Electromagnetic Hypersensitivity - a social, environmental or health problem
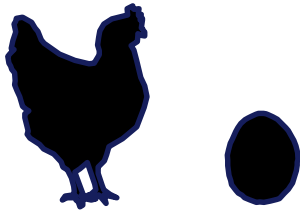
Anke Huss, PhD
University of Utrecht, NL

Wording

- Electromagnetic hypersensitivity
  - Selfdescription as being hypersensitive or intolerant towards EMF

- Electrosensibility
  - Ablity to sense fields (in any kind or way, could be feeling or symptoms)

- IEI – idiopathic environmental intolerance
  - Should express that the underlying cause is unknown

Prevalence

- Surveys
  - <10% of the population report currently or in the past having problems they attribute to EMF exposure

  - Variation, different types of questions
  - Includes also work place exposures

1. Exposure → Biological mechanism → Health complaint

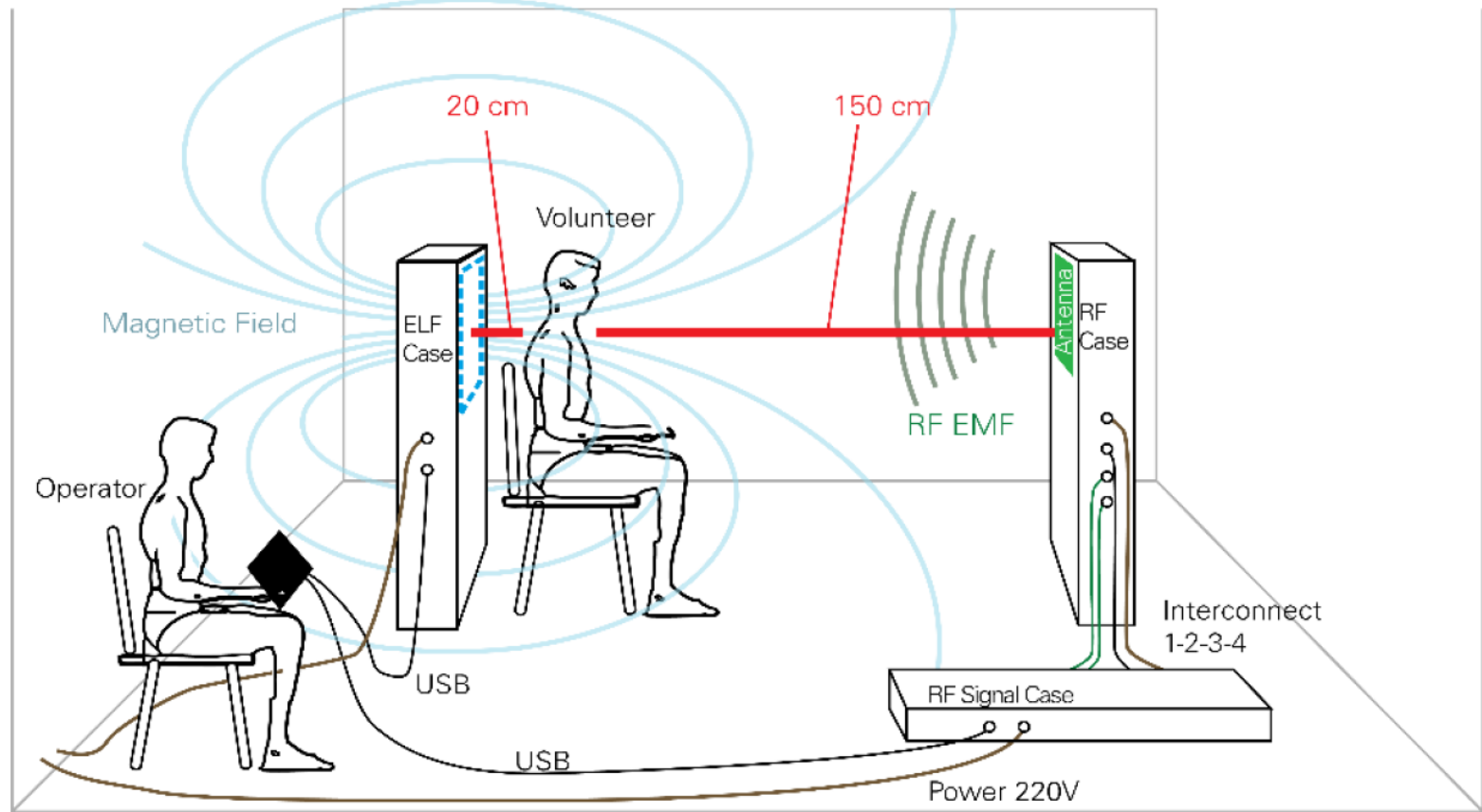1. Exposure → Biological mechanism → Health complaint

