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# Problems of objective assessment of idiopathic environmental intolerance related to electromagnetic fields

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Electromagnetic Hypersensitivity

# EXAMPLES

# 1<sup>st</sup> Patient



- 42 year old women accountant
- starting to work with a VDT in 1986
- soon after onset of work she had severe problems
  - a sound sensation similar to tinnitus
  - after 5 to 10 minutes severe headaches
- she contacted the occupational physician that inspected the workplace and improved the ergonomic conditions (better chair, adjusting the height of the table – the patient was very tall: 192 cm) but without success

- She consulted another physician because of the headaches
  - he prescribed metoprolol (Lopressor)
- She further tried biofeedback and acupuncture
- The conditions worsened and got only better if she refrained from working at the computer
- The occupational physician sent her to me about 5 months later after attending a lecture where I spoke about EMFs from VDT
  - I performed a thorough case history which revealed that she never had headaches except at primary school
  - She worked at an experimental VDT workplace at my institute for 3 h without any symptom

- I exchanged the VDT with the one from her workplace and this resulted in onset of the symptoms a few minutes after starting to work
- I concluded that the VDTs differed in the features responsible for eliciting the symptoms



The VDTs differed in several features among them the line repetition frequency

- A further interview with the patient confirmed her tinnitus like sensation which she described as a high pitch sound that vibrated
- We exposed her in an acoustic chamber to increasing frequencies produced by a sine generator
  - none of the frequencies exactly matched the tinnitus but a 20 kHz sine came close
- An audiogram did at first reveal no differences from normal
- A high-pitch audiogram at 20 kHz revealed that the patient had an about 20 dB lower threshold than normal

# Latest Patient



- 40 year old male employee
- in May 2012 he prepared for a climbing tour at the churches bell tower
- during this preparation he worked about 1 h a few centimeters from a mobile phone base-station



- At the morning of the next day he awakened with headaches and a feeling of numbness of the cheek at the side exposed to the antenna
- During the day he had problems with the left limbs and contacted with his general practitioner
  - the physician for the first time suspected a relationship with the exposure
- Consultation of a neurologist revealed no abnormalities of MRI
- The neurologist assigned an unclear hemiplegic symptomatology
- The symptoms vanished after 2 weeks



- After returning from sickness leave the symptoms of a tingling sensation and severe headaches returned, however, on the right side
- After 2 months vacation returning to the workplace led again to a reappearance of symptoms
- Unsuccessful efforts for resuming the job led to permanent assignment of disability since September 2012
- Various therapies including psychotherapy didn't lead to any improvement
- The patient cannot stay for longer than 1 h in an environment with high levels of RF-EMF (especially WiFi and mobile phones)

# EHS?

Causes other than EMF (but maybe correlated). Onset often related to new environmental or occupational conditions

True relationship with EMF. Onset often abrupt and from a singular (high) exposure event. EMF as cause rarely conjectured by the patient.

Attribution to EMF due to misinterpretation of a correlation with symptoms. Association often suggested by media reports, friends or relatives.

Electromagnetic Hypersensitivity

# FUNDAMENTAL PROBLEMS

## Diagnosis

- Is there a common diagnostic marker?

