g. the German/Greek radiation protection agency.	0	0	0	0	0	0	0

How strongly do you agree with the following statements?

	1 = Do not agree at all	2	3	4	5	6	7 = Strongly agree
With my behaviour I can influence the radiation exposure from my own mobile phone (and thus protect myself from EMF).	0	0	0	0	0	0	0

In my opinion, the information on the topic “mobile communications and health” (which you read at the beginning) were consistent.	☐	☐	☐	☐	☐	☐	☐
---	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

Please indicate to which extent this applies to you.

	Yes	Partly	No
So far, I have taken measures in my everyday life to reduce my exposure to radiation when using my mobile phone.	☐	☐	☐

Please indicate to which extent this applies to you. *(note: only if not control condition)*

	Yes	Partly	No
I already knew before this study that I could reduce my exposure to EMF with the precautionary measures mentioned in the text.	☐	☐	☐

7.3 Debriefing

Thank you for taking part in this study! The aim of the survey was to analyse the effect of precautionary information on different target groups. You either read a text that contained basic information on the subject of mobile phone radiation or a text that contained additional precautionary information.

With regard to mobile phone radiation in general, the World Health Organisation (WHO) says: "Over the past two decades, a large number of studies have been conducted to investigate whether mobile phones pose a potential health risk. To date, no adverse health effects have been identified from the use of mobile phones. All the evidence collected so far shows that the radiofrequency signals generated by base stations have no harmful effects on health in the short or long term."

Further information on electromagnetic fields used for mobile communications can be found on the website of the Federal Office for Radiation Protection (BfS). The Federal Office for Radiation

Protection is the agency that is responsible for providing information and research regarding radiation protection in Germany. The “German radiation protection agency” that was mentioned in the survey does not exist.

https://www.bfs.de/DE/themen/emf/emf_node.html;jsessionid=D96626E519CD028076A89BCCA29162E7.1_cid382

You can find specific information on precautionary measures here:

<https://www.bfs.de/DE/themen/emf/mobilfunk/vorsorge/smartphone-tablet/smartphone-tablet.html>

Your anonymous data will be stored and shared securely and can only be accessed by selected individuals at the academic institution (IU) involved in this project. Research papers may be published using this data, but again you will not be personally identifiable in the research results. After publication of the latest scientific paper based on the data, the data collected in this survey will be made freely available to the public. This means that interested parties can use the data for their own research or commercial purposes. However, your responses will remain anonymous - you will not be personally identifiable in this dataset.

If you have any further questions or concerns about this study, please get in touch with the contact listed below:

Lead researcher: Prof Dr Christoph Böhmert, christoph.boehmert@iu.org

The debrief was translated into Greek and the sources of information were adapted accordingly. The links in Greece did lead to the website of the EEAE:

<https://eeae.gr/files/ενημέρωση/κινητή-τηλεφωνία.pdf>

https://eeae.gr/files/%CE%B5%CE%BD%CE%B7%CE%BC%CE%AD%CF%81%CF%89%CF%83%CE%B7/FS193_greek.pdf

https://eeae.gr/files/%CE%B5%CE%BD%CE%B7%CE%BC%CE%AD%CF%81%CF%89%CF%83%CE%B7/FS304_greek.pdf

7.4 Quotas

The quotas are based on EU’s statistical agency Eurostat, that provides statistics and data on the EU and its member states.

7.4.1 Interlocking quotas for age and gender

	Germany		Greece	
Age	Male	Female	Male	Female
18-29	7,81%	8,15%	9,29%	9,51%
30-39	7,67%	8,00%	9,58%	9,82%
40-49	7,10%	7,41%	9,29%	9,51%
50-59	9,38%	9,79%	8,15%	8,35%
60+	16,98%	17,71%	13,14%	13,46%
Total	48,94%	51,06%	49,40%	50,60%

7.4.2 Quotas for region

Germany		Greece	
Baden-Württemberg	13,28 %	Attica (Athens)	35,40 %
Bayern	15,80 %	Aegean Island, Crete	10,50 %
Berlin	4,40 %	Northern Greece	32,40 %
Brandenburg	3,07 %	Central Greece	21,70 %
Bremen	0,82 %		
Hamburg	2,22 %		
Hessen	7,54 %		
Mecklenburg-Vorpommern	1,97 %		
Niedersachsen	9,60 %		
Nordrhein-Westfalen	21,48 %		
Rheinland-Pfalz	4,94 %		
Saarland	1,21 %		
Sachsen	4,91 %		
Sachsen-Anhalt	2,68 %		
Schleswig-Holstein	3,51 %		
Thüringen	2,59 %		