Investigation of electrosensitive persons with regard to accompanying factors or diseases such as allergies and increased exposure or sensitivity to heavy metals and chemicals

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Content

ES

- No diagnostic criteria ES, unspecific symptomatology

- ES: health troubles or medical conditions subjectively due to very low EM exposure

  Severity of symptoms is modulated by (perceived) extent of exposure

- According to some surveys affects up to 2-6 % of the population, probably less. Much more people are (not too much) „concerned"

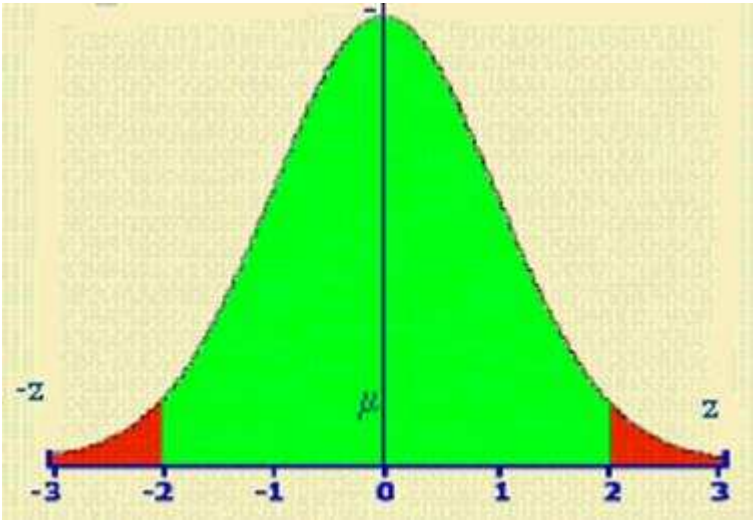
- ES is a highly relevant issue

  mobile phone (electronic swiss army knife) = computer, camera, tv, key, money, universal remote control, office, fashion device, tracking device & guide, ID and many more.

Mobile phones and other EM emitting devices will not go away easily any time soon

ES

- In general, ES affected persons can not discriminate between exposure and sham exposure
- No accepted biological mechanism(s), heterogenous disorder
- No data on the natural course of ES
- Psychotherapeutic intervention may have some success (without implying any disease mechanism)
- It is far from clear, whether or not clinical ES can serve as an „extreme group" of electrosensitivity in the general population



Scope of the study

- Primary aim is to give clinical information about persons who are convinced that their health problems are related to EM

  Study specifically looks at the small fraction of people who believe to be susceptible to EM damaging effects.

- Study will not measure the damage done by EM. It will not measure causality of any impairment and will not answere the question wether ES is a „true" disorder

- However, it can be analysed, wether or not results fit with different disorder models

Simple psychiatric disorder model

- Patients are suffering from psychiatric disorders that instill false believes
- ES can be explained in terms of delusion or psychological mechanisms like denial or part of the group of somatoform disorders
- Prediction: psychiatric disorders can be diagnosed and treated

Behavioral ES disorder model

- Unpleasant body sensations of a largely healthy person are experienced together with real or perceived EM. As a consequence the person is relieved to have found an explanation.

- The believe about the connection of symptom and EM is enforced by every occasion the person thinks about it

- With time sickness behavior follows, encouraged by secondary benefits

- Predictions from the modell: no abnormal laboratory findings, no increase in robust measurements of comorbidity. Behavioral therapy (e.g. „flooding“) and psychoeducation should work

Somatic disorder model

- Patients are suffering from somatic disorders and wrongly attribute their symptoms to EM

- Prediction: underlying somatic disorders can be diagnosed and treated

ES specific disorder model

- EM can do damage to susceptible persons in some not-understod way.

- Specific or characteristic symptoms as well as biological pathways can be identified

Environmental ES disorder modell

- modell can explain very different symptoms („the weakest link breaks"
- Interindividual differences in resilience are assumed to be relevant
- from this modell therapeutic options can be extracted e.g. „detoxification" and avoidance of exposure where it is easiest
- Model and therapeutic strategies have not been tested

Design

cross sectional study: no follow up

case-control-study:

130 cases

- Sample from selp-help-groups n=45
- sample from Mainz „EMF-Watchdog“ (Umweltministerium Rheinland-Pfalz und Universität Mainz), Internet-questionnaire appr. cases in total, in our study: n=65
- Sample recruited by the University of Regensburg by means of newspaper advertisments, n= 20

- Controls recruited through advertisments, n=101

ES sample: inclusion/exclusion criteria

Inclusion

- Health problems that are attributed to EM.
- Severity of ES symptoms: Intensity of symptoms during the last 30 days (54 items; (low=1, moderate to severe=2). Requirement value at least 12 age >18 years

Exclusion

- Acute psychiatric disorder (suicidality, acute psychosis)
- Impairment of free will

Scales and Instruments

- ES symptoms questionnaire: 54 items (no, low, moderate, severe)
- ES specific medical history questionnaire
- Multiple chemical sensitivity quesstionnaire (MCS-QUEESI)

- Somatic comorbidity (Medical history)

- Psychiatric comorbidity (MINI-DIPS)
- SKID II screening (personality disorders)
- Hamilton Depression Scale (HAM-D), Beck Depression Inventory (BDI)
- Pittsburgh sleep quality inventory (PSQI), Kiel headache Inventory (KKFB)
- Anxiety and avoidance (STAI, WI), proneness to somatoform thoughts (SOMS)

- Satisfaction with life (FLZ)
- SF-36 (short form health survey)

Laboratory parameters

- Routine laboratory workup of blood sample
- Heart rate variability (indicator of autonomic regulation)
- Genetically defined aspects of liver detoxification (genetic typing of 10 genes from phase I and phase II capacity (e.g. Cyp2E1)
- Geneticaly defined aspects of infection and fatigue risk (immunemodulatory genes such as interleukines)
- Low resolution HLA-typing
- 74 different specific IgE levels („allergy chip")
- Cadmium, lead, mercury, chrome, copper in serum

Characterization of sample

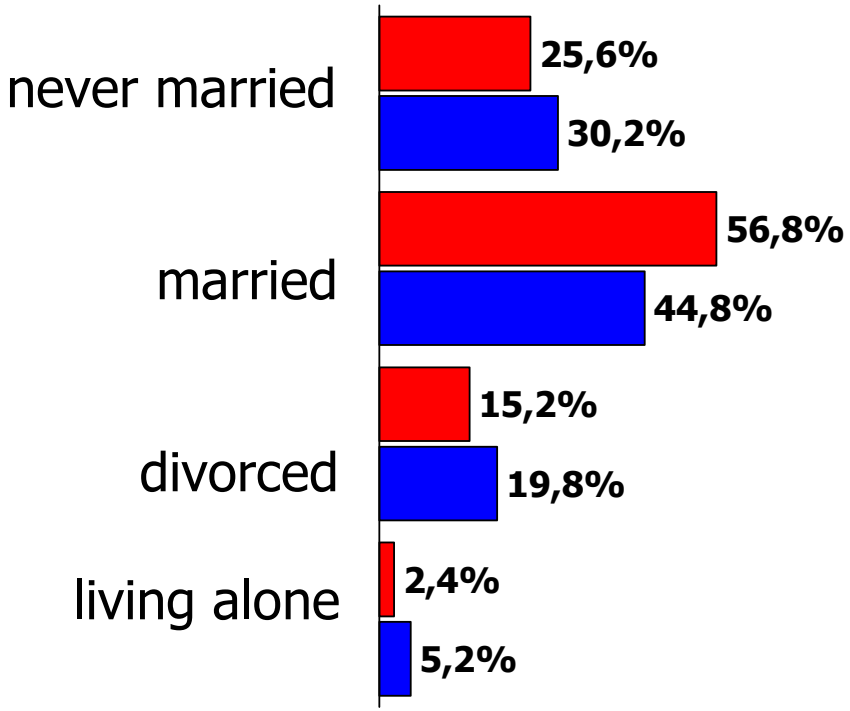
- Matching for age and sex

	Elektrosensible	Kontrolle
all probands (n=231)	n=130	n=101
age (average)	51,58	49,66
height (cm)	169,84	171,12
weight (kg)	71,29	71,34

	Elektrosensible	Kontrolle
male	31,5%	33,7%
female	68,5%	66,3%

Description of sample, marital status

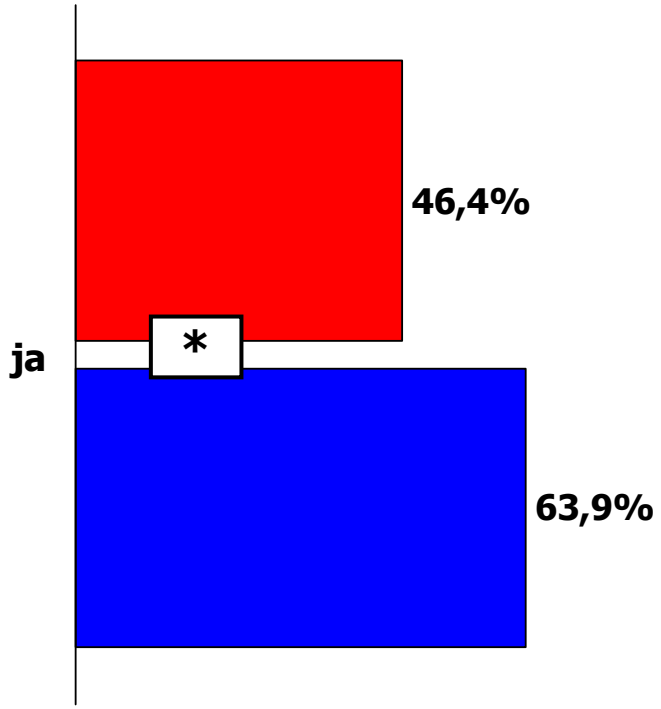
family



Basis: Alle Probanden (N=231)

