Clinically relevant Anatomical & Physiological Aspect of Balance Maintenance : Psychiatric aspect

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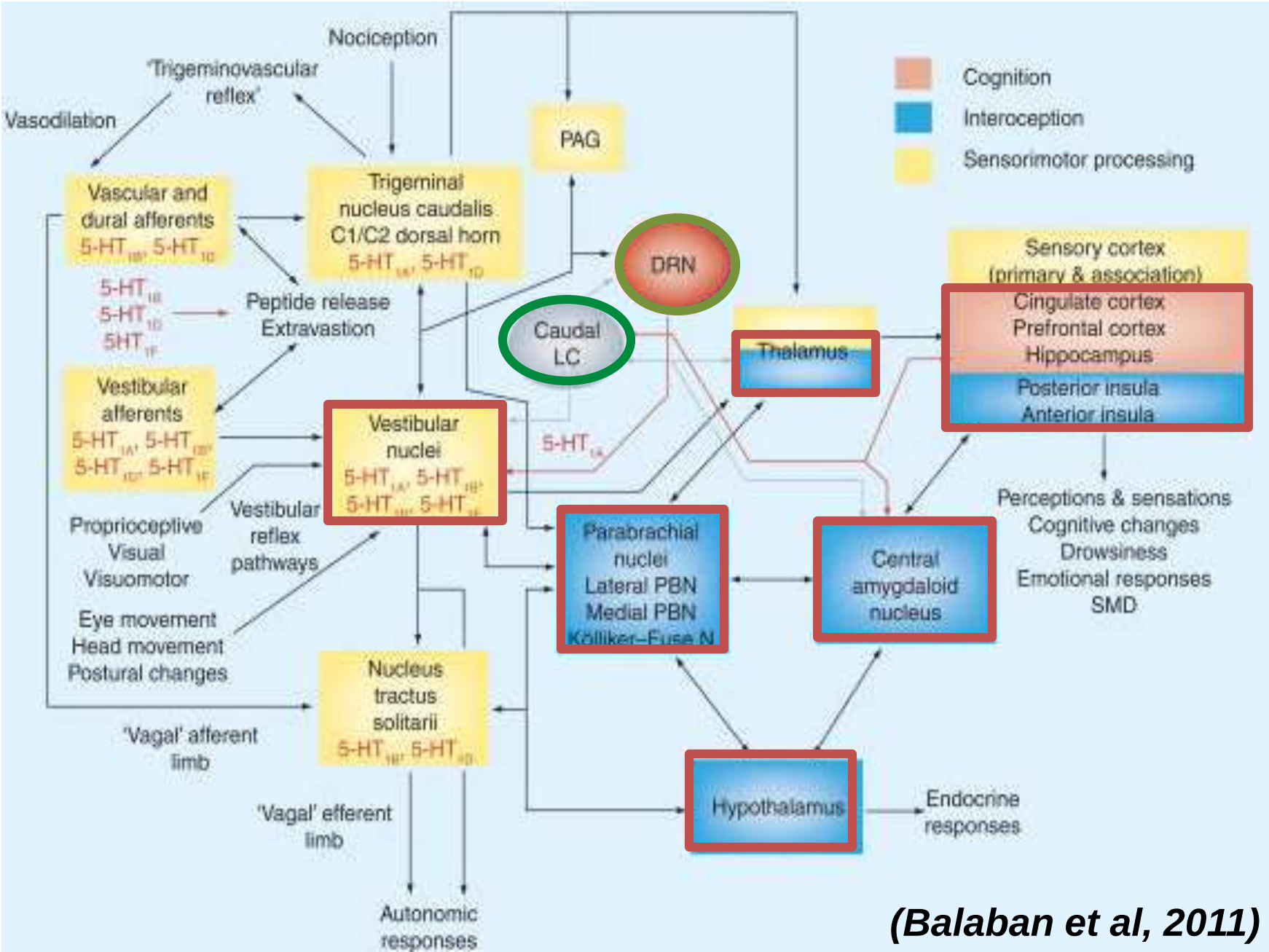
Dizziness & Psychiatric disorders

- Cross-sectional analysis of the 2008 National Health Interview Survey (NHIS) - individuals with vestibular vertigo relative to the rest of the US adults
- 3 fold increased odds of depression, anxiety & panic disorder
- 8 fold increased odds of ‘serious difficulty concentrating or remembering’ ***(Bigelow et al, 2015)***
- Best predictor of depression & anxiety was patient′s level of distress associated with symptoms of dizziness or vertigo ***(Hong et al., 2013)***
- Peripheral vestibular dysfunction has been linked to depersonalisation /derealisation symptoms ***(Lopez et al 2012)***

Neuroanatomical circuits: balance maintenance



(Balaban et al, 2011)

