

Biology and Experience Intertwined: trauma, neglect and physical health

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The body-mind divide causes neglect of the whole person

Transdisciplinary research in the areas of trauma and stress, psychoneuroimmunology, affective neuroscience, attachment, and psychophysiology (and more) confirms that the physical body can no longer be considered separate from the mind. Instead the body is understood as a tangible embodiment of a life made up of subjective meaningful experiences. Despite this new knowledge, much of biomedicine and psychiatry continue to use classical Greek and 17th century Cartesian dualist approaches to the body as an object for separate to the mind.

Good quality biomedical principles of positivist science exclude variables (context), favour study of fixed organ disease and disregard all but repeatable measurable objective information. This intentional disregard of subjective contextual information has served science well, except in medicine, where encounters with the person whose subjective experiences (including memories), relationships and context, are part of everyday practice. A reductionist approach to science has also caused medical care to be splintered into specialised fields of study that often do not acknowledge the unseen interconnected regulatory processes, the impact of relationships, the importance of culture, spirit and meaning, and the integration of experience and biology within each person.

These limitations of the medical gaze (Reeve, 2010) have constrained understanding, research and clinical care of those who suffer from the impact of lifetime adversity and social disadvantage. They have also influenced medicalisation of social and emotional distress, specialisation of care, narrowed understandings of prognosis and prevention, and increased use of medication as treatment for distress. This biomedical approach has also undermined care for Indigenous peoples worldwide, who do not share these divided dualist approaches to the whole person and have long understood that a person's body cannot be separated from his or her life story. The loss of an understanding of the embodied experiential meaning making person from medicine, in favour of biomedical evidence has far reaching impact on clinical care of the whole person, including their physical body.

How do we know *that* experience impacts on the physical body?

There is a growing body of robust evidence from many research fields that lived experience impacts physical health outcomes. The two most compelling fields of research include large epidemiological studies and the attachment research showing a direct link between the experience of relationships and multiple physical health outcomes, from wound healing (Gouin & Kiecolt-Glaser, 2011) to altered brain structure (Schoore, 2001). There is also evidence in the study of attention, emotion and arousal of bodily impacts of inner experiences.

Epidemiological studies link childhood experiences with physical health

An extensive epidemiological study that is key paradigm-shifting research has become known as the Adverse Childhood Experiences (ACE) study (Felitti et al., 1998) (Anda et al., 2006). It identified a dose-dependent impact of childhood adversity on physical health. This study used retrospective questions (which often underestimate prevalence) to analyse 10 types of adversities measured – including physical, emotional and sexual abuse, physical and emotional neglect, parental separation or loss, alcoholism or drug use in the home, incarceration, mental illness and domestic violence. It then followed this large cohort of more than 17,000 people prospectively to analyse their health outcomes. The ACE study comprehensively revealed direct dose-dependent risks to adult physical health (including cardiovascular diseases, chronic lung disease, stroke, diabetes autoimmune disease and

cancer), as well as risks associated with behaviours that influence health, such as smoking, alcohol and drug use, suicidality, promiscuity, broken relationships, and workforce absenteeism. Premature mortality was clearly documented in those who had adverse childhood experiences (of up to 20 years in those who had 6 or more of the adverse experiences measured). The impact of abuse on adult health and healthcare utilisation has also been documented in the Australian context (Reeve & Gool, 2013). Research in this field has exploded in the last 20 years resulting in important shifts in understanding across many disciplines (Bremner, 2006; Charney et al., 1998; Cozolino, 2006; Perry & Pollard, 1998; Schore, 2001; Teicher et al., 2003; Van Der Kolk, 2014) and requiring practitioners to acknowledge the link between physical health and lifetime experience.

Experience of relationships effects the body

The body is intricately interconnected with other people through relationships, what Cozolino (2006, p. 6) calls the “social synapse”. Attachment research, and the field of interpersonal neurobiology enhanced by functional neuroimaging, have established the role that relationships have on the body especially at key times in child development. From the existence of mirror neurones to evidence of failure to thrive in the face of emotional neglect, extensive research in this area has established that the quality of caregiving relationships in both childhood and adulthood affect the development, structure and function of the brain, immune function, autonomic nervous system, neuroendocrinological systems, procedural memory, sensory awareness of the self, and cortical capacity to downregulate or soothe emotion. Van der Kolk summarises the impact of these changes: “if you feel safe and loved, your brain becomes specialised in exploration, play and cooperation. If you are frightened and unwanted, it specialises in managing feelings of fear and abandonment.” (Van Der Kolk, 2014, p. 56). This specialisation of function affects the capacity for an individual to adapt, access memory, integrate information, self-regulate and respond appropriately in day-to-day functioning.

