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ELÖVERKÄNSLIGHET

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ÖVERKÄNSLIGHET MOT MOBILTELEFONER:

Resultat från en dubbelblind provokationsstudie av metodstudiekaraktär

Information från Enheten för Experimentell Dermatologi

vid

Karolinska Institutet

under ledning av Olle Johansson, docent, universitetslektor

(adress: Enheten för Experimentell Dermatologi, Institutionen för Neurovetenskap,  
Karolinska Institutet, 171 77 Stockholm)

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The translation is not proofread!

(Report no. 2/edition 2/ISSN 1400-6111)

ELECTRICAL SENSITIVITY

and

SENSITIVITY TO MOBILE PHONES:

Results from a double-blind provocation study of a methodological nature

Information from the Unit for Experimental Dermatology

at

Karolinska Institutet

under the direction of Olle Johansson, docent, university lecturer

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In nine attempts out of nine possible, one person was able to determine whether mobile phones were switched on or not in double-blind tests carried out by the Unit for Experimental Dermatology at the Karolinska Institutet in Stockholm.

The person reacted with both acute and delayed symptoms. Furthermore, it has been established that background factors of a high-frequency nature can seriously interfere with studies of this type. Finding an environment suitable for provocation studies in the increasingly 'electrified' society, with more and more sources of interference, should only become more and more difficult.

## PREFACE

The question of the emergence of the so-called electrical hypersensitivity and skin damage in connection with monitor work have worried me for a long time. Partly because I, and other people, in our work often spend hours in front of a monitor, partly because through work I have also come into contact with people who describe severe problems and disease-like symptoms for which they have not received adequate treatment, something that concerns me both as a fellow human being and as a representative of medical science.

Electrical hypersensitivity and screen damage are concepts that are now widely discussed among researchers worldwide. What is the background of these problems? Could it be high-frequency electric and/or magnetic fields from monitors, mobile phones and other electrical devices in our work, leisure and home environment? One way to investigate this was initiated at a research meeting in Linköping in 1993, namely to let electrically hypersensitive individuals be tested double-blind for the presence (or not) of mobile phones.

The issue has also recently become more and more relevant, not least in light of the ongoing research on cancer and magnetic fields, which has shown increased risks for a number of professions, incl. (female) "typists" (but, why nothing about "screen workers"?). Equally important is the debate about so-called technical compatibility, i.e. whether different devices (not least medical devices) are affected and disturbed by surrounding fields (including high-frequency ones from mobile phones), etc.) As a researcher, I have to ask myself: When will the question of human compatibility be seriously discussed? So, when will we see the birth of technology that does not pose a potential health hazard? The answer to this question can only be obtained through further research. Perhaps this description of our methodological study can be added to the basis of such research.

I would like to express my warmest thanks to the Working Environment Fund (proj. no. 93-0344 and 94-0375), Nokia Monitors, Sun Microsystems AB, Radians Innova AB, Sun-Flex Datamiljö AB, AST Computer Sweden AB, Käro-Produkter AB, Swedish Confederation of Industrial Employees (SIF), Cancer and Allergy Fund, Magn. Bergvall's Foundation and Karolinska Institutet's Research Fund, which contributed funds to the initiation of our investigations. I would also like to thank the private individuals who, by generously donating contributions to Karolinska Institutet, made these preliminary studies possible.

This study would not have been possible without the help from the following persons whom I forward my deeply felt gratitude: Ola Anderson, Leena Bodefjäll, the family Fogelström, Eva-Karin Johansson, Torbjörn Karlsson, Kenneth Nilsson, Brigitta Omazic, Stefan Sandborg, Jonas Tannerstad and Clas Tegenfeldt.

The present paper is the second edition.

Stockholm, Sunday 15th October 1995

(sign.)

Olle Johansson

## INTRODUCTION

Electromagnetic fields: an invisible environmental hazard?

Allergy, hypersensitivity, mass media epidemic, conditioned reflexes and phobias are terms that circulate in the debate around the so-called screen damaged and electrically hypersensitive. The conceptual confusion is very great, mostly due to the fact that very little research has been done in this new and exciting field. 'Electricity allergy' does not exist, many believe, and from a strictly immunological point of view they are probably right.

Hypersensitivity is a better term, a summary term for a number of symptoms, which cannot be explained in the same way as an allergy, but which are on the rise in today's society. The latter group is considered to include those who are hypersensitive to electricity and those with screen damage.