Insula

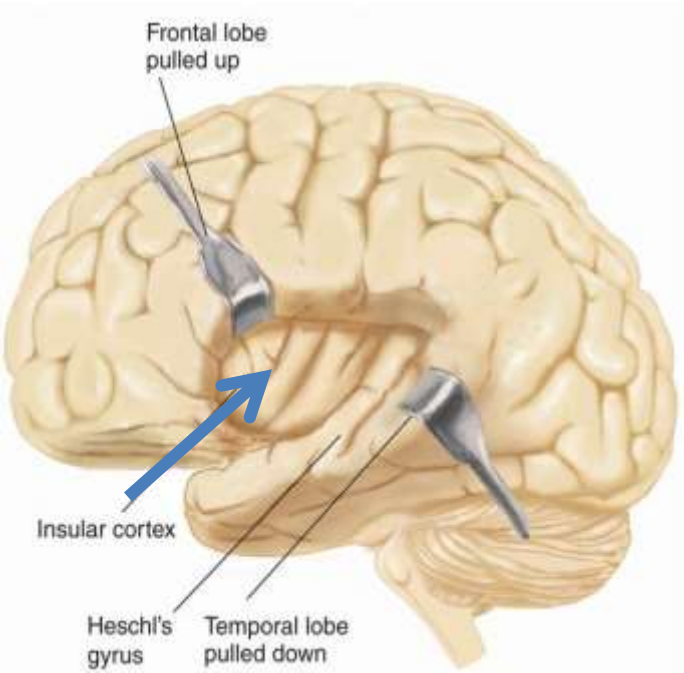
Emotion generation/processing

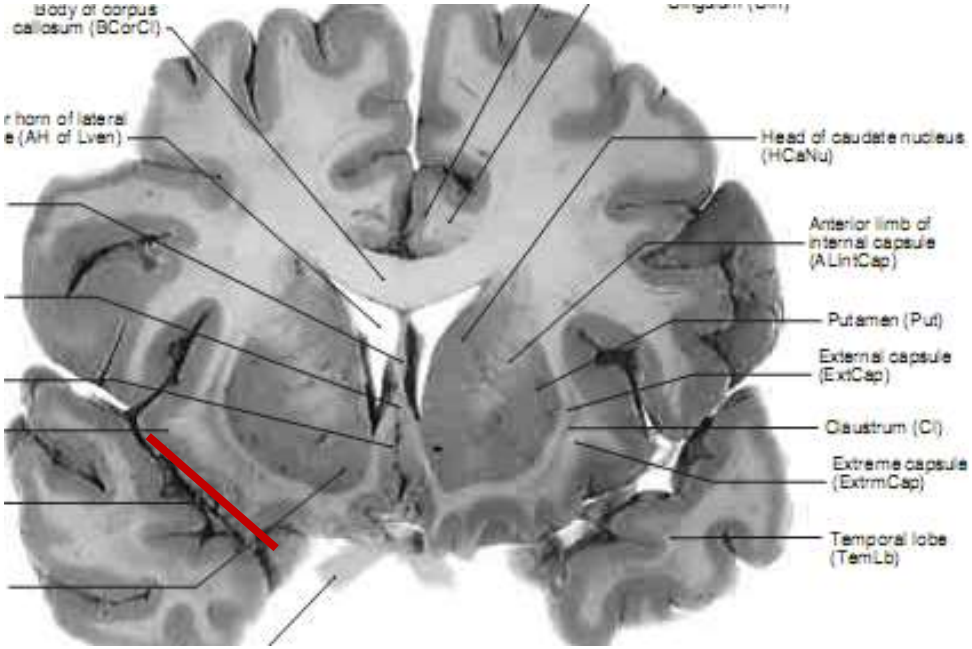
Anticipation of aversive stimulus

freezing & flight

identify facial expressions of disgust

Mediate shame, guilt





EMOTIONAL BRAIN

Emotion generating/processin regions

Decreased connectivity -

Emotion modulation regions

n in regions

identify fear s
generate fear

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emotion modu
attention cont

Deficiency – pathological anxiety

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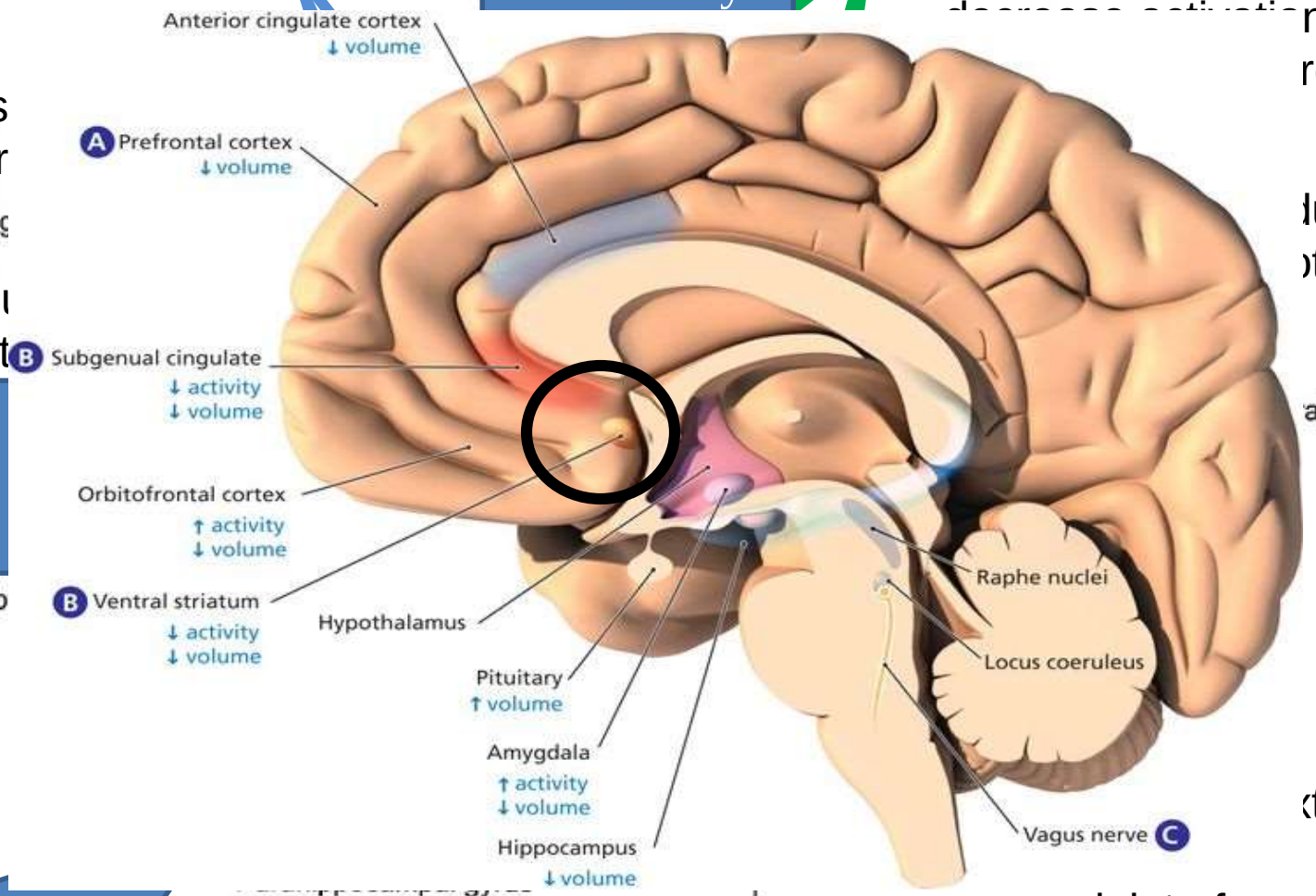