- Research focus
- Relevant
  - Everybody exposed
  - Symptoms frequent
  - Even small risks would have very large consequences
  - Exposure RF-EMF increasing

Study designs

- Immediate reaction (minutes - hours)
  - Experimental studies

- Longer time frame (days - months)
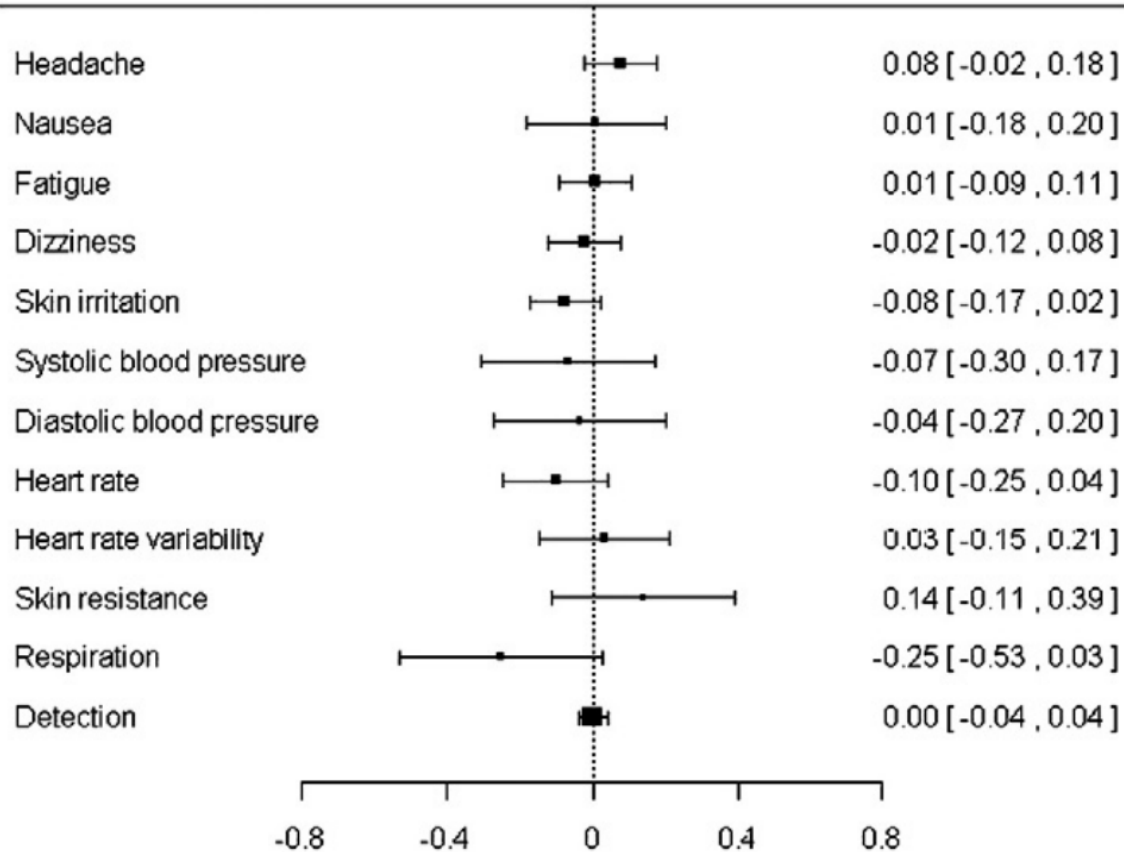 - Only observational studies possible