Being harmed or neglected shatters a person’s trust in relationships and safety in social situations and impacts neurology. This may contribute to mis-attuned reactive relationships (including with health care professionals), inability to navigate boundaries, and loss of capacity to re-establish inner equilibrium and self soothe or self-regulate. In those unable to receive physiological and relational respite from dys-regulated arousal, compelling strategies for relief (addictions) can become dominant processes. This drive to decrease experiences of threat can include an intuitive physiological craving for forgetting, distracting, altered mood, risk taking, relational closeness or distance, disconnection or dissociation from self, self-analysis, and driven behaviours, including perfectionism and workaholism. Loss of physiological adaptive, relational soothing, protection and connection due to loss of safe relationships has far reaching implications for physical health.

Sensations, Emotion and Experiences affect the body

Perceptions, memories, thoughts and sensations are part of physical experience – they are embodied. Emotions, for example, are grounded in the autonomic nervous system, striated musculature and sensations (both interoceptive and exteroceptive). They are physical responses to experience and can have ongoing impact on the body. Each person uses his or her senses to monitor the internal and external environment for danger and safety (nociception (Porges, 2011)). This adaptive mindful bodily awareness can be dys-regulated and disorganised by experiences of trauma and neglect. Sensation can also be heightened and reactivated, with increased somatic awareness and symptomatic (often unexplained (Kirkengen et al., 1993)) presentations to medical care (Maunder & Hunter, 2009). Numbness, and experiences of emptiness and bodily inattention, late presentation for medical care, loss of sense of agency and purpose (Van Der Kolk, 2014), risk seeking and self-harming (and associated ongoing physiological alarm processes) can also result from the “tragic adaptation” (Van Der Kolk, 2014) of disconnection from sensory experiences of the self. Loss of appropriate modulation of responses can mean that people remain chronically alarmed, find it difficult to accurately assess safety, develop trauma-related altered states of consciousness (TRASC) (Frewen et al., 2015) and

sensory fragments (including flashbacks and somatic experiences), have reduced expectation of reward, and are unable to soothe themselves (or anyone they are caring for) and are therefore pushed towards disconnection or distraction to cope. These physical manifestations of inner experience are important aspects to be aware of in care of the whole person.

How does experience impact on the physical body?

There is also a growing body of robust evidence from many research fields with regard to how lived experience impacts physical outcome. The most central of these fields are neurophysiology, immunology, cellular biology (mitochondria, glia, macrophages), epigenetics and telomere studies. Studies of the influence of relationships on brain development and neurological networks are also key pieces that help explain how the body is impacted by life experiences.

Allostatic load affects physiology, neurobiology and development

Allostasis means 'stability through change' (Kirkengen & Lygre, 2015) and reflects a person's physical capacity, when under stress, to "subjugate internal needs in response to external needs" (Porges, 2011, p. 66). Allostatic load "the physiologic response to stress" (McEwen, 1998, p. 171), impacts hypothalamo-pituitary-adrenal regulatory systems (HPA axis) and the autonomic system and adrenocortex (SAM axis). Allostatic overload dys-regulates the exquisitely balanced interactions between metabolic and immune systems, and decreases restorative autonomic parasympathetic processes that provide respite and recovery from stress. Experiences can dys-regulate or recalibrate the feedback system, impacting the autonomic nervous system, immunity, glucocorticoid regulation, levels of pro- and anti-inflammatory cytokines, endocrine function, cell survival and organ function. The experience of chronic threat overwhelms the usual adaptive regulatory allostatic systems of the body causing physiological wear and tear, "weathering" (Geronimus et al., 2006) or "multisystem physiological dysregulation" (Wiley et al., 2016) – that silently impacts morbidity and mortality (Juster et al., 2011) over a person's life time.

