# Dizziness, the Stress Response and Mindfulness as part of Holistic Management
# A tale of three dizzy Debbies…

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Hypatia Gold May2023

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# Dizziness, the stress response and anxiety: overview

- What is happening physiologically?
  - Helpful and unhelpful stress in vestibular disorders
  - Overlapping of vestibular/anxiety/PPPD/migraine pathways

- How it may prevent compensation and contribute to PPPD
  - Prevention and treatment

# Introductions…

Deb1


Deb2

Deb3

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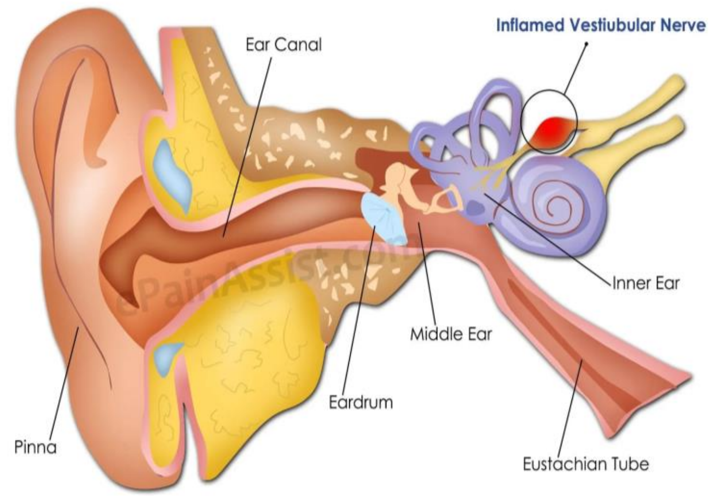
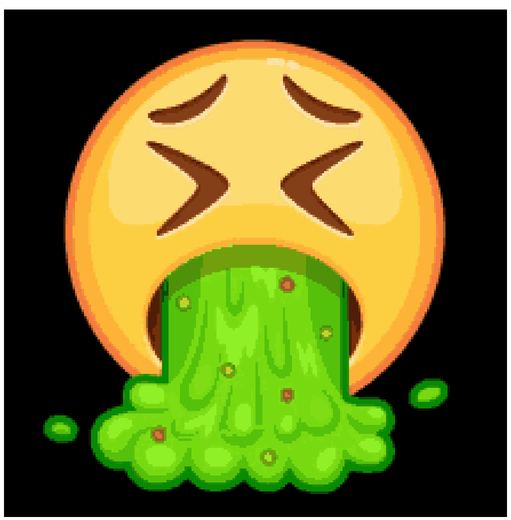
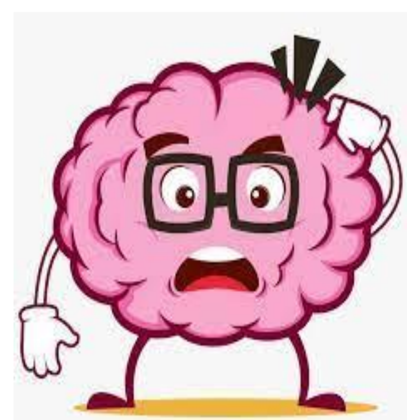
# One day…. Vestibular neuritis



BRAIN
'What is wrong??'



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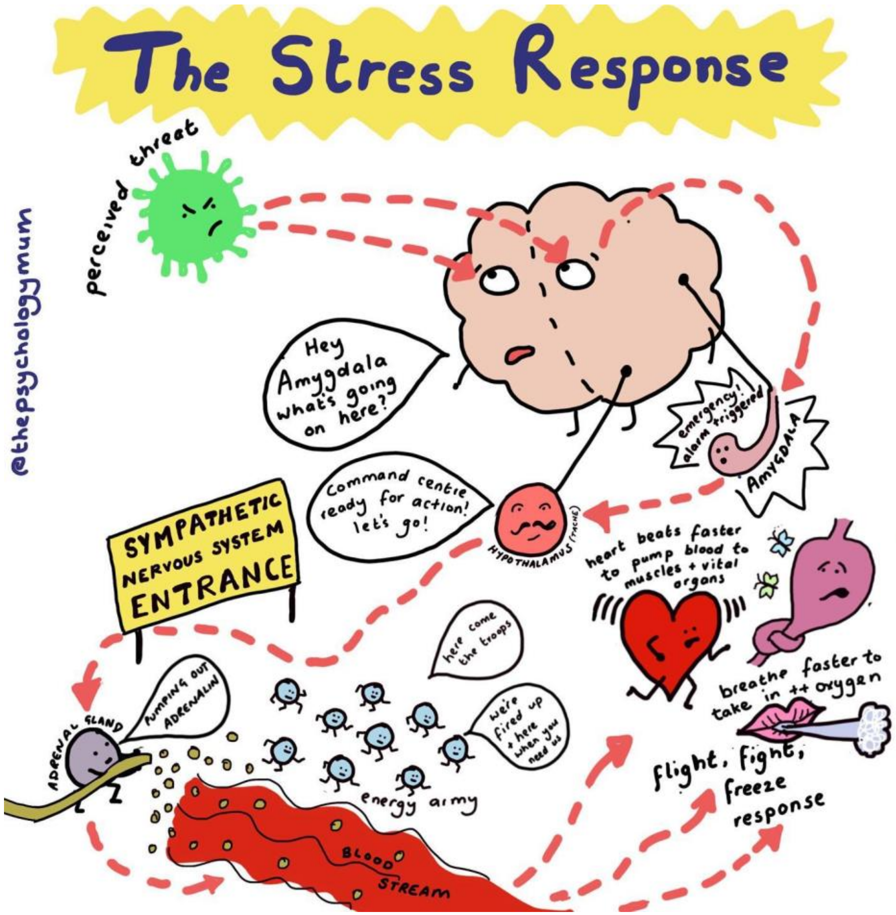
# What happened?