ippocampal formation

ctual

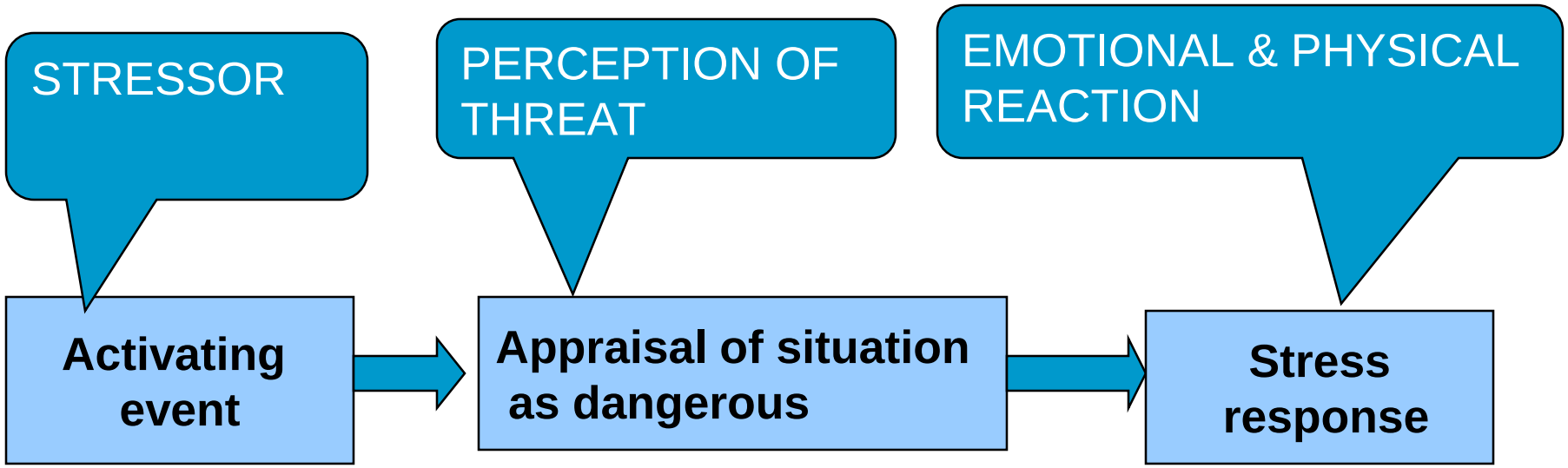
modulate fear response within context of threat & safety signals

Poverty stress trauma - reduced amygdala to prefrontal/cingulate connectivity -impaired top-down regulation of emotion processing

What is Stress?

- Stress is your mind and body's response or reaction to a real or imagined threat, event or change

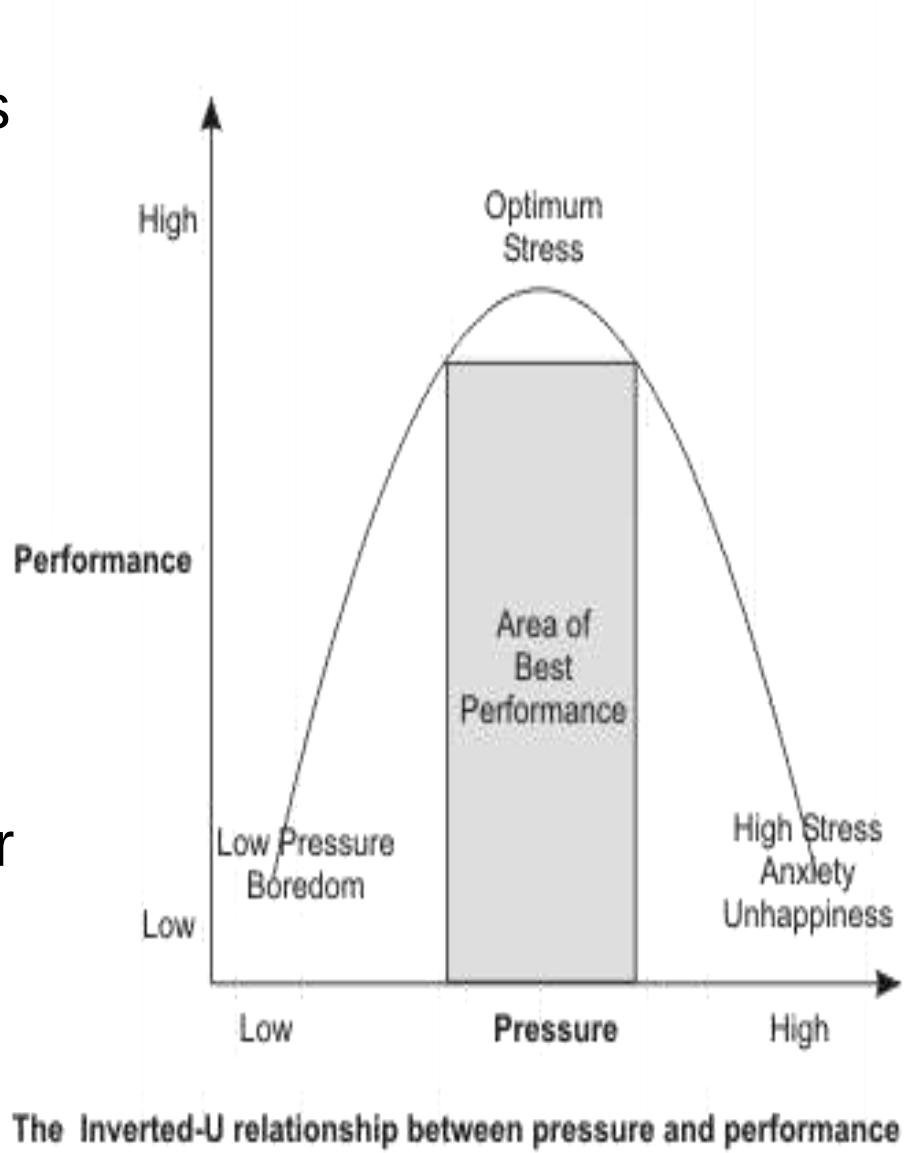
- The threat, event or change are commonly called stressors. Stressors can be internal (thoughts, beliefs, attitudes) or external (loss, tragedy, change)



