



Entering the Heart of Home

HUMAN DEVELOPMENT, CHILDHOOD ADVERSITY AND
FLOURISHING IN AN ERA OF ORDINARY MAGIC

Celebrate Life Festival | “Home In Self” Workshop | July 28, 2019
Facilitator: Christina Bethell

Workshop Overview

We think of home as a safe place to “be”. Yet, to be at home and safe in ourselves-to “be”- requires intimacy within. This “interoception” capacity leads to an abiding, compassionate and resonant sense of self beyond the conditions of our lives; where we experience life as an unending dance and our innate brilliance, goodness and inner compass naturally emerge.

Science shows clearly that the conditions of our early life –from before conception and all throughout childhood-are foundational to the ability to develop this abiding sense of safety. Attuned, responsive and consistently loving relationships are required. Yet, most people today carry trauma from adverse childhood experiences (ACEs) –like physical or emotional abuse or neglect, sexual abuse and family conditions like alcohol or drug abuse, parental divorce, death of a parent or violence in the home. These conditions can pass down through generations and are socially conditioned responses that both reflect and perpetuate the larger trauma held in the world. ACEs shorten lives, lead to disease and perpetuate pain. Without the buffering love brings, ACEs have a profound impact on brain and nervous system development, the formation of our identities and sense of possibility in life and even our genetic expression.

We live in a time where we are awake to the causes and effects of developmental trauma. And science shows that resilience, flourishing and thriving with adversity is possible through the restoration of intimacy with ourselves, exquisite presence and mindfulness and rewriting the book our own life from the inside out. The capacity for love and peace cannot develop in isolation. “We” are the medicine we require. Using our lived experiences as the main curriculum, this workshop will review the science of ACEs and resilience and introduce breakthroughs in neuroscience and epigenetics that bring hope for healing and restoration no matter how old we are. The science helps us make sense of our pain and shows that not only is healing possible, but it is inevitable when we open with intention, allow ourselves to see and be seen and restore the broken relatedness we lacked. Echoing what awakened people throughout all time have taught us, we are wired for love, healing and home within a resonant self that moves with life despite the adversities we may have experienced and that are present in the world today.

OPTIONAL READINGS AND RESOURCES

1. Article on how childhood trauma is a biologic marker for health throughout life (Berens, Jensen, Nelson, 2017)
2. Purpose in life as a biologic marker for health (Hill and Turiano, 2014)
3. Article on assessing childhood trauma using a resilience model (Leitch)
4. Positive and Adverse Childhood Experiences Survey (PACES) for personal and professional use (Leitch, 2017)
5. Getting Your ACEs Score—1 page ACEs survey used in the US Centers for Disease Control Study (CDC)
6. Interoception skills article (Price and Hooven, 2018)
7. Mentalization skills article (Bateman and Fonagy, 2010)
8. Parent “Refrigerator Page” on implementing “whole brain child” parenting practices (Daniel Seigel)

REVIEW

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Biological embedding of childhood adversity: from physiological mechanisms to clinical implications

Anne E. Berens^{1,2,3}, Sarah K. G. Jensen^{1,2,3} and Charles A. Nelson III^{1,2,3,4*}

Abstract

Background: Adverse psychosocial exposures in early life, namely experiences such as child maltreatment, caregiver stress or depression, and domestic or community violence, have been associated in epidemiological studies with increased lifetime risk of adverse outcomes, including diabetes, heart disease, cancers, and psychiatric illnesses. Additional work has shed light on the potential molecular mechanisms by which early adversity becomes “biologically embedded” in altered physiology across body systems. This review surveys evidence on such mechanisms and calls on researchers, clinicians, policymakers, and other practitioners to act upon evidence.

Observations: Childhood psychosocial adversity has wide-ranging effects on neural, endocrine, immune, and metabolic physiology. Molecular mechanisms broadly implicate disruption of central neural networks, neuroendocrine stress dysregulation, and chronic inflammation, among other changes. Physiological disruption predisposes individuals to common diseases across the life course.

Conclusions: Reviewed evidence has important implications for clinical practice, biomedical research, and work across other sectors relevant to public health and child wellbeing. Warranted changes include increased clinical screening for exposures among children and adults, scale-up of effective interventions, policy advocacy, and ongoing research to develop new evidence-based response strategies.

Keywords: Adverse childhood experiences, Brain development, Stress, Health promotion, Social disparities, Primary care

Background

Epidemiological studies have demonstrated that adverse childhood experiences, namely exposures such as neglect, abuse, caregiver mental illness, and family or community violence, predict poorer long-term outcomes across health and social domains. Outcomes associated with early adversity include higher risk of type 2 diabetes, obesity, ischemic heart disease, cancers, depression, addictions, and premature mortality, as well as social outcomes including unemployment and lower educational attainment [1–8]. Particularly convincing evidence comes from large birth cohorts and prospective, longitudinal life-course studies exploring predictive relationships [3, 5–9]. Meanwhile, human and animal

research has provided insights into candidate molecular mechanisms by which early adversity may become “biologically embedded” in disrupted physiology [10]. Such findings support life-course models of human health describing how early physiological development interacts over time with behavior and ongoing risk environments to shape outcomes holistically [7].

Nevertheless, evidence about the pathogenic effects of childhood psychosocial adversity has not been widely applied in clinical practice or public health initiatives. Such knowledge has the potential to improve screening and intervention strategies aiming to decrease exposure to early adversity (primary prevention), limit resulting pathology (secondary prevention), and help those already suffering effects (tertiary prevention and treatment). Efforts must span the life course, involving pediatric and adult clinicians, researchers, educators, public health practitioners, families, and communities. Awareness of

* Correspondence: charles_nelson@harvard.edu

¹Boston Children's Hospital, Boston, Massachusetts, USA

²Harvard Medical School, Boston, Massachusetts, USA

Full list of author information is available at the end of the article



the effects of adversity can furthermore enhance investigations into the roots of human disease.

This review surveys the evidence on biological mechanisms thought to link early childhood adversity to later disease. While prior literature has predominantly described changes in one or a few physiological axes, this review summarizes changes comprehensively across body systems, offering a unified orientation for clinicians and researchers. The specific questions addressed include (1) How can often time-limited early exposures produce durable physiological changes? (2) How do such physiological changes converge to generate disease? (3) What factors underlie “differential susceptibility” to developmental adversity, and how can interventions promote resilience? Finally, we consider how answers to these questions should shape action across social sectors to promote child wellbeing and lifelong health.

Defining early life adversity

In this review, we conceptualize childhood adversity as a negative childhood experience associated with increased lifetime risk of poorer health and social outcomes. The review is limited to postnatal exposures, while separate literature covers important effects of prenatal adversity [11]. We specifically consider psychosocial adversity, namely that involving relationships (to caregivers, family, community, peers) and other social experiences interacting with psychological processes [12]. Examples of psychosocial adversities include childhood maltreatment, violence exposure, caregiver psychopathology, unstable or depriving care environments (e.g., low-quality foster or institutional care), adverse societal exposures such as crime and discrimination, and other causes of psychological stress or trauma. Various childhood adversities are prevalent globally. A recent review found that at least 44% of children in developed countries and 59% in developing countries had been victims of physical, emotional, or sexual violence or had witnessed domestic or community violence in the preceding year [13]. Caregiver poor mental health is also common, with depression currently representing the leading cause of disease-related disability globally [14].