Deb1
- Saw GP that day
- Recovered independently

Deb2
- Phoned by GP
- Vestibular rehabilitation grounding and breathing exercises

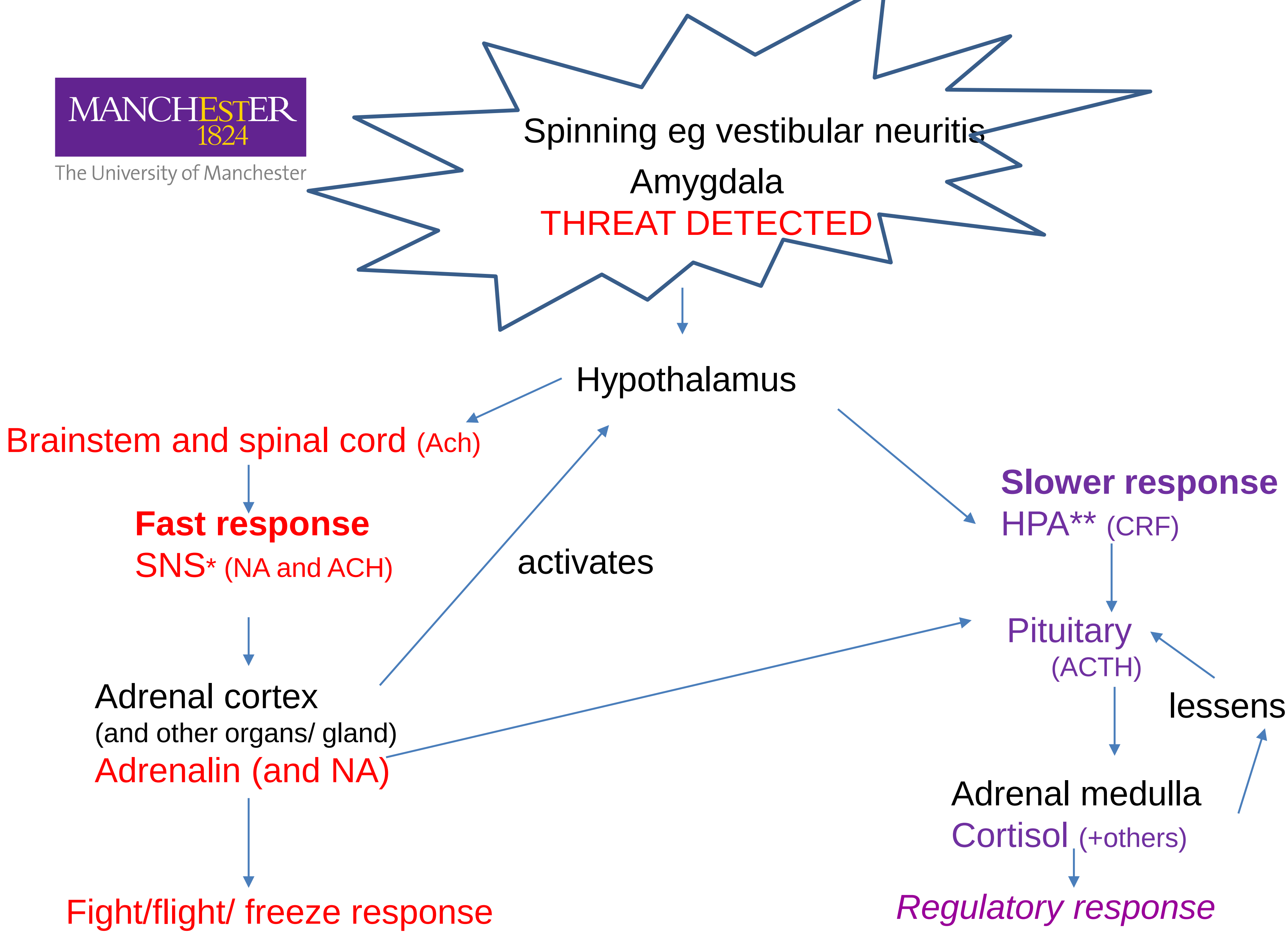
Deb3
- Couldn’t get through
- Dizziness got worse
- Palpitations
- Eventually given stemetil- didn’t help
- Follow up cancelled
- Persistent dizziness and anxiety




Brain: THREAT DETECTED.
We don't normally feel as if we are spinning! We cant balance!

ACTIVATE STRESS RESPONSE!

- SNS activation + stay safe
  - ***Very helpful acutely.. And can help in recovery***

