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The psychobiological meaning and measuring of Hypersensibility

BIOnet-Area 1: Biology/Medicine

Introduction

Hypersensibility is an increase in nervous system or emotional reactions to various stimuli. So called 'unspecific hypersensiblity' is often affected by stress load during long periods, whereas hyperaesthesia is defined as a condition that involves an abnormal increase in sensitivity to stimuli of the senses. Usually one distinguishes between 'tactile hyperaesthesia' (an increased sensitivity to touch), and 'auditory hyperaesthesia' (increased sound sensitivity). Furthermore some people show different kinds of electro-sensibility or chemo-sensibility.
An example of hypersensibility was the Empress Elisabeth of Austria (1837-1898), also known by her nickname Sisi. Sensibility can change during day (Maschke, Hecht, Balzer 1996). Balzer & Hecht demonstrated that sometimes unspecific hypersensibility appears from time to time. This suggests that hypersensibility arises from the superposition of different stressors from inside and outside the body system. In the case of normal healthy conditions hypersensibility will not arise.

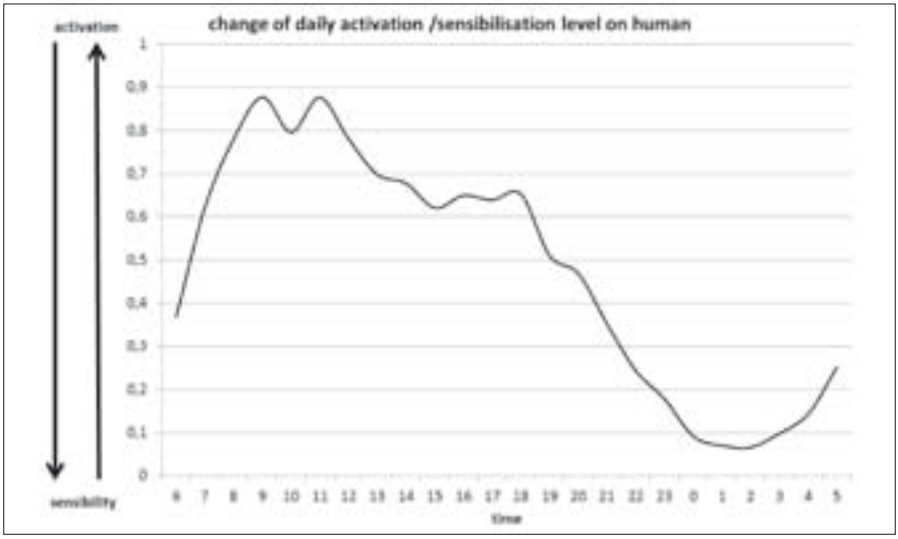


Figure 1: *Change of activation/sensibilisation.*

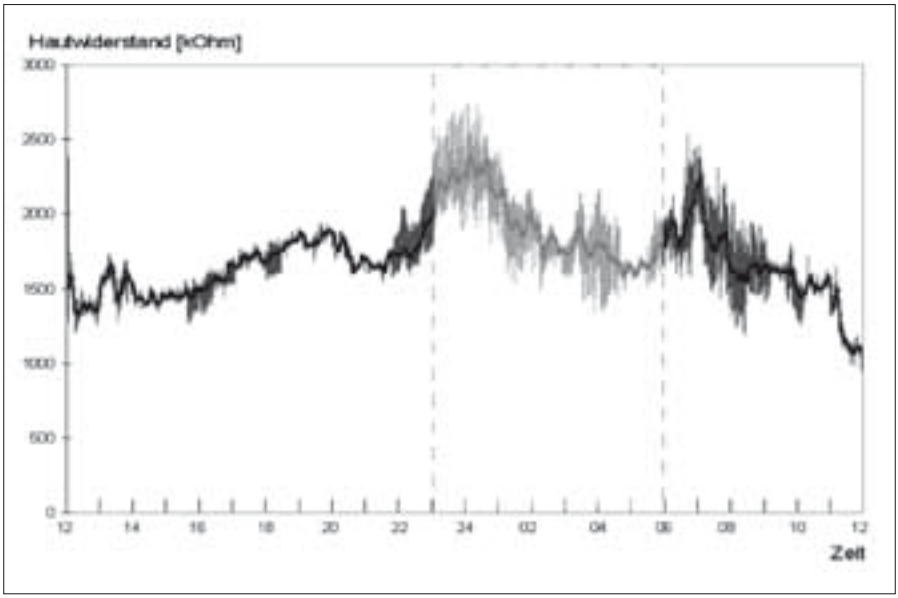


Figure 2: *Circadian change (trend + deviation) of skin resistance (n = 10), ISF 2000.*

One way to measure human vegetative reactions is to measure the skin resistance. Skin resistance (or skin conductance) is interpreted as a part of electro-dermal activity (EDA – Boucsein 1988). Depending of the type of electric current which is used to make the measurement, Boucsein separates between skin resistance (or conductance) measuring with direct current and measured with alternating current. Additionally electric potentials can exist in skin tissue (Bureš 1960).