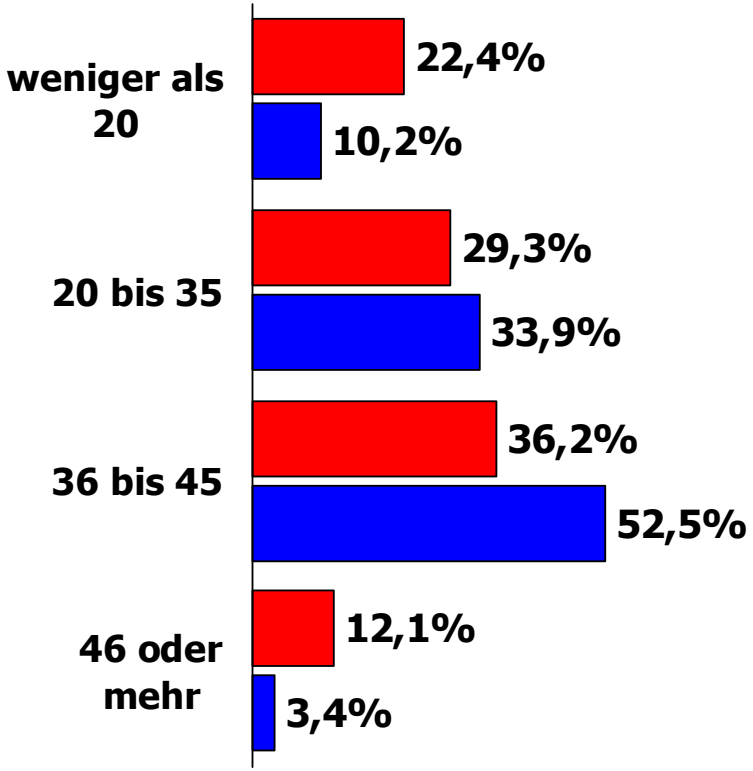
Comparison of samples

Are you currently working ?



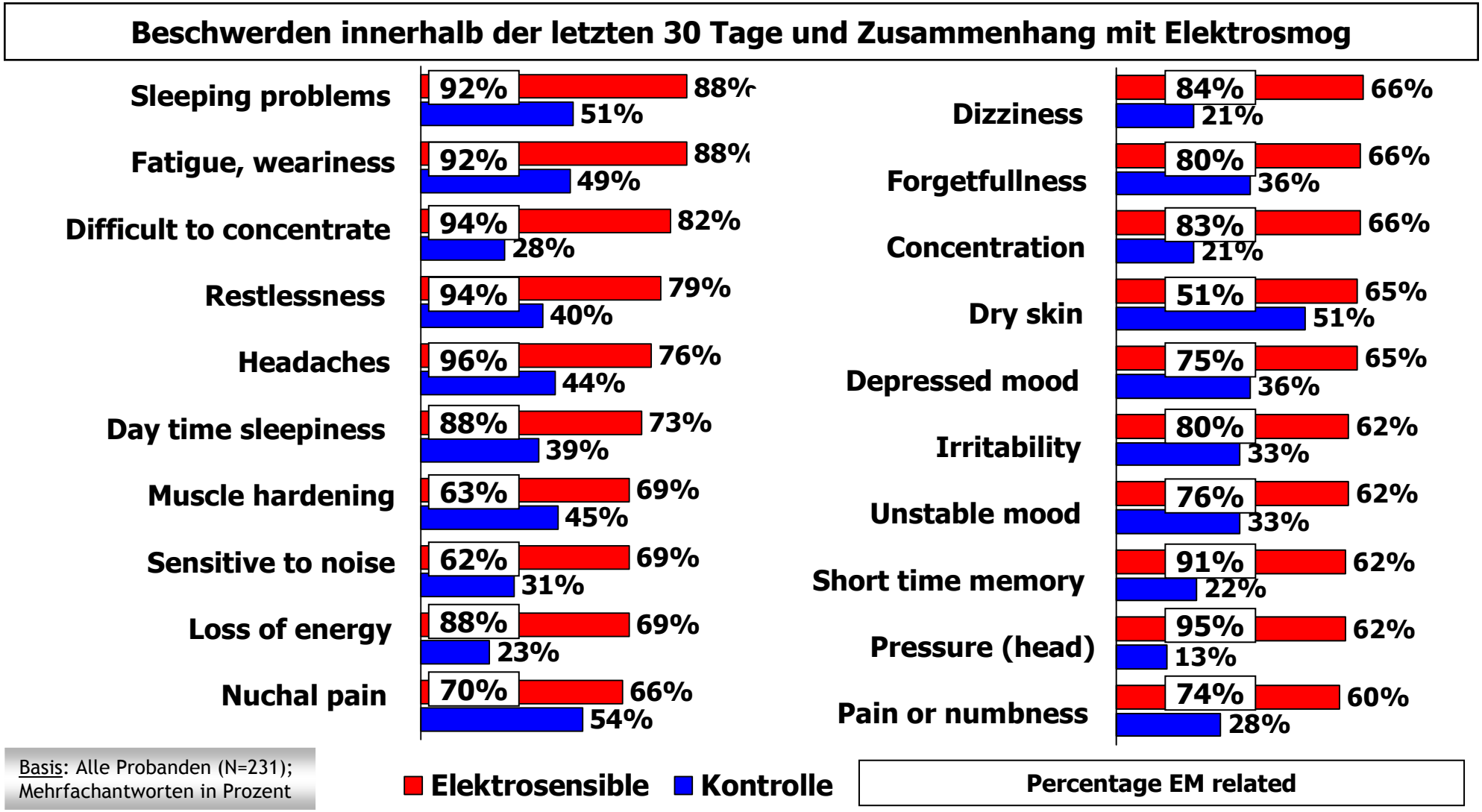
Basis: Alle Probanden (N=231)

If you work, how many hours do you work (average) ?



Basis: Alle erwerbstätigen Probanden (n=58)

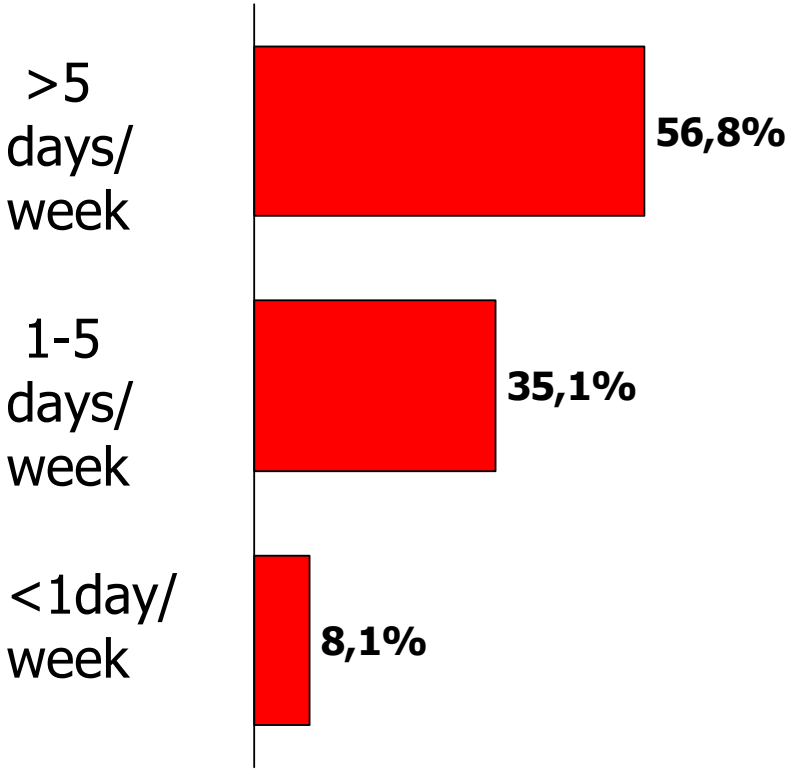
Symptoms [20 most frequent]