## Provocation test

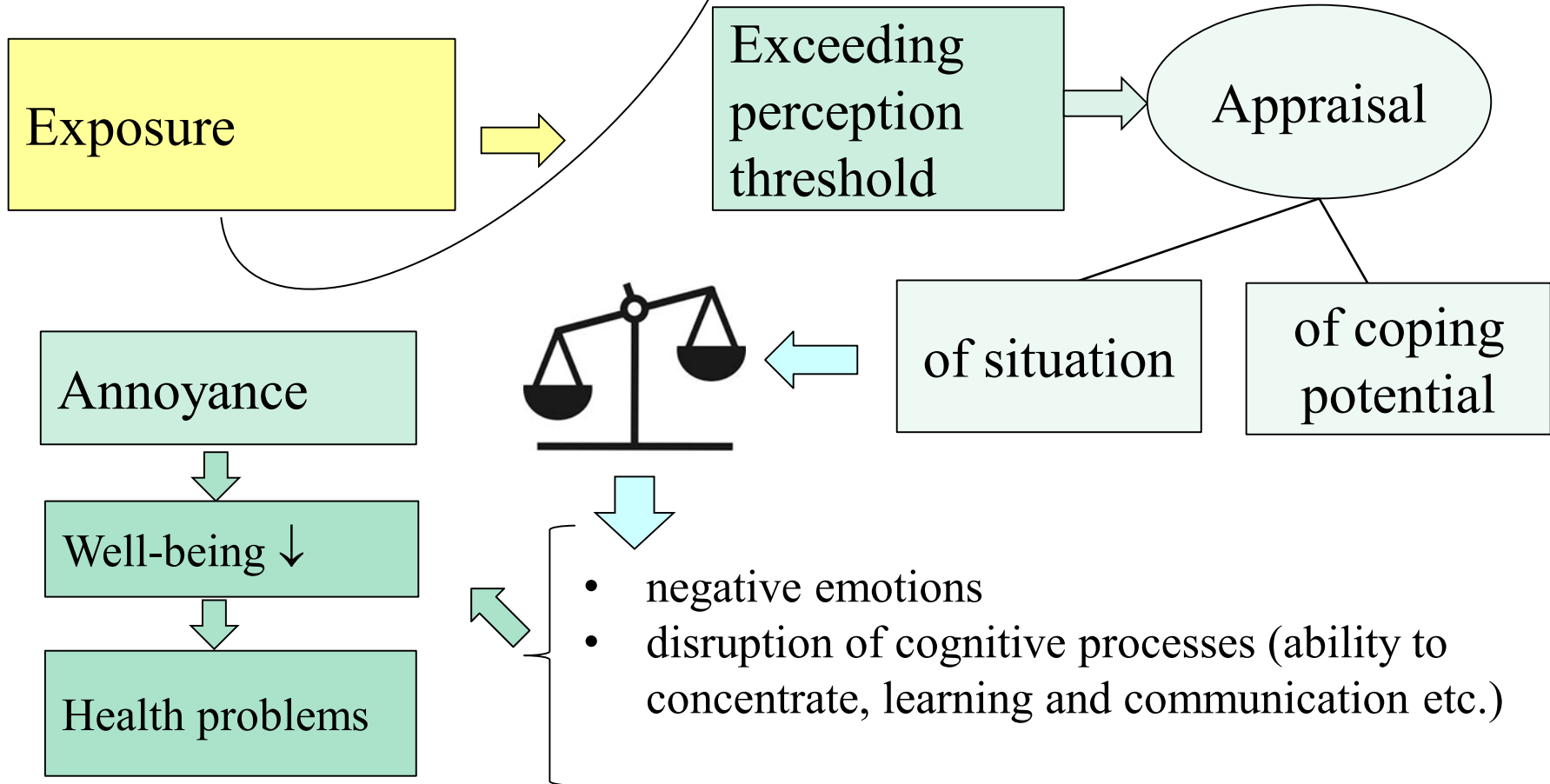
- Is a provocation test necessary and feasible?

## Therapy

- What measures can be taken to improve patients' conditions?