Stress versus Performance

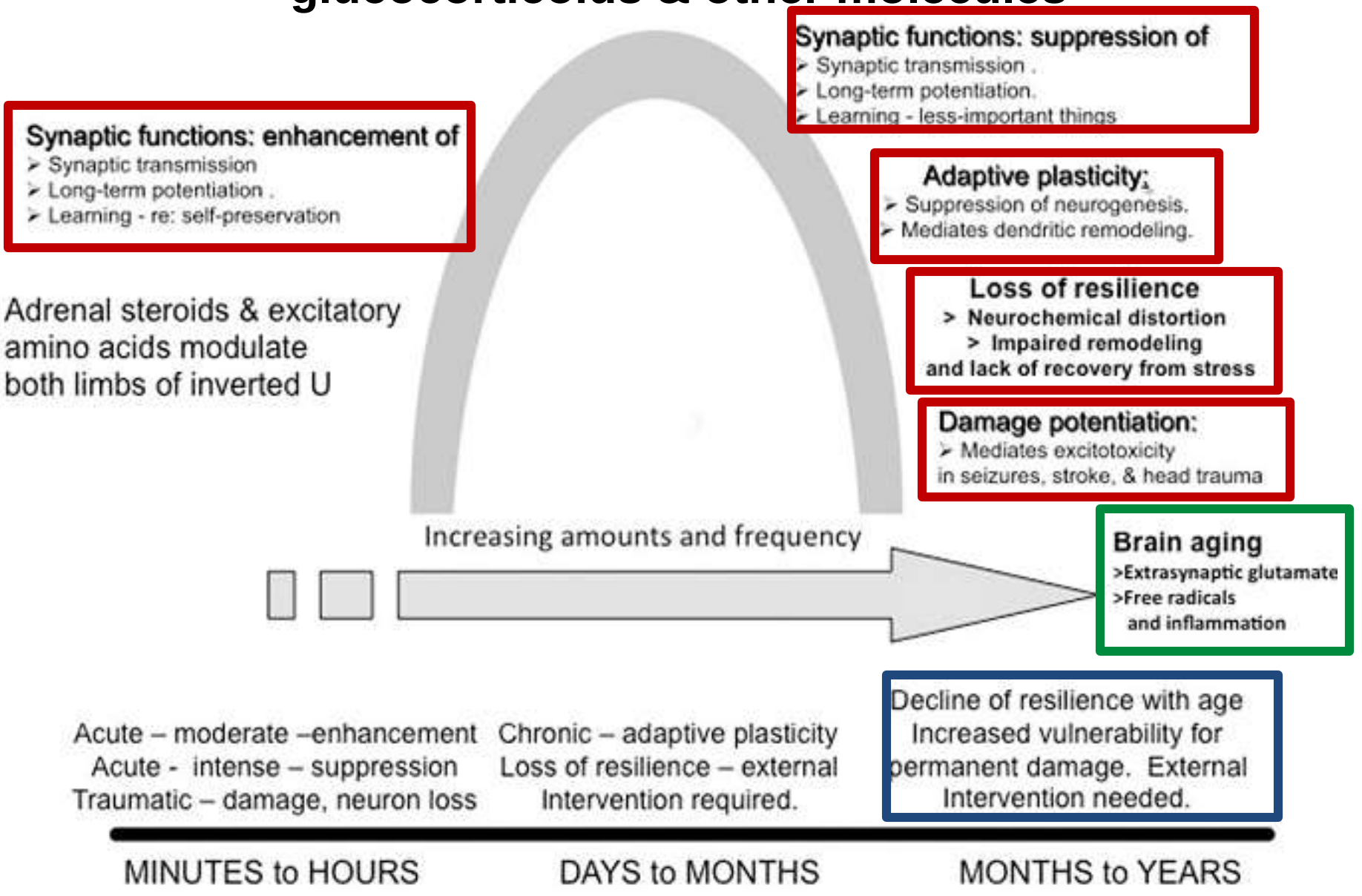
- In small doses, stressors can increase energy & alertness, keep us focused on problem at hand
- Healthful stress levels vary

- As the level of pressure increases, stress eventually surpasses our ability to cope with it in a positive way



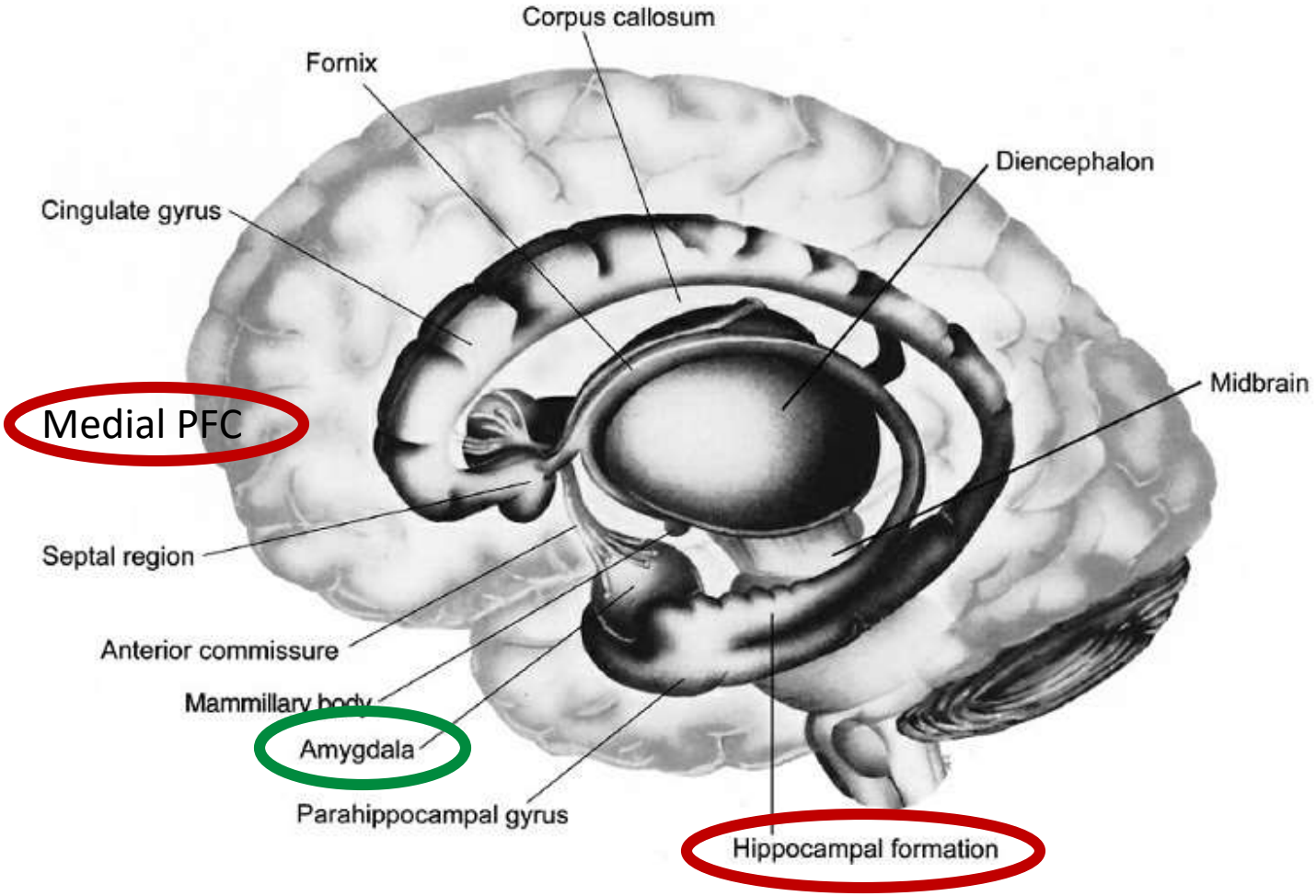
The Inverted-U relationship between pressure and performance