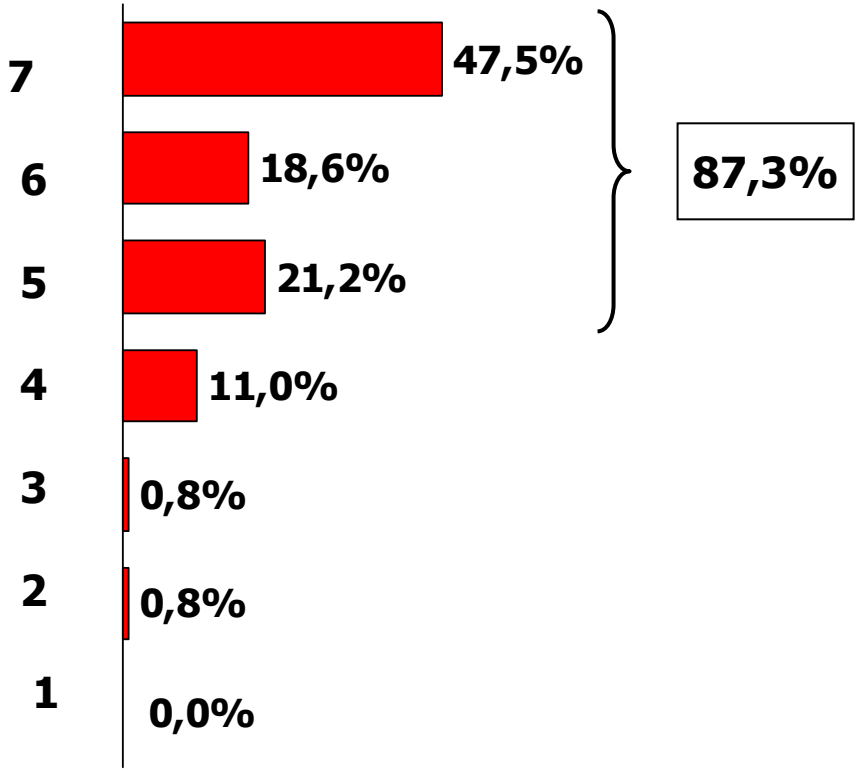
Symptoms

More than half of the ES group had symptoms more than five days/week

Frequency of symptoms



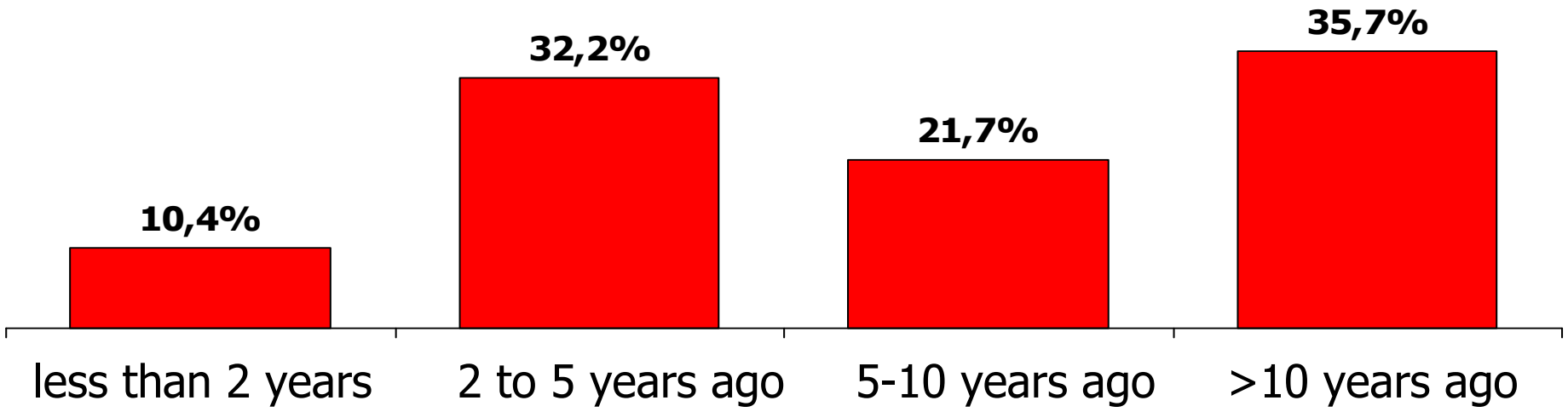
Subjective degree of impairment



Basis: Nur Elektrosensible (n=125)

Duration of symptoms

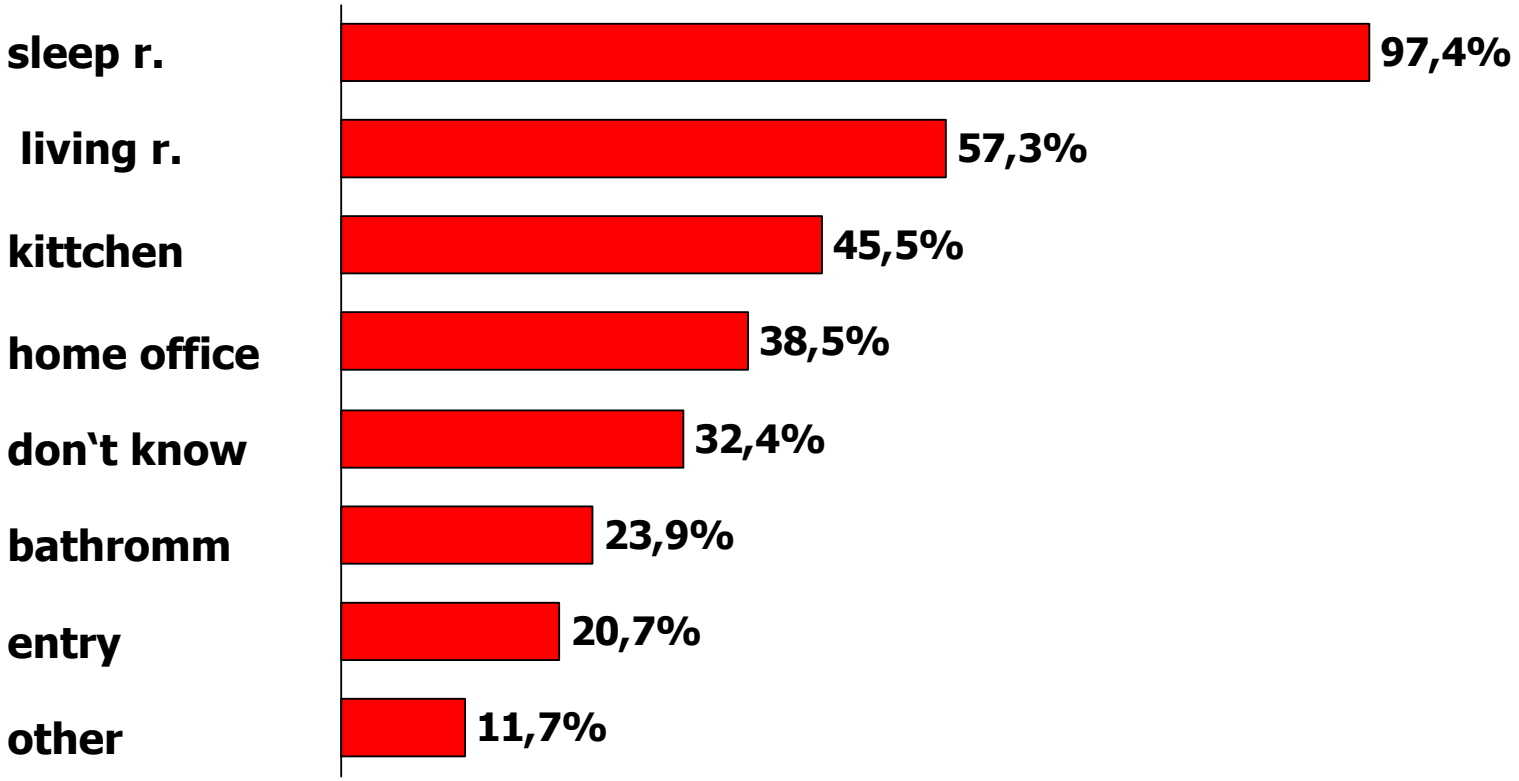
First time
symptoms were noticed



Base: ES group (n=125)

Symptoms are worst in the bedroom

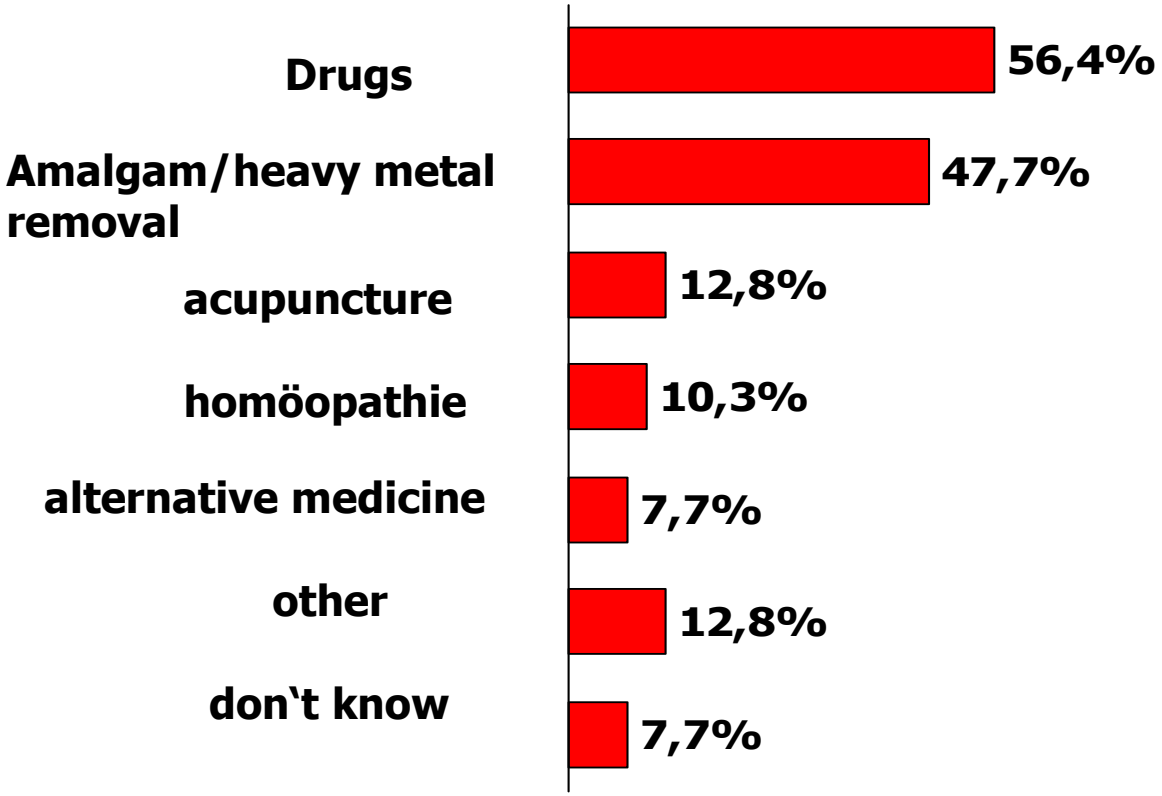
Where at home do you experience mot symptoms



Basis: Nur Elektrosensible (n=125)

48 (37%) persons of ES group had recieved medical treatment for ES

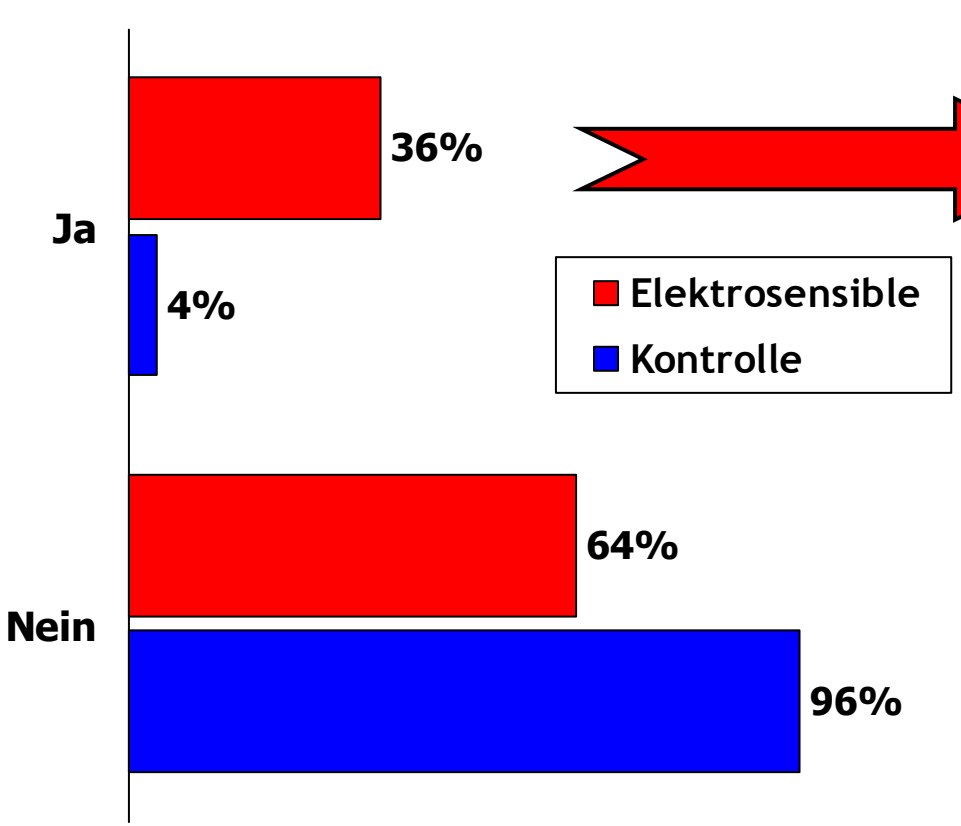
What kind of treatment did you receive ?