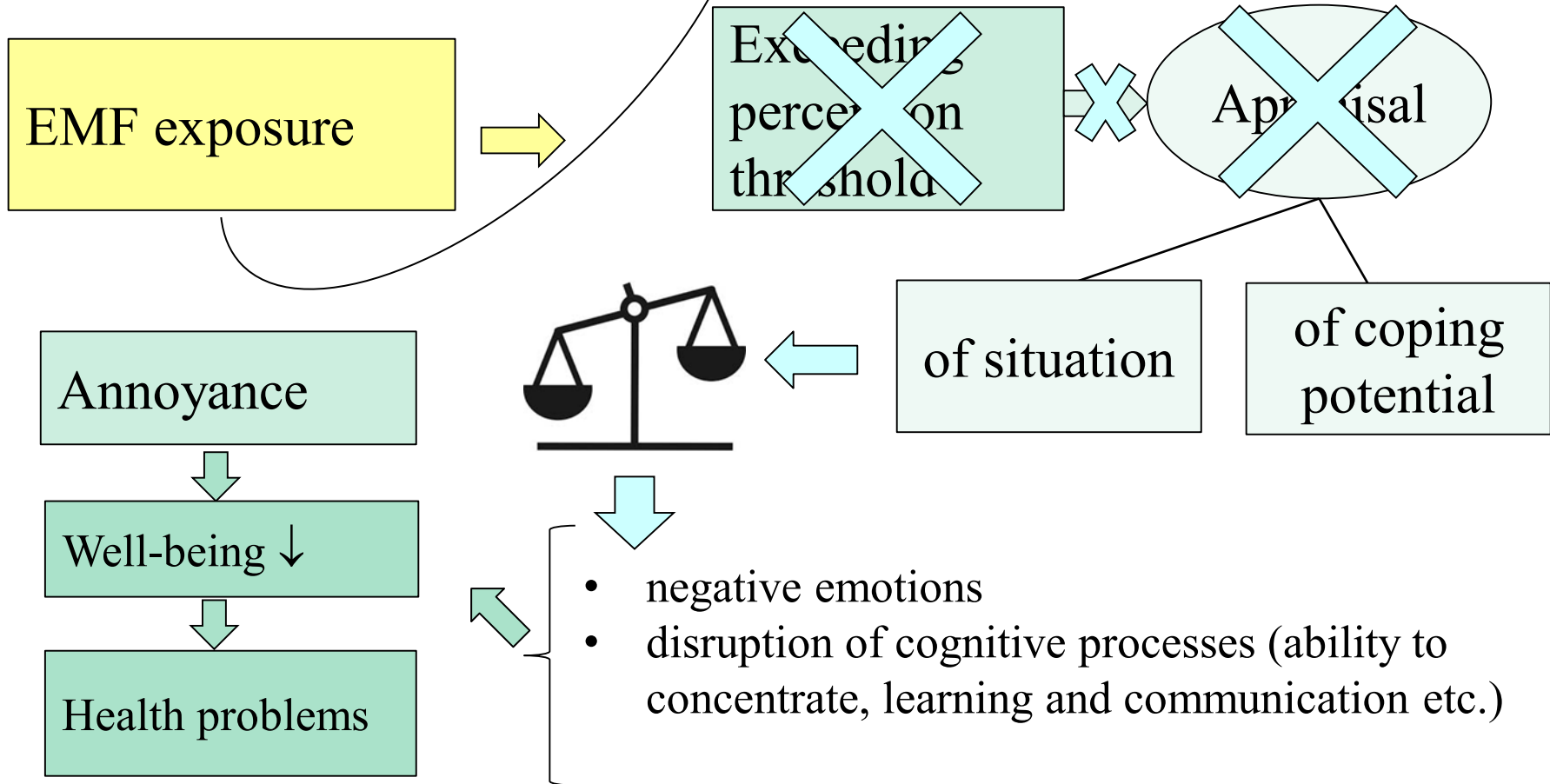
# Environment

# Organism



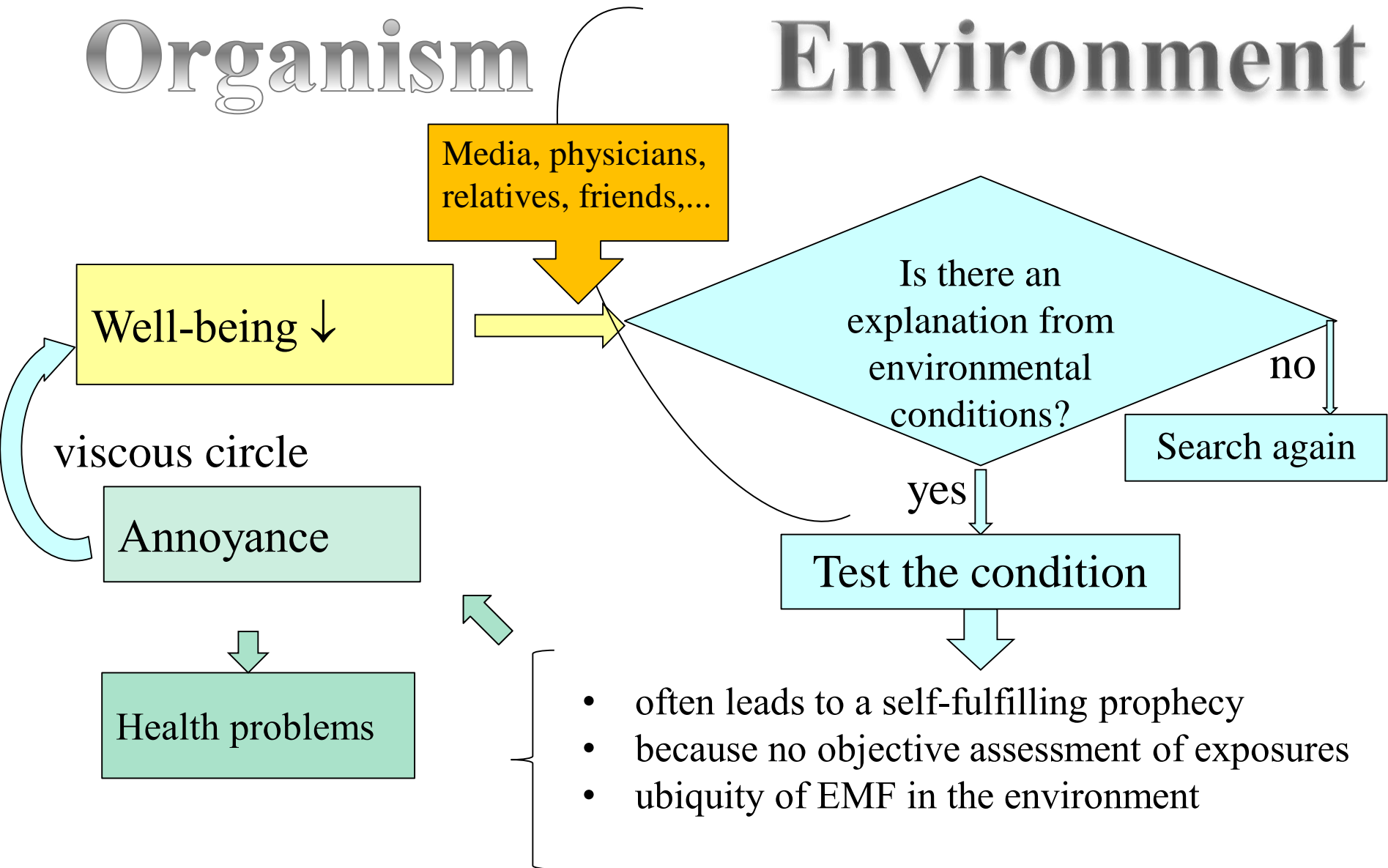
# Environment

# Organism



# Organism

# Environment



# Therefore diagnostic procedure is essential

- Thorough case history

At present there is no specific diagnostic marker of EHS. Questionnaires are relevant for a systematic and unified assessment of symptoms but cannot establish a diagnosis! Provocation tests are difficult and at present cannot be recommended.

- if no improvement, establish reduction by measurement, if still no improvement → no EHS



# *Review*

## **Do People With Idiopathic Environmental Intolerance Attributed to Electromagnetic Fields Display Physiological Effects When Exposed to Electromagnetic Fields? A Systematic Review of Provocation Studies**

G. James Rubin,<sup>1</sup> Lena Hillert,<sup>2</sup> Rosa Nieto-Hernandez,<sup>1</sup> Eric van Rongen,<sup>3</sup> and Gunnhild Oftedal<sup>4\*</sup>

group. At present, there is no reliable evidence to suggest that people with IEI-EMF experience unusual physiological reactions as a result of exposure to EMF. This supports suggestions that EMF is not the main cause of their ill health. *Bioelectromagnetics* 32:593–609, 2011.

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# **Aggregated Data From Two Double-Blind Base Station Provocation Studies Comparing Individuals With Idiopathic Environmental Intolerance With Attribution to Electromagnetic Fields and Controls**

**Stacy Eltiti,<sup>1,2\*</sup> Denise Wallace,<sup>1</sup> Riccardo Russo,<sup>1</sup> and Elaine Fox<sup>1,3</sup>**

not interact with radiofrequency-EMF exposure. These findings are consistent with a growing body of literature indicating there is no causal relationship between short-term exposure to EMFs and subjective well-being in members of the public whether or not they report perceived sensitivity to EMFs. *Bioelectromagnetics*. 36:96–107, 2015. © 2015 Wiley Periodicals, Inc.

## Sensitivity/sensibility

- there is a frequent misunderstanding about EHS persons, many do not claim they can sense the EMF – they only have symptoms

## Time structure

Due to these facts it is no miracle that simple provocation tests have not revealed a higher than chance relationship between exposure and effect!