In a healthy person, glucocorticoids influence neurogenesis, myelination and neuronal synapse formation and maturation. Adaptive release of glucose gives energy for fight or flight responses, increases vigilance, attention and learning (Lupien et al., 2009), and buffers mitochondria against apoptosis (Picard et al., 2014). Prolonged elevation of glucocorticoids can cause metabolic oversupply, oxidative stress, systemic inflammation, neurotoxicity (Gilbertson et al., 2002), telomere shortening (Picard et al., 2014; Ridout et al., 2017), change in "mitochondrial energetics" (Shaughnessy et al., 2014, p. 1273), epigenetic changes and apoptosis or cell senescence (Picard et al., 2014). Researchers exploring the function of the mitochondriae suggest that real or perceived threat induces metabolic stress involving catecholamines, and glucocorticoids that "could help explain how chronic psychosocial stress promotes cellular senescence and disease susceptibility." (Picard et al., 2014, p. 1). Metabolic stress in response to threat is therefore a significant risk to physical health including organ damage and cell death.

The experience of stress, "a threat, real or implied, to the psychological or physiological integrity of an individual" (McEwen, 1998, p. 177) has negative impact at many levels of physiology. Shonkoff and colleagues link stress and relational experiences in their definition of toxic stress as "excessive, persistent, and/or uncontrollable adversity, without the buffering protection of stable adult support" (Shonkoff et al., 2009, p. 2255). The proposed pathogenic process is that chronic stress, without relational refuge, causes long term withdrawal of ventrovagal tone resulting in loss of organ-preserving physiological regulation and restoration. Experiences can cause a person's sympathetic nervous system to be intensely or chronically activated in a way that causes metabolic, immune and neurological dysfunction. Another autonomic state that affects organ function is activation of the unmyelinated dorsal vagus in extreme danger, helplessness or overwhelm, that causes defensive bradycardia and freezing behaviours as survival strategies. The experience of this dissociative state is

a profound distortion of homeostasis and fragments neurological connections, sense of self, awareness, memory, thoughts, identity and somatosensory information, including pain. Scaer (2014, p. 15) postulates an exaggerated sympathetic/parasympathetic oscillation (what he calls “cyclical autonomic dysregulation” (Scaer, 2008)) in freeze states that underlies vascular, digestive, fatigue and musculoskeletal pain syndromes. The intensely physical nature of the autonomic ‘social engagement system’ which involves interpersonal interactions of prosody, eye gaze, gestures, facial expression, ear drum receptivity to human voice, head orientation, and visceromotor processes of heart and respiratory rate variability is part of how relationships affect the experience of threat or safety in the body.

The experience of toxic stress in childhood - if unmodulated by attuned parenting - also affects normal developmental processes and contributes to a loss of synaptic connectivity and neuronal survival causing significant disorganisation and loss of function (Perry et al., 1995). Shonkoff and co-workers (Shonkoff et al., 2012) view many adult diseases as developmental disorders that began in the context of toxic stress in childhood. They call for an ecobiodevelopmental framework that would encourage clinicians to be aware of the impact of childhood experiences on health. Significantly, the impact of stressful experiences on epigenetics is also established (Shaughnessy et al., 2014). Stress researchers from Selye (1956) to those working in the field of psychoneuroimmunology (Fleshner & Laudenslager, 2004) and other transdisciplinary fields (Juster et al., 2010) have confirmed the dys-regulating impact of embodied stressful experience on physiology and therefore, health

Carly's story

A fictional person, who we shall call Carly, describes her experiences: *“I grew up in a home filled with fear, my dad, and grandad were pretty violent when they got drunk. They hit me, and my younger brother Jonny, but mostly they hit Mum often when they got in their rages. I can remember the feeling in my guts when I heard Dad open the front door after being at the pub. His unsteady footsteps made me feel a panic. If I heard him early enough, I could get myself under my bed where he sometimes left me alone, but then I'd have the awful feeling that I couldn't help Mum or Jonny. I still feel like I let them down, and of course the smell of alcohol brings back memories of that house and fragments of memories of what happened there, and I still find with that same dread at night sometimes. I don't think I have ever been able to trust men since those days. When I was married, I used to get those flashbacks more often, and sometimes I lost track of time and my husband used to say I was zoned out like a zombie, especially if he got angry or unpredictable. Now that I can support myself from my work as a bookkeeper, I am so happy to live alone. I still find it really hard to relax, I often can't sleep and I have been told I have an Anxiety Disorder. I sometimes find myself comfort eating if life gets stressful. After my marriage got messy, I had lots of tests to try and work out why I got gut pain, and they diagnosed Irritable Bowel Syndrome then – so I try to eat lots of fibre to manage that these days but it still bothers me when life gets stressful. I have been on citalopram for about 20 years now – and I think it helps- but I have put on 20 kgs since I've been on it.”*

