

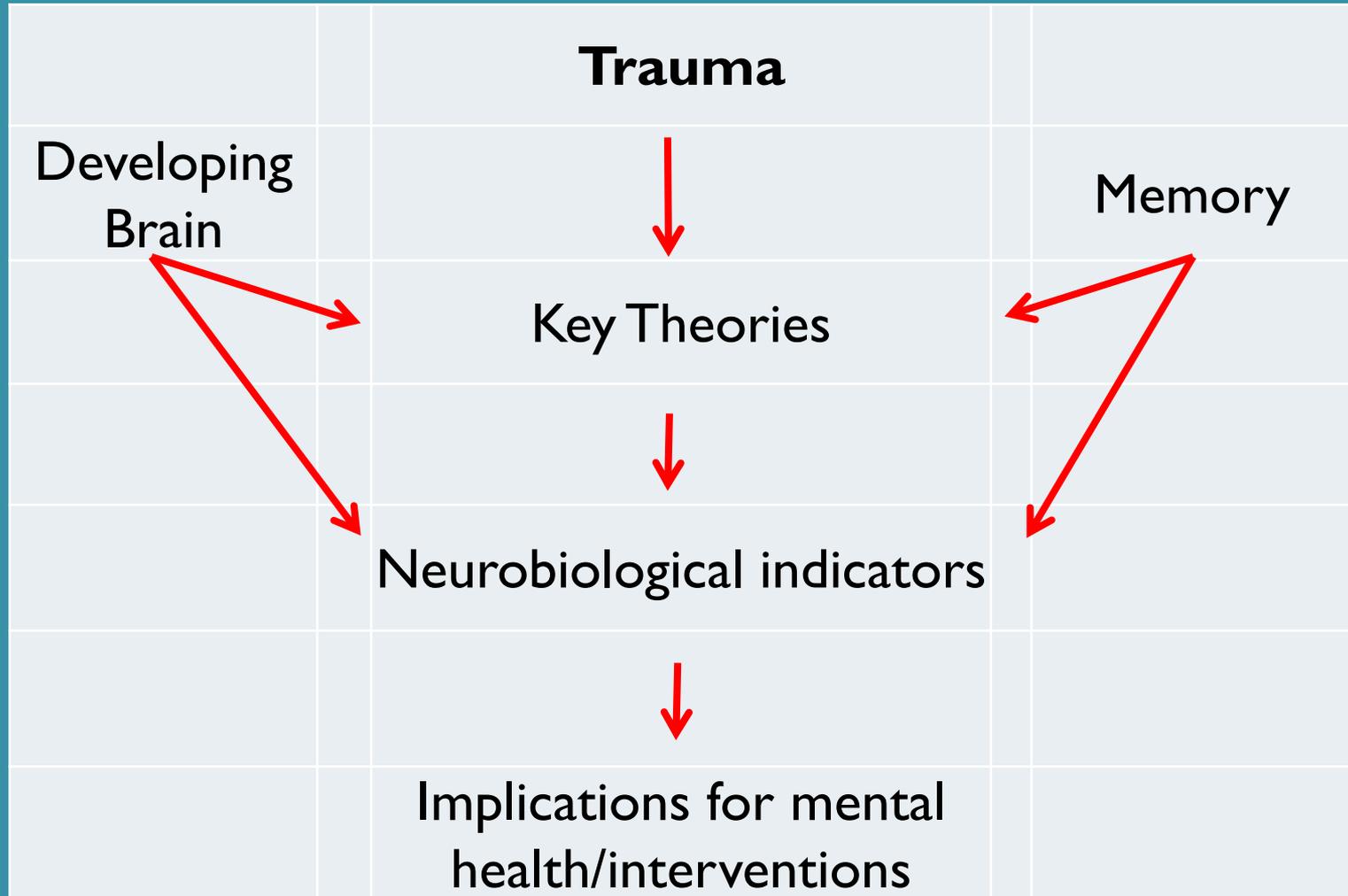
Trauma and the Brain – A Neuroscience Approach

