



Cognitive-behavioral treatment with biofeedback-assisted exposure in a patient with idiopathic environmental intolerance attributed to electromagnetic fields (IEI-EMF)



Katleen Bogaerts^{a,b} & Omer Van den Bergh^b

^a REVAL – Rehabilitation Research Center, Faculty of Rehabilitation Sciences, Hasselt University, Diepenbeek, Belgium
^b Research Group on Health Psychology, Department of Psychology, University of Leuven, Belgium

Contact:
katleen.bogaerts@uhasselt.be

INTRODUCTION

Idiopathic environmental intolerance attributed to electromagnetic fields (IEI-EMF) is a poorly understood chronic condition, characterized by reports of various non-specific physical symptoms when an EMF source is present or perceived by the individual. IEI-EMF is associated with increased illness behavior and severe physical, social and professional disabilities.

Epidemiological and provocation studies found no proof for EMF as causal agent, whereas increasing evidence suggests an important role for psychological processes such as nocebo-effect and attribution. Research on treatment options is still in its infancy. The best evidence currently available suggests that cognitive-behavioral therapy is most appropriate. However, more treatment studies are urgently needed (Eltiti et al., 2018; Rubin et al., 2006; 2010).

METHOD

Design

Single-case pre-post AB design

Setting

Comprehensive behavioral treatment package (14 one-hour sessions) including psycho-education, elements of Acceptance and Commitment Therapy, and biofeedback-assisted exposure in vivo in an outpatient treatment center specialized in medically unexplained physical symptoms

Participant

62 year old female with IEI-EMF. Medical tests excluded underlying organic pathology. Various physical complaints present since 2 years: dizziness, skin rash, memory and concentration problems, sleeping problems, fatigue, dry mouth, chest pain, stomach ache and palpitations, with as main complaint a sharp, stabbing pain in the head. Patient suffers from severe social, professional, physical and financial impairment

Main Outcome Measures

- ❖ Pre-post measures of the Dutch version of the SCL-90, AAQ-II
- ❖ Pre-post measures of physiological parameters (PetCO₂, skin conductance, sEMG, peripheral skin temperature, heart rate, heart rate variability)
- ❖ We looked at clinical significance and reliable change index
- ❖ A randomisation test was used to evaluate the effect of the treatment on the main complaint of stabbing pain in the head, which was measured repeatedly over time