(1) Exposure (minutes)

Experimental, N=42 electrosensible, personalized and open exposure followed by 10x double blind exposure - "**not better than chance**"

Van Moorselaar et al, Env Int, 2017

Experimental studies

Headache		0.08 [-0.02 , 0.18]
Nausea		0.01 [-0.18 , 0.20]
Fatigue		0.01 [-0.09 , 0.11]
Dizziness		-0.02 [-0.12 , 0.08]
Skin irritation		-0.08 [-0.17 , 0.02]
Systolic blood pressure		-0.07 [-0.30 , 0.17]
Diastolic blood pressure		-0.04 [-0.27 , 0.20]
Heart rate		-0.10 [-0.25 , 0.04]
Heart rate variability		0.03 [-0.15 , 0.21]
Skin resistance		0.14 [-0.11 , 0.39]
Respiration		-0.25 [-0.53 , 0.03]
Detection		0.00 [-0.04 , 0.04]

-0.8   -0.4   0   0.4   0.8

- Meta-analysis GSM phone – physiological reaction
- **No evidence for short term effects or detection**
- "headaches deserve further study"

Augner et al, STOTEN 2012

Experimental studies

- Schmiedchen et al, Env Health, Oct 2019

    – 28 studies: VDU/ELF/RF
    – N=1- ~130
    – EHS/ not-EHS participants
    – Exposure duration usually minutes (sek-3h)

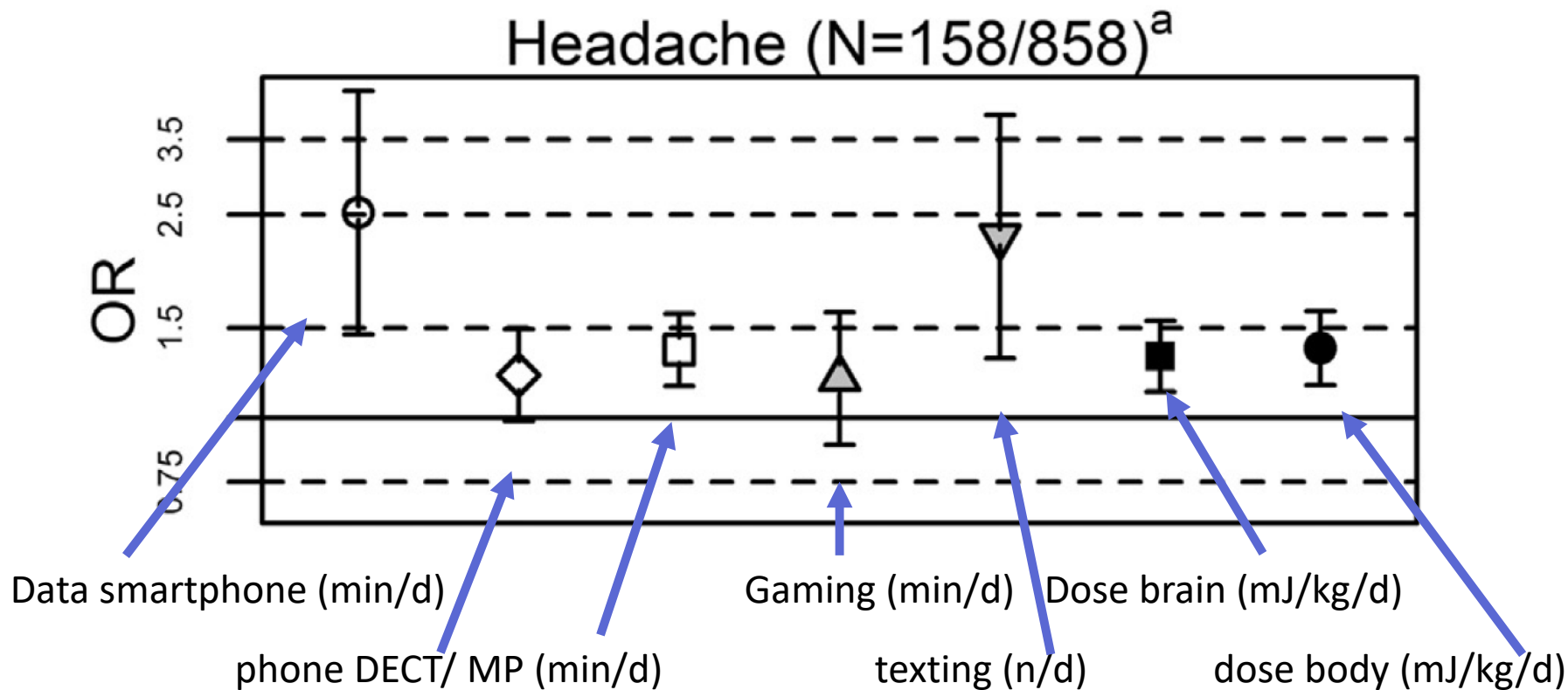- "**no reliable evidence for an effect of exposure**"