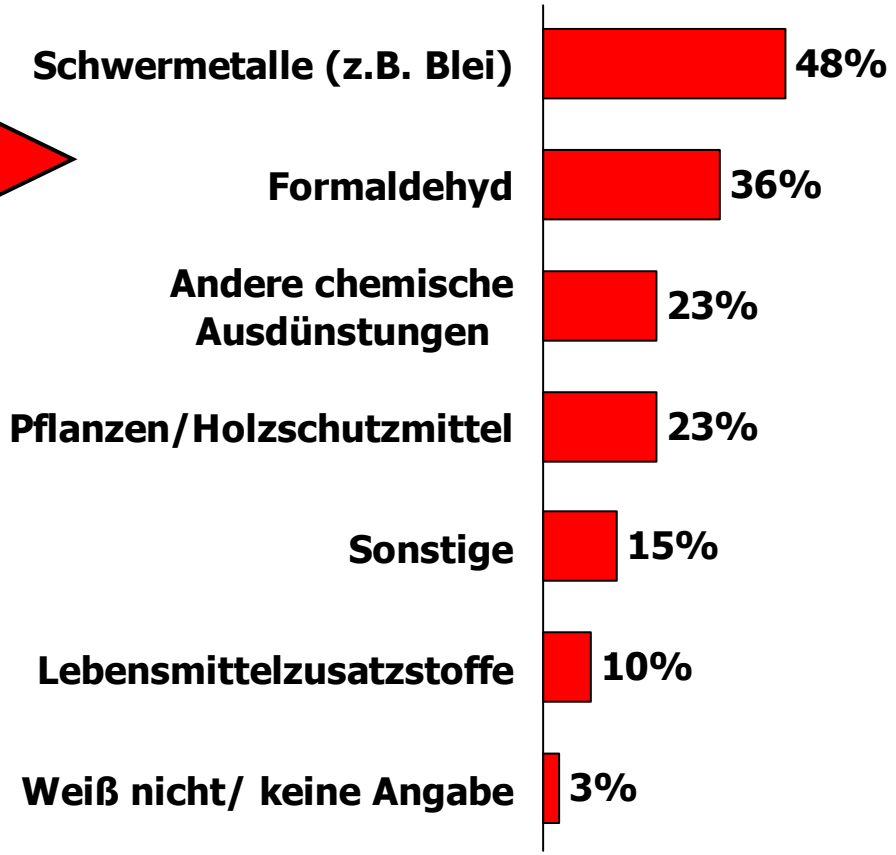


Basis: Nur Elektrosensible (n=48)

ES group has concerns about environmental hazards

Do you feel, pollutants have a health impact on your live? If so, which ones?



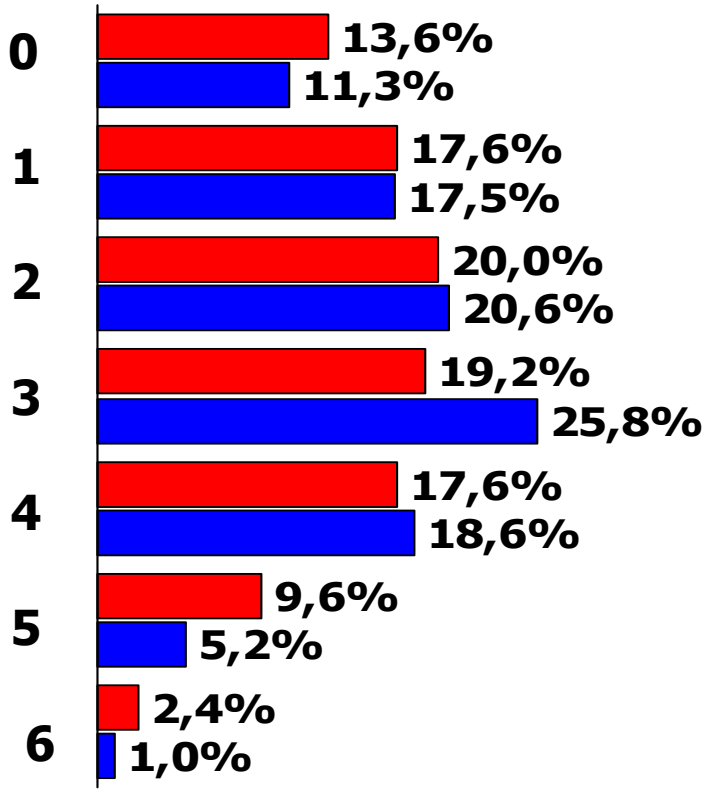


Basis: Alle Probanden (N=231)

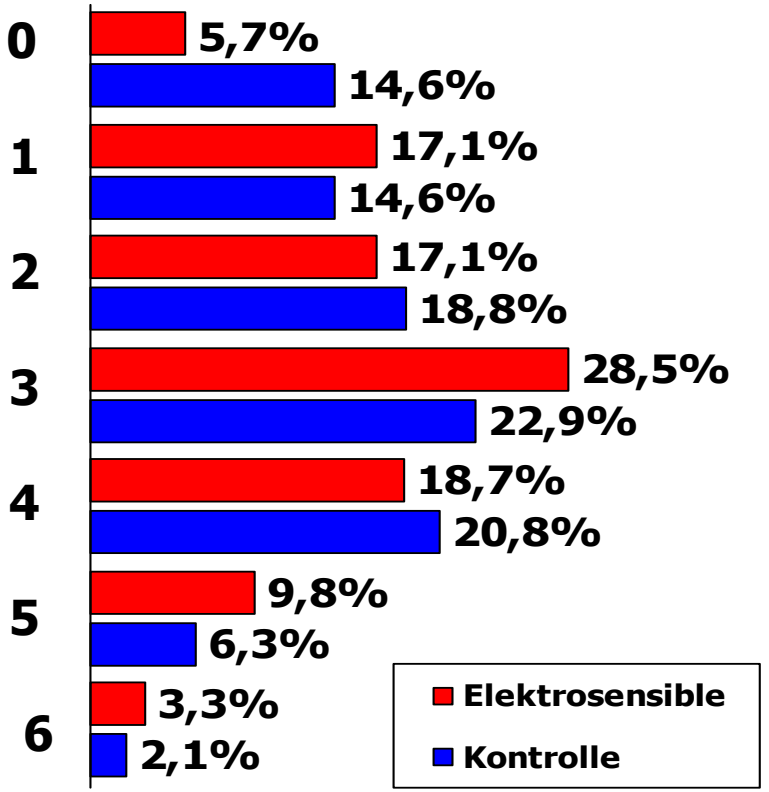
Basis: Elektrosensible, die an Umweltbelastungen leiden (n=32)

ES persons were not general „complainers“

How bad is the noise pollution where you live?



How bad is the air pollution?



Basis: Alle Probanden (N=231)

Psychiatric (life time) comorbidity

MINI-DIPS

- Short medical history part
- Assesses 17 different diagnoses
- In addition, asks screening questions for psychotic symptoms
- Diagnoses can be grouped into categories:

  Anxiety,affective disorders, compulsion, somatoform disorders, eating disorders, abuse/addiction