For brevity, we refer to childhood psychosocial adversity as “early life adversity” (ELA), employing an aggregative approach to conceptualize exposures. Such an approach facilitates the synthesis of complex evidence for application, and is supported by observed dose–response effects linking cumulative early adversity to later outcomes [1, 3, 5], and by the “allostatic load” paradigm exploring pathogenic effects of cumulative all-cause stress [15]. Such aggregative approaches require complementary efforts to differentiate effects of exposures varying in nature, timing, and intensity [16]. Here, we do not specifically examine low childhood socioeconomic

status (SES) as a psychosocial adversity, as poverty influences health in part via non-psychosocial pathways (e.g., increasing exposure to physical environmental hazards). Meanwhile, some families living in poverty provide safe psychosocial environments despite the challenges posed by socioeconomic disadvantage. Nevertheless, childhood adversities are strongly partitioned by SES, and shaped by inequities intertwined with poverty such as those defined by race, gender, immigration status, class, and other axes of social inequality.

Biological embedding

Biological embedding describes processes by which initially transient, homeostatic responses durably alter physiology [10]. Events early in life may be embedded preferentially due to a preponderance of sensitive periods, or windows of rapid development and heightened plasticity (responsiveness to experience). While traditionally described in neurodevelopment [16], sensitive period effects have been suggested elsewhere, including in the immune [17] and metabolic [18] systems. Epigenetic processes represent a key family of mechanisms driving embedding. Epigenetic change involves stable alteration of gene expression via mechanisms including, among others, attachment of chemical residues (e.g., methyl groups) to DNA or to molecules involved in packaging and transcriptional control (e.g., histones) [19].

Methodological challenges

A key methodological challenge is the difficulty of causal demonstration amidst social complexity. While epidemiological studies statistically explore confounding and mediational pathways, randomized controlled trials – the “gold standard” in causal inference – are often impossible or unethical. This challenge necessitates substantial use of animal models, enabling controlled experimentation and use of targeted molecular manipulations clarifying causal pathways. These models are considered in this review when potentially useful to understand human processes. An additional challenge has been the reliance on retrospective self-reporting of ELA in many studies. Such reports may agree only moderately with prospective measures, and could be more prone to bias, though both types of measures tend to predict similar disease and social outcomes [20]. We therefore focus on the direction (versus size) of effects and on physiological mechanisms, and prioritize studies using prospective, longitudinal designs.

Search strategy

We identified peer-reviewed, academic literature from multiple databases, including PubMed, Medline, and PsycINFO, using search terms specifying timing in early life (e.g., early, child*, infan*) and adverse exposures

(e.g., advers*, psychological stress, maltreat*), as well as terms for specific physiological axes as appropriate. Priority was given to more recent studies, major reviews, and prospective human studies. Cross-sectional and animal studies were included where prospective human evidence was unavailable.

Biological embedding by physiological axis

ELA has diverse effects across neural, endocrine, immune, metabolic, and gut microbial axes, as reviewed below. Table 1 summarizes key findings, while Fig. 1 provides a working conceptual model of ELA's biological embedding.

Axis 1: The brain

Human brain maturation is a protracted process beginning in fetal life and continuing into early adulthood [21]. Dramatic growth in gray and white matter occurs in the first 2 years of life, when the brain attains 80–90% of its adult volume before continuing to grow at an attenuated rate [22, 23]. Alongside growth, experience-dependent neural pruning eliminates inactive synapses. Anatomically, the brain matures “from the bottom up,” beginning with primitive brainstem structures and progressing anatomically in anterior-posterior and inferior-superior directions, culminating with the prefrontal cortex (PFC). Functional development similarly progresses from basic sensory and motor capacities to subsequent language and executive functioning (e.g., cognitive control, working memory), and ultimately higher cognition [16]. Normative neurodevelopment thus enables environmental adaptation and progressively complex cognition, but leaves the brain susceptible to negative exposures for an extended period of time.

Extensive literature links ELA to pervasive, quantifiable variation in brain structure and function [15, 21, 24, 25]. Investigation has preferentially examined “stress sensitive” areas dense with glucocorticoid receptors, including limbic structures (e.g., hippocampus and amygdala) key to memory, learning, and emotion regulation, as well as the PFC, critical for higher cognition, executive functioning, and “top-down” control of lower regions [26]. Studies of adolescents and adults provide consistent evidence of smaller PFC gray matter volumes after ELA, paralleling findings from experimental animal models designed to demonstrate causality [21, 24, 25]. Smaller hippocampal volumes have been consistently observed in ELA-exposed adults, though not children, reflecting potential latent effects on a slow-developing structure. Amygdala volumetric effects are complex, including both increases and decreases, likely moderated by exposure timing and type [21, 27].

Considering potential embedding mechanisms, the “neurotoxicity hypothesis” posits that early elevation of

stress mediators, particularly glucocorticoids, kills or impedes growth of neurons in stress-sensitive regions via mechanisms including oxidative damage [28]. Stress mediators potentially linked to neurotoxicity in humans include cortisol as well as inflammatory cytokines, excitatory amino acids (e.g., glutamate), and various other molecules (e.g., brain-derived neurotrophic factor (BDNF) and endogenous opioids) [29]. Oxidative stress during early neurodevelopment may also disrupt (delay or extend) neural sensitive periods [30]. Considering epigenetics, experimental animal models show altered expression of genes implicated in basic neurodevelopmental processes (e.g., cell adhesion, sensitive period closure) [31]. Human studies of ELA show genome-wide methylation changes as well as gene-specific effects on neural signaling molecules important to psychological health and neural function, for instance serotonin, glutamate, dopamine, catechol-O-methyl transferase (COMT), and BDNF [19].