Figure 1: Classical and operant conditioning processes in IEI-EMF

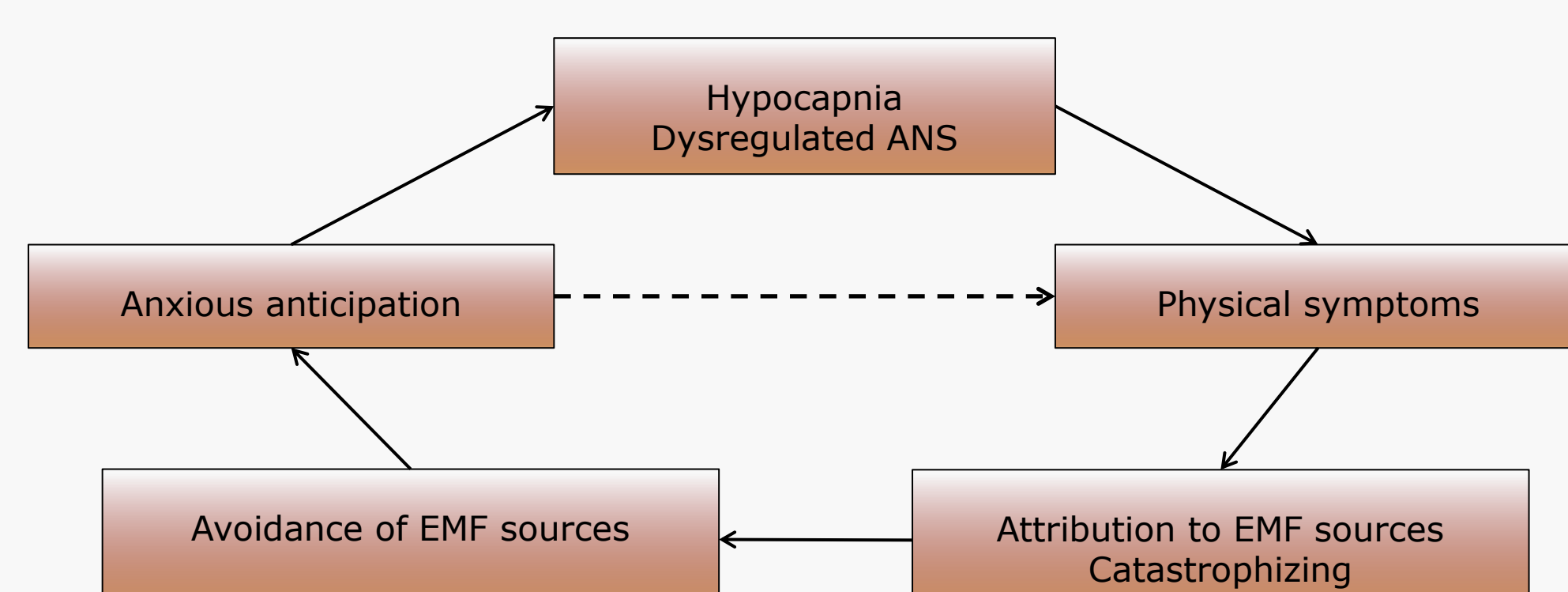


Figure 2: Exposure hierarchy and biofeedback components

1. TV
 2. Radio
 3. Electric household appliances
 4. Low energy lamps
 5. Landline
 6. Neon lamp (in vivo)
 7. Computer (in vivo)
- Biofeedback:
- skin conductance
 - sEMG
 - respiration
 - heart rate variability
8. Public transport
 9. Wifi
 10. Mobile phone

RESULTS

Figure 3: Clinical significance and reliable change (RC) for SCL-90 and AAQ-II

End scores for all (sub)scales are within reach of the healthy population (Criterion B) and functioning after treatment (POST) lies closer to the mean of the healthy group than to the mean of the patient group (Criterion C).

	PRE	POST	RC Index
SCL-90			
Total	177	118	32.45*
ANX	16	12	8.48
AGO	12	10	6.04
DEP	30	19	13.97
SOM	27	15	10.19*
IN	27	15	5.77*
SEN	35	25	13.3
HOS	7	6	5.05
SLE	12	6	2.79*
AAQ-II			
	37	51	10.88*

* p < .05
ANX = Anxiety (10 items); AGO = Agoraphobia (7 items); DEP = Depression (16 items); SOM = Somatic Symptoms (12 items); IN = Inadequacy of thinking and acting (9 items); SEN = Interpersonal sensitivity (18 items); HOS = Hostility (6 items); SLE = Sleeping problems (3 items)

Figure 5: Randomisation test shows significant effect of treatment on the main complaint of stabbing pain in the head, which was measured repeatedly over time

The right panel shows that the difference between A and B is largest at point of Intervention (20.5). Chance to find a difference equal to or larger than actual point of intervention is 1/17 (p = .05).