In the 1990's we investigated changes in the physiological parameter skin resistance in various studies on humans who had underlying sleep disturbances and disturbances of their health by stress load. The measurement device HIMEM was used; some unexpected data were recorded. Comparing the results to answers from questionnaires on psychological states, it was clear that such data reflected states of unspecific hypersensibility.

Methods:

While measuring skin resistance with help of HIMEM device the r/f-transformation has been used. By this way skin resistance data were transformed into time intervals with lengths from 250 msec to 5000 msec. Later skin potential was measured directly using bipolar leads and the 'SMARD-watch' system.

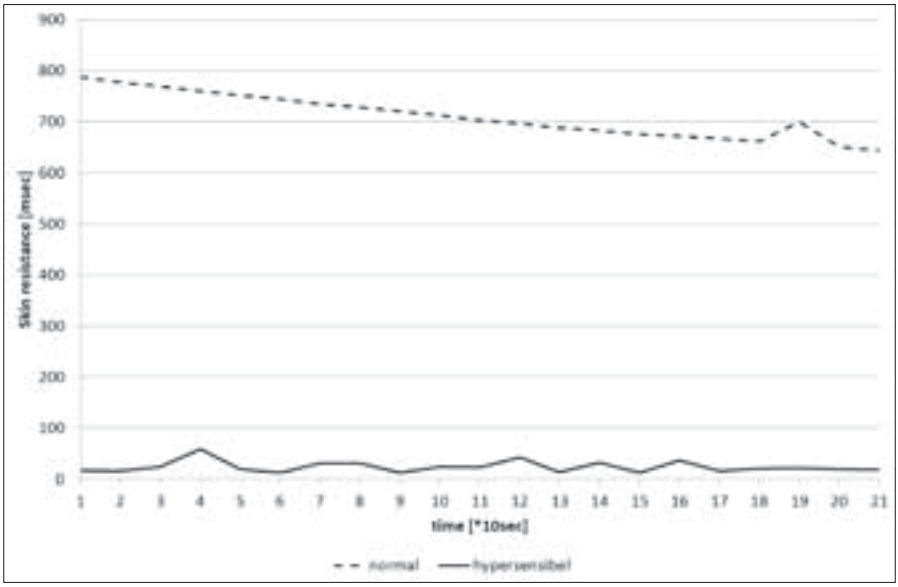


Figure 3: *Different measurement data using r/f-transformation in case of hypersensibility in comparence to normal situations on human.*

Results

In 2003 U. Anske (2003), investigating patients with sleep disturbances, showed, that 25 % of so called clinical healthy persons (n = 40) showed hypersensibility but only 17 % of patients (n = 40) suffering from sleep disturbances showed hypersensibility. Stück (2001) has compared states of hypersenbility with states of hyperaesthesia in persons suffering from hyperaesthesia (n = 32) and healthy persons (n = 32). In 22 % of healthy persons was hypersensibility detected (in agreement with Anske's result), whilst only 0.6 % of the hyperaesthesia persons showed also hypersensibility.

A better understanding about the circumstances which lead to exhaustion states came from the analysis of data recorded during a high mountain expedition to Cho Oyu (Nepal, 8.602 m, Stück et al 2005). The expedition took place in 1999 from 26.04 to 15.05. All 8 participants were monitored continuously using the HIMEM device. We found that hypersensibility can exist partially during a day or for several weeks (see fig 4). One of the most interesting findings was the exchanging of hypersensibility between two persons depending on their work load.