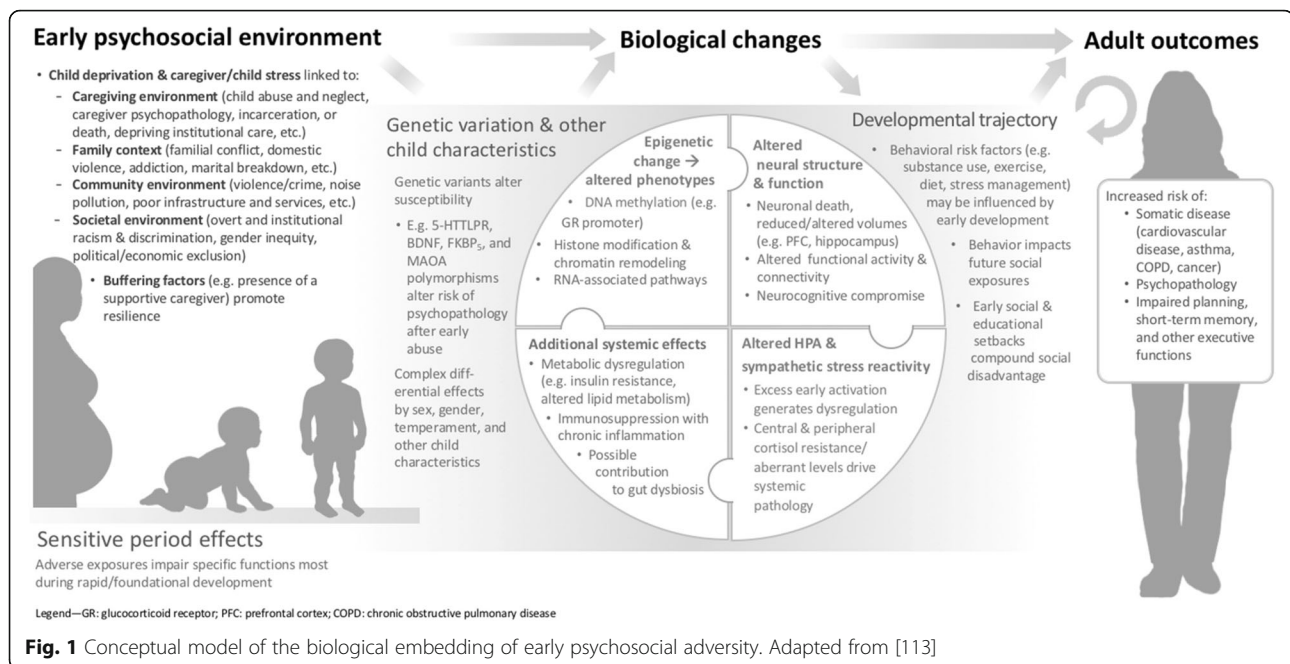
Beyond excess stress, environmental deprivation may also play a role in neurodevelopmental compromise, for instance, among children in low-quality institutional care [32]. Broadly, absence of normative psychosocial stimuli (e.g., language exposure or caregiver interaction) during experience-dependent development is proposed to promote excessive synaptic pruning [33]. Indeed, children raised in depriving institutions in infancy show globally decreased cortical thickness [34], a finding possibly paralleled by reduced brain-wide dendritic arborization, spine density, and brain volume in rodent models of early deprivation (e.g., rearing in single-occupancy cages) [35]. Nevertheless, “depriving” exposures (such as caregiver absence) generally evoke potent stress responses [36] while stress mediators regulate synaptic plasticity [37], complicating efforts to discern whether the observed structural changes reflect excess pruning (versus, for instance, glucocorticoid neurotoxicity) and if these mechanisms are, in fact, independent of stress-mediated pathways.

The neurodevelopmental changes described may have far-reaching functional and health implications. Studies suggest that neural-structural changes mediate ELA effects on depression [38], while sensitive period disruption may contribute to schizophrenia and autism pathogenesis [30, 39]. Studies of ELA-associated brain functional changes show deficits in processes including emotion regulation, fear learning, and executive functioning [21]. Functional MRI studies show differences in centrally-driven reward processing that could mediate ELA-related risk of psychopathologies and substance use-related illnesses [40, 41]. Finally, disruption of central stress-regulatory structures may promote neuroendocrine disruption linked to diseases of excess allostatic load [42], as discussed below.

Table 1 Selected effects of early life adversity (ELA) on physiological functioning

Examples of physiological changes observed after ELA	Overall clinical and functional effects	Key reviews
Brain structure and activity		
Structural variation in gray and white matter	Increased risk of:	Bick & Nelson, 2016 [21]
1) Changes in local/global gray matter volumes	- Impairments in executive functioning (e.g., working memory, cognitive control)	Hart & Rubia, 2012 [24]
a) Some evidence for widespread, global gray matter change	- Impaired emotion regulation and social functioning	McEwen, 2013 [50]
b) Decreased gray matter volume of PFC and hippocampus	- Adverse effects on reward processing and stress regulation (e.g., hippocampus, amygdala, PFC) may increase risk of mood and substance use disorders	Nemeroff et al., 2016 [25]
c) Complex volumetric changes in amygdala		
2) Changes in local/global white matter volume and microstructure		
a) Complex white matter volumetric changes in frontal lobes		
b) Microstructural variation in various white matter tracts that may impair communication between brain regions		
Functional variation in brain activity and functional connectivity		
3) Aberrant amygdala reactivity to emotional stimuli		
4) Alterations in amygdala-PFC connectivity		
Altered neurotransmitter metabolism or production		
5) Potential altered neurotransmitter levels/signaling involving key molecules, e.g., serotonin, dopamine, GABA, glutamate		
Neuroendocrine (HPA) stress response axes		
Hyper-responsiveness	- Both HPA hyper- or hypo- reactivity are characteristic patterns generating excess "allostatic load," linked to cardiovascular disease, metabolic syndrome, accelerated cellular aging, and various psychopathologies	Doom & Gunnar, 2015 [36]
1) Enhanced ACTH and cortisol response to stress/stimulation	- Downstream effects of aberrant cortisol levels (e.g., neurotoxicity, heightened inflammation, metabolic dysregulation) may drive pathology across other axes	Heim & Binder, 2012 [87]
2) Evidence of impaired GR-mediated feedback inhibition		
Hypo-responsiveness		
4) Blunted HPA response (ACTH and cortisol) to stress/stimulation		
5) Heightened ACTH response with inappropriately blunted cortisol (normal or low)		
Altered basal diurnal rhythms		
3) Elevated, or suppressed, average cortisol/CRF		
6) Complex changes to diurnal cortisol rhythms (e.g., lower morning and flatter decline, or higher morning and steeper decline)		
Autonomic functioning		
1) Complex patterns of sympathetic- or parasympathetic-predominant imbalance of reactivity to acute stress, with alterations in responsiveness and counter-regulatory control	- Both parasympathetic- or sympathetic-predominant autonomic imbalances are linked to diseases of elevated "allostatic load" (discussed above)	Alkon et al., 2012 [55]
2) Elevated or decreased sympathetic or parasympathetic basal tone		El-Sheikh et al., 2009 [56]
Immunity and inflammation		
1) Systemic immune suppression (e.g., impaired cellular immunity)	- Chronic inflammation linked to increased cardiometabolic and other disease risk	Slopen et al., 2012 [66]
2) Chronic basal inflammation (e.g., elevated CRP, TNF- α , IL-6)	- Immunosuppression linked to impaired control of infectious/neoplastic threats	Baumeister et al., 2016 [67]
3) Heightened inflammatory reactivity		
Metabolism		
1) Impaired peripheral glucose handling with insulin resistance	- Heightened risk of type 2 diabetes, obesity, hyperlipidemia, or other metabolic disease	Maniam et al., 2014 [70]
2) Altered fat metabolism with dyslipidemia		
Microbiome functioning (emergent evidence, animal models only to date)		
1) Transient microbiome perturbations after stress in infancy linked to aberrant immune development	- May contribute to inflammation, immune-suppression, and/or neurodevelopmental risk	O'Mahony et al., 2015 [74]
2) Possible durable microbiome changes in adults after early stress		

PFC prefrontal cortex, ACTH adrenocorticotrophic hormone, GR glucocorticoid receptor, CRF corticotropin releasing factor, CRP C-reactive protein, TNF tumor necrosis factor, IL-6 interleukin-6, HPA hypothalamic-pituitary-adrenal



Axis 2: Neuroendocrine stress regulation

ELA broadly impacts stress reactivity as controlled by the hypothalamic-pituitary-adrenal (HPA) and autonomic (sympathetic/parasympathetic) axes. Both axes are under central control by corticolimbic structures, including the PFC, hippocampus, and amygdala [29], and involve common molecular mediators (e.g., corticotropin-releasing factor (CRF), an HPA hormone and autonomic neurotransmitter) [43], suggesting potentially overlapping embedding pathways.