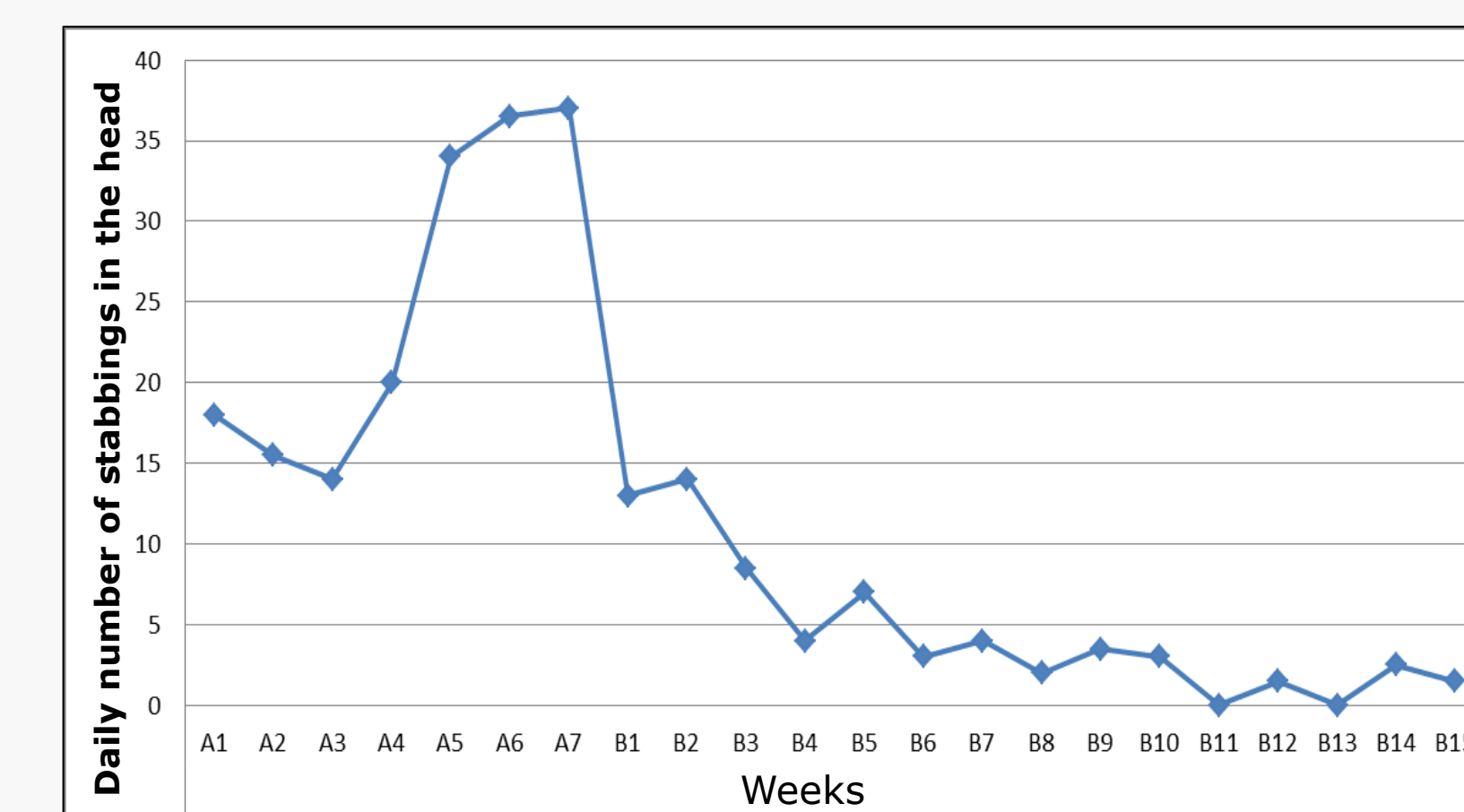


Figure 4: Pre-post treatment physiological measures

All physiological parameters are improved and within normal range after treatment.

	PRE	POST
PetCO ₂ (mmHg)	30	38
Heart Rate (bpm)	92	83
Skin Conductance (µS)	3.64	1.03
Peripheral Skin Temperature (°C)	29.53	30.19
sEMG M. Trapezius descendens left shoulder (µV)	22.21	5.50
sEMG M. Trapezius descendens right shoulder (µV)	45.66	4.87
Heart Rate Variability (ms ² /HZ)	12	320

CONCLUSIONS

Results show a reliable change in acceptance, subjective well-being, and reduced avoidance behavior. A pre-post treatment effect was observed for stabbing headache, as well as for all physiological parameters, showing recovery of the autonomous nervous system. A reliable change and clinically significant decrease were observed for the total SCL-90 score, as well as for the subscales of Somatic Symptoms, Inadequacy of thinking and acting, and Sleeping problems. Attribution towards environmental factors was reduced, yet not completely absent after treatment.

Overall, this single-case study may serve as a good example of the scientist-practitioner model and contributes to our knowledge of treatment options for IEI-EMF.

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