How does this information have a direct impact on patient care and change our understanding of best practice?

The increasing awareness, and solid documentation of the impact of each person's experiences on their physical health means that clinicians should maintain an awareness of lived experience, relational environment and physical health of each person they care for. Biomedical reductionist care, even when part of a bio-psycho-social-spiritual framework, and the ‘co-morbid’ way it frames illness, ignores the environmental and relational influences on bodily health and does not adequately address dysregulation and its unrecognised subclinical impact on central health-preserving functions.

Assessment and treatment of those who have encountered trauma and neglect in their life story (which could be any of our patients) require comprehensive whole person assessment. There is an

evidence based ethical duty (Kirkengen & Thornquist, 2012) for medical professionals to attend to the whole person and regard the body as embedded in context, experience and emotions, thoughts and beliefs. Any assessment should be conducted in an environment that helps to soothe the highly vigilant sensory system of the person, that facilitates disclosure within a safe responsive therapeutic relationship and that offers the time required to do so. Approaches to the person should aim at normalising the physiological embodied responses to experience, acknowledging the importance of listening carefully and appraising a person's life story as part of quality health care.

This comprehensive approach also has the potential to decrease fragmented care, to increase the person's own understanding of their intuitive emotional responses to their experiences, to increase recognition of the influence of life experiences on health, to protect each child's development and to improve health promotion, coordinated care, and thereby reducing health costs overall.

In 'Carly's' case, she has received a few categorical disconnected diagnoses, and consequently has been on long-term psychoactive medication despite limited effect on her emotional distress, and potentially harmful side-effects. Her childhood relational experiences, physical emotions of fear, vigilance, shame and powerlessness, and her subjective flashbacks and changes in consciousness when she is triggered with memories have not been included in an understanding of her physical health. She has not received a comprehensive assessment that shows awareness of embodied experience.

As well as epigenetic influences of trauma, intergenerational environmental and relational adversity can be transmitted within families and through other relationships. It helps to be aware that "the family literally embodies the fear-filled experiences its members have also shared" (Karr-Morse, 2012, p. 15). This means that awareness of family context, adults' capacity to offer safe relational soothing (including the role of grandparents), and parenting capacity is an essential part of health assessment and may provide a way forward in treatment. Understanding the role of intergenerational transmission of adversity is an important element of trauma-informed care of parents and children. This also points towards screening of children, active parenting training and family therapy, education that is designed to protect brain function through kindness (Shonkoff, 2011), and support for relational and sensorimotor needs of each person. Some are calling for trauma informed public health surveillance (Anda et al., 2010), while others suggest a range of interventions, from psychological interventions that improve glycaemic control (Ismail et al., 2004) and protect mitochondrial function to interventions in schools to decrease bullying (Scott et al., 2014). If Carly's family could have had some martial and parenting support, perhaps the fear-filled experiences of her childhood could have been prevented. Perhaps Carly may also have been offered intervention at school to modify her family situation. These early interventions, if implemented at a population level, will have an impact on the body, health, productivity and adult healthcare utilisation, in fact, Heckman and colleagues have determined that no society can afford economically to ignore childhood adversity (Heckman, 2006; Knudsen et al., 2006).