Effects of acute & chronic stress mediated by Glutamate, glucocorticoids & other molecules



(McEwen et al, 2015)

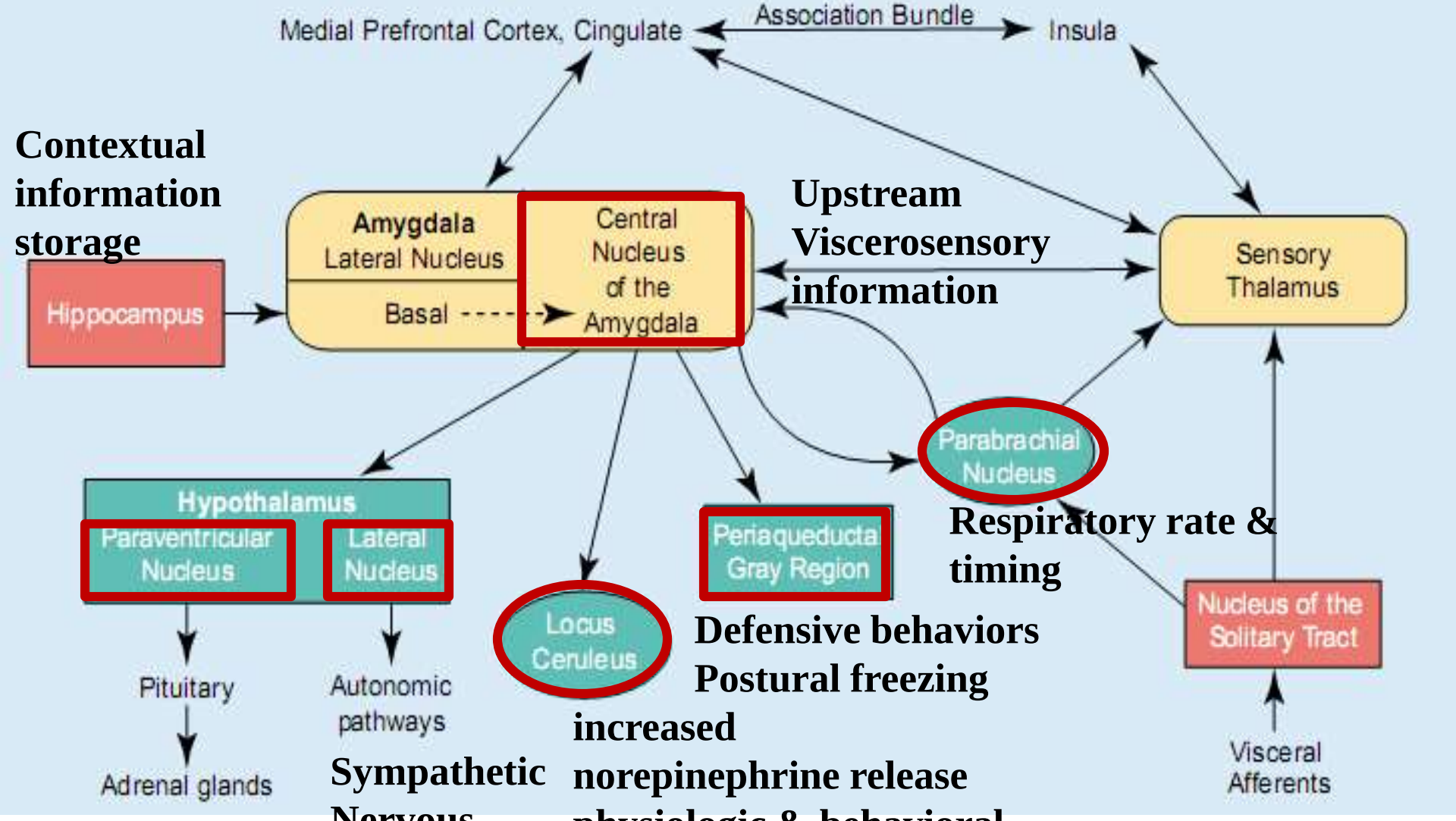
Stress : effects on Brain



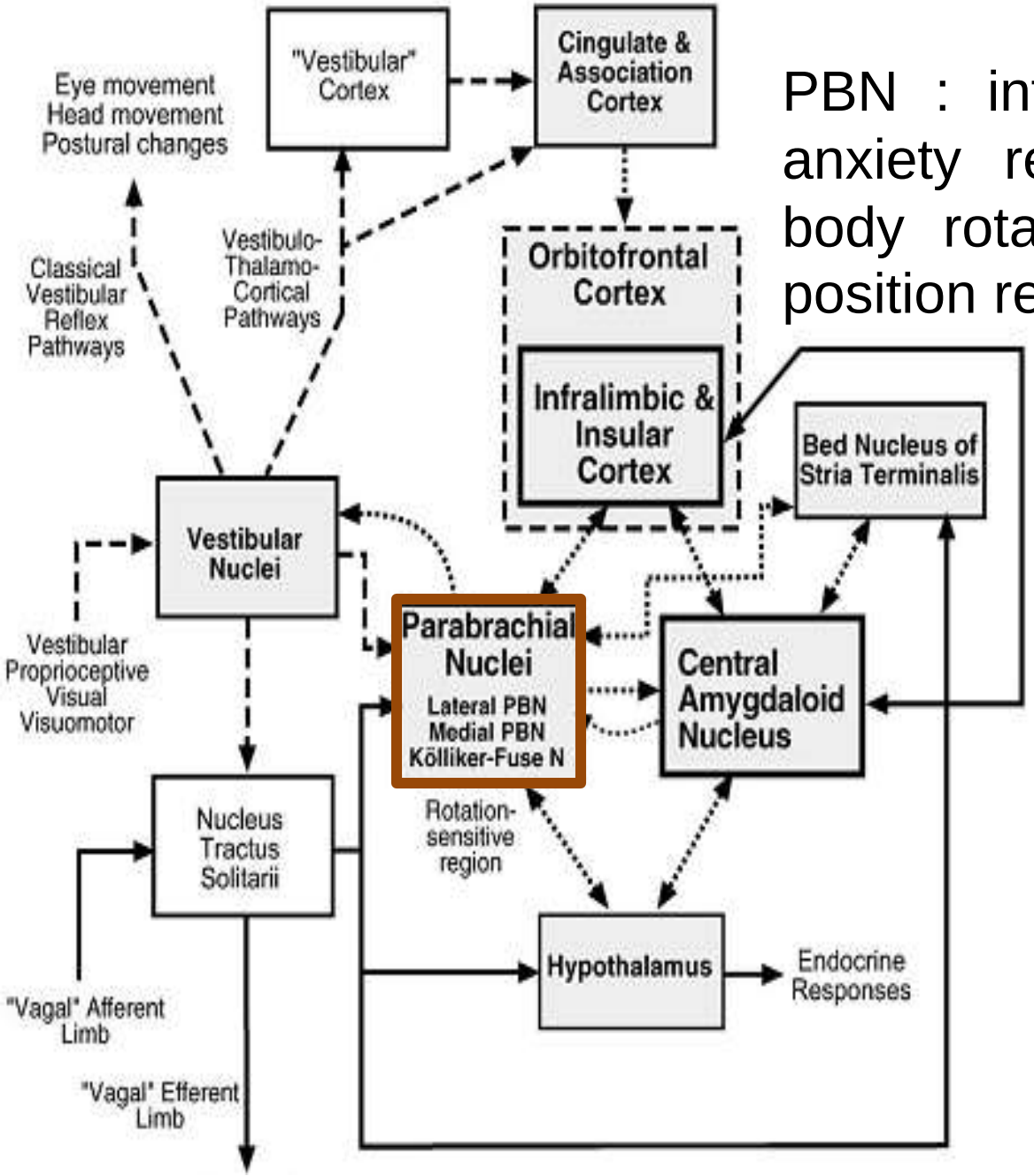
(McEwen et al, 2015)

Neuroanatomical Pathways of Viscerosensory Information in the Brain