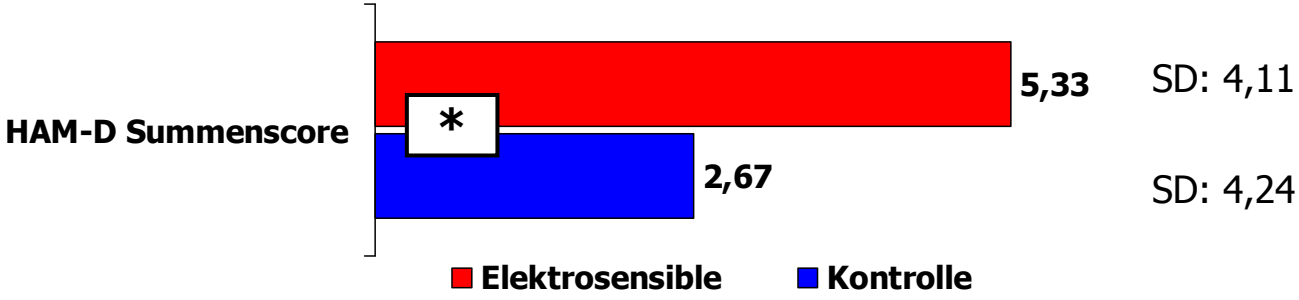
MINI-DIPS Diagnosis

ES: MINI-DIPS positive 54%

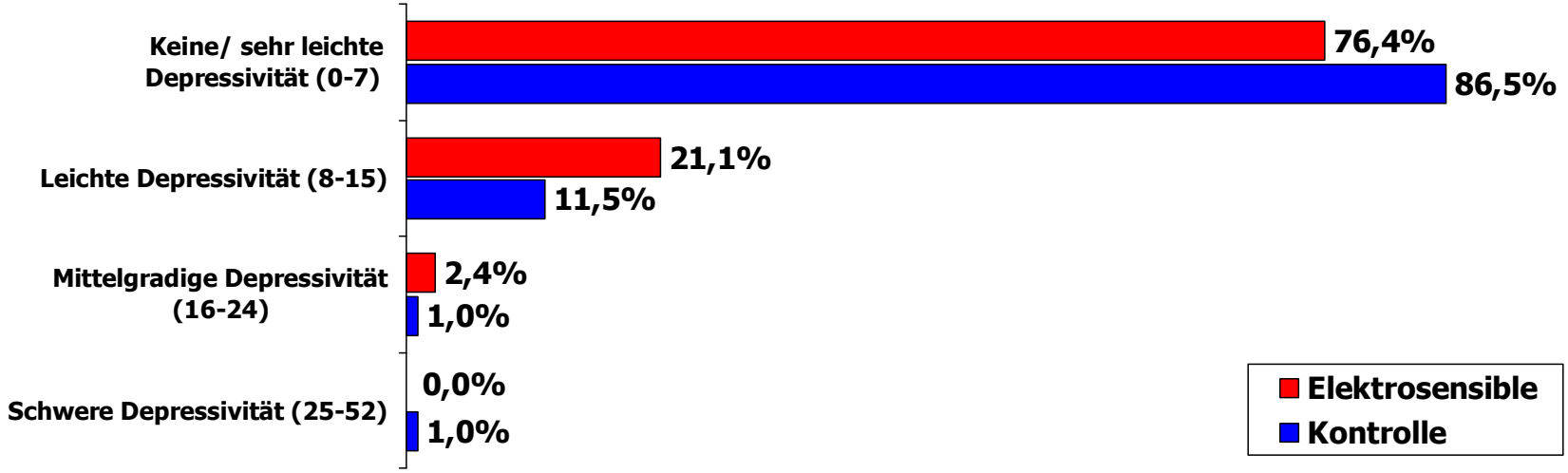
Controls: 48 %

Hamilton Depresion Scale (HAM17-D)

HAM-D Summenscore (gebildet durch Addition der klassischen 17 HAM-D Items, Score: 0-52)



Klassifikation:

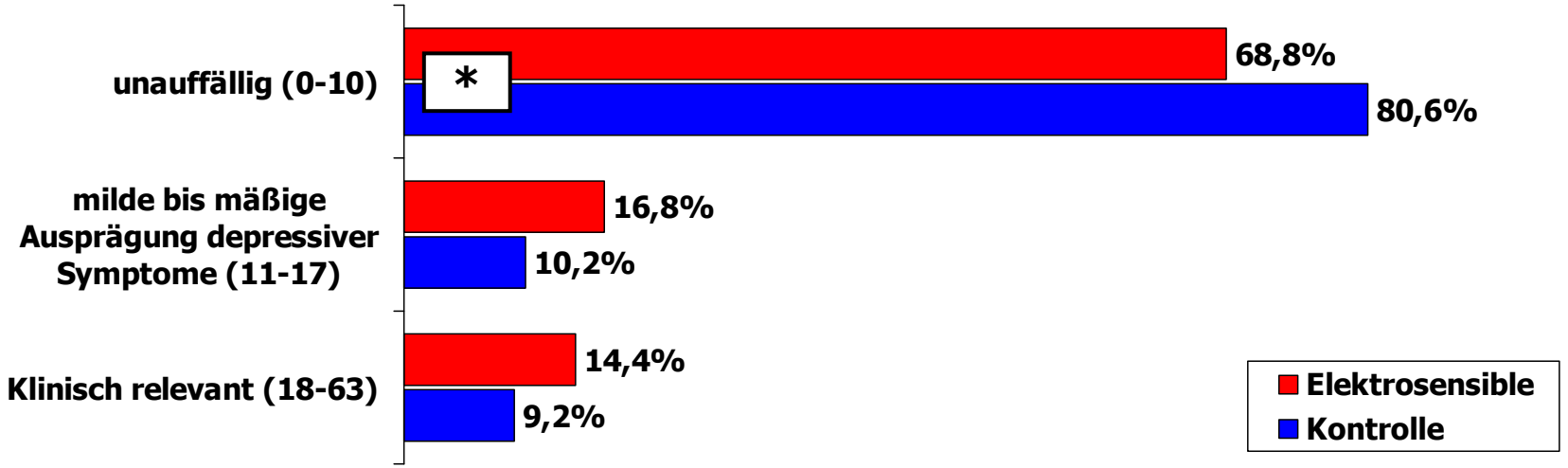


Basis: Alle Probanden (N=231)

Beck Depression Inventory (BDI)

BDI Summenscore (0-63)

Klassifikation der Probanden laut Hautzinger/ Bailer/ Worall/ Keller (1995)



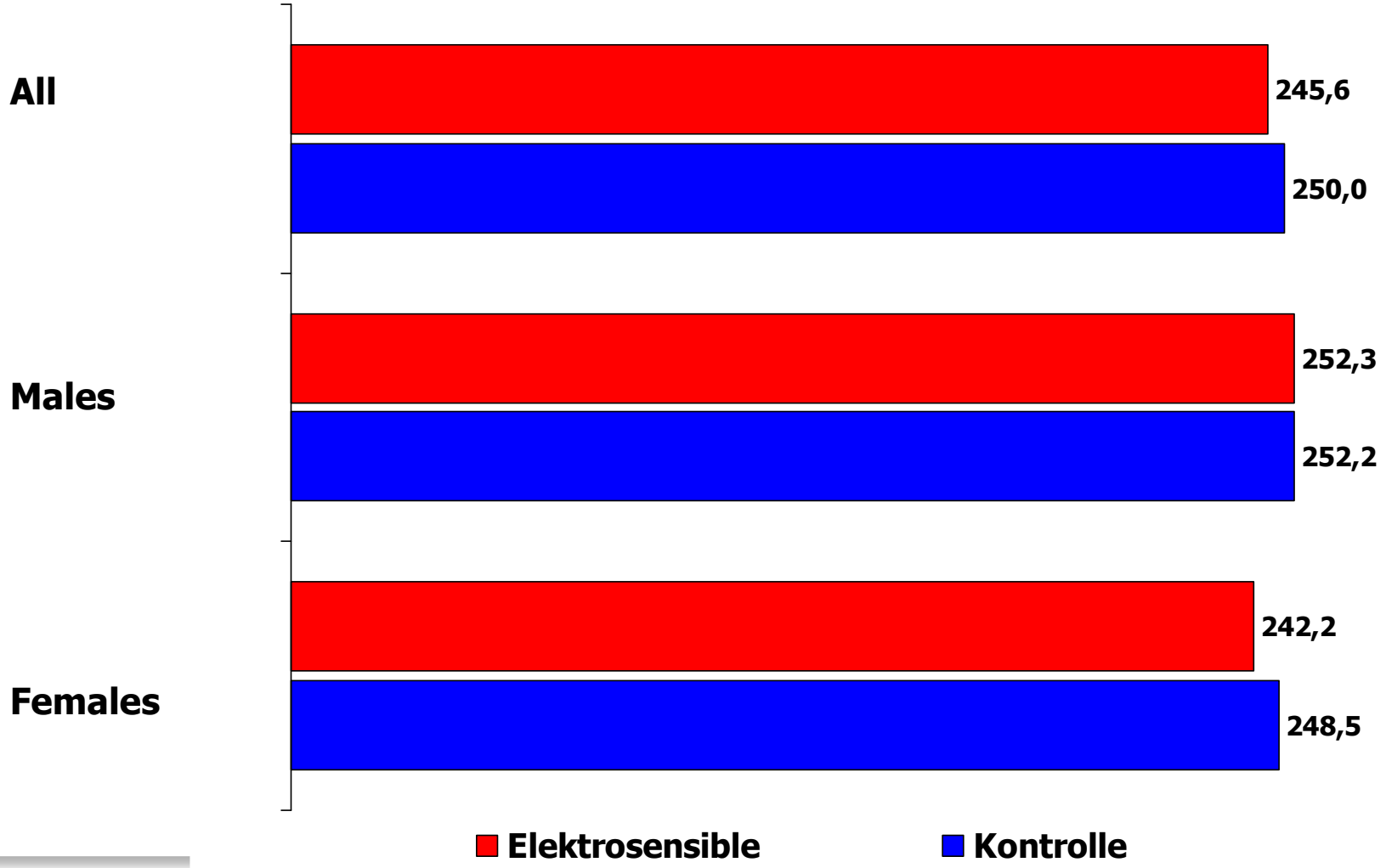
Basis: Alle Probanden (N=231)

Satisfaction with life (FLZ)

- **Asks for 10 different aspects of life satisfaction**
- **Health, financial situation, recreational activities, estimation of self-worth, sexuality, friends, accomodation, situation at work, relation to partner, relation to children**