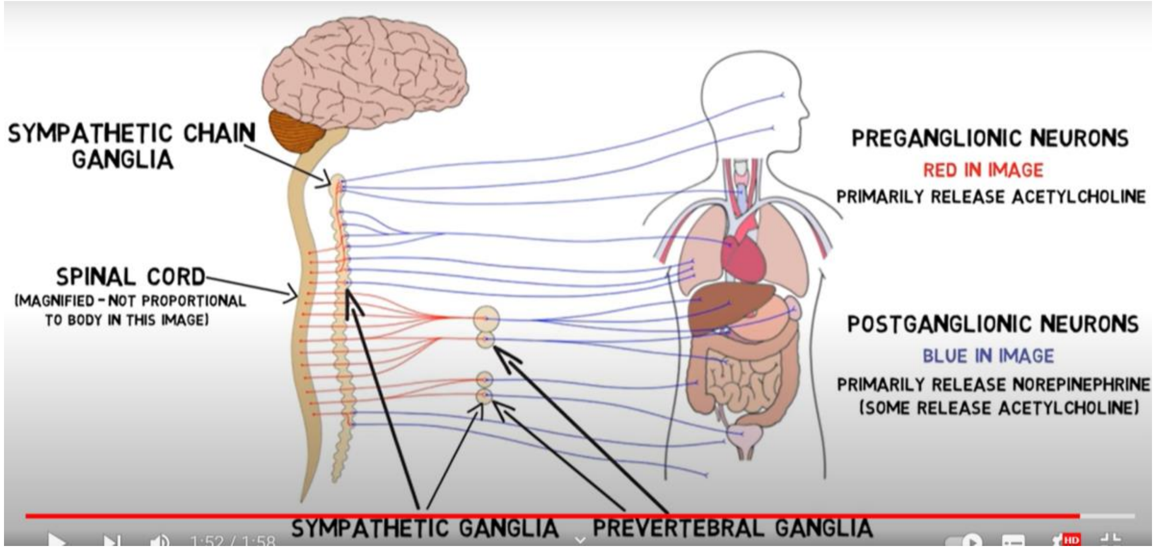



# Stress response pathways

*SNS: sympathetic nervous system
**HPA: hypothalamus, pituitary adrenal

# What happens?

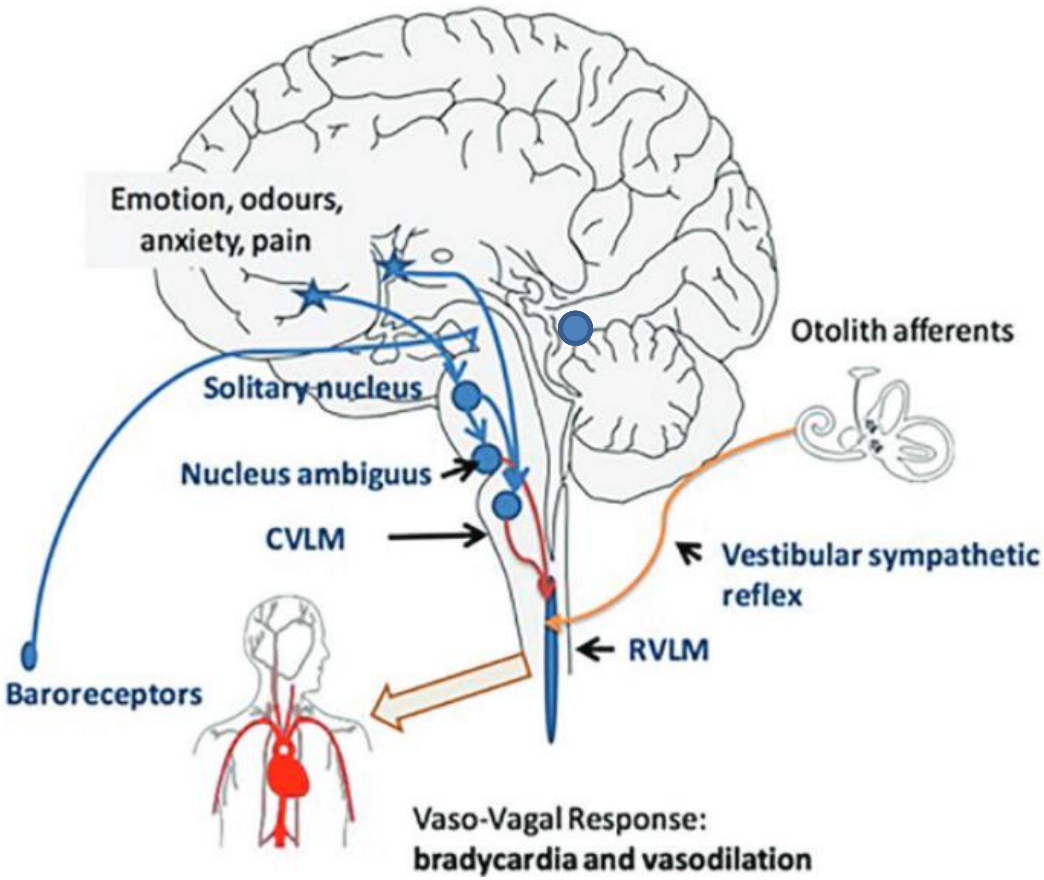
- **SNS stimulation**
  - Blood pressure
  - Blood circulation
  - Heart rate
  - Respiration
  - Circulation




https://www.youtube.com/watch?v=FNHRSXe5do8

- **HPA: acute**
  - *Regulates* body's stress response
  - Release of glucose for fast energy release
  - Sleep wake cycle
- **HPA: long term:**
  - Supressed immune response
  - Increase BP
  - Poor control of blood sugars and diabetes

# *Vestibulo-sympathetic reflex* via parabrachial nuclei
**(dorsolateral pons)**




PBN role in conditioned fear/anxiety response

Influences:
- Blood pressure
- Blood circulation
- Heart rate
- Respiration
- Circulation

Yates et al 2011, Sailesh et al 2018)

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# *Helpful* activation of *SNS* in response to dizziness initially..

→ acute adaptation response *(helpful)*

- Don’t move, stay in bed
- Environmental vigilance for ‘danger’
- Avoidance of things that may cause symptoms
- High risk postural control strategies
- Upweight visual input
- Internal monitoring of symptoms

- May also promote central compensation (Joels et al 2006)

# Stress responses ..

- **Good stress ☺**…
  - Something is wrong.. Action needed
  - Need to meet this deadline
  - Adrenaline secondary to exciting events!

- However.. Need to be able to turn this response off!