HPA axis

In response to stress, hypothalamic CRF stimulates pituitary adrenocorticotrophic hormone (ACTH) release and, in turn, adrenal cortical secretion of glucocorticoids—principally cortisol in humans and corticosterone in many animal species. Glucocorticoids trigger diverse systemic homeostatic responses while exerting negative feedback on the axis. In human studies and animal experimentation, ELA consistently predicts HPA dysregulation generally persisting into adulthood, including patterns of hyper-reactivity, suggesting potential acquired resistance to glucocorticoid negative feedback [29], or hypo-reactivity, suggesting possible attenuated stress sensitivity or exaggerated axis suppression [44]. Differential patterns of dysregulation may reflect variation in factors including timing and type of ELA [45], genotype [46], current age [29], and concurrent psychopathology [47]. Importantly, HPA hyper- and hypo-reactivity both represent prototypical patterns associated with excess allostatic load, and both predict human stress-related chronic illnesses, including cardiovascular,

metabolic, and psychiatric diseases linked epidemiologically to ELA [15, 29, 48]. Glucocorticoid dysregulation may also promote oncogenic tumor cell microenvironments (in part via pro-inflammatory effects, as discussed below), fostering growth, migration, invasiveness, and angiogenesis [49], thus potentially contributing to observed links between ELA and cancers [7].

Considering potential mechanisms of HPA changes, animal models of early stress have demonstrated altered expression of the glucocorticoid receptor (GR) (involved preferentially in axis downregulation) and receptors for CRF, ACTH, and other key molecules [50]. In particular, altered serotonin signaling in rats receiving unfavorable maternal care has been shown to induce hypermethylation (silencing) of the GR promoter and related genes [51]. Similar GR hypermethylation was subsequently demonstrated in hippocampal tissue [52] and peripheral lymphocytes [53] of humans maltreated in childhood. Other epigenetic changes shown in animals include genes controlling other key stress-related receptors (e.g., for CRF) and hormones (e.g., CRF, AVP, ACTH, and cortisol), as well as in neurotransmitters/neuropeptides in stress-regulatory brain regions [54].

Autonomic axis

In response to stress, amygdala signaling initiates sympathetic activation via the brainstem, terminating in adrenergic signals to end organs (e.g., liver, heart, digestive tract, and pancreas) and induction of adrenal medullary epinephrine/norepinephrine release producing the prototypical “fight or flight” response. The parasympathetic branch exerts countervailing control, and dynamic

sympathetic-parasympathetic balance shapes overall stress physiology [55]. Experimental animal models and observational human studies have consistently linked ELA to autonomic dysregulation, including both hyper- and hypo-responsiveness of sympathetic or parasympathetic pathways. Imbalance in either sympathetic- or parasympathetic-dominant directions again represent manifestations of excess allostatic load and predict stress-related diseases, including heart disease, obesity, type 2 diabetes, cancers, and psychopathologies [55]. Pathology associations may differ by pattern of autonomic imbalance. Several studies, for instance, found that attenuated sympathetic reactivity correlated with antisocial behavior with callous-unemotional traits in ELA-exposed boys, while heightened reactivity correlated with antisocial behavior without callous-unemotional traits [56]. Such findings remain exploratory, and the direction of causal links, if present, is unclear. Among few studies specifically examining mechanisms of autonomic changes, one found that volumetric changes in the amygdala, hippocampus, and PFC statistically mediated autonomic changes as well as risk of psychopathology [57]. Overlapping regulation by corticolimbic structures and core molecular mediators (e.g., CRF) suggests that some HPA-related alterations may also impact autonomic functioning.

Axis 3: Immune functioning

Innate and adaptive immune responses work jointly to control exogenous (e.g., microbial) and endogenous (e.g., necrotic/neoplastic) threats in processes dependent upon inflammatory mediators. When chronically elevated, however, inflammatory mediators contribute to immunosuppression as well as oxidative stress and cytotoxicity [58]. ELA has been linked in human studies and animal experimentation to chronic inflammation [59] and low-level immunosuppression, including impairment of mucosal immunity in children [60] and cellular immunity (e.g., poorer control of latent viral infection) in adolescents [61] and adults [62]. Important work has characterized a "pro-inflammatory phenotype", involving exaggerated cytokine response to bacterial challenge and progressive glucocorticoid receptor desensitization, among ELA-exposed individuals [63]. Considering potential mechanisms, acquired peripheral glucocorticoid resistance may attenuate cortisol's anti-inflammatory effects [18]. Meanwhile, genome-wide analysis in ELA-exposed individuals has shown increased expression of genes controlling not only cortisol output, but also the activity of key inflammatory mediators like NF- κ B and interleukin-6 (IL-6) [64], with potential antecedents including developmental programming of monocytes for excessive inflammatory responses [18, 65]. Finally, emerging research posits that ELA-related gut dysbiosis may contribute to chronic inflammation, as discussed below.

Health implications of immunosuppression include compromised control of infection and other threats. Meanwhile, inflammatory mediators linked to ELA (e.g., IL-1, IL-6, TNF-alpha, CRP, and fibrinogen) are implicated in risk of cardiovascular and metabolic disease [17, 66, 67]. Inflammation is also a proposed mechanism mediating ELA effects on later depression, age-related diseases [3], neurodevelopmental changes [40], cancers [49], and other systemic effects discussed. Considering cancer risk in particular, immunosuppression impairs control of latent oncogenic viruses [68], while inflammation further promotes oncogenic tumor microenvironments in conjunction with stress mediators, as discussed above [49].

Axis 4: Metabolic health

Interest in metabolic embedding of ELA stems from epidemiological [1, 69] and clinical [70] studies linking ELA to obesity, dyslipidemia, and type 2 diabetes, raising questions about possible causal pathways. While research directly linking ELA to altered development of metabolic physiology remains emergent (versus clear indirect impacts via, e.g., chronic inflammation [3]), potential loci of embedding are multiple. Feeding-related regulation involves, among other networks, dopaminergic reward pathways under top-down control by the PFC, and hypothalamic nuclei integrating nutrient signals to induce hunger or satiety, and systemic shifts between catabolism and anabolism [71]. Peripheral energy homeostasis involves an interplay of anabolic (e.g., insulin) and catabolic (e.g., cortisol, glucagon, epinephrine/norepinephrine) signals promoting increased glycemia and tissue insulin resistance.

Considering mechanisms of potential ELA effects, chronic inflammation, as well as excess catabolic signaling in those with hypercortisolemia, are proposed to drive metabolic dysfunction. Preliminary models also posit that ELA may durably alter hepatic expression of cortisol-activating and -metabolizing enzymes, enhancing tissue-level insulin resistance even in those who later suppress hypercortisolemia [70]. Furthermore, a previous study linked ELA to altered central reward processing promoting excess food intake in some individuals [72]. Additional work is needed to explore the hypothesized pathways.