(2) Days

Part #59)
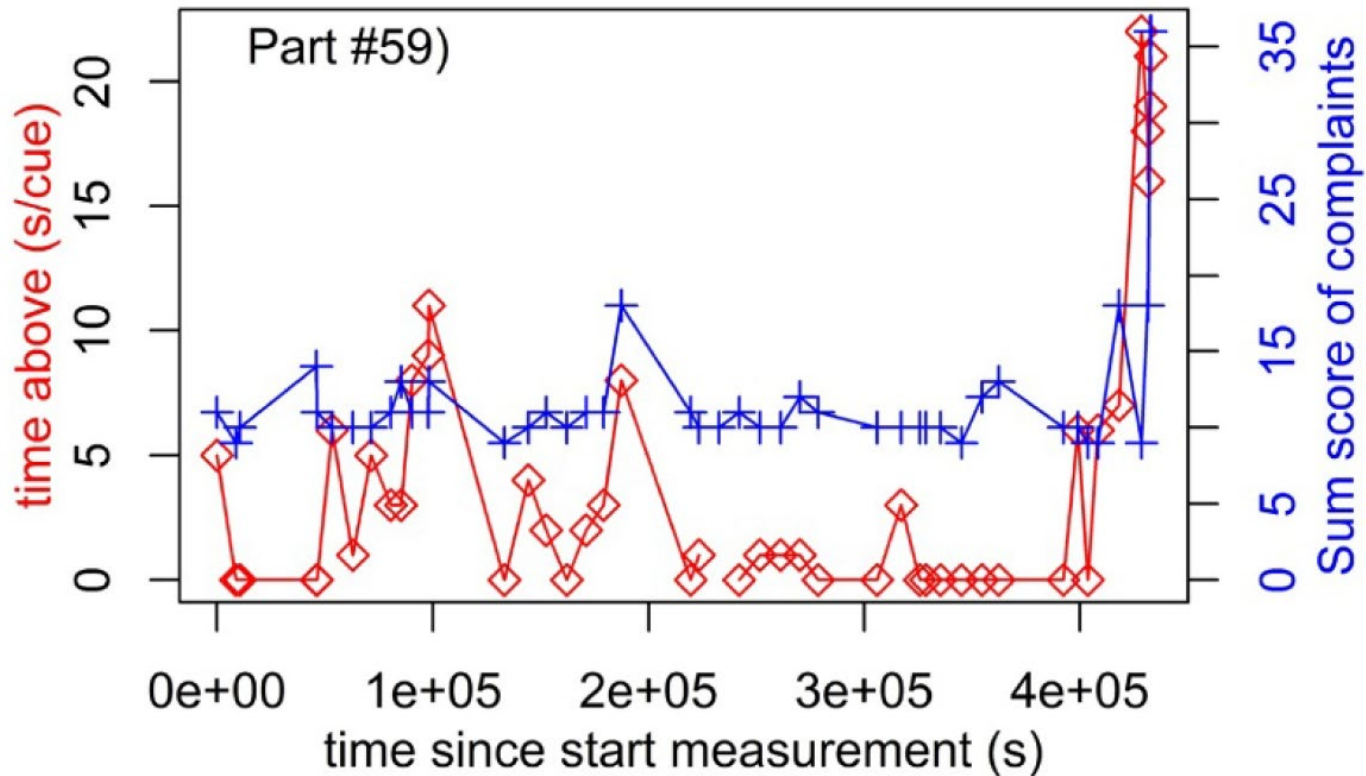
WiFi timeabove 0-1 hr*.