The first reports of skin problems in connection with monitor work came from Norway and the USA in the early 80s. Since then, the phenomenon has been described in the majority of Western countries, where in some of them there has also been a larger public debate. The debate surrounding electromagnetic fields and health risks has been based on 1) the relationship between power lines near homes and the occurrence of certain forms of cancer, 2) the influence of electromagnetic fields on fertility, pregnancy or fetal development, and 3) electrical hypersensitivity/screen damage.

A descriptive study of a group of 32 people with "hypersensitivity to electricity" was done in 1989 by the Institute for the Working Environment (Knave B, Bergqvist U & Wibom R. Symptoms and subjective complaints in "hypersensitivity to electricity". The Institute for the Working Environment 4, 1989). Ninety seven percent (97/100, 31/32) stated that their complaints were localized to the skin such as redness/rosiness/redness (75/96), as heat/warmth/burning sensation (69/96) and as stinging/pain/tightness (63/96). The other main type of discomfort, such as dizziness, could be attributed to the central nervous system.

These two body areas were also where the symptoms debuted.

As is well known, the question of the cause of the aforementioned symptoms and complaints has been debated very lively. No uniform and coherent explanation has yet been given.

Rather, it has become clear that the scientific expertise is very divided on the issue. We still maintain our opinion that it is of the utmost importance that experimental studies be carried out and critically evaluated before one can neither dismiss nor recommend anything in the matter of risks with electrical environments on scientific grounds.

Next, I want to present some preliminary findings, as well as their interpretations, from our own research concerning sensitivity to mobile phones in people with electrical hypersensitivity and monitor-associated skin problems. Note that these findings are preliminary in nature and thus do not allow for complete conclusions. More research is needed for that.

The present description should therefore be seen as a method or pilot study. However, there were so many interesting findings that the undersigned felt it was very important to let more people take part in our results.

## BACKGROUND

Swedish researchers have so far not been able to prove that those who consider themselves hypersensitive to electromagnetic fields really react to them. So far, only low-frequency fields up to 400 kiloHertz (kHz; =400,000 oscillations/second) have been investigated. This study addresses a whole new dimension of electrical hypersensitivity by examining reactions to high-frequency radiation, frequencies around 900 megaHerz (MHz; =900,000,000 oscillations/second).

The undersigned has wanted to see if there is any possible method to demonstrate a connection between electromagnetic radiation and subjectively experienced complaints in this group of people. To this was also added an assessment of any objective findings, such as skin redness, etc.

## THE EXPERIMENT

The experiments took place in an electricity-free friggobod two kilometers southwest of Linköping.

Two telephone jacks for the cottage were disconnected at the main building. Twelve people participated in the method study, which began in the early summer of 1994 and ended in the late autumn of the same year. Of these, seven remained for the full trial (see below). Of the subjects, 3 participated in all trials, the others were excluded on various grounds during the course of the trial.

Stage 1 consisted of the subjects getting used to possible background phenomena (i.e. without the presence of any mobile phones), i.e. that they accepted to sit up to 30 min. in the existing environment and that they did not get any clear symptoms of this. Some people reported mild discomfort, but still felt they could participate in stage 2 (see below). Stage 2 meant that the subjects had to 'train' on their own to recognize the mobile phones in question, this in an "open format", meaning they were fully aware of when the mobile phones were in the room. Sometimes an empty bag was also used. The intention was that each test subject would learn to recognize their own reaction and also determine the time from power on to acute reaction. In addition, the subjects noted their delayed reactions. The subjects were allowed to train as many times as they themselves deemed necessary. At step 1 or 2, no experimenter was present, but the results were described afterwards.

Only people who considered themselves capable of sensing the phones participated in the final experiment (=step 3). Finally, seven of the twelve subjects remained.

These were then used in step 3, which meant that a double-blind procedure was applied, i.a.o. neither the experimenter nor the subject knew whether they were exposed to fields from mobile phones or not. Based on the results from steps 1 and 2, the maximum challenge time was determined to be 30 min. Subjects were free to discontinue the challenge at any time. Before the experiment, each subject had to take part in a subject instruction (see appendix 1). The Research Ethics Committee at the University of Health in Linköping has approved the trial.

The mobile phones used were mainly NMT900 (but there were also occasional NMT450 or GSM phones), which were switched on and placed in a bag, which was placed on a chair half a meter in front of the subject. The energy that the telephones emit when switched on is far less than during a call. The subjects were supposed to register negligible signals at a longer distance than when the devices are held to the ear.

The experiment itself (=step 3) was carried out in the following way: The test person sat down in the cabin for a while (5-20 min.) before the experiment began. Then the experimenter came in and both he and the test subject were blindfolded.