Balzer (2006) performed 24h-monitoring of skin resistance and skin potential on a person who had been suffering for some time from hypersensibility, using the

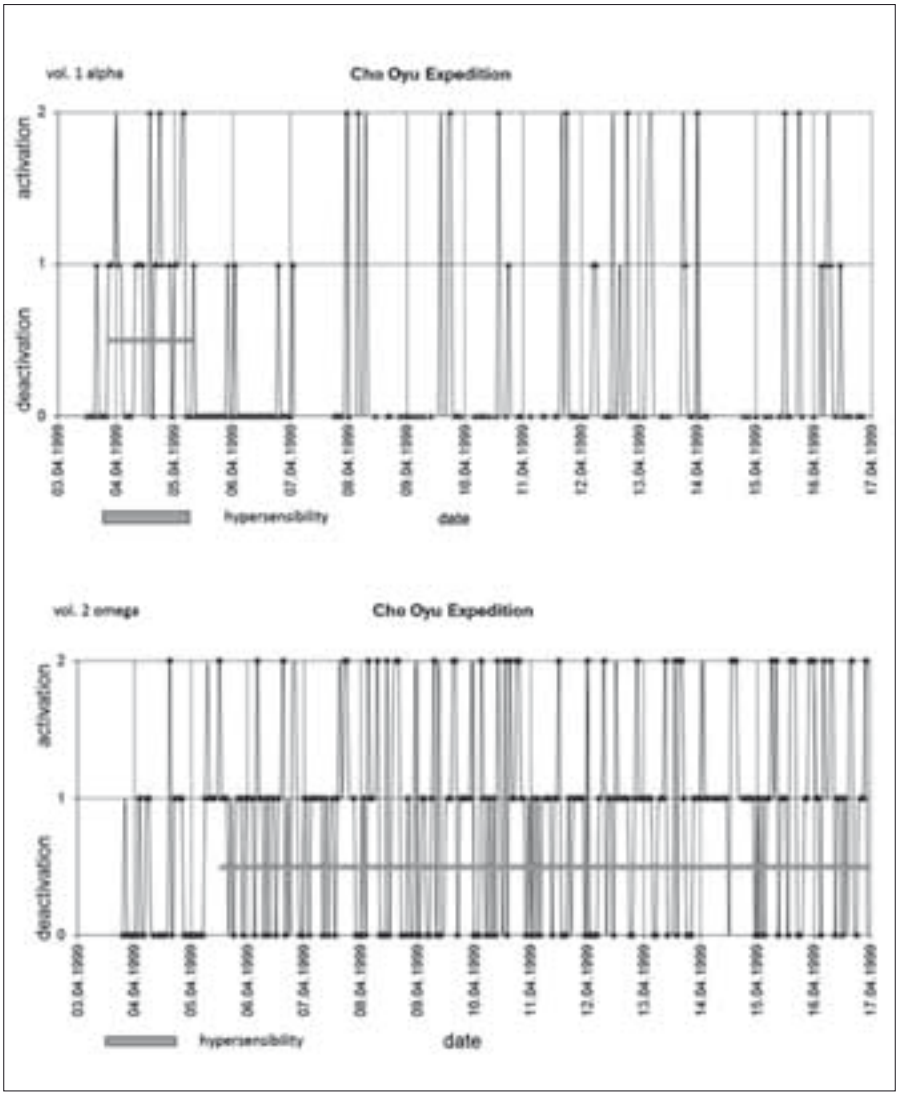
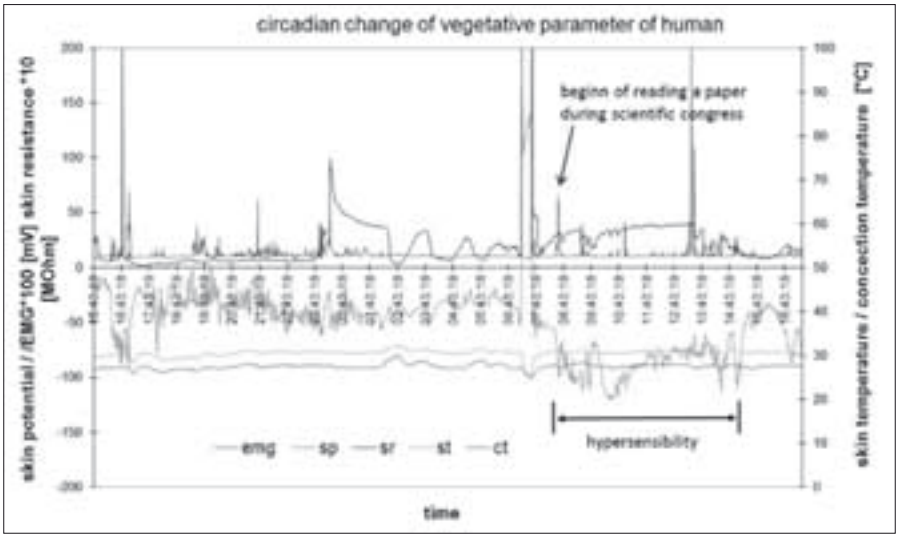


Figure 4: *change of hypersensibility between former leader of expedition (vol. 1) to new leader of expedition (vol. 2) at the same time (from monday to thursday, 05.04.1999 to 06.04.1999).*

Smard-Watch system. The hypersensbility phase was accompanied by very negative skin potential data (lower than minus 50mV) – see figure 5. In addition some investigations showed that hypersensibility can exist for only part of a day (maybe just a few hours).