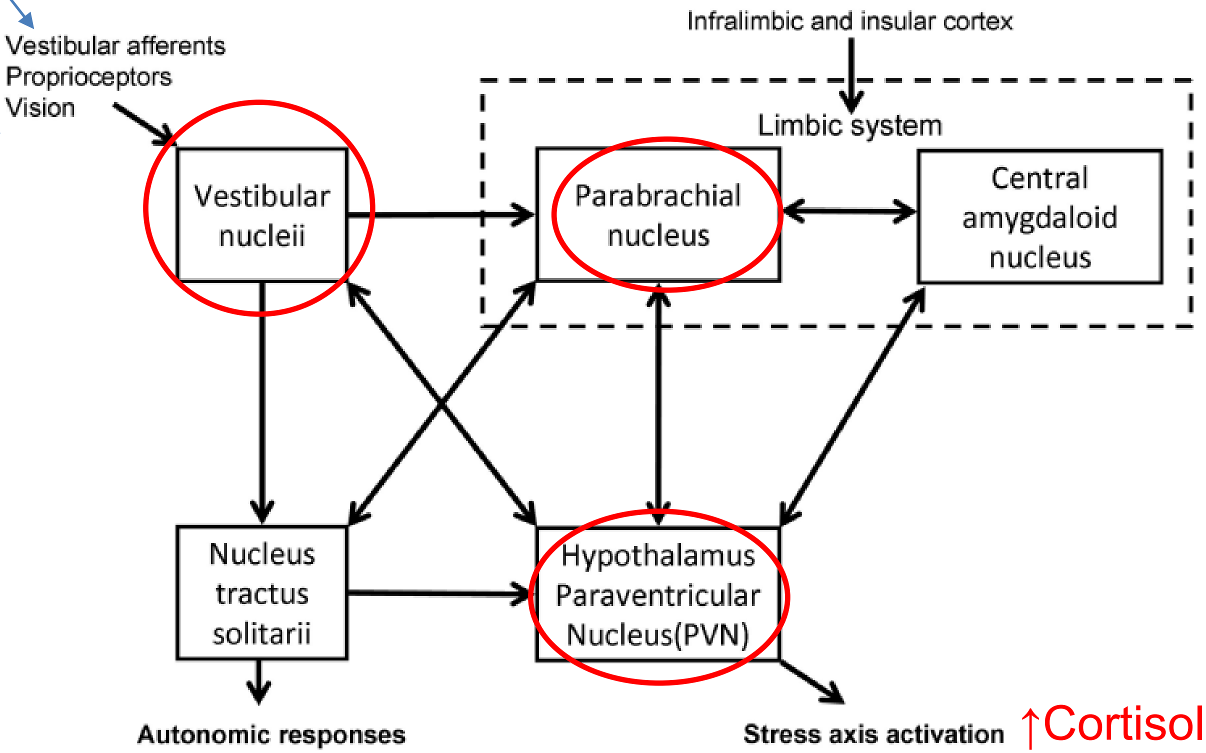
The Impala

Impala escapes and shakes off stress
https://www.youtube.com/watch?v=-QgglTik6G4

# Evidence for this? Varying results Healthy animals

Caloric/electrical stimulation in healthy animals

Review: Saman 2012




↑Cortisol

↑PVN firing (gpig) (Azzena et al 1993)

↑Arginine vasopressin (AVP) and ACTH (rat) (Horri et al 2001)

# Vestibular stimulation and stress response in *healthy humans*..

- Calorics in normals *increased* cortisol (Dagilas 2005)
- Rotating chair: ↑ levels of ACTH, Ad, NA (cf vestibular stress response)

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# What happens in vestibular dysfunction? Animal models: *varying results*

- Gpigs uvd vs sham:
  - ↑*salivary cortisol* (Gliddon et al 2003)
- Rats: uvd, sham surgery, no surgery (anesthetic control):
  - *no sig difference in serum cortisol* (Lindsay et al 2005)
- *Difficult to do these exps in humans!*

*Review by Saman 2012*

# Does the stress response help central compensation?

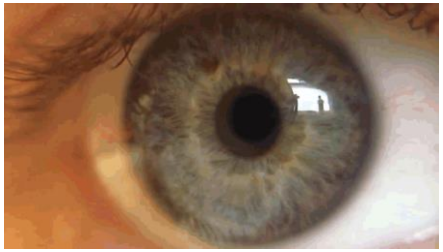
- Animal models: *'HPA axis activation facilitates* vestibular compensation (action of glucocorticoids (cortisol) via mvn)'
- ACTH injections following bilateral vestibular labyrinthectomy (squirrel monkey Igarahsi  et al1987)
- Methylprednisolone helped compensation (gpig Jerram 95)

- Adults: May also promote central compensation
  - 'only if the stress acts at the same time on the same neural circuit' (Joels et al 2006)

Saman 2012

# Bad stress..In animals

- **Excess stress** can *impair compensation*
  - – Restraint of a compensating animal (Yamamoto 2000)
  - – Anecdotally handling animals…

Saman 2012

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# Bad stress.. humans


- ‘Vestibular stress’ + additional stressor or..
- Extreme acute stress response or..
- Chronic stress response
  - **May prevent/slow down compensation (Kohl)**
  - **May lead to constant low level symptoms = PPPD**
  - Other health issues eg diabetes

- *? Nature of ‘stress’ (vestibular insult) and patients <u>ability</u> to adapt may be important*
  - General coping mechanisms/life events/support
  - Single episode of VN vs repeated MD/VM attacks

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# Dizziness and anxiety
## *(in <u>some</u> vestibular disorders..)*

- 700 patients with dizziness/vertigo (Szirmai 2011)
  - 45.7% anxiety disorder
  - 15.7% panic disorder
  - 11.4% depression

- Higher prevalence of anxiety (Eckhardt Henn et al 2008)
  - *Menieres (MD): 57%*
  - *Vestibular migraine (VM): 65%*
  - Normals : 20 %

- N= 144 (vestibular migraine (63%) and Menieres (37%)
  - 28% had PPPD (Neff et al, 2012)

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# Just deep breaths a bit longer!


**One more (complicated) cycle follows ☺**

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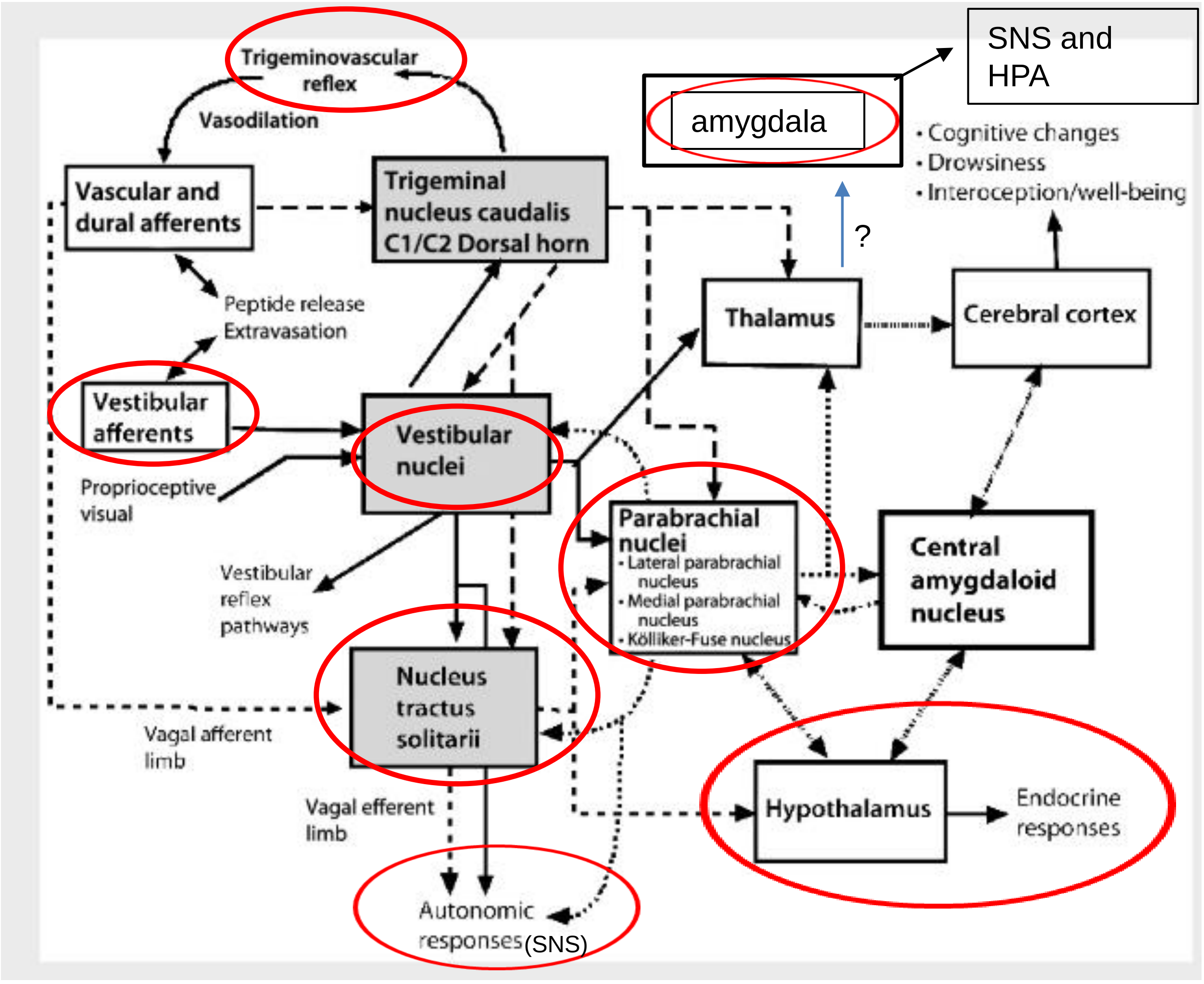



