

Sensor reactivity and autonomic regulation in persons with perceived electrical hypersensitivity (EHS)

Study I. Exposure to amplitude modulated (flickering) light.

- Electrohypersensitive (EHS) subjects often associated their symptoms with VDU, fluorescent tubes, TV-sets
- These appliances are sources of amplitude modulated light
- Could amplitude modulated light affect the nervous system and lead to reported functional symptoms?
- Are there objective physiological measurements of sensitivity to flickering light?

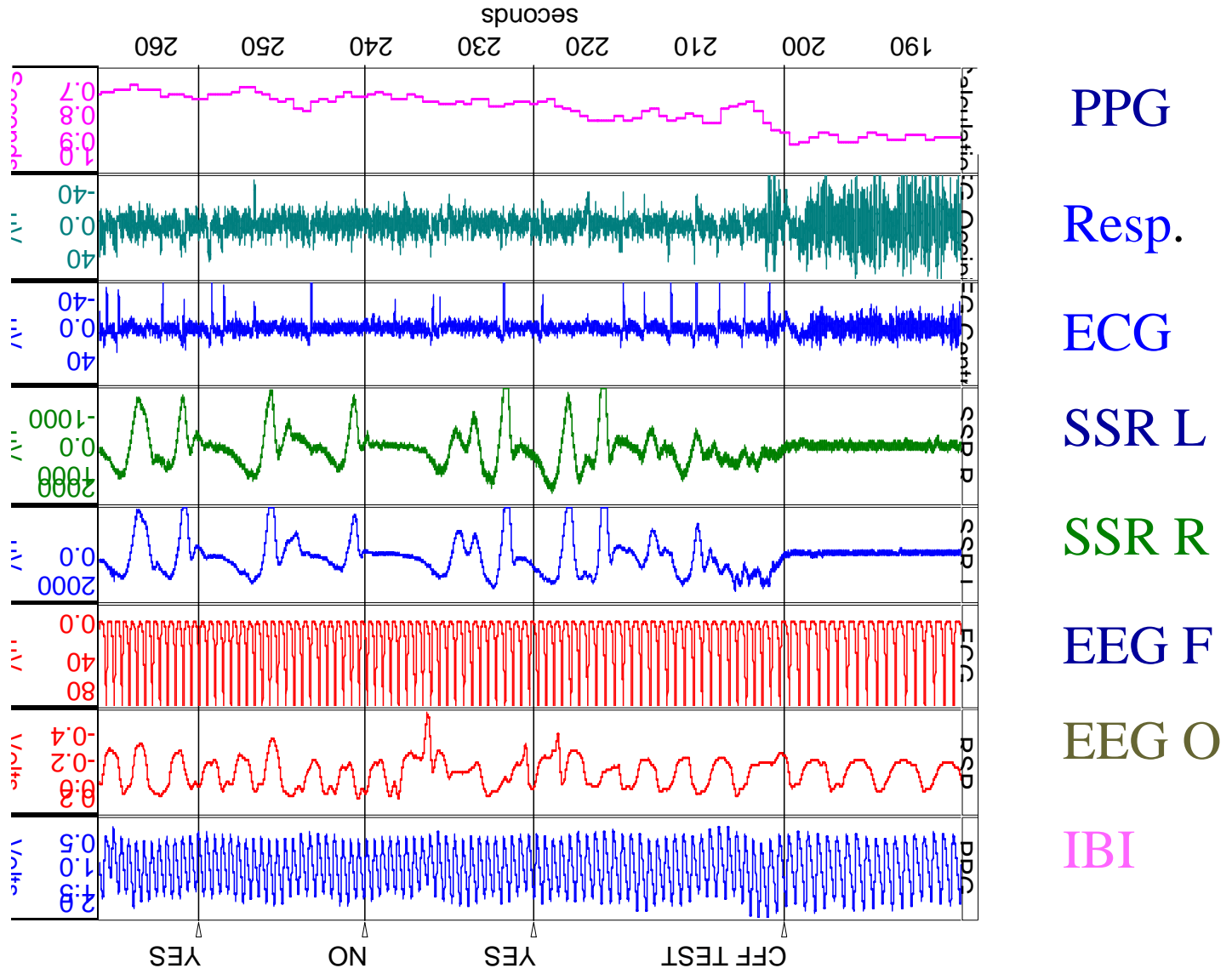
Materials, results

- Electricoretinogram (ERG), occipital brain visual evoked potentials (VEP), ECG
 - High frequency photostimulation, 30-70 pps, steady-state structure of responses
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- No difference in ERG between EHS and controls
 - Increased amplitude of VEP at all frequencies of stimulation in EHS in comparisons with control
 - Trend to increased heart rate in EHS subjects