Downstream –-neurocognitive processing &modulation of sensory information



(Gorman et al, 2000)



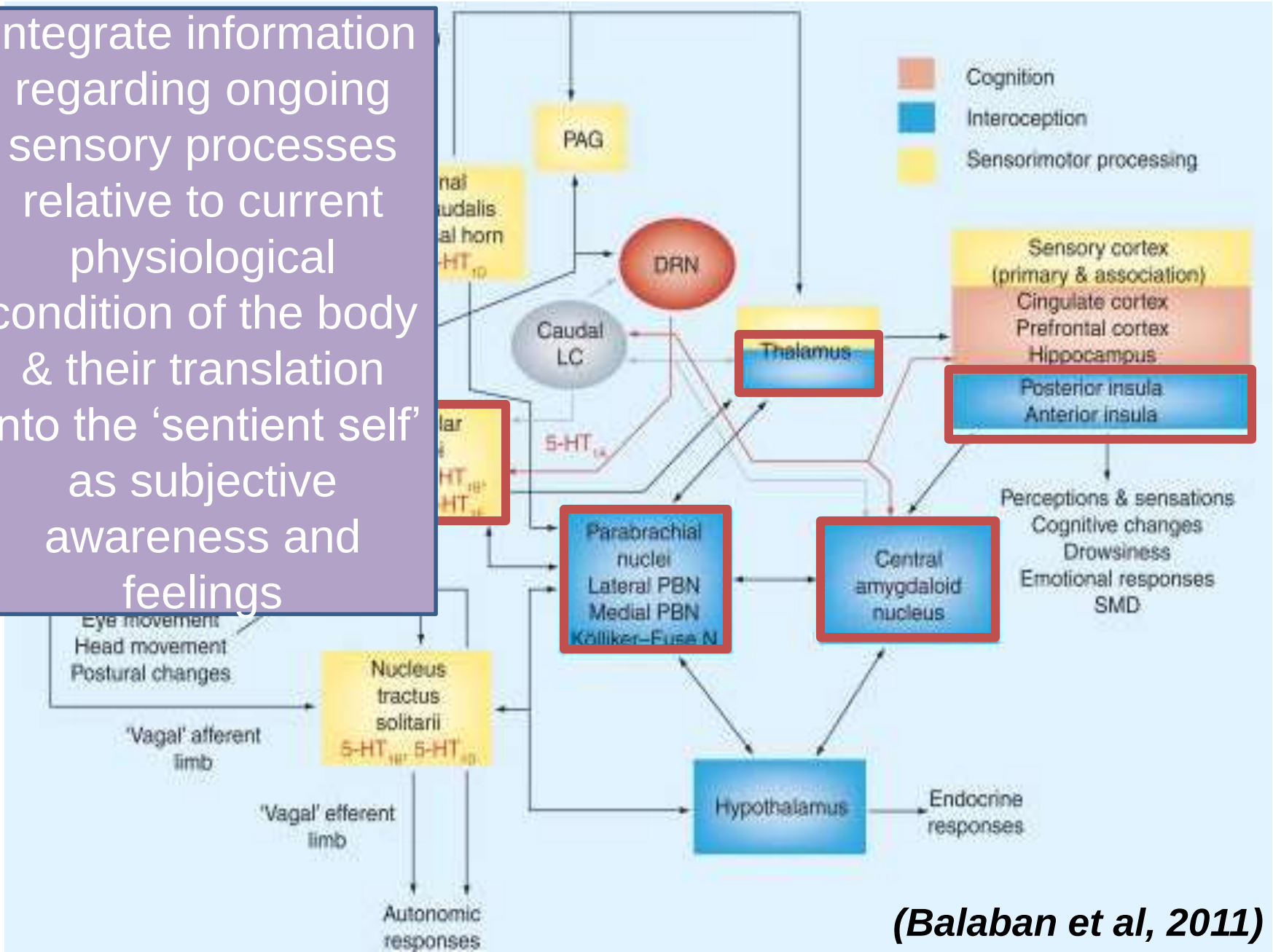
PBN : inform circuits mediating anxiety responses about whole body rotational velocity & body position relative to gravity