Modified from Balaban et al 2012

# Dizziness, stress/anxiety and vm pain…

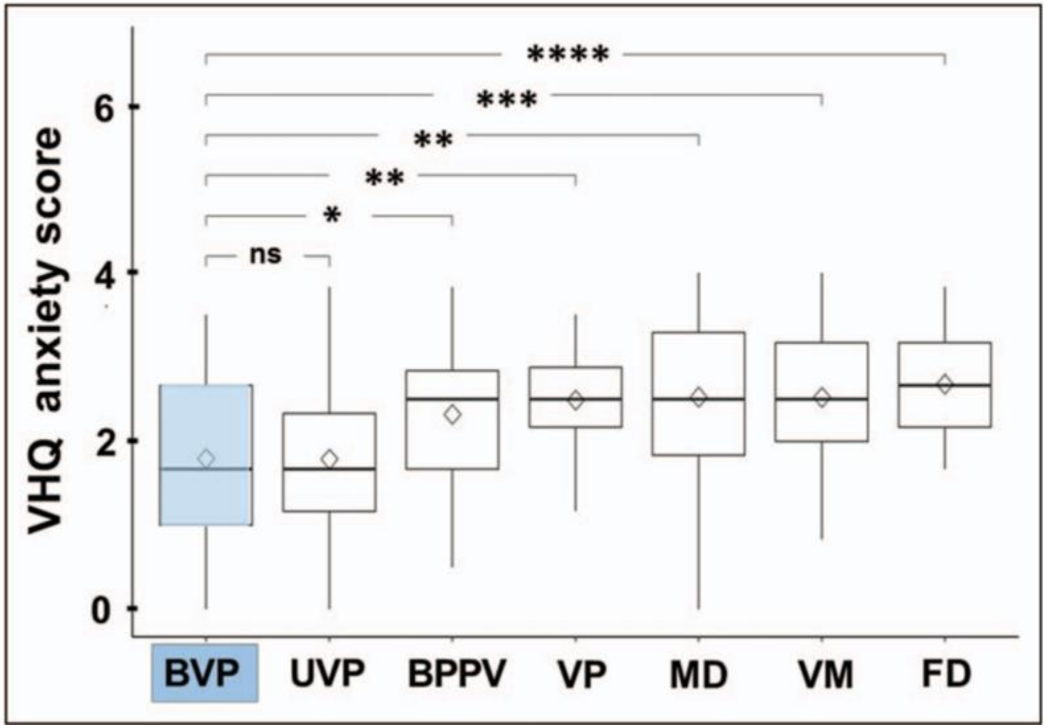
*Shared/ovelap pathways*

**PBN important role in fear and anxiety**

# What about those with BVL?

- Q: More likely or less likely to suffer from anxiety?

# Vestibular function is needed for anxiety?!




Modified from Decker et al

- Balance disorders which cause *episodic vestibular excitation or acute asymmetry*
  - ↑ anxiety /depression comorbidity and anxiety related to vertigo
- BVL (and chronic UVL):
  - *no increase in anx/dep comorbidity,* anxiety related vertigo, fear of heights or falling

Brandt and Dietrich

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# Oscillopsia and reported handicap

- ‘Retinal slip speed was negatively correlated with oscillopsia handicap score’ (Grunfield at al 2000)

- ‘Adaptation to oscillpsia may be related to:
  - *Tolerance* to retinal slip
  - Patients *feeling of control over their health’*

- Could this be a focus for rehab?

# Deb 3: The dizzy, anxious patient..☹

- Dizziness causes unpleasant symptoms with *cognitive* and *behavioural* consequences
  - Fear, worry.. **What if…. I go out and have a dizzy attack**
  - Avoidance, safety behaviours
  - Hyper vigilance
  - Failed to dispose of other acute (helpful) adaptation strategies
    - Can lead to PPPD

# PPPD: Barany Society

A. One or more symptoms of dizziness, unsteadiness, or non-spinning vertigo are present on most days for 3 months or more