Axis 5: The microbiome

The gut microbiome represents the collective genome of nearly 100 trillion commensal microorganisms, including over 1000 bacterial species. Dysbiosis, a pathogenic disruption of gut microbial composition or host-microbe interactions, is implicated in diseases including obesity, type 2 diabetes, and depression [73]. While genetically influenced, gut microbial composition responds to

factors including stress, diet, infection, drugs, and toxins, making the gut a potential mediator between environment and disease. Various previous studies have suggested profound microbiome effects on neuroendocrine and immune function, such that dysbiosis could compound ELA-related changes including cortisol dysregulation and chronic inflammation [73–77]. Furthermore, growing literature on the “gut-brain axis” describes microbial influence on neural development and functioning [78]. Pathways of influence may include microbial vagus nerve activation, neural signaling by microbial metabolites or molecular patterns, heightened inflammation with downstream neural effects, and induction of epigenetic changes [77, 79, 80]. In animal experimentation and some small human studies, dysbiosis has also been shown to impact relevant brain and behavioral parameters, including cortisol regulation, depressive and anxious symptomatology, and social functioning [77, 79].

Whether ELA itself produces dysbiosis is a question of ongoing interest [74]. A study in rodents found that infant maternal separation durably altered fecal microbiota and increased later inflammatory reactivity [81]. Work in monkeys, meanwhile, found that transient dysbiosis triggered by infant maternal separation predicted durable immune dysfunction, supporting the possibility of early microbiome effects on development in other axes [82]. If human research replicates such findings, the health implications may be considerable.

Interactive effects across axes

The above evidence illustrates how ELA-related physiological changes generate feed-forward synergies; for instance, if glucocorticoid toxicity compromises brain regions tasked with stress regulation [29], or stress-related inflammation further disrupts neural, gut microbial, and metabolic axes to compound HPA dysregulation and further inflammation [83]. Meanwhile, brain functional changes (e.g., altered executive functions and reward processing) may shape health-related behaviors and ongoing social risk exposures [84]. Synergistic effects of ELA thus produce wide-ranging physiological changes marked by aberrant neural function, endocrine activity, chronic inflammation, immunosuppression, insulin resistance and, potentially, dysbiosis. These changes are substantially mediated by altered development of stress-response systems; when acute, activation of these systems generates adaptive changes across body systems (e.g., immune, metabolic, cardiovascular) to address threats. However, chronic or excessive activation contributes to the pathogenic physiological “wear and tear” described within the allostatic load paradigm [15, 29]. In full, ELA-induced changes may mediate epidemiological links to key diseases, including, among others, obesity, dyslipidemia, type 2 diabetes,

atherosclerosis, asthma, thromboembolic events (myocardial infarction, stroke), cancer onset and progression, as well as addictions, psychopathology, and adverse social outcomes [1–6, 18].

Differential susceptibility to adversity

Despite described trends, outcomes among ELA-exposed individuals are markedly diverse. A rich literature describes this apparent differential susceptibility to adversity, as selectively reviewed in Table 2 and recommended as further reading [85, 86]. Some observed modifiers of ELA effects include genetics [25, 87–89], child sex and/or gender [19, 90, 91], exposure features (e.g., timing, nature, and intensity) [21, 25], and the presence of other risks or protective factors [36]. Of note, substantial literature suggests that nurturing caregiving is a particularly powerful protective factor mitigating ELA associations with physiological parameters, including elevated allostatic load [92, 93], inflammation [94], cortisol reactivity [95], and cellular aging [96]. Considering neurodevelopment, a prospective study found that caregiving behaviors mediated the association of early childhood socioeconomic stress with hippocampal volumetric change [97]. Such studies suggest that caregiving quality critically shapes psychosocial risk trajectories and developmental effects.

Clinical, research, and public health applications

The evidence linking ELA to lifelong health is substantial, with important implications for clinical practice and public health summarized in Table 3. We highlight four recommendations in particular. First, we suggest that screening for ELA should become a routine part of clinical care for children and adults. This aspect of the “developmental history” can provide information about a patient’s risk of major pediatric and adult diseases, facilitating social support, protective intervention, and/or decisions about disease screening and prevention.

Second, screening for ELA must be matched by investment in scale-up of known effective interventions promoting health by addressing ELA. Considerable evidence suggests that caregiving-focused interventions, for instance, may mitigate the physiological effects of ELA. Some parameters improved by caregiving-focused interventions in longitudinal research include ELA-associated chronic inflammation [98], telomere shortening (accelerated genetic aging) [99], and gray matter volumetric changes [100]. Similarly, cortisol reactivity appears to be sensitive to caregiver-targeted interventions and to psychological support interventions with ELA-exposed individuals [101]. Scale-up investments must include quality monitoring and ongoing assessment of impact at scale. Assessments must disaggregate effects by population

Table 2 Selected effect modifiers

Modifier	Examples of findings	Further reading
Genetic variability	<ul style="list-style-type: none"> Genetic polymorphisms found to moderate associations between ELA and various outcomes; Specific examples of outcomes impacted with implicated genes include: <ul style="list-style-type: none"> Emotional and neuroendocrine stress reactivity: 5-HTTLPR Inflammatory response to stress: 5-HTTLPR Common forms of psychopathology, including depression, ADHD, and substance addiction: NR3C1, CRHR1, OXTR, 5-HTTLPR, HTR3A, DRD2, MAOA, BDNF, COMT Atherosclerosis risk: MAOA 	<p>Lester et al., 2006 [86]</p> <p>Fredericks et al., 2010 [88]</p> <p>Nemeroff et al., 2016 [25]</p> <p>Heim & Binder, 2012 [87]</p> <p>Zhao et al., 2013 [89]</p>
Child sex and gender	<ul style="list-style-type: none"> Complex sex differences in HPA and autonomic dysregulation after early stress observed in animals and humans Differential effects of maternal vs. paternal stress on boys vs. girls leads some to posit ELA effect moderation by socially embedded gender roles Genetic moderators of the effects of ELA may be sex and/or gender specific <ul style="list-style-type: none"> Meta-analysis found stronger effect of MAOA genotype on psychopathology in boys Different polymorphism on the 5-HTTLPR gene have been linked with increased risk of depression following ELA in males vs. females 	<p>Essex et al., 2013 [19]</p> <p>Kim-Cohen et al., 2006 [90]</p> <p>Brummet et al., 2008 [91]</p>
Other child characteristics	<ul style="list-style-type: none"> Pre-existing health conditions, e.g., prematurity, poor physical health status, etc. alter social and physiological consequences of ELA Child temperament, sensitivity to the environment, and emotion processing are associated with risk for psychopathology and may affect the ways in which children respond to adversity 	<p>Doom & Gunnar, 2015 [36]</p> <p>Lester et al., 2006 [86]</p>
Exposure characteristics	<ul style="list-style-type: none"> Characteristics of the exposure, including type (e.g., sexual, physical, emotional abuse, or neglect), chronicity, and intensity, modify associations with physical and mental health outcomes Exposures occurring during early sensitive periods can have heightened impacts on specific developmental domains leading to “timing effects” 	<p>Nemeroff et al., 2016 [25]</p> <p>Bick & Nelson, 2016 [21]</p>
Social context and caregiving	<ul style="list-style-type: none"> Family structure and stability, birth order, caregiver stress and social support, community and societal context may modify effects of specific adversities Presence of a dependable, supportive caregiver may “buffer” children from effects of otherwise adverse environment 	<p>Doom & Gunnar, 2015 [36]</p>
Cumulative occurrence	<ul style="list-style-type: none"> Dose-response relationship between number of adversities and health and social effects are observed in large epidemiological studies 	<p>Felitti et al., 1998 [1]</p> <p>Danese et al., 2009 [3]</p>

ADHD attention deficit hyperactivity disorder, *HLA* hypothalamic-pituitary-adrenal, *ELA* early life adversity

subgroups, for instance, as defined by culture, SES, religion, race, or ethnicity, to identify diverse needs [102].