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Overview



Key Principles of understanding the Brain

The Brain – a hardwired electric structure

- ▶ Hardwiring and the electrical make up

The “soup” model – the role of chemicals

- ▶ (Grossman 1967, Milner 1965)
- ▶ Neurotransmitters and neuromodulators (Barondes 1993)
- ▶ “*No twisted thought without a twisted molecule*” (Abood 1960)
- ▶ Goal – smart drugs
- ▶ Fundamental difficulty of “soup” theory

Mental disorders and neural networks

- ▶ Communication between cells (Sporn 2011)
- ▶ Key function of circuits and networks
- ▶ The synapse (LeDoux 2003)

- 3 ▶ Life experiences

The Developing Brain and Trauma

Sigmund Freud's Theory of psychosocial development

B F Skinner's Behavioural theory

Jean Piaget's Theory of Cognitive Development

Albert Bandura's Social Cognitive Theory

Erik Erikson's Theory of Psychosocial Development

Kohlberg's – Moral reasoning Stages

Mahler's Theory of Development

Lev Vygotsky & Socio-Cultural Theory

Paul MacLean's theory of Brain development

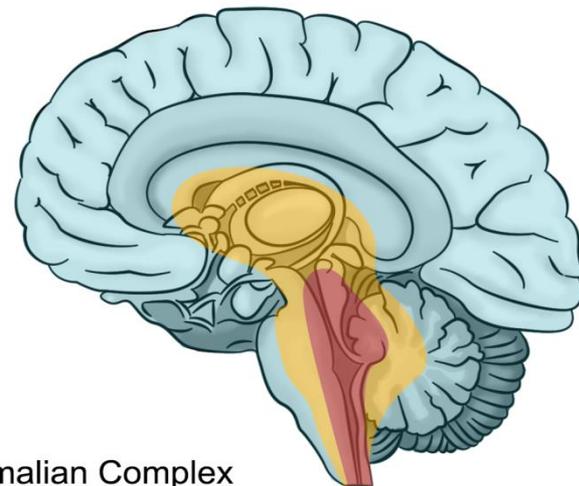
The Brain-based model

The reptilian complex

The paleomammalian complex

The Neomammalian complex (neo cortex)

- ▶ Only in mammals
- ▶ Ability to down regulate other functions
- ▶ Bottom up development



3. Neomammalian Complex

Executive Activity
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Interneural communication:

Donald Hebb – Neurons that fire together – wire together (Hebb 1949; Paulson & Sejnowski 2000)

NMDA- glutamate receptor – controls synaptic plasticity and memory - neural affinity

Challenge to establish new neural networks

Neuroplasticity, Neural growth and Neurogenesis

Neurons are plastic

- ▶ plasticity

Neurons can change firing direction

- ▶ synaptogenesis

Chemical enhancers and inhibitors

- ▶ neural growth

Ability to build new neurons

- ▶ neurogenesis

Key neural circuit - the “fear circuit”

Essential to survival

Establishes predominantly in first 10 months after birth

Established in paleomammalian brain

Limbic system and its environment

- ▶ Thalamus
- ▶ Amygdala
- ▶ Hypothalamus
- ▶ Hippocampus

Up- or down-regulation of responses

The stress response

The Limbic System

- ▶ The structures that ring the upper part of the brainstem – regulate emotion and memory
- ▶ Sometimes called the Emotional Brain

- Thalamus
- Hypothalamus
- Amygdala
- Hippocampus

Trauma and neuroanatomy

Trauma – stress – extension of stress response

Changes in

- ▶ Neural activation
- ▶ Neurochemicals
- ▶ Neural structures
- ▶ Neural networks

Key concepts

- ▶ Avoid and approach patterns
- ▶ Open and closed neural firing
- ▶ Safety
- ▶ Enriched environments

Key concepts – avoid and approach

Triune brain model – MacLean (1990)

- ▶ Primitive brain
- ▶ Limbic system
- ▶ New Cortex

Basic needs

- ▶ Attachment
- ▶ Control
- ▶ Self-esteem enhancement and self-esteem protection
- ▶ Pleasure maximization and distress avoidance

