

NEUROBIOLOGY AND PSYCHOTHERAPY

from the perspectives of neuroscience and PBSP

Arnoud van Buuren, MD-PBSP-psychotherapist
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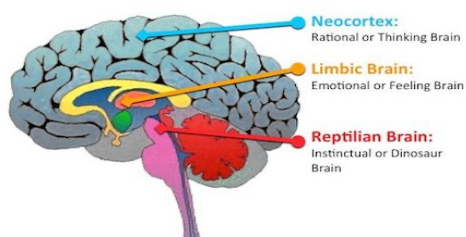
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regulation of emotions

- (almost) all psychiatric problems are associated with emotion-regulation (Panksepp)
- no regulation of emotion without brain, developmental en evolutionary context (Nicolai)
- there is a neurobiology of good care and one of bad care (Baylin)
- feelings take care of the homeostasis of every living creature (Damasio)

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one brain, three systems



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reptilian brain

- **brainstem:** all automatic (reflexive) processes, regulation of bloodpressure, breathing, heartbeat, vigilance

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limbic (mammalian) brain

diencephalon, midbrain (=septum, amygdala, thalamus-connectionpoint and hypothalamus-sexual and stress hormones, hippocampus-autobiographical memory, cortex cingularis-learning, processing motivation and emotions, memory, acc-consciousness of emotions) =limbic system: coordination of movement, sleep, appetite and satiation, production of neurotransmitters (serotonine, (nor)adrenaline, dopamine, other stresshormones), implicit (and trauma) memory

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neocortex

- **(frontal) cortex:** rationalizing, problem solving, verbal expression, explicit memory

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development of the brain

- brain develops in stages and development is 'experience dependent'
- first year of life: bottom-up: **vertical integration**: creation of the fronto-limbic circuit: 'the core social brain'
- toddlerhood: **horizontal integration** from the right brain to the left brain: emergence of language
- adolescence: **lateral integration** : myelinisation from back to front : speeding up transmission (100x)

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vertical integration (bottom-up)

- 0-18 months
- right hemisphere dominance: bodily and non-verbal, driven by emotions: 'core social brain'
- hard wired (genetic) and experience dependent (epigenetics)
- connecting limbic system and pre-frontal cortex (PFC)
- forming implicit memory (representations of interactions)
- creating the working model of self and self-other relationships

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horizontal integration

- in safe toddlerhood, shift from right to left hemisphere
- emergence of language: words, narratives, sharing experiences, processing information and giving meaning: understanding self and other
- activation left frontal: approach and positive affect (activation right frontal: avoidance and negative affect)

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lateral integration

- adolescence: hypermyelinisation: level of transmission speeds 100 fold up
- longer proces of thinking and planning before going into action
- 'vetopower' to the PFC, inhibiting limbic system
- capability of not doing

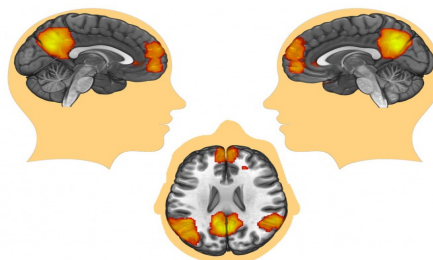
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social buffering: the neurobiology of attachment

- good enough parenting: excreting oxytocine, calming (inhibiting) the amygdala (defense system) triggers the social engagement system (SES)
- amplifying the fronto-limbic system: better self-regulation and connecting to others
- child is capable of feeling the pain of separation and seeking consolation, rapprochement
- good experiences triggers different pattern of gene activity (epigenetics)

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social reflective system, default mode network (DMN): sense of self



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DMN (oa de MPFC)

- after good care : space for self-reflection, focus from outside to inside
- affective/reflective: mentalisation
- adaptive possibilities in new circumstances, flexibility
- evaluation of self and other, capable of creating 'new memories'
- MPFC = 'the pilot': affective processes (limbic system) merge with information from perception: self-related thought informed by feelings

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social development: 5 functional systems

- Social Engagement System (SES) that supports attachment and sociality
- Self-defence System: sensory experiences for safety and threat
- Social-emotion System: supports emotions of separation distress and development of empathy
- Stress-response System (HPA-axis): produces stress hormones to deal with challenges
- Social Switching System: state regulation system that orchestrates between social engagement and self-defence

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neurobiology of bad care

- self defence system stronger developed at the cost of SES
- epigenetic high sensitive alarm system in the brain
- sensitisation of autonomic nervous system (ANS): fight/flight/freeze/faint
- defensive representations in implicit memory
- hinders development of new relations
- hypervigilance
- DMN underdeveloped: no self-reflection in rest

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Connectedness

A biological Imperative:

- The body's need to co-regulate biobehavioral state through engagement with others
- Connectedness is the ability to mutually (synchronously, and reciprocally) regulate physiological and behavioral state.
- Connectedness provides the neurobiological mechanism to link social behavior and both mental and physical health.