Third, investigators must continue to test new intervention strategies to prevent or reduce the physiological effects of ELA. New approaches should be ever more accurately targeted (e.g., based on genotype-dependent response variation), scalable, effective, and evidence based, making use of the rich literature on biological embedding. In particular, novel approaches are needed to reach the most vulnerable families often least impacted by existing strategies [102]. Efforts should be aided by ongoing development of biomarkers of ELA [103], which can be used

to track intervention effects and optimize timing and targeting. Additional research priorities include better characterization of ELA-microbiome links, and consistent use of prospective ELA measures.

Finally, we recommend that practitioners across multiple social sectors recognize ELA as a common soil giving root to various manifestations of poor health over the life course, and better align strategies to advance child welfare and public health. Disease prevention paradigms must move beyond proximal focus on risk behaviors (e.g., diet, substance use) for specific diseases towards life-course models accounting for early influences on lifelong health. Efforts require coordination

Table 3 Proposed clinical implications of reviewed findings

Practitioner activity	Recommendations	Recommended resources
Understanding disease etiology and risk	<p>Consider how ELA contributes to a patient's risk of common health problems, e.g.:</p> <ul style="list-style-type: none"> • Mental health disorders: Depression, anxiety, substance use disorders, post-traumatic stress disorder, psychosis • Cardiovascular disease: Ischemic heart disease, hypertension, atherosclerosis • Metabolic pathology: Obesity, type 2 diabetes, dyslipidemia, metabolic syndrome • Neoplasm: Breast, liver, lung cancers 	<p>Results of major epidemiological studies assessing health effects of ELA [1–6]</p> <p>Further reading suggested throughout</p>
Screening	<ul style="list-style-type: none"> • Screen for ELA history • Assess social service and protection needs • Consider ELA history when assessing risk and screening for ELA-related diseases or developmental needs 	<p>Adverse Childhood Experiences Questionnaire [1]</p> <p>WHO Adverse Childhood Experiences International Questionnaire [104]</p> <p>American Academy of Pediatrics Resilience Project Clinical Screening Tools [105]</p>
Intervention	<p><i>General practice</i></p> <p>Provide access to:</p> <ul style="list-style-type: none"> • Mental healthcare • Early prevention and treatment for other ELA-related diseases • Social services and poverty alleviation • Violence response and prevention interventions <p><i>Pediatric practice</i></p> <ul style="list-style-type: none"> • Family and caregiver support programs • Early development interventions • Services to prevent or respond to ELA exposures, including child protection services 	<p>WHO Preventing Child Maltreatment guide [106]</p> <p>WHO mhGAP Intervention Guide [107]</p> <p>Interventions resources to support healthy child development from Frontiers of Innovation – Center on the Developing Child at Harvard University [108]</p>
Transforming care models	<p>Adopt best-practices from “medical home models” to support ELA-exposed patients, including strategies promoting:</p> <ul style="list-style-type: none"> • Patient- and family-centered wraparound care • Cultural competency • Enhanced access and follow-up 	<p>National Center for Medical Home Implementation Tools & Resources [109]</p>
Advocacy	<p>Incorporate evidence on ELA into advocacy relating to:</p> <ul style="list-style-type: none"> • Access to mental health services • Poverty alleviation, criminal justice reform, and violence prevention • Fair parental leave and high-quality child care • Immigration and refugee policies protecting children and families 	<p>WHO guidance package on Advocacy for Mental Health [110]</p> <p>United Nations Children's Fund policy advocacy and children's rights tools [111]</p> <p>Children's Defense Fund policy campaign resources [112]</p>

ELA early life adversity, WHO World Health Organization

across health, social services, education, justice, child protection, and other sectors to improve alignment around children's needs. Among others, relevant priorities might include improving access to mental health services, childcare, and parental leave, expanding family poverty programs, seeking immigration and criminal justice practices that avoid separating children from nurturing caregivers, and addressing racial inequities impacting children.

Conclusions

The findings reviewed here explore various biological mechanisms that may explain links between adverse childhood experiences and disease. These insights can inform efforts to improve health across the life course. As the emergence of novel tools, such as biomarkers of early adversity, drives a new wave of intervention research, strong collaboration is needed between medical and public health practitioners, families, and communities based on a deep appreciation for the effects of early

adversity. The understanding of the physiology of biological embedding, as explored here, supports those leading practice-transforming efforts.

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AB contributed to conceptualization, drafted the majority of the initial manuscript, and finalized edits. SJ contributed to conceptualization and drafting of the review and offered critical comments and edits. CN oversaw conceptualization of the review, provided scientific guidance, and offered critical comments. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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Author details

¹Boston Children's Hospital, Boston, Massachusetts, USA. ²Harvard Medical School, Boston, Massachusetts, USA. ³Laboratories of Cognitive Neuroscience, Boston Children's Hospital/Harvard Medical School, 1 Autumn Street, Boston 02215, Massachusetts, USA. ⁴Graduate School of Education, Harvard University, Cambridge, Massachusetts, USA.

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Interoceptive Awareness Skills for Emotion Regulation: Theory and Approach of Mindful Awareness in Body-Oriented Therapy (MABT)

Cynthia J. Price* and Carole Hooven

School of Nursing, University of Washington, Seattle, WA, United States

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*Correspondence:

Cynthia J. Price
cynthiap@uw.edu

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Emotion regulation involves a coherent relationship with the self, specifically effective communication between body, mind, and feelings. Effective emotion regulation involves the ability to accurately detect and evaluate cues related to physiological reactions to stressful events, accompanied by appropriate regulation strategies that temper and influence the emotional response. There is compelling evidence demonstrating links between poor or disrupted awareness of sensory information, or interoceptive awareness, and difficulties with emotion regulation. This paper presents a framework, based on psychological and neurobiological research, for understanding how interoceptive awareness facilitates regulation and an integrated sense of self, and thus contributes to health and well-being. A mind-body therapeutic approach called mindful awareness in body-oriented therapy (MABT), uniquely designed to teach fundamental skills of interoceptive awareness, is described. MABT develops the distinct interoceptive awareness capacities of identifying, accessing, and appraising internal bodily signals that are identified in physiological models as the critical components of interoception for emotion regulation. The explanatory model is that the development of these key interoceptive capacities improves sensory (physical and emotional) awareness, reduces distress, and improves regulation. Strategies for teaching and learning interoceptive awareness are not well-developed in mindfulness or psychotherapeutic approaches, particularly important for people who may have difficulty attending to interoceptive awareness due to stress, chronic pain or trauma. To address this issue, MABT provides an individualized protocol for scaffolding interoceptive awareness through a combination of psychoeducation and somatic approaches explicitly addressing difficulties with interoceptive processing. Clinical vignettes are included to provide exemplars of this approach and to highlight key components of the therapeutic process. Results from research are also included to highlight the acceptability, safety, health outcomes, and possible mechanisms underlying the MABT approach.