In another building, 25 meters away, a representative of the municipality of Linköping randomly decided whether the phones would be switched on or not. He came into the cabin with the bag and it then contained either the switched on phones or dummies. Only when the bag was placed on the chair were the blindfolds removed. The experimenter or subject was not allowed to touch the bag or the chair it was on.

The subjects then sat for a maximum of 30 min. in front of the bag and the undersigned meanwhile noted subjective and objective symptoms where applicable, while the test subjects returned with a written and verbal report on any delayed reactions. At each test round, the same template was used for questions and answers, this to standardize possible comparisons time and time again. There was at least a week between each trial. The subject decided each time himself when the provocation should be interrupted.

## RESULTS

On all nine occasions, one person could tell whether the phones were on or off. She lives next to the friggeboden and was thus staying in her home environment. The woman reacted acutely with, among other things, shortness of breath, concentration difficulties, headache and pressure over the eyes, as well as increased electrical hypersensitivity several days afterwards if the phones had been switched on. She was able to correctly indicate the presence of the mobile phones both in the acute stage and with her delayed reactions. Other people had worse accuracy (see appendix 2).

## MEASUREMENT

During the autumn, a measurement was made of the background values in the cabin (see appendix 3). Unusually high values were then discovered around certain frequencies. The high-frequency interference probably originates from nearby military transmitters. In other parts of Linköping municipality, the background radiation is low, areas where some of the test subjects came from.

## POSSIBLE SOURCES OF ERRORS

People who experience themselves as electrically hypersensitive often react to environmental changes. They can feel reasonably well at home, really well in a sanitized environment, but

react strongly when they stay somewhere else. The body seems to calibrate itself to the environment where they are most of the day, even if there are minor sources of disturbance.

During the first three trials, some people experienced symptoms even though the phones were not switched on. It is not impossible that these people felt the high background radiation in the cabin, a radiation that probably does not occur in their home environment. Previous studies have had no control over high-frequency disturbances at all. An unexplored area is the geophysical force fields and their influence on biological matter. Namely, the force fields can vary from place to place.

Most common among electrosensitive people, who have been exposed to something to which the body reacts, is a delayed reaction without noticeable acute symptoms. Often these reactions occur six to twelve hours after exposure. Therefore, it is very difficult to determine exactly what disturbed the people who had delayed reactions in cases where the phones were not present. None of the test subjects live in isolation, but are exposed to sources of disturbance from their surroundings in everyday life.

All people came by car to the trials except one. He stayed in a caravan near his home during the test series. The car journeys to the test site can in some cases be likely sources of error. Several of the test subjects develop symptoms in cars and may have already been affected when the experiments began, which means that they have difficulty discerning further reactions, since practically all symptoms only subside a long time after exposure. A person traveled along power lines, which may have caused an unwanted impact.

The person in the caravan on one occasion showed strong reactions even though the phones were not switched on. In the surroundings there are several sources of interference that he cannot control, for example the caravan is next to a garage, whose fluorescent tubes he detects when they are lit, as well as machines used for hobby work - both examples are empirically established sources of interference. Five months had passed when the trials resumed in the autumn. Experience shows that electrosensitive people slowly, very slowly, get better when they avoid environments where they get symptoms. The improvements are not noticeable day by day, and a person who once reacted strongly to a mobile phone may have that strong and unpleasant reaction imprinted on their memory. Symptoms can be ignored by the test subject if they are noticeably weaker than before. There is also the possibility that some form of habituation occurs if a sensitive person is repeatedly exposed to the same weak stimuli.

A curiosity worth mentioning is that some women have reported a stronger resistance to electricity in connection with the monthly menstruation. In our experiment, this may have come into play at one point for one of the subjects. Can the female hormonal cycle affect electrical hypersensitivity? So, how?

The technology may at some point have played tricks on the trials by the batteries in the phones being too weak. This reasoning can possibly be applied to one of the two subjects who participated in all nine trials (see Appendix 2).

In summary, it can be stated that on the next trial occasion, one must make sure to have these error sources well controlled.



## FUTURE STUDIES

The method study gives reason for continued attempts to determine possible connections between people's perceived discomfort and electromagnetic fields in our everyday environment. Provocation studies combined with subjective statements raise several questions to avoid likely sources of error" in this study.

" Is there any field-free environment at all in our modern society given the enormous "pollution" in the airwaves? " Where should new studies be conducted?

In the home if the people feel well there?