Comprehensive physiological examination

- EEG; steady state visual evoked potentials
- Electrodermal activity, sympathetic skin response
- ECG, heart rate variability
- Blood pressure
- Visual contrast sensitivity, visual acuity, critical fusion frequency
- Plasma hormones
- Baseline
- Visual stimulation
- Audio stimulation
- Deep breathing test
- Orthostatic probe

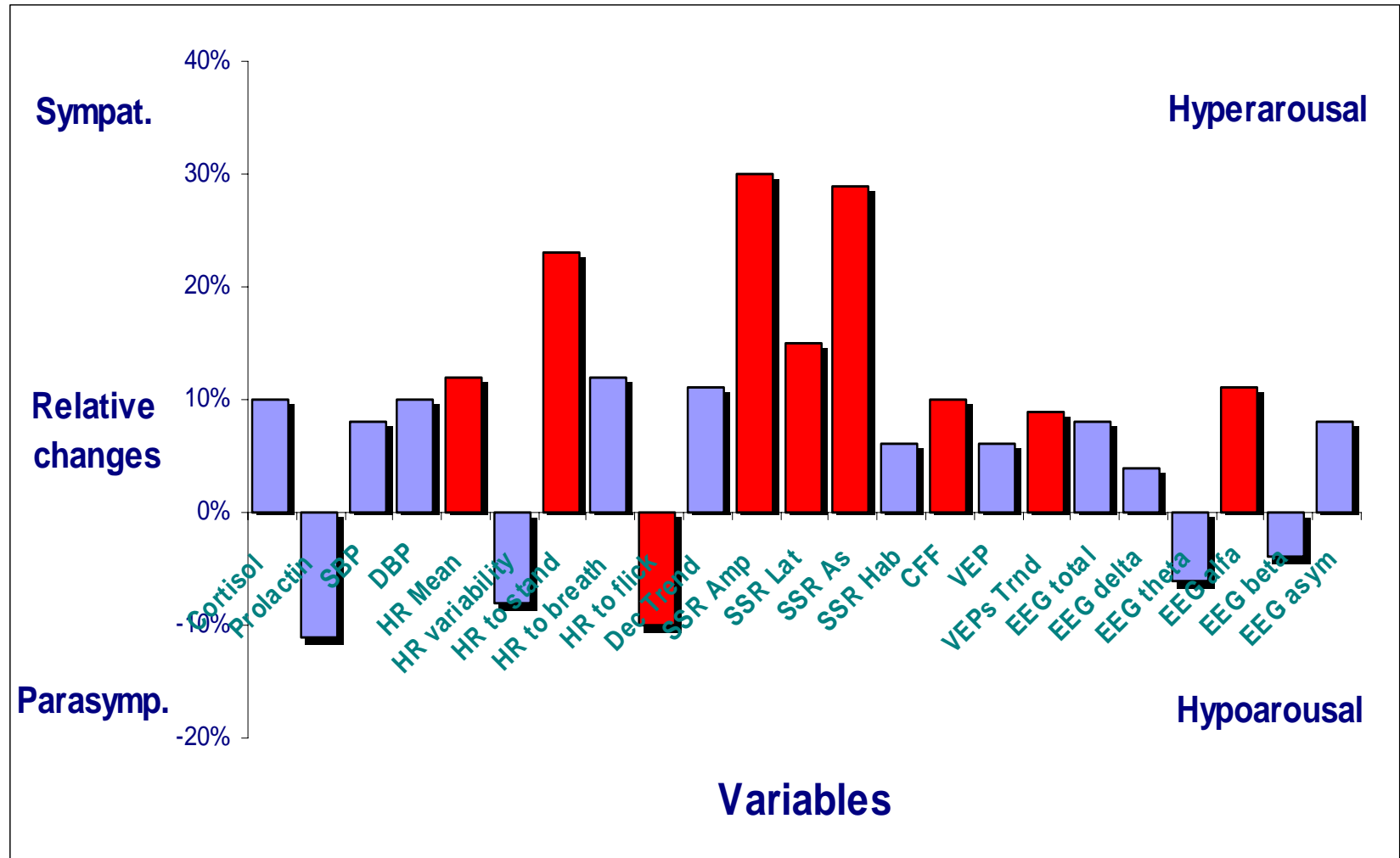
Polygraph record during the test



EHS in comparison with controls

- No difference in visual contrast sensitivity, increased critical fusion frequency
- Increased baseline heart rate and decreased HRV
- Decreased 15:30 ratio in orthostatic probe
- No difference in deep breathing test
- Facilitation of sympathetic skin responses to audio stimuli
- Increased amplitude of visual evoked potentials
- Decreased (NS) occipital alpha EEG band

Physiological profile of EHS



EHS physiological pattern:

- Increased sympathetic activity during baseline relaxation period as measured by heart rate variability and electrodermal activity, decreased reactivity in response to orthostatic probe
- Hyper responsiveness to external stimuli as measured by sympathetic skin responses to visual and audio stimulation and brain evoked potentials
- Physiological profile showed imbalance of autonomic regulation with a trend towards hyper sympathotone and increased arousal

Exposure to 60 Hz magnetic field

- Selected physiological variables and tests
- Exposure to 60 Hz, 10 μ T rms, 15 sec on/off
- MF exposure was synchronised with refresh rate (amplitude modulated light) of the computer monitor
- Subjects were exposed in relaxed state and during cognitive task (Rest vs. Arousal)
- Brain visual evoked potentials in response to computer monitor flickers

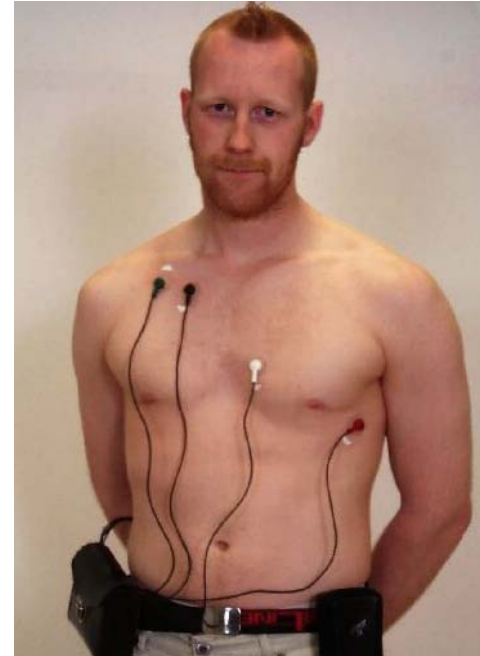


EHS in comparison with controls

- Increased heart rate and decreased Hi/Low ratio of HRV