B. Symptoms are present without specific provocation, but are exacerbated by:

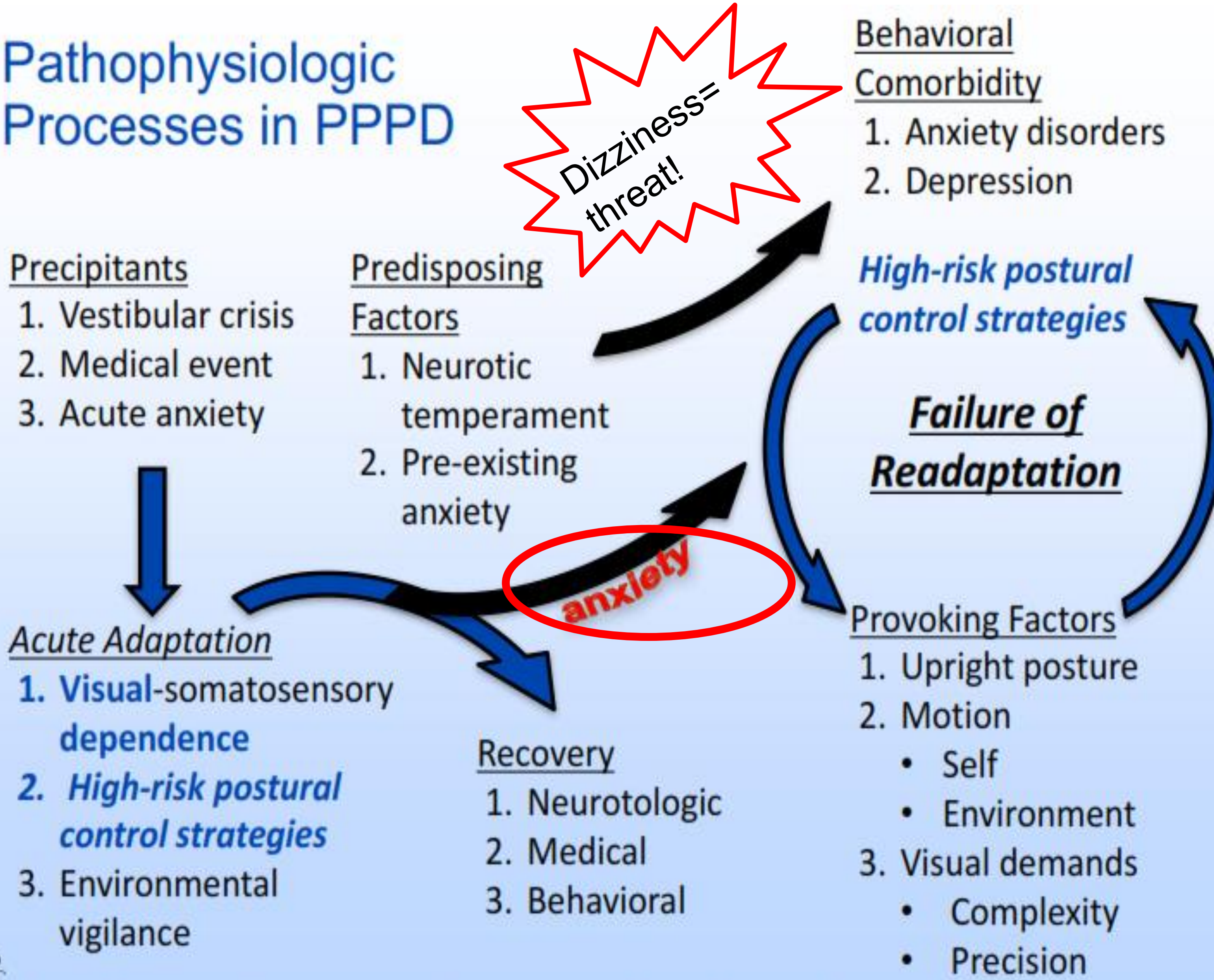
1. *Upright posture,*
2. *Active or passive motion without regard to direction or position, and*
3. *Exposure to moving visual stimuli or complex visual patterns, although these three factors may not be equally provocative.*

C. The disorder usually begins shortly after an event that causes acute vestibular symptoms or problems with balance, though less commonly, it develops slowly.

D. Symptoms cause significant distress or functional impairment.

E. Symptoms are not better attributed to another disease or disorder.

# Pathophysiologic Processes in PPPD




MAYO CLINIC

Staab, Behavioural Neuro-otology in Bronstein (ed), Oxford Textbook of Vertigo, 2013

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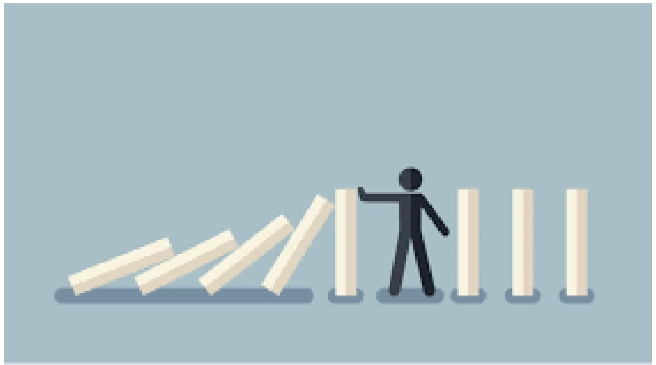
# Could we have prevented Deb3 getting anxiety/ PPPD?