- **10 subscales or summary scale**

Summary scores FLZ – no significant difference

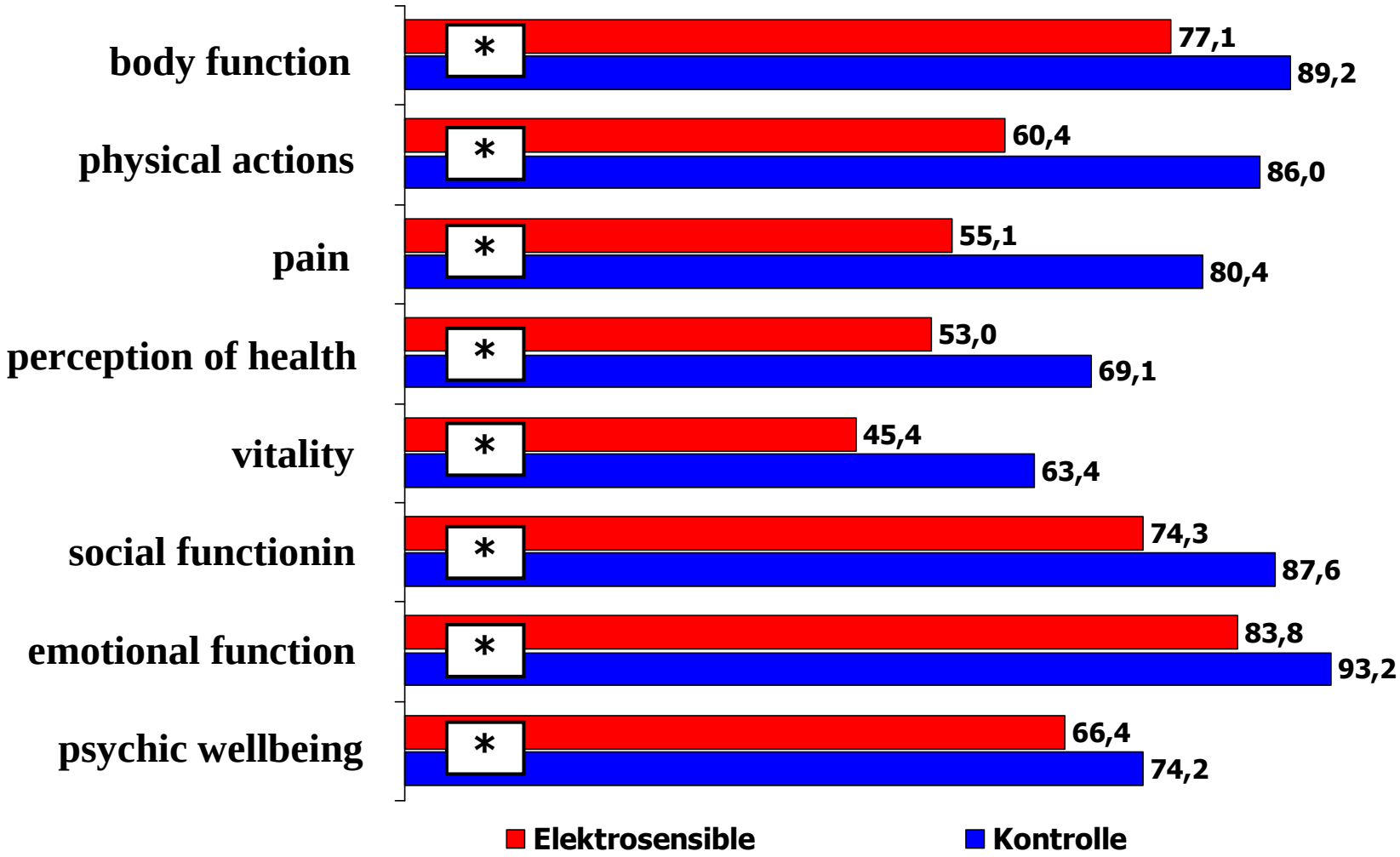


Basis: Alle Probanden (N=231)

SF-36 health related quality of life

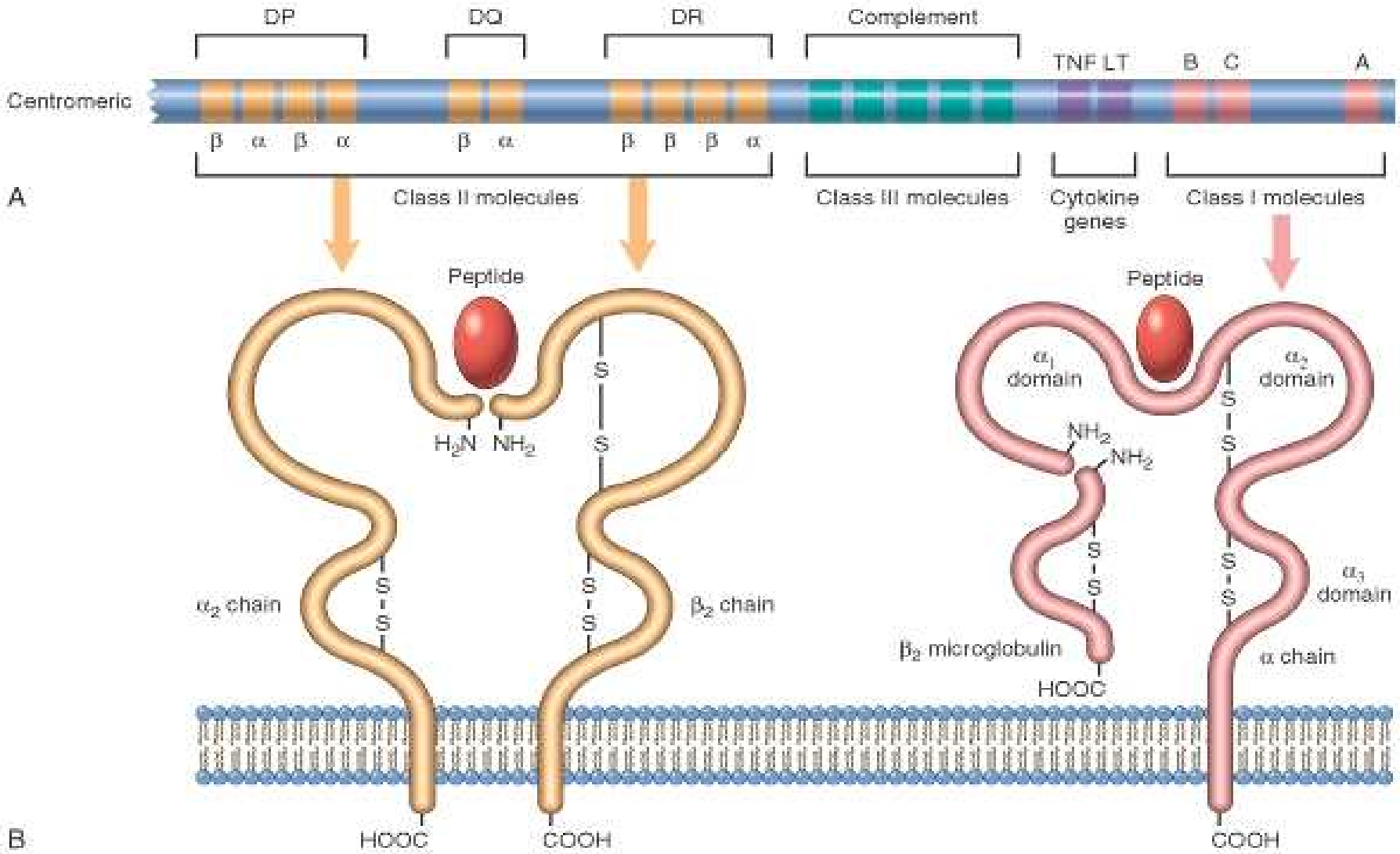
- **SF-36 (Health survey)**
  - **Assesses eight dimensions related to the subjective health**
  - **body function, ability for activities, pain, vitality, perception of health, social functioning, emotional functioning, psychic wellbeing**
  - **Summary score + subscales**

SF-36: significant difference in all dimensions



Basis: Alle Probanden (N=231)

Electrosensitivity and HLA genotype



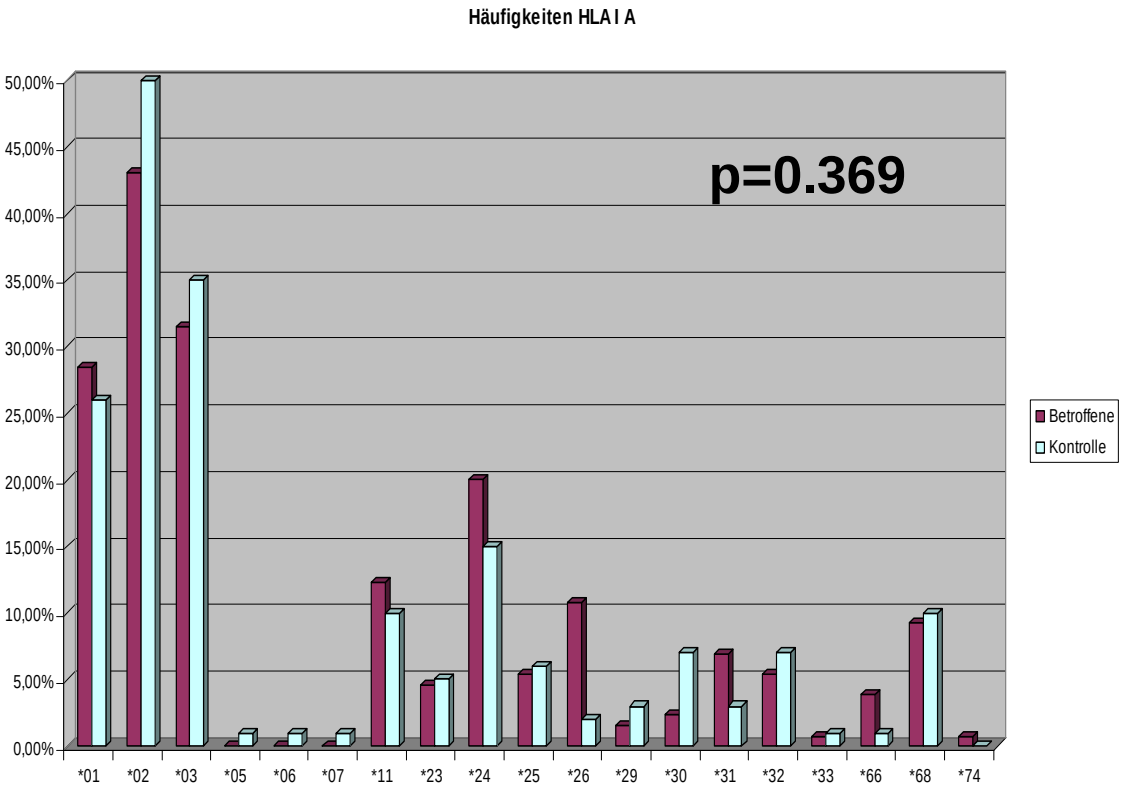
HLA-A

Associated with HLA-A alleles

- A*01 Myasthenia gravis (OR 2,6x)
- combination A*02 with A*11 schizophrenia (OR 9,8x)
- A*03 hämochromatosis (OR 6,7x)
- A*29 Birdshot-Retionochorioidopathie (OR 224,3x)