Keywords: interoception, awareness, emotion, regulation, therapy

INTRODUCTION

Emotion theory and understanding have undergone notable shifts as the field of emotion science has developed. Such shifts in theoretical perspectives often appear to travel along a particular continuum that leans toward either body-oriented or mind-oriented explanations. At one end of the continuum it is bodily cues and sensations that are the key source and explanation for emotional experience, at the other it is cognitive processes. Are emotional feelings pre-conscious, arriving fully formed and physically coherent, and then later interpreted by the mind to be named and understood? Or is it the case that cognitive interpretations of the self and context trigger emotional responses that will organize and energize an emotional response, with consciousness of bodily cues and feelings following?

Early science of emotion pointed to a bodily source: a patterned emotional response in the service of survival. The evolutionary model was subsequently modified in embodied theories of emotional experience (James, 1890; Schachter and Singer, 1962) to include the important roles of awareness and interpretation of bodily cues. With a shift, the 20th century saw an emphasis on the role of mind in determining emotion responses, and furthermore in articulating treatment such as cognitive therapy for emotional pain and dysfunction. As theories have shifted between being more bodily-oriented vs. more cognitively-oriented, there has been increased integration and elaboration of the separate perspectives (Izard et al., 1984). Scientists who followed found that locating the origins of organized emotional response in the body provided a foundation for more nuanced and complex models of emotion response and regulation augmented by cognitive activities such as appraisal and sensitivity to internal signals (Damasio, 1999, 2005). Embodiment theorists in philosophy and anthropology wrote about ‘bringing the body back’ into conceptualization of the self (Evans et al., 1991; Csordas, 1994), a view supported recently in neuroscience by interoception models (Craig, 2015) that indicate how the body and mind interact in complex ways to influence each other as they are expressed and understood as emotion.

Interoception is the perception of sensations from inside the body and includes the perception of physical sensations related to internal organ function such as heart beat, respiration, satiety, as well as the autonomic nervous system activity related to emotions (Vaitl, 1996; Cameron, 2001; Craig, 2002; Barrett et al., 2004). Much of these perceptions remain unconscious; what becomes conscious, i.e., interoceptive awareness, involves the processing of inner sensations so that they become available to conscious awareness (Cameron, 2001). There are multiple processes involved in interoception, reflected in conceptual variations of interoceptive awareness across disciplines (Khalsa and Lapidus, 2016; Khalsa et al., 2018), the evolving state of the science, and the emergence of transdisciplinary models to address conceptual and measurement questions (Farb et al., 2015; Khalsa et al., 2018). Importantly to this paper, there is empirical evidence of the connection between interoceptive awareness and regulation of emotion (Craig, 2015). Such research links a lack of interoceptive awareness with emotion disorders (Paulus and Stein, 2010; Khalsa and Lapidus, 2016); and has opened

new avenues for working with difficult to treat or intractable emotional disorders, such as depression, post-traumatic stress disorder (PTSD) and substance use disorder (SUD) (Farb et al., 2015). In addition, research on the neurobiological effects of stress has identified neural and physiological changes subsequent to adversity and trauma that influence emotional experience and internal emotion-related processes and awareness (Evans and English, 2002; Lupien et al., 2006; Ellis et al., 2011, 2013; Taylor et al., 2011). For example, physiologic adaptations to persistent or traumatic stress include both autonomic hyper and hypo arousal (for a review, see Taylor et al., 2011). Thus, converging trends in therapeutic practice and neuroscience invite reconsideration of the body, pointing to its central role in emotional experience and regulation.

The purpose of this paper is to present a framework of emotion regulation that highlights the integrative role of interoceptive awareness and ability. Interoceptive awareness is key to identifying internal physiological processes related to affective feeling, and by so-doing is a means of integrating bodily sensations, cognitive processes, and emotional feeling (Craig, 2015). Hence, interoceptive awareness is a window to emotional experience, as well as potentially providing access to important mechanisms of emotion regulation (Khalsa and Lapidus, 2016). This paper has two distinct sections. The first section presents a framework, based on psychological and neurobiological research, for understanding how interoceptive awareness facilitates regulation and an integrated sense of self, and thus contributes to health and well-being. The second section presents a mind-body therapeutic approach called mindful awareness in body-oriented therapy (MABT), uniquely designed to teach interoceptive awareness skills to increase capacity for emotional regulation, expression, and understanding.

SECTION I: CONCEPTUAL FRAMEWORK RELATING INTEROCEPTIVE AWARENESS AND EMOTION REGULATION

Models specific to interoception and stress response (Schulz and Voge, 2015), neurobiology (Paulus, 2007), and physiology (Craig, 2002) converge to pinpoint interoception as central to emotion experience and regulation. The stress response system (SRS) directs and organizes a complex sequence of physiological activities to respond to stress and thus ensure homeostatic balance for the organism. The detection, interpretation and behavioral integration of these internal activities involve interoception. In particular, this information from the body has, as well, a necessary and central role in emotion experience and regulation (Garfinkel and Critchley, 2013). We describe a framework for understanding how interoceptive ability contributes to emotional awareness and regulation.

Interoception

Interoception involves the bi-directional communication between bodily sensation and multiple levels of cortical

oversight, a process by which information about invisible internal physiological states are communicated to cognitive centers in the brain in order to support physical and emotional well-being, including effective response to stress via emotional awareness and regulation (Craig, 2003; Critchley and Garfinkel, 2017). Interoception can be seen as a precursor and even a blueprint for emotion response (Damasio, 1999). Sensations from the body underlie most if not all of our emotional feelings, particularly those that are most intense, and most basic to survival (Craig, 2002). It has a role in survival, supporting regulated response to sensations related to bodily integrity (e.g., sensations of hunger, temperature, and pain) as well as emotion sensations directed at social integration (e.g., positive emotion, affection, and intimacy) and physical survival (e.g., fear and anger/aggression). Interoceptive awareness – the ability to identify, access, understand, and respond appropriately to the patterns of internal signals – provides a distinct advantage to engage in life challenges and on-going adjustments (Craig, 2015).

Emotion Regulation

Regulated emotion is attuned and adapted to relevant psychosocial and physical circumstances, optimizing opportunities to function in a restorative and growth-oriented manner (Porges, 2011). This involves marshaling an adaptive, appropriate emotional response that organizes behavior and benefits an individual, attuned to internal personal cues as well as external circumstances (Blair and Raver, 2012). On the other hand, emotion dysregulation involves an emotional response that is out of proportion, erroneous or inappropriate with respect to the stimulus, and ineffective for achieving overall and consistent well-being. There may be benefits to a dysregulated response (e.g., intense aggression may remove the irritant), however, inappropriate or intensity of emotional sensations and responses distinguish dysregulation as problematic to overall health. In its most intense and persistent manifestations, dysregulated emotion can be characteristic of diagnosable anxiety, depression, and aggressive disorders as well as PTSD.

At a deeper level, emotion regulation involves a coherent relationship with the self, specifically effective communication between body, thoughts, and feelings. It implies tolerance and understanding of signals from the body and the related cognitive attributions. It also implies having the capacity to positively manage challenging sensations and related behavioral responses, such as behaviors or decisions to moderate, suppress or change signals toward a desired end. From an embodiment perspective, the accurate detection and evaluation of cues related to physiological reactions is accompanied by appropriate regulation strategies that temper and influence the emotional response. Optimally, emotional regulation confers benefits in terms of health, well-being, social connection, and competence with life tasks.