# More support earlier?

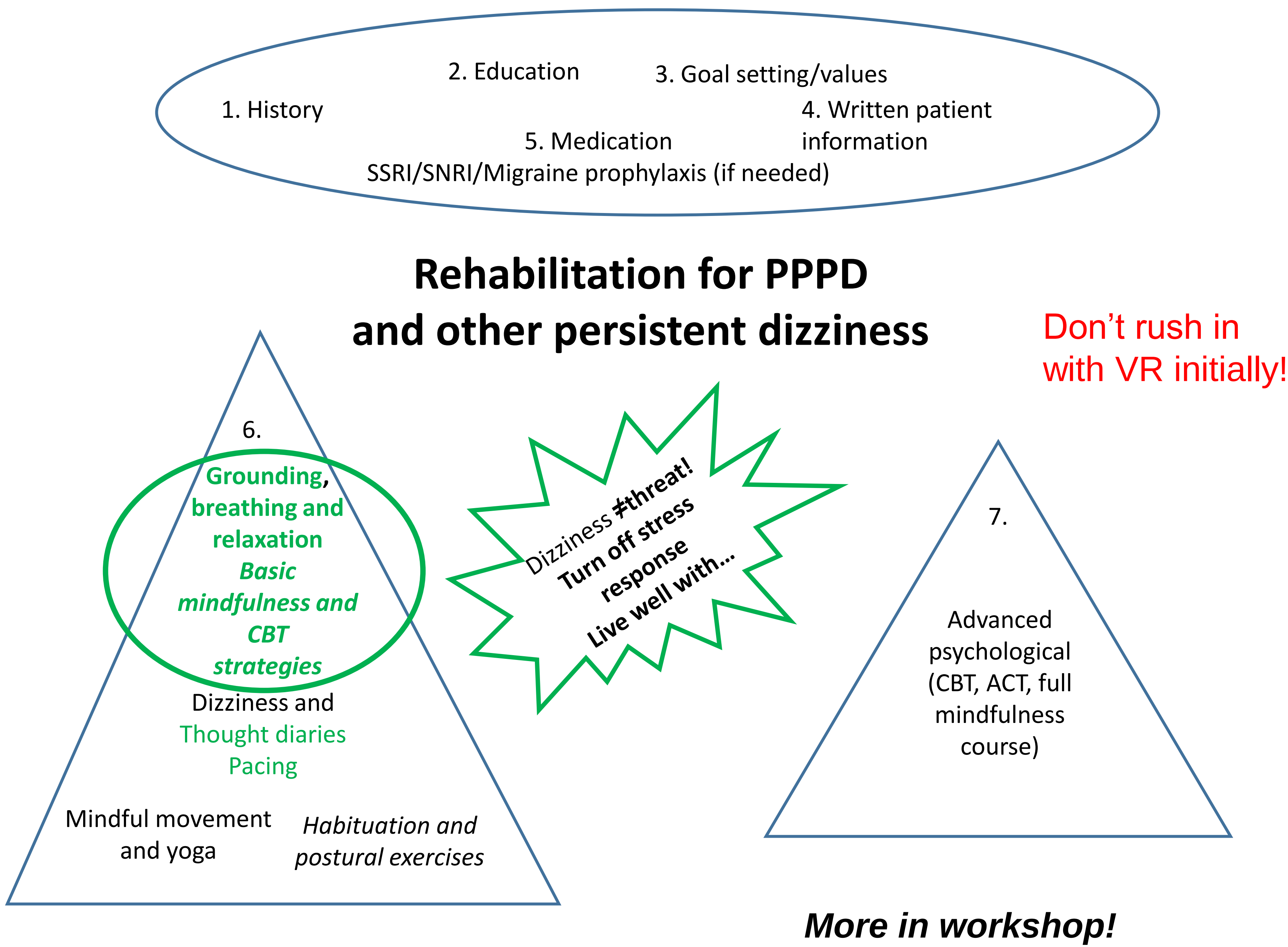
# Prevention of PPPD! (Trindade et al 2021)

- ‘PPPD: **neuroticism and anxiety:** stat sig differences to non-dizzy patients, *but not* recovered vestibular controls

- **‘Body vigilance** was increased in PPPD when compared with both recovered vestibular and non-dizzy patient groups’.



- ‘PPPD: **negative illness perception**…*’may be the key element driving the development of PPPD’.*



1. History
2. Education
3. Goal setting/values
4. Written patient information
5. Medication
SSRI/SNRI/Migraine prophylaxis (if needed)
Rehabilitation for PPPD
and other persistent dizziness
Don't rush in with VR initially!
6.
Grounding, breathing and relaxation
Basic mindfulness and CBT strategies
Dizziness and
Thought diaries
Pacing
Mindful movement and yoga
Habituation and postural exercises
Dizziness ≠threat!
Turn off stress response
Live well with…
7.
Advanced psychological (CBT, ACT, full mindfulness course)
More in workshop!

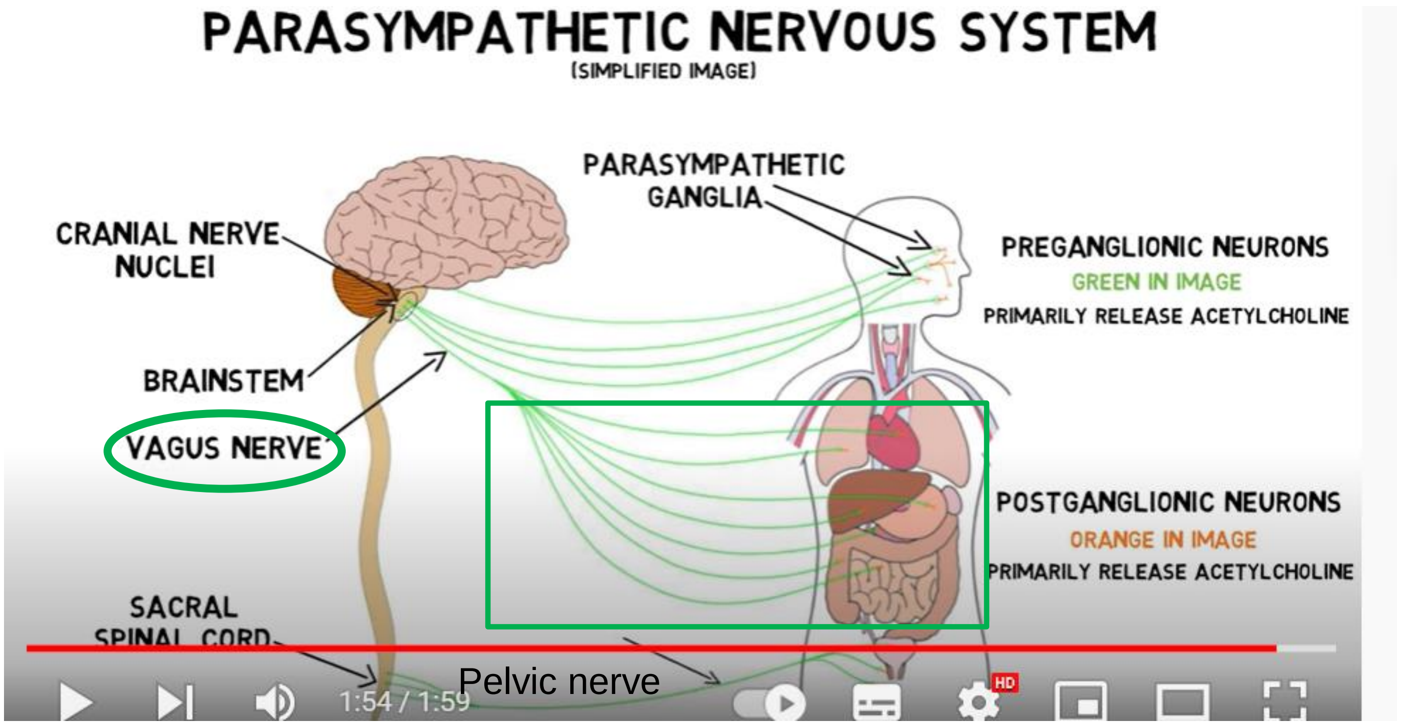
# What do we all need now?

