Psychogenic seizures

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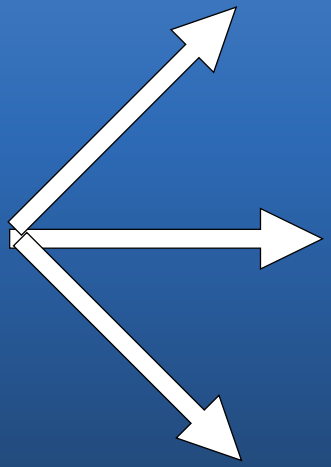
Seizure types

Seizures with a changed consciousness, motor behavior, sensory problems or behavior

Causes:



Epileptic seizure

Physiologic non epileptic seizure

Psychogenic non-epileptic seizure (PNES)

Non epileptic seizures

some examples

- vasovagal syncope
- breath holding spells
- cardiovagal syncope
- migraine
- hypoglycemic situation
- tics
- pavor nocturnus
- sleep walking

- panic attacks
- psychogenic non-epileptic seizures

The definition of PNES

- Definition used most: PNES present as paroxysmal time-limited, *alterations in motor, sensory, autonomic, and/or cognitive signs and symptoms*, but unlike epilepsy, PNES are *not associated by ictal epileptiform activity* (ILAE workgroup, LaFrance et al 2013).

- Definition PNES is misleading.

  -> because are more than the two options: epilepsy or not

Elements from the diagnosis

- Sudden paroxysmal change in consciousness or behavior
- No abnormal electrophysiological changes (as seen in epilepsy): no ictal or postictal EEG characteristics
- No proof somatic (organic) cause
- Seizures can (clinically) resemble epilepsy
- Suspicion for psychological cause
- And in that order: first not somatic, than maybe psychogenic
- PNES / conversion special situation, no real positive diagnosis possible (psychological problems can always coexist).
- And: no voluntary control (no simulation)

Diagnostic process tools

- In the diagnostic process the anamnestic and hetero-anamnestic information, the video and preferably video EEG are important tools in confirming/rejecting epilepsy.

- The total of characteristics must be in agreement with the cause.
- In epilepsy the semiology, preferably by video EEG registration, must be what you can expect from a seizure from that specific localization.

- Always be careful with what you hear or see…

What did you see?

- A bird (in general)
- A parrot
- Something else

First stage: medical diagnostics

- Golden standard: ‘video EEG monitoring’
- Not always possible (low seizure frequency)
- Clinical observation and seizure characteristics
- Medical (social, psychiatric context) for exclusion of medical/organic causes

Diagnose in two consecutive phases

- **First phase:** medical diagnosis
  to differentiate PNES from epileptic seizures and somatic non-epileptic seizures

- **Second phase:** psychological diagnosis
  a ‘positive’ diagnosis to determine management pathways and to **motivate** the patient for mental health treatment

Second phase: what else could PNES be?

- Characteristics of the PNES patient group
- Classifications in mental health
- Tailor made diagnosis
- Pitfalls

Patient characteristics

Study of newly referred PNES patients to the epilepsy center (n= 90)

- Percentage female 75.6%
- Mean age at time of diagnosis 31.7 years (sd = 12.59)
- Also epilepsy 28%
- Seizure frequency:

Daily	21%
Weekly	44%
Monthly	13 %
1-3 yearly	11%

- Seizure type:

with major motor manifestations	39%
with absences, unresponsiveness	46%
more than one seizure type	14%

Classifications for PNES in mental health: DSM edition V

DSM: Diagnostic and Statistical Manual of mental disorders

Most common:

- Conversion disorder with seizures or convulsions (Functional neurological symptom disorder, with motor or sensory symptoms)

  Symptom(s) of altered voluntary motor or sensory function; not better explained by another medical or mental disorder; Symptom(s) cause clinically significant distress or impairment in social, occupational, or other important areas of functioning; Specify with or without psychological stressor

- But: no term that fits all!