Trauma – facilitation of avoid patterns

Neuropsychotherapeutic Interventions

Facilitate open neural activation

- ▶ Down regulate fear response
- ▶ Safety – empathy and support
- ▶ Controllable incongruence – slow pace

Client - explain fear response

- ▶ Awareness of avoid patterns
- ▶ Empower to manage therapeutic process
- ▶ Enhance therapeutic support “attachment”

Neuropsychotherapeutic Interventions

Introduce sense of control

- ▶ Trauma facilitate safety through avoid patterns
- ▶ New patterns of open neural firing may up regulate sense of unsafety
- ▶ Resistance is caused by uncontrollable incongruence
- ▶ Slow pace of intervention – controllable incongruence
- ▶ Eventual habituation of safety through approach patterns – neural shift

Trauma treatment

Down regulate fear

- ▶ (establish trust and safety)

Activate cortical blood flow

- ▶ Enriched environments - Writing, talking, nutrition, exercise, relaxation, reflection

Enhance ability to challenge feelings, thoughts and behaviours

- ▶ ABCD's, therapeutic activation

Enhance Dopamine release

- ▶ (motivation)

Strengthen new patterns

- ▶ Ongoing activation

Mechanisms of Forgetting

fMRI studies – Benoit and Anderson – Cambridge (2012)

Voluntary forgetting of Unwanted memories

Neural systems –

- ▶ Hippocampus
- ▶ Dorsolateral PFC

Neural mechanisms

- ▶ Thought substitution
- ▶ Direct Suppression

Mechanisms of Forgetting

Thought substitution

- ▶ Activated Hippocampus and DLPFC
- ▶ Shift memory systems – effective changes – less intrusive memories
- ▶ Korean subway disaster (Lyoo et al 2011)
 - ▶ DLPFC thickness
 - ▶ Much lower PTSD symptomatology
 - ▶ Cortical thickness normalized – 3 years
 - ▶ Memory triggers – less response (more cortical “protection”)
- ▶ Reduction – stress hormones
- ▶ Suppression group – increase – stress chemicals
- ▶ Implications for treatment

Trauma treatment – Increase focus

Practical guideline – Increases:

Increase amygdala GABA barrier

- ▶ Role of relaxation and control experiences

Increase hippocampal activity

- ▶ Enriched environments - good sleep, good nutrition (reduce CATS), exercise, relaxation, social outreach

Increase cortical blood flow

Increase parasympathetic nervous system activity

- ▶ Down regulation of distress – relaxation, breathing, mindfulness

Increase serotonin flow

- ▶ Activities; (Low GI)-rich diet like oatmeal, whole grains, beans, good sleep, social outreach

Increase in approach patterns

Trauma treatment – Decrease focus

Practical guideline – Decreases:

Decrease Amygdala triggers

- ▶ Identify triggers – activate alternative responses; regular relaxation exercises – enhance sense of control

Decrease negative effects of cortisol

- ▶ Exercise, healthy sleep, good nutrition, mindfulness

Decrease patterns of avoidance

- ▶ Identify avoid patterns, facilitate safety, enhance safety and control – invade the avoid space with safe approach

Decrease stress response

- ▶ Mindfulness, control exercises (visualisation), laugh

Conclusion – Trauma – everyone's business

Unique nature of trauma – different from client to client

No Recipe - “Trauma treatment in a can”

Neuropsychotherapy

- ▶ Principles of neural activation
- ▶ Uniqueness of trauma
- ▶ Facilitation of safe, new neural activation networks towards effective approach patterns through safe controllable incongruence.
- ▶ Enriched environments – everyone's business

Eric Kandel

Kandel's Third law:

Patient care is our most important responsibility. That is why we are here. Never let patient care take a secondary role. Patient welfare is the ultimate goal of biological science and it is the engine that drives the whole scientific enterprise.

Neuroscience opens amazing new opportunities to benefit you clients – utilise it, do it justice and enjoy the future!” (Kandel 2005)