# Parasympathetic/(rest and digest) nervous system *and the vagus nerve*

Brainstem-vagus nerve:

- Heart
- Lungs
- Liver and digestive organs

- Slows heart and respiration rate
- Lower blood pressure
- Promotes digestion
- Promotes relaxation
- Immune system +



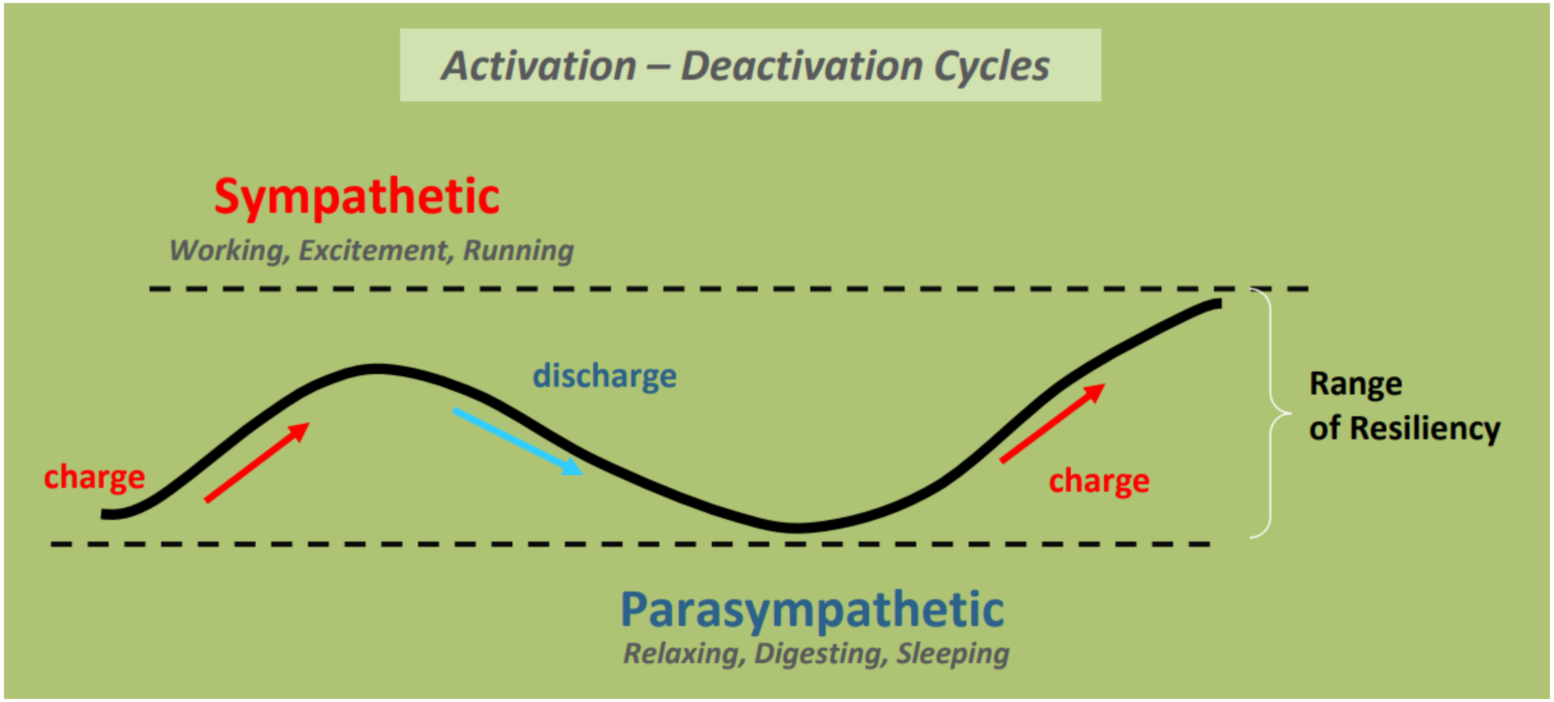

Pelvic nerve

Activate!

https://www.youtube.com/watch?v=ADnWvmOIBZI

Connections of vestibular system to dorsal motor nucleus of vagus nerve

# Find balance..




In persistent dizziness:

- Overactivation of SNS/HPA
- Underactivation of PSNS

From Bunce, Dandelion seed conference 2017

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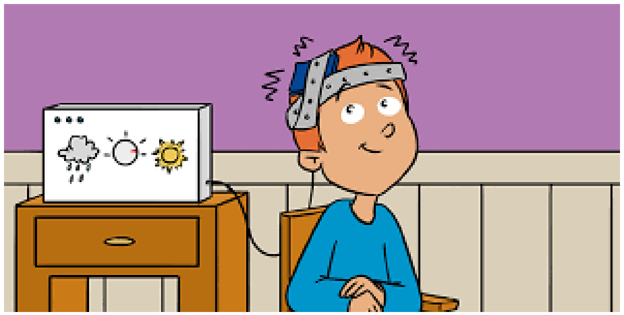
# Helpful vestibular stimulation?!



- ‘Hanging beds were used to stimulate vestibular system by ancient Greek  to ↓ pain and to induce sleep.’
- ‘Roman physicians used vestibular stimulation to treat mental illness
- Use of swings, rotating chairs to treat various pathological conditions.(all Sailesh et al)

- ‘Mild gvs helps mood control and anxiety
- Rocking mice sleep better!’ (Brandt and Dietrich)

# What happened to the 3 Dizzy Debs?!

- Deb1  had got better on her own
- Deb 2 was a little worried but received good advise and support, got better with VR
- Deb3: *eventually* referred to audiologist who knew how to rehab patients with PPPD..

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# Summary


- ‘Stress response’ is a normal physiological and *helpful response acutely*
- *Unhelpful if continues* and failure to dispose of acute adaptational strategies
- Can lead to anxiety +/- PPPD
- Educate all!
- Identification of those who may be prone to PPPD and *offer additional early support*

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