  Descriptive categories are not enough to tailor treatment to the individual patient

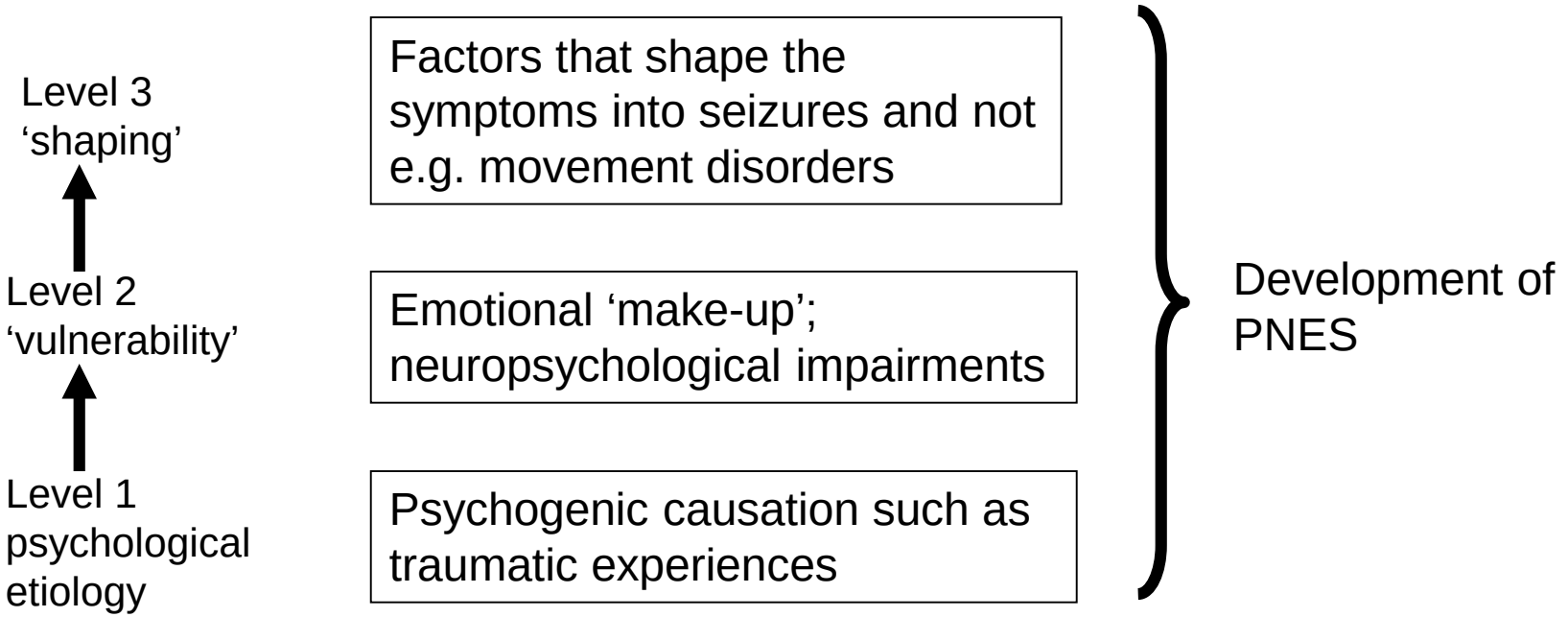
Tailor made diagnosis

- Allways more than one factor involved:

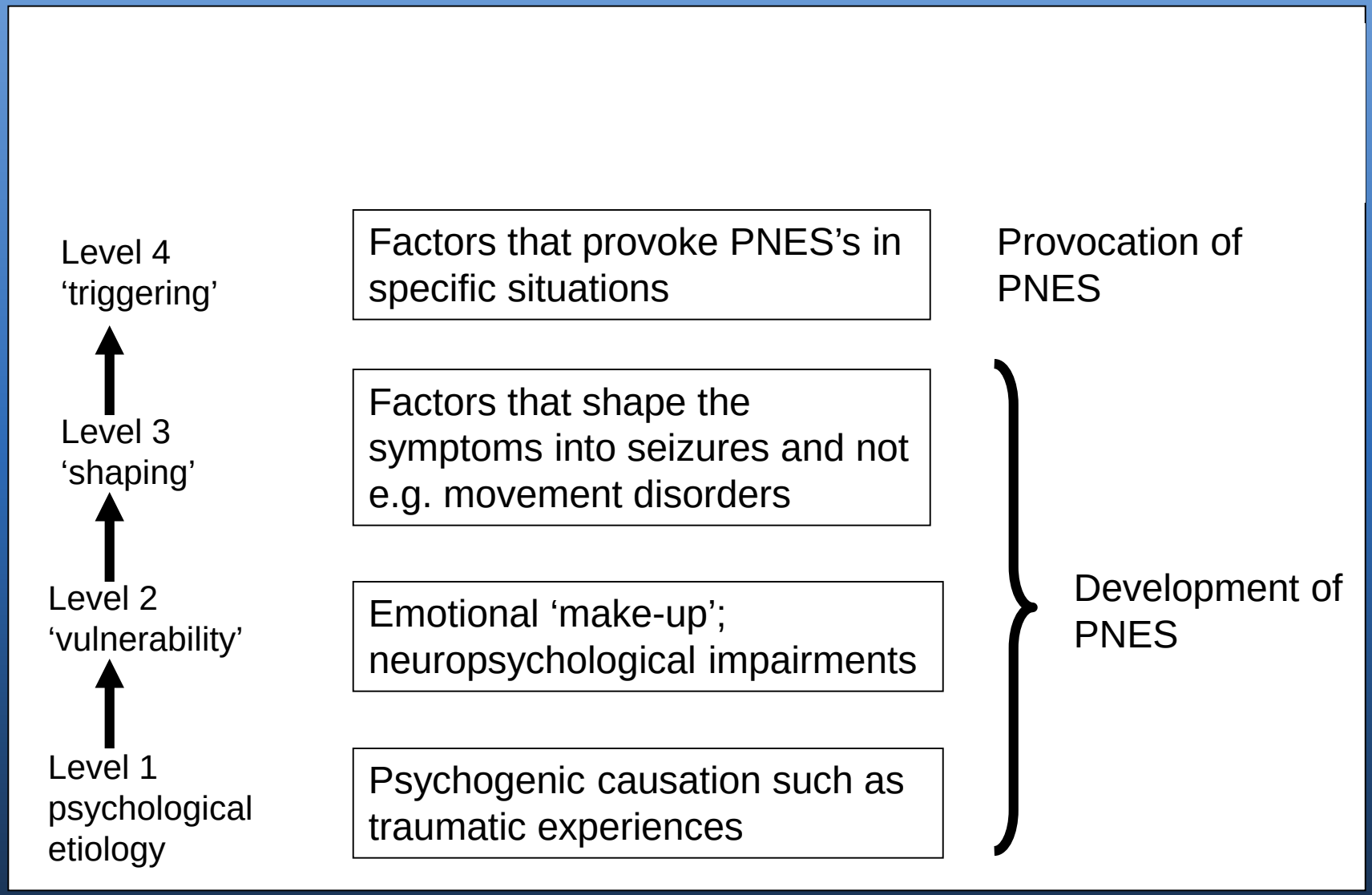
  broad assessment of psychological, psychiatric and social mechanisms is necessary