HLA-A

Allel	ES (n=130)		control (n=100)	
A*01	37	28,46%	26	26,00%
A*02	56	43,08%	50	50,00%
A*03	41	31,54%	35	35,00%
A*05	0	0,00%	1	1,00%
A*06	0	0,00%	1	1,00%
A*07	0	0,00%	1	1,00%
A*11	16	12,31%	10	10,00%
A*23	6	4,62%	5	5,00%
A*24	26	20,00%	15	15,00%
A*25	7	5,38%	6	6,00%
A*26	14	10,77%	2	2,00%
A*29	2	1,54%	3	3,00%
A*30	3	2,31%	7	7,00%
A*31	9	6,92%	3	3,00%
A*32	7	5,38%	7	7,00%
A*33	1	0,77%	1	1,00%
A*66	5	3,85%	1	1,00%
A*68	12	9,23%	10	10,00%
A*74	1	0,77%	0	0,00%



HLA-B

HLA B*27 associated disorders:

Krankheit	Odds ratio im Vergleich zu nicht Genträgern
M. Bechterew	87,4 x
M. Reiter	37,0 x
reaktive Arthritis durch Shigellen	20,7 x
reaktive Arthritis durch Salmonellen	17,6 x
reaktive Arthritis durch Yersinien	17,6 x
reaktive Arthritis durch Gonokokken	13,9 x
Psoriasisarthropathie	4,0 x

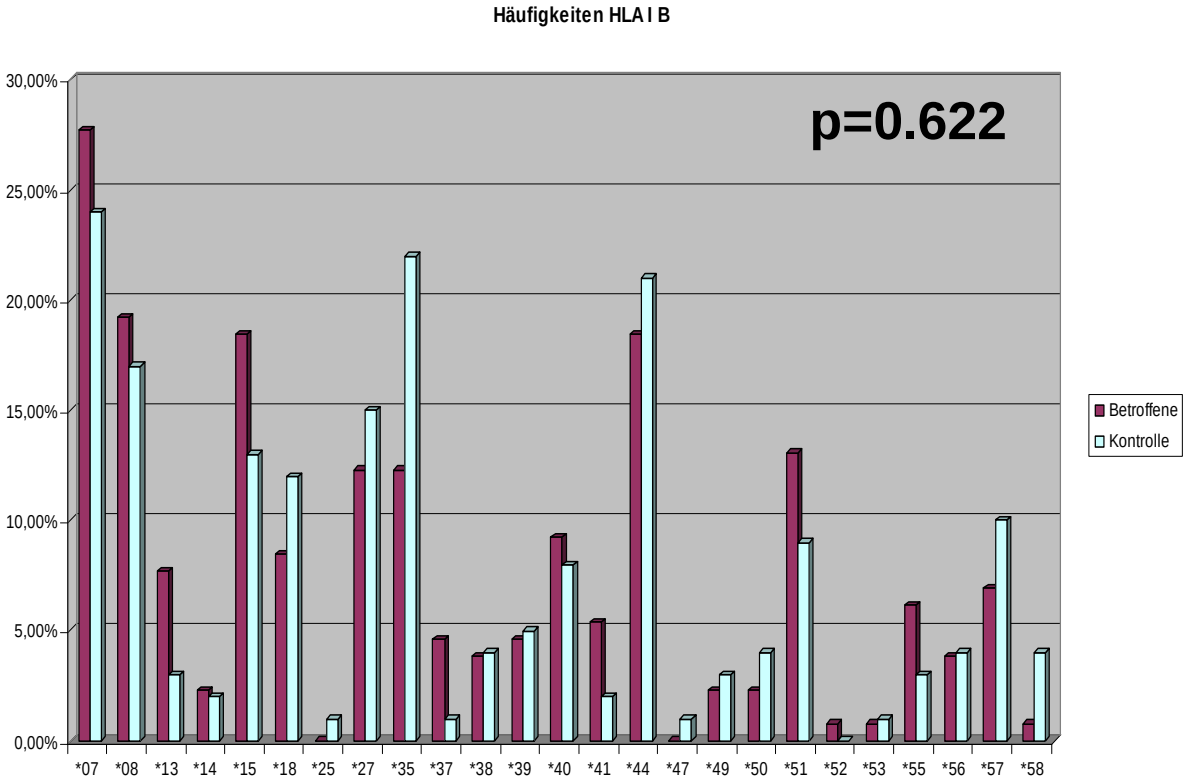
HLA-B

with other HLA-B alleles associated disorders

- B*07 M. Alzheimer (OR 2,8 x)
- B*08 Lupus erythematodes (OR 4,6 x)
- B*08 M. Basedow (OR 3,3 x)
- B*08 Dermatitis herpetiformis (OR 8,7 x)
- B*13 Sarkoidose (OR 3,1 x)
- B*14 Hämochromatose (OR 26,7 x)
- B*35 subakute Thyreoditis (OR 13,7 x)
- B*37 Psoriasis vulgaris (OR 6,7 x)
- B*51 M.Behcet (OR 6,3 x)

HLA-B

Allel	Betroffene (n=130)		Kontrolle (n=100)	
B*07	36	27,69%	24	24,00%
B*08	25	19,23%	17	17,00%
B*13	10	7,69%	3	3,00%
B*14	3	2,31%	2	2,00%
B*15	24	18,46%	13	13,00%
B*18	11	8,46%	12	12,00%
B*25	0	0,00%	1	1,00%
B*27	16	12,31%	15	15,00%
B*35	16	12,31%	22	22,00%
B*37	6	4,62%	1	1,00%
B*38	5	3,85%	4	4,00%
B*39	6	4,62%	5	5,00%
B*40	12	9,23%	8	8,00%
B*41	7	5,38%	2	2,00%
B*44	24	18,46%	21	21,00%
B*47	0	0,00%	1	1,00%
B*49	3	2,31%	3	3,00%
B*50	3	2,31%	4	4,00%
B*51	17	13,08%	9	9,00%
B*52	1	0,77%	0	0,00%
B*53	1	0,77%	1	1,00%
B*55	8	6,15%	3	3,00%
B*56	5	3,85%	4	4,00%
B*57	9	6,92%	10	10,00%
B*58	1	0,77%	4	4,00%



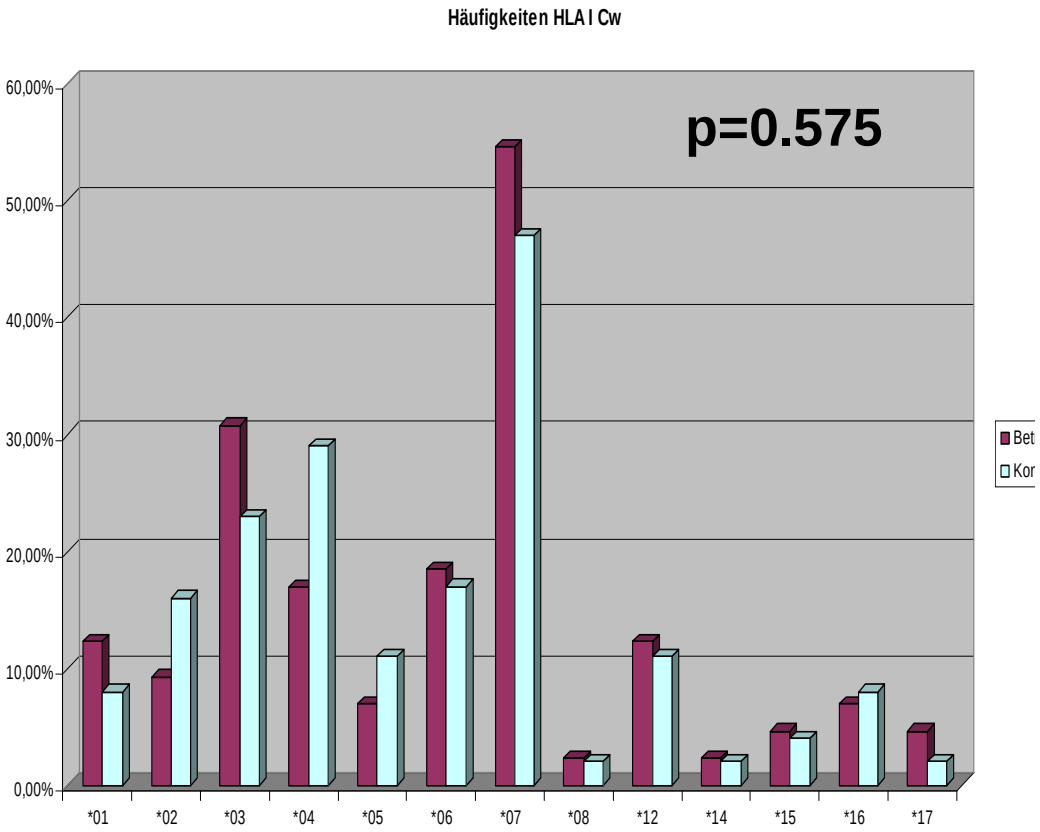
HLA-C

Associated with HLA Cw-alleles

- combination Cw*03 und B*07 M.Alzheimer (OR 28,0)x
- Psoriasis vulgaris (OR 13,3 x)

HLA-C

Allel	Betroffene		Kontrolle	
Cw*01	16	12,31%	8	8,00%
Cw*02	12	9,23%	16	16,00%
Cw*03	40	30,77%	23	23,00%
Cw*04	22	16,92%	29	29,00%
Cw*05	9	6,92%	11	11,00%
Cw*06	24	18,46%	17	17,00%
Cw*07	71	54,62%	47	47,00%
Cw*08	3	2,31%	2	2,00%
Cw*12	16	12,31%	11	11,00%
Cw*14	3	2,31%	2	2,00%
Cw*15	6	4,62%	4	4,00%
Cw*16	9	6,92%	8	8,00%
Cw*17	6	4,62%	2	2,00%