- Increased diastolic blood pressure
- Increased spontaneous EDA and facilitated SSR
- No difference in EEG
- No difference in response to cognitive task
- Subjects failed to recognize MF exposure
- *No physiological effects of exposure in both relaxed and active conditions*

24 hours monitoring of HRV and MF

- Holter ECG, hour-by-hour based analysis of HRV in the spectral domain, averaged values in time domain
- EMDEX II, 40-800 Hz, broadband display of resultant magnetic field



Results of 24 hours monitoring

- No difference between EHS and controls in HRV in time domain (accumulated from 24 hours registration)
- Hour-by-hour analysis show that high frequency component of HRV and LF/HF ratio decreased in EHS subjects during night hours
- Indications of disturbed pattern of circadian rhythms
- No difference in mean values of MF between groups

Conclusions

- Signs of autonomic imbalance are moderate, however statistically significant and rather consistent between studies
- Data on SSR, evoked potentials and CFF indicate increased sensory responsiveness
- Sensory amplification and lability of the autonomous nervous system can be considered as a physiological predisposition to stress vulnerability and increased sensitivity to physical (chemical) environmental factors
- No data indicating a role of MF in genesis of EHS

Viewpoints

- **Clinical physiology:** Overlap between EHS and other functional somatic syndromes. The same clinical-physiological pattern was described as a neurocirculatory asthenia. Old prescriptions valid?
- **Bioelectromagnetics:** peer-review monitoring and public disseminating of relevant scientific results. “Paradoxically positive” results: EEG effects? Attention? Pain threshold?
- **Management:** Integration of national activities, promotion of the international multidisciplinary research projects