- Define the relationship and interaction between the factors in a model

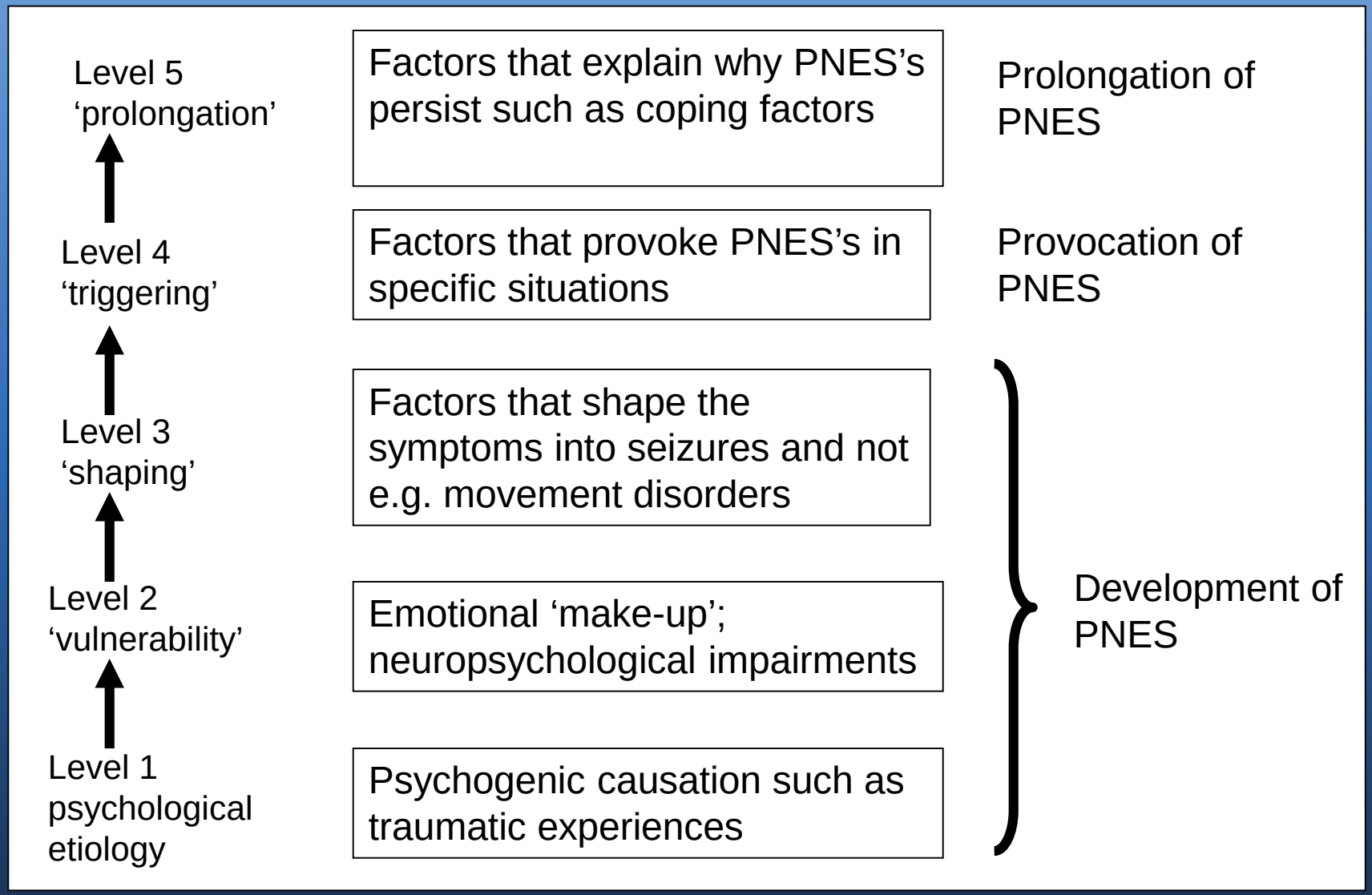
Model of psychological factors involved in PNES



Model of psychological factors involved in PNES



Model of psychological factors involved in PNES



Second phase: what else could PNES be?

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Pitfalls during the diagnostic proces

- Diagnosis in two phases, transfering the patient from a medical point of view to focussing on psychogenic factors.

- Cooperation of the patient (and relatives) is essential and there are many pitfalls negatively affecting the willingness and motivation of the PNES patient to change

Pitfall: struggle with acceptance

- Conversion reaction: a strong tendency to pursue a medical explanation for the seizures as well as being reluctant to accept psychogenic explanations

Video

Pitfall: struggle with acceptance

- Triggers often not recognizable for the patient

Video

Help of technical devices: feedback of body signals

- Focus on level 4 of the model: ‘’triggering’’; provocation of PNES

- The autonomic nervous system
- Using a smart watch…?

Autonomic nervous system

- The nervous system can be divided
  - part for ‘voluntary’ actions
  - part for not voluntary actions -> autonomic nervous system.

- The main goal of this system is homeostasis
  (to keep the interior the same / optimal adapted even when the surroundings changes).

- Two subsystems: sympathetic and parasympathetic

- Sympathetic: adaptation to extra activity
- Parasympathetic: adaptation to rest / relaxation (but for example activation of gastrointestinal system)
  - Influenced by vagal nerve, so also called vagal system

Autonomic influences on heart

- Heart beats involuntary (by sinus knot, own beat frequency).
- This intern frequency can be accelerated (by sympathetic influence) or decelerated (by parasympathetic influence)
- The sympathetic system also influence the atrioventricular conductance and the ventricular excitability and contractility.
- The parasympathetic system causes the opposite.
- Knowing this, we can understand that the heart rate, and the variability (HRV), tells something about sympathetic and parasympathetic state -> but not straightforward...

Heart rate variability

- Frequency-domain methods
- High frequency component (0.15 - 0.4 /sec). Component is partially made by breathing frequency (0.1–0.4 Hz). It is believed to be a representative for parasympathetic activity.
- Low frequency component (0.04 – 0.15 /sec). It is probably a measure for sympathetic activity (maybe with some parasympathetic influence).
- Very low frequency component (< 0.04 /sec), representing the thermoregulatory loop.
- LF/HF ratio; when higher represents more sympathetic influence.