Or

In the form of a camp in a place with as little background radiation as possible, a place where the test subjects get used to the environment before the start of the experiments and stay in the place for the whole test series?

[The following pages are untranslated and comprise the instructions to the subjects and results from the tests.]



## FÖRSÖKSPERSONSINSTRUKTIONER

Du kommer nu att vara med om ett experiment. Som Du vet finns det personer som upplever sig bli sjuka av att arbeta vid datorbildskärmar, lysrör, mobiltelefoner och andra elektriska apparater. Syftet med försöket är att undersöka om sådana patienter (=Du) skiljer sig från friska, frivilliga vad det gäller möjligheten att upptäcka sådana apparater i ett s.k. blindtest, alltså där försökspersonen ej känner till om Han/Hon blir utsatta för elektromagnetiska fält från mobiltelefoner, eller ej. Hittills har väldigt litet forskning gjorts på fenomenet och vi hoppas med denna studie kunna undersöka eventuella skillnader mellan friska, frivilliga samt ovan beskrivna patienter.

Du kommer att anmodas att vara med flera gånger (=dagar) i försöket, dock bara med en blindtest/dag. Vi kommer att låta Dig sitta i en fältfri miljö till vilken en svart väska förs in. Antingen innehåller denna väska flera mobiltelefoner, eller också finns i väskan attrapper. Väskan kommer att placeras bakom Dig. Du får ej beröra väskan eftersom Du då skulle kunna avgöra dess innehåll. Din uppgift är att försöka avgöra om Du utsätts för ett elektromagnetiskt fält, eller ej. När Du är säker på det ena eller andra tillståndet, säg då till. Om Du inte vet säkert efter 30 minuter avbrytes ändå försöket. Eventuella fördröjda symptom skall rapporteras till försöksledaren vid påföljande försökstillfälle.

De resultat vi erhåller kommer att bearbetas statistiskt.

Dina resultat kommer att föras med en laboratriekod och all kommande bearbetning av Dina svar och personuppgifter följer denna kod. Du kommer därigenom att vara anonym.

Du är hela tiden fri att avbryta Ditt deltagande närhelst Du önskar. Säg då bara till att Du vill avbryta.

Har Du några ytterligare frågor?

Olle Johansson  
Högskolelektor, docent

Bilaga 2

RESULTAT AV PROVOKATIONSSSTUDIEN

(vid varje provokationstillfälle (=prov.) anges i turordning innehållet i väskan (**I** = mobiltelefoner närvarande; **O** = väskan tom), därefter det akuta svaret (**I** = mobiltelefoner närvarande; **O** = väskan tom) resp. det fördröjda svaret (**I** = mobiltelefoner närvarande; **O** = väskan tom). e.d. = ej deltagit.

Försöksperson (kön; ålder)	Prov. 1	Prov. 2	Prov. 3	Prov. 4	Prov. 5	Prov. 6	Prov. 7	Prov. 8	Prov. 9
Kvinna; 49 år	I-0-I	0-0-0	I-0-0	e.d.	e.d.	e.d.	e.d.	e.d.	e.d.
Kvinna; 56 år	0-0-I	I-0-0	I-0-I	e.d.	e.d.	e.d.	e.d.	e.d.	e.d.
Kvinna; 50 år	I-0-0	0-0-0	I-0-I	I-I-I	0-0-I	0-0-0	0-0-0	0-0-0	I-0-0
Man; 48 år	0-0-I	0-0-I	I-I-I	I-I-I	0-I-0	0-0-0	0-0-0	e.d.	e.d.
Kvinna; 34 år	0-0-I	I-0-0	I-0-0	e.d.	e.d.	e.d.	e.d.	e.d.	e.d.
Kvinna; 60 år	I-I-I	0-I-I	0-I-I	e.d.	e.d.	e.d.	e.d.	e.d.	e.d.
Kvinna; 45 år	0-0-0	I-I-I	I-I-I	I-I-I	0-0-0	I-I-I	0-0-0	I-I-I	0-0-0

## MÄTNING

På Hargs Lillgård 1994-11-26. Utförd av Torbjörn Karlsson, Emicon Elektromagnetisk Konsult AB.

### Bakgrundsstrålning i friggebod (V/m = volt/meter)

615,9 MHz	0,200 V/m
662,8 MHz	0,200 V/m
686,2 MHz	0,030 V/m
694,1 MHz	0,035 V/m
705,2 MHz	0,060 V/m
718,6 MHz	0,100 V/m
853,7 MHz	0,005 V/m
947,5 MHz	0,002 V/m