It is important that practitioners are aware of the impact of stress on metabolic risk (obesity, diabetes, renal and cardiac function), immunity (increased autoimmune, allergic and cancer risk), neurological system (increased sympathetic tone causing loss of restorative sleep, abdominal pain, digestion problems, muscle tension, decreased heart rate variability) and organ damage (eg. heart, kidney and liver). This awareness is especially important in those sections of the population who have experienced chronic multi-generational trauma, dispossession or dislocation. This knowledge may have decreased the need for numerous investigations of Carly's abdominal pain, may have helped her understand her life story and its impact on her body, and allows the practitioner to have an increased awareness of the risk of cancer, autoimmune disease, infection, and endocrine and metabolic

dysregulation. Practically this may mean that Carly is educated about the link between her childhood experiences of chronic hypervigilance, and allostatic overload, cortisol and glucose dys-regulation, and even her 'behavioural allostasis' (Garner, 2013) of overeating. This would increase her involvement in attempts to manage her weight and exercise, and to learn the importance of self-soothing and regulating without using food. She would also be more informed about her lifelong risk for end organ damage including diabetes, cardiac and renal damage.

Practitioners also need to be aware that trauma and neglect can lead to use of psychoactive drugs to modulate life experience and support neurological function that have their own complex and individual "pharmaceutical allostatic load" (Juster et al., 2011) and impact on quality of life, attention, executive function, energy, weight, memory and attention (De Jonghe & Swinkels, 1992; Reynolds & Kirk, 2010). This may lead to more informed discussions with patients about risks and benefits of long term pharmaceutical treatments.

Awareness of the physical impact of experience, and the neurological nature of memories and emotions means a clinician can more fully integrate the lived experience story and awareness of the body. In Carly's case, her family experience will mean that she experienced helplessness, feeling stuck, overwhelmed and perhaps even terrified, often triggered by other persons' unpredictable drunken behaviours. This will mean she has become neurologically primed to be vigilant to threat and violent behaviour (especially at night) in a way that may be triggering flashbacks in the present. These neurological and structural brain changes may be longstanding and contributing to her experience of anxiety, insomnia and flashbacks of dread and altered dissociative, or zombie-like states. These experiences as well as her feeling of shame and even guilt when she reflects on not having been able to protect her mother and brother may be contributing to her abdominal discomfort and anxiety. Carly's vigilance and present day triggers may be part of the vagal impact on her digestive system, the IBD and even her obesity. Her sensations may also increase her use of food to soothe her anxiety. The experience of not being able to trust people is also an existentially logical, physical-emotional-neurological imprint or inscription (Teicher & Samson, 2016) that is grounded in her past and is affecting her capacity to have trusting relationships. This may even cause her to avoid medical encounters due to distrust, or increase her dependence in an attempt to find safe relationships. Her obesity may also be a physical "means" to manage social interactions in a way that protects her from having to get close enough to people.

The health practitioner also needs to be aware of the risk to each person they care for of direct physical injury at the time of trauma, be it bruising, head injuries, fractures, genital mutilation, anal prolapse, vaginal tears, cuts, burns and so on. Direct impacts can also include sexually transmitted diseases, pregnancy, pelvic pain and later, infertility or even coerced abortion. Neglect can also cause direct physical impacts in the form of malnutrition, failure to thrive, obesity, infections, tooth decay, and delayed presentation to medical help. Another direct form of neglect is the injury to the prenatal infant from drug and alcohol abuse, including withdrawal symptoms, and fetal alcohol syndrome, as well as the risk of preterm birth and perinatal complications and impact on infant mental health of chronic maternal distress (Hillis et al., 2004).

Conclusion

Awareness of the embodied person impacted by experience can focus the direction of health care towards provision of comprehensive assessment and relational, sensorimotor, metabolic and relational treatments. This has the potential to unify care around the whole person, allowing for understanding of direct bodily impacts of trauma, physiological dys-regulation as a result of allostatic overload, physical and neurological impact of experiences and relational and intergenerational influences from genes to mirror neurones. It will require training, new approaches to remuneration that do not discourage time spent with the patient, and systems that highly prioritise care of families,

parents and couples to improve the experiences of each child and adult in our community. This focus is inspired by the new knowledge that embodied humans can heal through positive experiences and relationships, through the restoration of hope, and through an increase in sense of enablement. This facilitates positive neuroplastic changes, self-soothing through restoration of a “visceral sense of control and safety” (Van Der Kolk, 2014, p. 31) and the rehabilitation of personal integrity and selfhood that is central to health. The unique privilege of every clinician is to acknowledge their patients as people within their own socio-cultural context who represent their lifetime experiences as these were perceived, interpreted, and embodied.

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