~~symptoms do often not disappear soon after exposure terminates but~~  
persist for some time

## Non-specificity

- symptoms are usually non-specific (sleep disturbances, head aches, nausea,...) and do not occur only from exposure to EMF

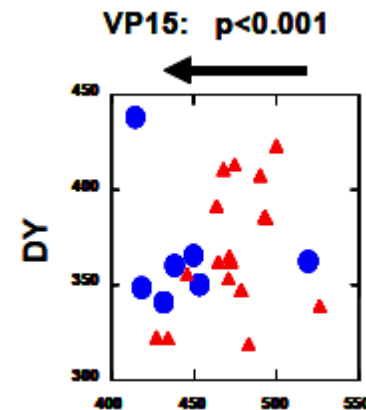
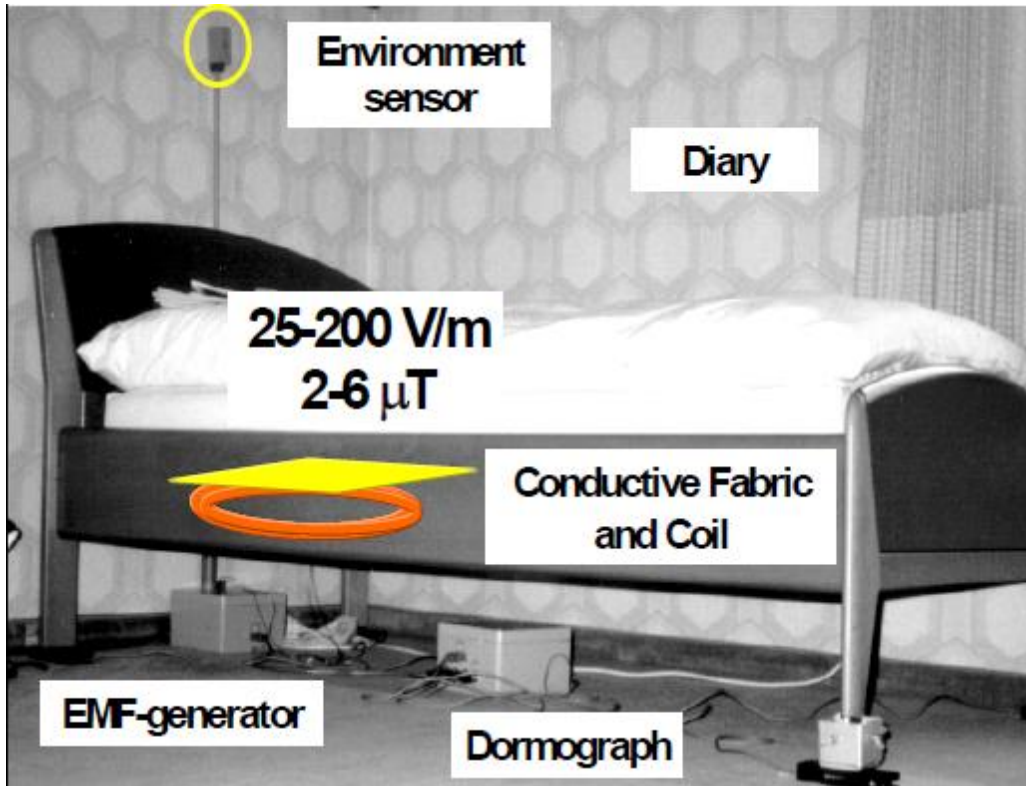
# Criteria for provocation tests

- The test must not induce the symptoms under no-exposure conditions
  - the so called nocebo effect is nothing else than a consequence of a strenuous and unpleasant (laboratory) test atmosphere
- The test must allow differentiation of the probability of symptom appearance from the individual decision criterion about presence of the symptom
- Preferentially the person should not be aware of the test situation
  - if feasible the test should be performed under familiar conditions (e.g. at home) with the person unaware when the test is performed
- Using everyday-life exposure variation is insufficient
- Test conditions must be aligned to the individual time course of appearance and disappearance of symptoms

# Project NEMESIS

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# Conclusions

- EHS or IEI-EMF exists but it is difficult to assess which patient belongs to this category
- Provocation tests could be important to differentiate between correct and wrong attributions to EMF but must follow criteria that are difficult to meet
- Specific diagnostic markers do not exist at present but more research is needed to follow some promising paths
- Scientific debate will persist unless some steps of the pathophysiology can be enlightened