Observational study, N=63 electrosensible, N=36 with measurement (per 10 sec) and symptom diary. 1 person with correlation. "**incomplete adjustment for location and activity**"

Bolte et al, Env Int, 2019

(3) One year

Headache (N=158/858)[a]

Data smartphone (min/d)

phone DECT/ MP (min/d)

Gaming (min/d)   Dose brain (mJ/kg/d)

texting (n/d)   dose body (mJ/kg/d)

N=425 adolescents, new symptoms (6 categories) after 1 year.
MP use self-reported and from providers.
"**Association with use, rather not RF-EMF**"

Schoeni et al, Env Res, 2017

(4) Four years (COSMOS)

|	Amount of mobile phone use (call-time in percentiles) at baseline by network	
	GSM (2G) network	UMTS (3G) network
No. of participants	19 005 [1617]	10 896 [958]
Lowest 50%	1 (reference) [809]	1 (reference) [476]
50 − 74th percentile	0.96 (0.85 − 1.10) [389]	0.90 (0.76 − 1.07) [216]
75 − 89th percentile	0.93 (0.80 − 1.09) [235]	1.13 (0.93 − 1.37) [159]
90 − 100th percentile	1.06 (0.89 − 1.26) [184]	1.16 (0.93 − 1.46) [107]
P trend	0.99	0.14

N~20000, cohorts Sweden, Finland, weekly headache; higher risk in highest group of MP callers
"weak association […] rather other factors than RF-EMF"

Auvinen et al, IJE, 2019

Observational studies

- Cohort studies
  - Longitudinal, x-sectional studies not suitable
  - Device usage / health endpoints not blinded
  - Stress?
  - Unclear which time frame relevant
  - Exposure from multiple sources, increasingly complicated to assess reliably
  - Personal measurements very time intensive and expensive
  - Studies assume exposure-response relationship
  - Difficult if indeed higher sensitivity in specific subgroups
  - Very small sensitive subgroups difficult to identify
  - Reverse causality?

- Association with symptoms
- RF-EMF vs device usage (behavioural aspects)
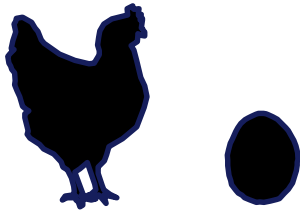
2. Perceived exposure/ risk → Nocebo effect → Health complaint

Experimental studies

- 40 particpants (students)
- Exposure "weak" / "strong"
- "big coils", "impressive control unit with coloured lights"
- 1) Perception
- (0=not at all/ 4=completely) Mean 0.75 vs. 1.23 perception "weak"/ "strong" fields

- 2) Number of symptoms 7.1 vs. 10.7 symptoms "weak"/"strong" fields
- **"no real connections"**