Context-dependent processing of body motion information due to reciprocity of connections among vestibular nuclei & structures comprising PBN network

(Balaban, 2002)

Neuroanatomical circuits: balance maintenance

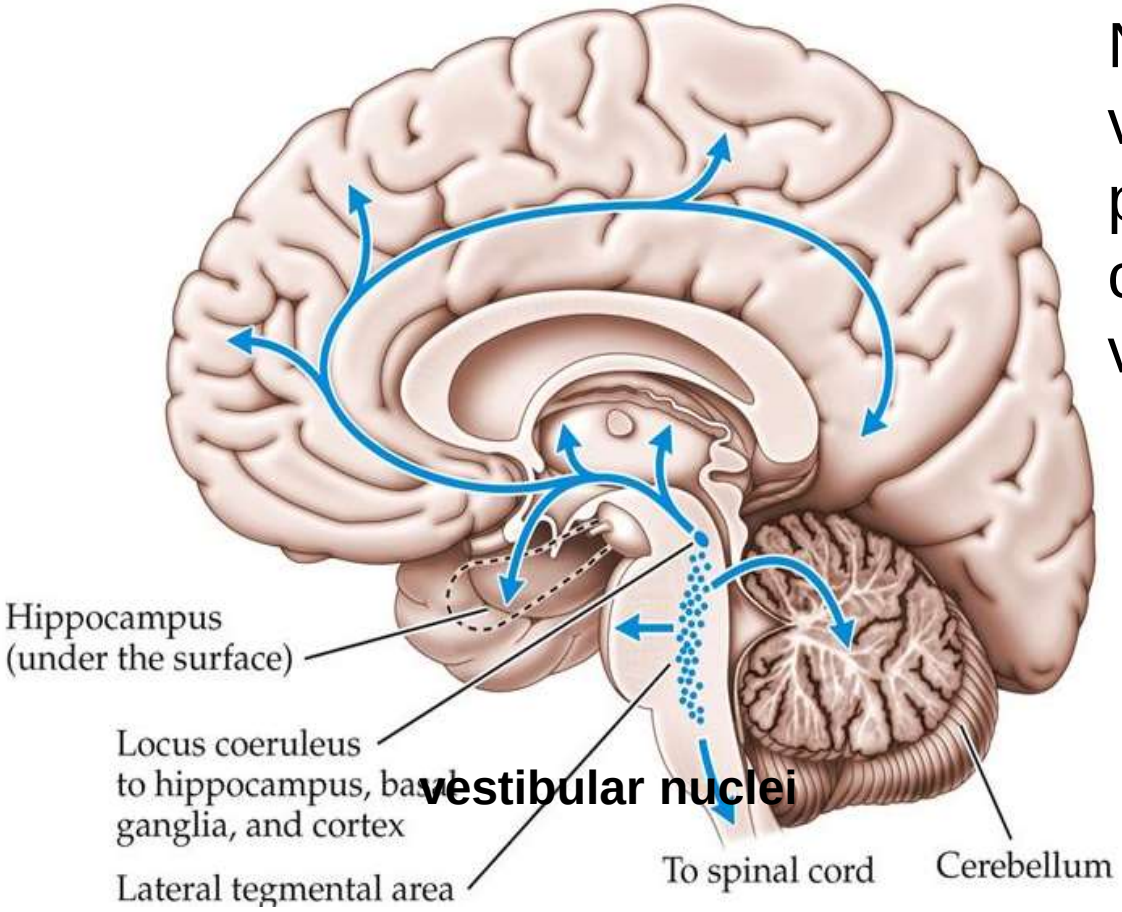
Integrate information regarding ongoing sensory processes relative to current physiological condition of the body & their translation into the 'sentient self' as subjective awareness and feelings



(Balaban et al, 2011)