Stephen Porges 2017

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Coregulation, social engagement behaviors

Face to face behaviors:

- facial expressions
- gestures
- prosodic vocalizations

maintains a physiological state that supports health, growth, and restoration.
 optimizes the ability to rest, relax, sleep, digest, and perform bodily processes
 enables feelings of trust, safety, and love.

Stephen Porges 2017

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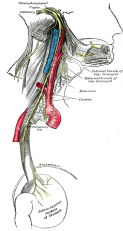
Polyvagal theory (Stephen Porges)

- Evolution provides an organizing principle to understand neural regulation of the human autonomic nervous system as an enabler of social behavior.
- Three neural circuits form a phylogenetically-ordered response hierarchy that regulate behavioral and physiological adaptation to safe, dangerous, and life threatening environments.
- "Neuroception" of danger or safety or life threat trigger these adaptive neural circuits.
- Nervus vagus is bi-directional (body-mind-body): 80 % is sensory

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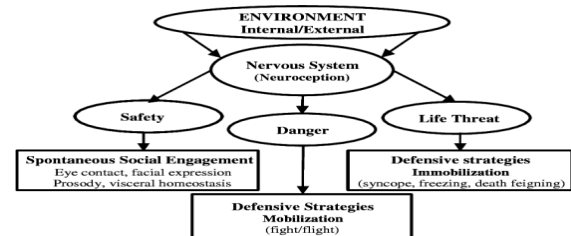
Evolutionary timeline nervus vagus (N-X)

500 million years old: dorsal unmyelinated vagus former parasympathetic	400 million years old: ventral vagus former sympathetic	200 million years old: (ventral)myelinated vagus mammals
below diaphragm, bowel	supradiaphragmatic, heart, lungs	muscles of the face, pharynx, larynx, ears, upper body
life-threat: IMMOBILIZATION (death feigning)	danger: MOBILIZATION (fight-flight)	safety: SOCIAL ENGAGEMENT (bonding)
conservation of energy, fatigue analgesia fainting, dissociation	action of major limbs hearing low frequency sounds	softens eye, kind tone of voice, slow heart rate, self-compassion



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The Quest for Safety: (Stephen Porges)



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Polyvagal approach to therapy (Porges/Dana)

- Recognize the autonomic state
- Respect the adaptive (autonomic unconscious) survival response
- Regulate or co-regulate into a ventral vagal state
- Re-story

"Goal of therapy is to engage the resources of the ventral vagus to recruit the circuits that support the prosocial behavior of the SES. The SES is our "face-heart" connection, created from the linking of the the ventral vagus (heart) and the striated muscles in our face and head that control **how we look (facial expressions)**, **how we listen (auditory)** and **how we speak (vocalization)**".

Deb Dana 2018

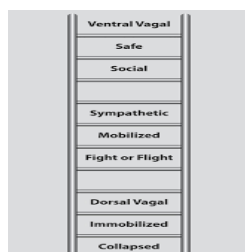
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PBSP approach to therapy (Pesso-Boyden)

- Recognize the autonomic state
- Respect the adaptive survival response
- Regulate or co-regulate into a ventral vagal state
- Re-story
- What do you feel in your body ? energy, add: which state ?
- What does it need/want to do ? action-interaction, possibility sphere, add: respect and value survival strategies
- Microtracking; witness (face/gestures/sound) and voices (language and prosody)
- Antidote (new symbolic memory also in sound !), meaning

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ANS-ladder (Deb Dana)



'glimmers':

'triggers':

'triggers':

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the neurobiology of PBSP

- **possibility sphere** calmes the defence system and creates the safety to get the DMN 'online'
- **3 modalities of movement** represent three evolutionary brain systems: reflexive, emotional and voluntary
- **microtracking**: using witnessing (eye contact, affective reflection in context and using prosodic voices) triggers the SES and DMN
- **addressing the pilot** activates the MPFC
- **using ideal figures** takes care of reconsolidation and creating new memories (when DMN is online)

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