Legend: emg – emectromyogram, sp – skin potential, sr – skin resistance, st – skin temperature, ct – concection temperature

Figure 5: *Existance of partially hypersensibility during day followd by cocnitive work load on human reading a paper.*

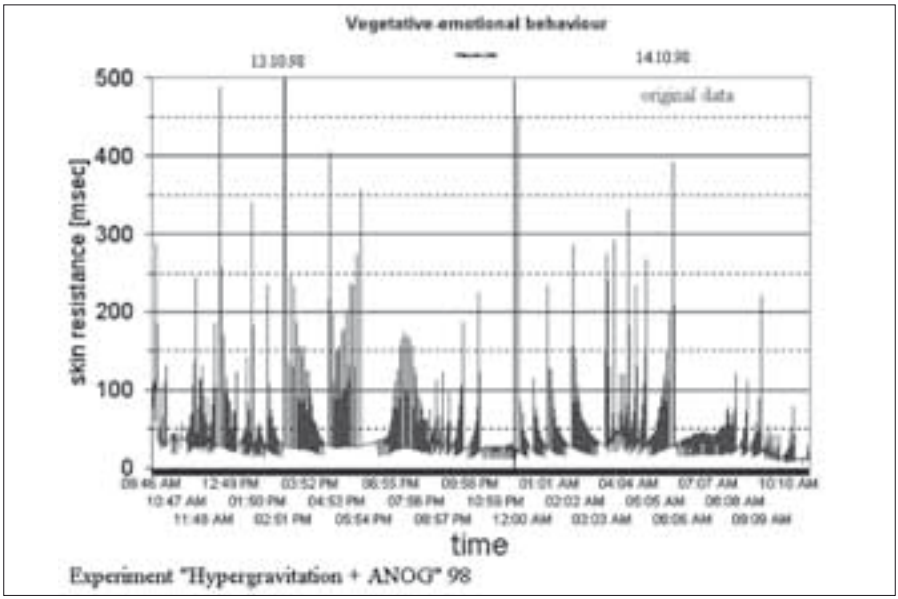


Figure 6: *Effect of hypergravity and antiorthostase on a primate suffering from acute gastritis.*

Salzberg-Ludwig (2003) describes hypersensitivity in a x-year old child student at 3rd class of a primary school measured using skin resistance with a HIMEM-device. This child was diagnosed with neurodermatitis in the same year. These facts suggest that hypersensibility is embedded in chronobiological processes within the body.
Balzer (1998) found hypersensitivity when he investigated the effect of hypergravity and antiorthostase on primates, in a primate who was suffering from acute gastritis (figure 6).

Scales of psychological processes	Hypersensibility					
	Yes		No			
	M	SD	M	SD	p	Effect size
TPF – self-forgetfulness(T-Value)	56.44	5.64	51.83	8.47	.04	.64
TPF – ability to love (empathy) (T-Value)	42.18	7.33	47.97	7.85	.01	.76
FKK – Internal control beliefs (T-Value)	47.35	6.94	52.27	7.73	.02	.67
Stress quick test – Social Support	3.24	0.66	2.67	1.02	.01	.66
Stress anamnesis – Chronobiological anamnesis	25.89	9.04	18.84	10.22	.01	.73
FABA – Excessive Planungsambition	18.12	2.76	19.42	2.50	.07	.49
FEG – Extent of sleep (T-Value)	39.06	9.61	45.05	9.03	.02	.64
FEG – General Welfare (T-Value)	45.88	10.75	50.22	7.64	.07	.47
FEG – Current well-being (T-Value)	44.41	9.16	49.00	8.62	.06	.52
AVEM – Type Health (%)	0.13	0.18	0.23	0.33	.09	.38

Summery

Summarizing these findings we could estimate, that the process of exhaustion will begins as usually with tiredness which is combined with the increase of overload inhibitions, followed by states of nervousness and/or hypersensibility leading to long term exhaustions states combined with states of depression or apathy. The hypothesis, which has to been proven statistically is, will leads hypersensibilty to any extreme increase of the negative skin potential, which could effect to the measurement of skin resistance.

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