NORADRENARGIC PATHWAYS

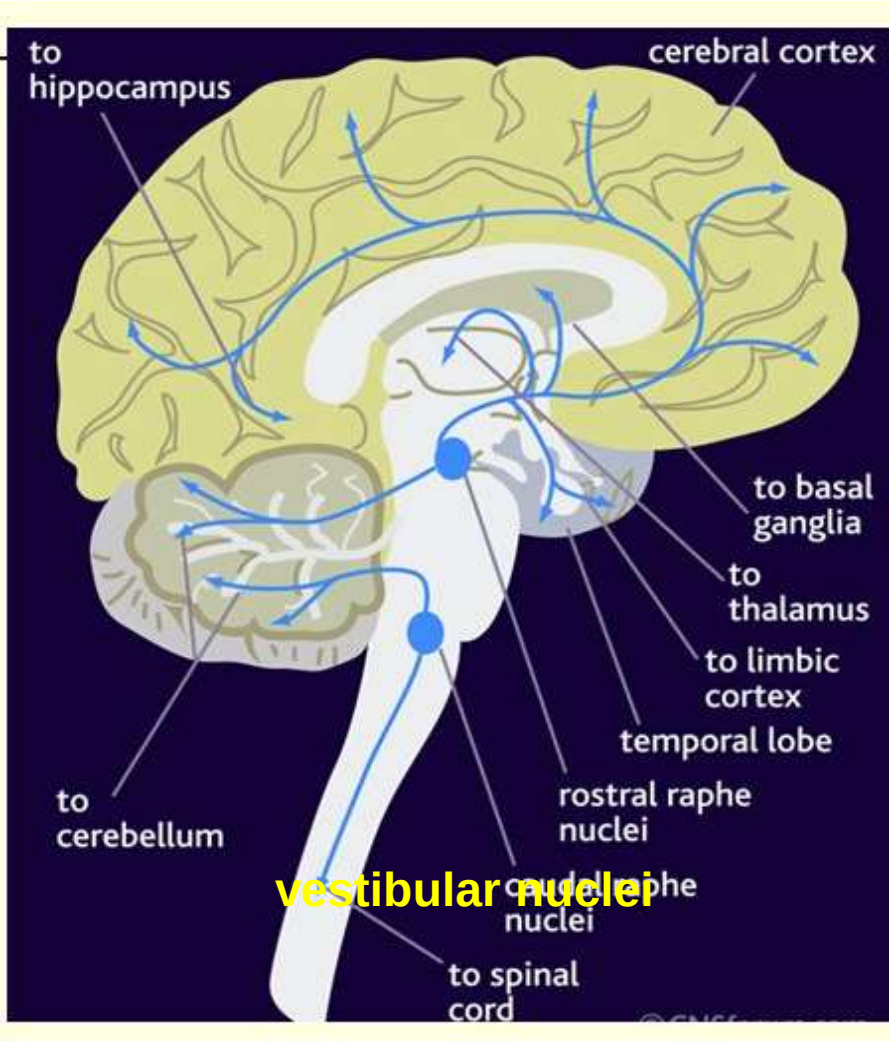
Dense projections from ACC & orbitofrontal cortices to locus coeruleus - regulation of affective states in parallel with modulation of postural control



Noradrenaline modulate vestibular-related motor performance with changes in alertness, vigilance & arousal

(Gurvich et al, 2013)

SEROTONERGIC PATHWAYS



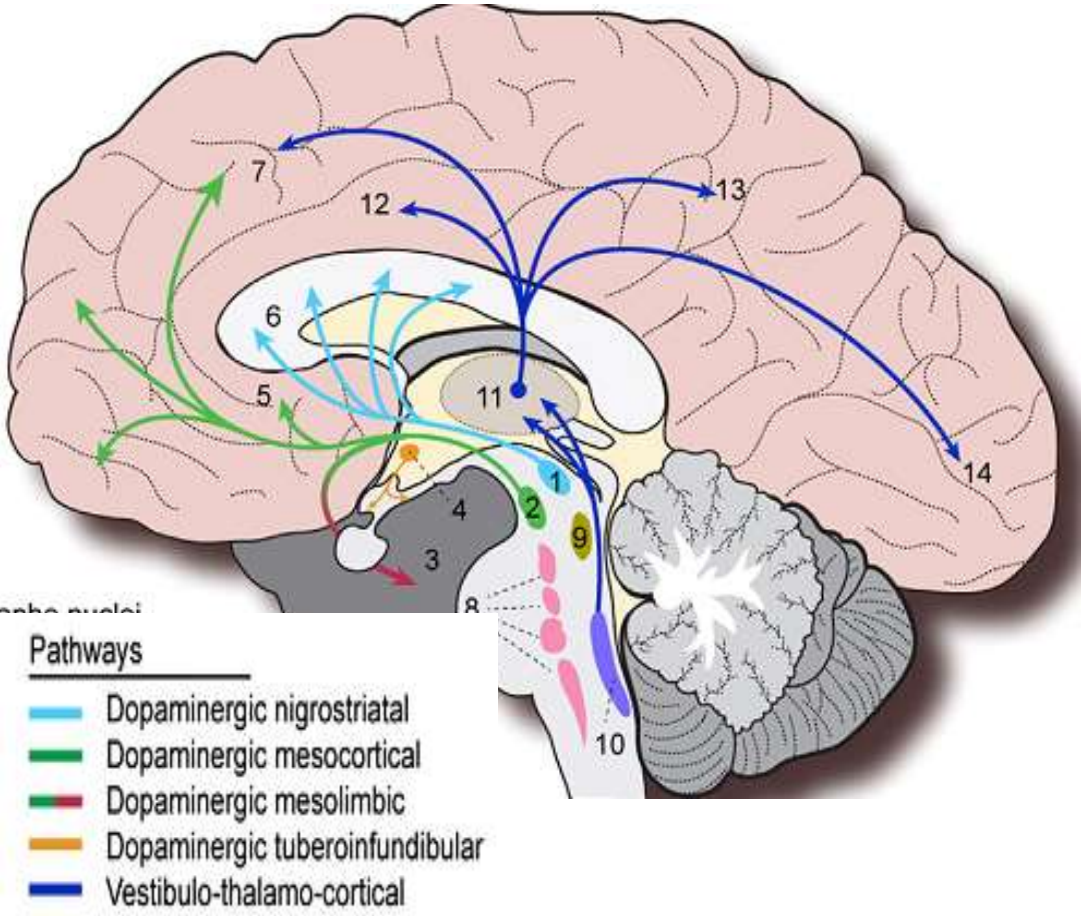
- Serotonergic & non serotonergic projections coactivate major structures in vestibulo-parabrachial pathway

- Vestibular nucleus neurons respond to stimulation by exogenous serotonin
- Rise in serotonin levels observed in medial vestibular nuclei after vestibular stimulation

- SSRIs efficacious in treatment of vertigo & withdrawal is associated with vestibular manifestations

(Licata et al., 1995; Johnson,1998; Halberstadt & Balaban, 2006; Gurvich et al, 2013)

Dopamine pathways



(Petrosini & Dell'Anna,1993; Vibert et al,1995; Gurvich et al, 2013)

- D2 receptors present in medial & lateral vestibular nuclei
- Dopamine might exert modulatory action on vestibular system, either by direct action on vestibular neurons or by modulation of GABAergic transmission
- Dopamine may play a role in recovery from vestibular asymmetries

CONCLUSION

- Psychiatric symptoms may be a “reaction” to distress of living with a vestibular disease
- May represent alterations to the neural circuitry that involves anatomical &neurochemical (predominantly monoaminergic) connections between the vestibular system & areas such as the hippocampus, amygdala & infralimbic cortex
- The vestibular system plays a role in controlling autonomic functions (e.g. heart rate, blood pressure) which may also trigger a range of changes in cognition, emotion & personality

THANK YOU