- Power spectral density (PSD), using parametric or nonparametric methods -> power distribution across frequencies.

Heart rate variability

- Time-domain methods
  (based on variation of the beat-to-beat (RR or NN) intervals):

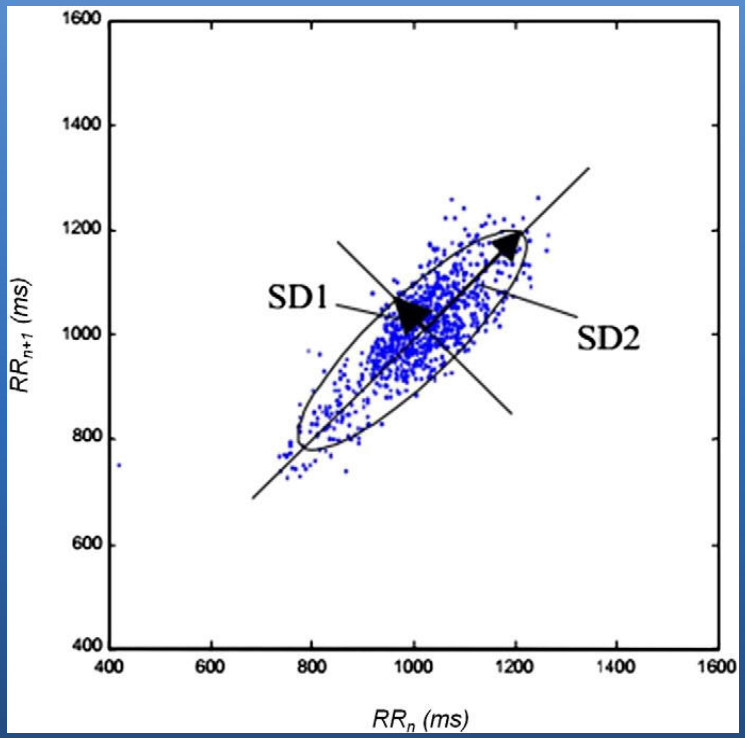
- SDNN, the standard deviation of all NN intervals. influenced by the duration of measurement. (Standard time for analyses 24 hours)
- SDANN, the standard deviation of the average NN intervals calculated over short periods, usually 5 minutes. Measure of changes in heart rate due to cycles longer than 5 minutes. Reflects all cyclic components responsible for variability.
- RMSSD ("root mean square of successive NN interval differences"). (Has relatively less problems from breathing effects). -> paraympathetic indicator (comparable with the HF component).
- SDSD ("standard deviation of successive differences"), the standard deviation of the successive differences between adjacent NNs.

Geometric methods: RR interval graphics

- sample density distribution of RR interval durations or differences between adjacent RR intervals

- Pointcaré plot (“Lorentz” plot): RR interval plotted against previous RR interval.
- The width of the point cloud (SD1 of T) indication for variance of the RR intervals. -> Measure for parasympathetic activity.
- The length of the point cloud (SD2 of L) indication of the extensiveness of the RR intervals. -> Measure for sympathetic and parasympathetic activity.

- Cardiovagal (parasympathetic) index (log (SD2 * SD1) or log (L * T))
- Cardiosympathetic index (SD2 / SD1 of L/T)



Some results of HRV in PNES

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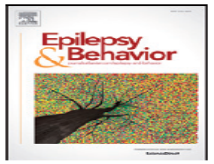

Clinical Research

Autonomic nervous system functioning associated with psychogenic nonepileptic seizures: Analysis of heart rate variability

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Methods: Heart rate variability measures were extracted during 1–7 days of video-EEG of 20 patients with PNES. Heart rate (HR) and HRV measures in time and frequency domains were calculated.

Results: Total of 118 PNES recorded

5-minute interval before PNES: HR significantly increased, whereas SDANN and VLF power significantly decreased. During PNES, significant increase in HF power, SD1, and SD2 were observed.

5-minute interval immediately following PNES: SDANN and VLF power significantly increased, and HR and SD1/SD2 ratio decreased, compared to the interval preceding PNES.

Conclusion:

PNES episodes are preceded by increased sympathetic functioning, followed by an increase in parasympathetic functioning during and after PNES.