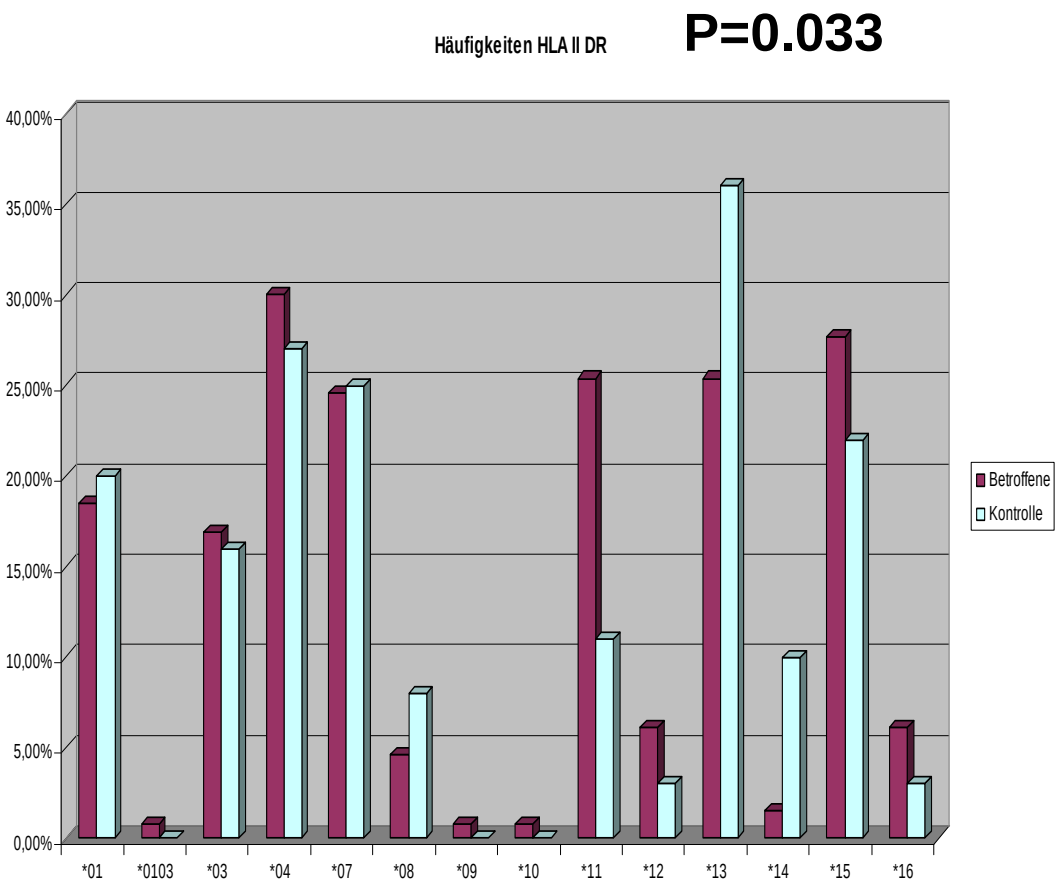
HLA-DRB1

Associated with DR-alleles

- DR*01 Lichen Planuu (OR 11,8 x)
- DR*01 Pemphigus vulgaris (OR 7,3 x)
- DR*03 Sjögren-Syndrom (OR 9,7 x)
- DR*03 M. Addison (OR 6,3 x)
- DR*03 M. Basedow (OR 3,2 x)
- DR*03 Sklerodermie (OR 16,7 x)
- DR*04 rheumatoide Arthritis (OR 10,2 x)
- DR*04 Pemphigus vulgaris (OR 14,4 x)
- DR*08 juvenile rheumatoide Arthritis (OR 9,0 x)
- DR *08 Dermatitis herpetiformis (OR 15,4 x)
- DR*11 Sklerodermie (OR 4,2 x)
- DR*11 CREST-Syndrom (OR 8,1 x)

HLA-DRB1

Allel	Betroffene		Kontrolle	
DR*01	24	18,46%	20	20,00%
DR*0103	1	0,77%	0	0,00%
DR*03	22	16,92%	16	16,00%
DR*04	39	30,00%	27	27,00%
DR*07	32	24,62%	25	25,00%
DR*08	6	4,62%	8	8,00%
DR*09	1	0,77%	0	0,00%
DR*10	1	0,77%	0	0,00%
DR*11	33	25,38%	11	11,00%
DR*12	8	6,15%	3	3,00%
DR*13	33	25,38%	36	36,00%
DR*14	2	1,54%	10	10,00%
DR*15	36	27,69%	22	22,00%
DR*16	8	6,15%	3	3,00%



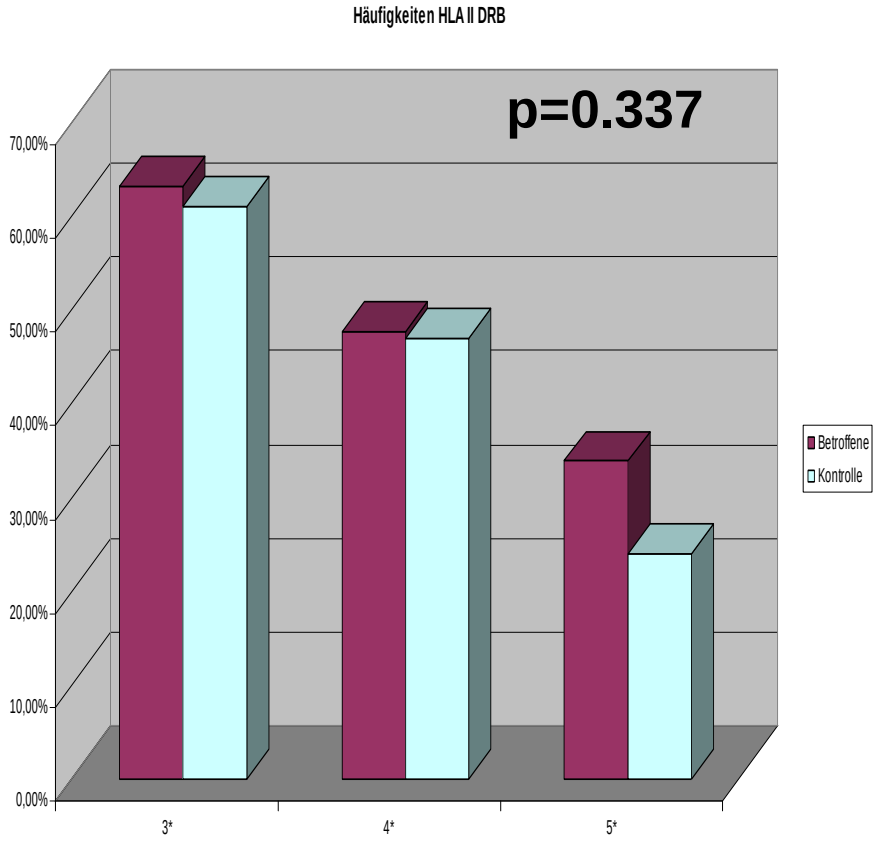
HLA-DRB3

Mit DRB-Allelen assoziierte Krankheiten

- DRB3*02 HPA-1A-Antikörper-Bildung der Mutter (OR 11,3 fach erhöht)

HLA-DRB3, DRB4, DRB5

Allel	Betroffene		Kontrolle	
DRB3*	82	63,08%	61	61,00%
DRB4*	62	47,69%	47	47,00%
DRB5*	44	33,85%	24	24,00%



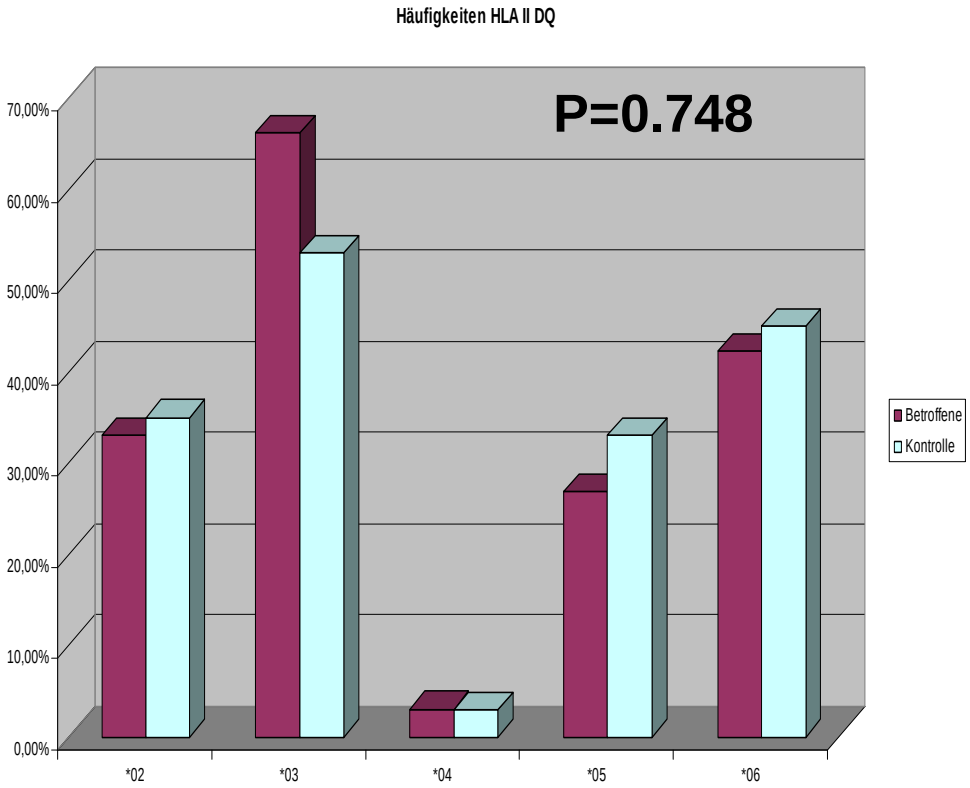
HLA-DQ

Associated with DQ-alleles

- DQ*02 Zöliakie (OR 36,4 x)
- DQ*03 Diabetes mellitus Typ I (OR 22,5 x)
- DQ6*0602 Narkolepsy (OR 130,0 x)

HLA-DQ

Allel	Betroffene		Kontrolle	
DQ*02	43	33,08%	35	35,00%
DQ*03	86	66,15%	53	53,00%
DQ*04	4	3,08%	3	3,00%
DQ*05	35	26,92%	33	33,00%
DQ*06	55	42,31%	45	45,00%



Conclusions

- No single disease model can be applied to all ES patients
- Psychiatric comorbiditys affect roughly half of ES population
- Differences in laboratory data between ES and controls suggest, that the phenomenon can not be described in psychiatric terms alone
- Heterogenous disorder with different mechanisms
- Immunological mechanisms may play a role in some patients
- Enviromental factors may play a role in some patients (data not shown)

Research needs

- Replication in independent samples
- Measurements of ES or susceptibility in the general population
- Research in the „natural course“ (time course)