Source: Szemerszkya et al, Int J Hyg Env Health, 2010

Observational studies

Web Table 1. Logistic Regression in the Full AMIGO Cohort ($n = 14{,}829$) at Baseline: Effects of Modeled and Perceived Exposure to Mobile-Phone Base Stations on *Individual Symptoms*

| Health Outcome	Odds Ratio (95% Confidence Interval)	
	Modeled Exposure (Dichotomous, Cutoff 90th Percentile)	**Perceived Exposure (0–6)**
Dizziness	1.14 (1.02, 1.29)	1.15 (1.12, 1.18)
Pain in muscles	0.97 (0.87, 1.09)	1.11 (1.07, 1.14)
Fainting	0.84 (0.55, 1.31)	1.22 (1.12, 1.34)
Neck pain	1.03 (0.92, 1.15)	1.14 (1.11, 1.17)
Back pain	1.06 (0.95, 1.19)	1.08 (1.05, 1.11)
Excessive sweating	1.09 (0.97, 1.22)	1.09 (1.05, 1.12)
Palpitations	1.07 (0.94, 1.22)	1.17 (1.14, 1.21)
Headache	1.04 (0.93, 1.16)	1.09 (1.06, 1.12)

N~1700, cohort NL, modelled/perceived exposure MP base stations - symptoms, 2011/13/14, cohort/longitudinal change analysis "**cohort analysis not associated**", "**change in perceived exposure associated with change in symptom reporting**"
Martens et al, AJE, 2017

Experimental, observational

- Interpretation
  - Nocebo effects ("evil twin of placebo")
  - Risk perception + perceived exposure
  - Sufficient to elicit symptoms

- But
  - Many studies target eliciting nocebo
  - Not entirely clear how we would prevent it
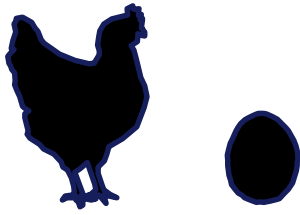
3. Health complaints → Perceived exposure/risk → Attribution

Qualitative Studie

- eg Dieudonne, Bioelectromagnetics 2017
  - Qualitative interviews with 40 EHS
  - Identified stadia, starting with symptoms, do research, experiment, acceptance
  - EHS self-attribution helps in explaining and coping with pre-existing health problems
  - Conclusion: symptoms are first, followed by risk perception and then attribution
  - Therefore cannot be nocebo

EHS = dynamic

- Röösli et al, CR Physique 2010

2008 \ 2009	EHS/Attribution	non-sensitive	Total
EHS/Attribution	**102**	139	**241 (21%)**
non-sensitive	145	773	881 (79%)
Total	**247 (22%)**	875 (78%)	**1122 (100%)**

- Kowall et al, Int J Pub Health 2012
  - 2004: 284/3253 (9%) EHS
  - 2006: 234/3253 (7%) EHS   } 89 in both surveys

- EHS dynamic (**31-42% remains EHS within 2 years**)
- We know little about who/why attribution starts, maintains / stops
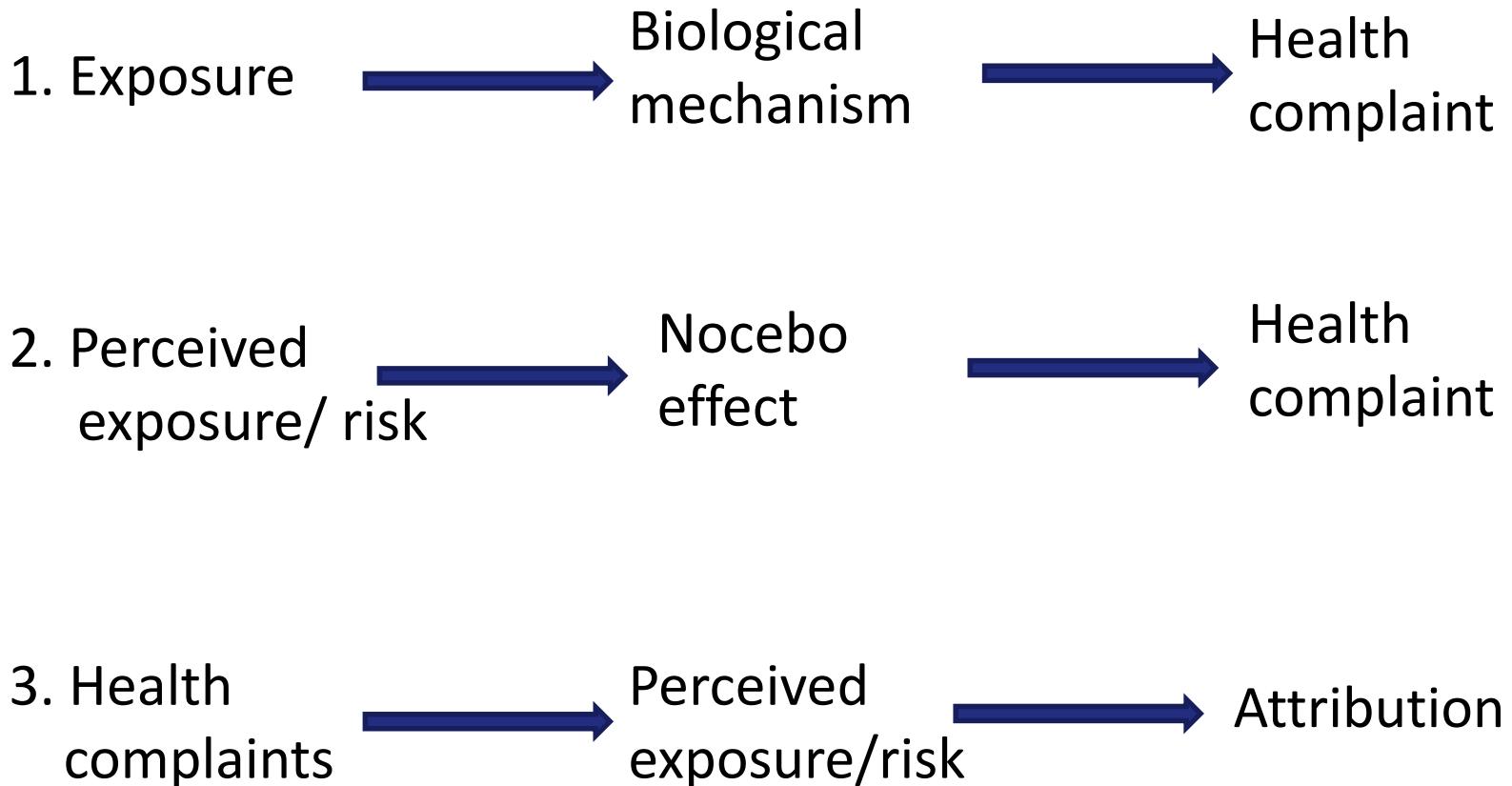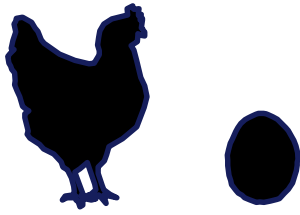
MP/device usage/ symptoms

Device usage

- Concentration problems
- Sleep problems
- Too little sleep
- Headache
- Fatigue
- Reduced wellbeing
- Stress
- Depression/ mental Health

Mechanisms

Device usage

- More screentime
- Replacement of physical activity
- Replacement of sleep
- Unfavourable usage
- Dependence/ addiction
- Blue light?
- RF-EMF?

Interpretation

- Clear associations device usage - symptoms
  - Usage of devices and RF-EMF exposure not easy to disentangle
  - Idea that it is "all just nocebo" or
  - "not RF-EMF – therefore affected people are responsible themselves"
  - not helpful
  - "what is good usage" ??