Stress Response System (SRS), Interoception and Emotional Regulation

Being responsive to interoceptive information allows an individual to be aware of an emotion cue early, and therefore to

process, interpret and strategize at the onset of stressful events. There is a complex relationship between interoception and stress (Schulz and Vogele, 2015) as both processes reflect the neurological communication between the central nervous system (CNS) and peripheral nervous system (PNS), which is critical to mobilizing the organism for homeostasis and survival, and both are shaped by key interactions with the environment. For these systems, the bi-directional communication between the CNS and PNS involves interoception, perception, and processing of internal bodily states that are transmitted to brain, and involves activated stress processes that are transmitted from the CNS to the peripheral system as well as to metabolic and immunologic functions via neural and endocrine pathways.

General stress models, such as the Allostatic Load model, posit that a stressful environment leads to a dysregulation of the SRS (Del Giudice et al., 2011; Ellis et al., 2011). The SRS codes and filters information from the environment to prepare the body to respond to threats to its equilibrium. The SRS involves several subsystems (SNS; PNS; HPA) each with patterns of response to stress, constituting a primary integrative pathway through which psychosocial environmental factors are transmuted into behavioral, autonomic and immunologic adaptation, or pathology. Dysregulation of the SRS is typically initially reflected in hyper-responsivity and causes wear and tear on physical, mental, and emotional regulatory systems (Del Giudice et al., 2011; Ellis et al., 2011; Blair and Raver, 2012). However, over time, the SRS system may become down-regulated and hence *less* sensitive and responsive to cues, marked by insensitivity to internal states and their causes. Both hyper and hypo sensitivity affects the relationship with the body and emotions: hyper vigilance is associated with overly reactive responses and negative, possibly inaccurate, interpretations; conversely buffered responsivity is less informed and engaged, and therefore less likely to respond when responding is called for. Hence, the excessive and/or unrelenting demands from a difficult environment can get ‘under the skin’ and change a person’s physiological response to stress (McEwan and Seeman, 2003; Lupien et al., 2006; Taylor et al., 2011; Ellis et al., 2013). Such exposure to constant stress and the changes described can lead to decreased interoceptive ability that may be a reflection of the noted difficulties in detecting, tolerating, and interpreting cues.

Schulz and Vogele (2015) present a model that integrates stress response and interoception, suggesting that undue stress affects interoceptive awareness by altering the intensity of the internal cues as well as their perception and interpretation. Thus, stress may influence multiple levels of interoceptive process. Stress and trauma affect the strength of signals at the most basic levels of interoception, as well as the ability to ‘access’ or tolerate the disturbance, which in turn compromises accurate interpretation of sensations and related decisions regarding behavior. Schulz and Vogele focus their arguments on psychological disorders directly influenced by uncomfortable sensations emanating from the body (e.g., rapid heart rate leading to anxiety; dissociation). In addition, we suggest that their argument for maladaptive emotional response can be applied to dysregulated emotional patterns that have documented associations with maladaptive stress responses such as suicide behaviors, depression and anger

management disorder (Hooven et al., 1995; Briere and Jordan, 2009; Anestis et al., 2011).

The Adaptive Calibration Model (Del Giudice et al., 2011; Blair and Raver, 2012; Ellis et al., 2013) allows that the benefits of upregulated or down-regulated stress may be momentarily adaptive. However, difficulty arises when the response that is adaptive to difficult environments remains ‘set’ even when the environment is changed. Set points represent a long-term calibration of the SRS during early life events, resulting in consequential patterns of autonomic and HPA responsivity that are sustained long after the events that precipitated them, and possibly long after they are adaptive (Del Giudice et al., 2011; Pluess, 2015). For instance, the individual with a more reactive, open response to stress, developed in a supportive, safe environment, will be at a disadvantage if they continue to be sensitive and reactive in an adverse situation. There is a ‘sweet spot’ in regulation, between being sufficiently buffered so not to be overwhelmed, but still engaged with the environment (Ogden, 2009). This is the therapeutic window where affect is both tolerable and helpful, i.e., affective responses between hyper and hypo arousal.

For a highly responsive individual, the SRS amplifies the signal coming from the environment and maximizes the chance an individual will be modified by that experience; the costs may include being hypersensitive to social criticism or becoming interrupted or overwhelmed by minor challenging events (Blair and Raver, 2012; Pluess, 2015). On the other hand, chronic stress may result in lower tolerance for physiological response, solidifying a strategy at the physiological level to buffer and defend the organism from activation of the SRS, such as physiological ‘set points’ that buffer signals and protect the organism (Del Giudice et al., 2011; Ellis et al., 2013). The tasks and challenges of coping with a difficult environment can shape the capacity to attune oneself to bodily signals, and even affect the shape and size of those signals themselves. From a survival perspective, it may be preferable to be buffered from an onslaught of environmental insults and the resulting cues to respond, thus protecting the organism from mounting undue, ineffective and eventually deleterious stress responses. By and large, an environment with ‘normal’ or common stressors may lead to moderate and somewhat adaptive buffering of external cues, whereas a nurturing, facilitative environment may render one more ‘open’ to the environment, more in tune with bodily sensations, and more likely to adaptively respond to stimuli (Del Giudice et al., 2011). The downside to buffering is that the capacity to maintain awareness, notice feelings and interpret feelings may likewise be compromised, and may remain so long after the need for protection is resolved. Similarly, an individual open to the effects of their environment may have less ability to withstand prolonged or dramatic difficulties and frustrations when they are encountered.

Implications for Intervention

The work we have presented thus far places physiologic cues at the center of emotion regulation theory and research, and, by logical extension, places the body at the center of intervention approaches designed to address emotion regulation. Such an

intervention approach is particularly relevant for individuals who experience undue stress, physical or psychological pain or trauma. Implicit in models of both emotion regulation and stress described above is the importance of attending to the ways daily stressors, large and small, impact body–mind communication, specifically the ability to attend to and interpret internal signals of stress-related emotion.

Therapeutic approaches designed to re-shape the response to environmental cues to make physiologic responses more knowable, accessible and tolerable, and thus available to aid in regulation, will have to work with the client to adjust their ‘set points’ in ways that facilitate optimal emotional responding within a general set of current and relevant environmental expectations. Thus therapeutic work directed toward emotional tolerance may expand the therapeutic window, or the sweet spot, between hypo and hyperarousal. Such activities gently nudge the client toward greater interoceptive awareness and emotional regulation by incrementally moving them toward therapeutic goals in a safe and conscious manner.

SECTION II: MINDFUL AWARENESS IN BODY-ORIENTED THERAPY

In this section, we present the MABT approach, explicitly designed for teaching and learning interoceptive awareness. MABT was developed by co-author Cynthia Price in the 1980s in response to the need to integrate somatic and emotional awareness work within body-oriented therapy practice. Drawing from Focusing (Gendlin, 1981), an experiential psychotherapeutic approach that involves attention to the “felt sense” to enhance sensory awareness of emotional experience, the MABT approach teaches interoceptive awareness using the combination of manual (touch-based), mindfulness, and psychoeducational approaches.

Mindful awareness in body-oriented therapy develops the distinct interoceptive awareness capacities of identifying, accessing, and appraising internal bodily signals (Cameron, 2001) that are identified in physiological models as the critical components of interoception for regulation (Craig, 2003). An incremental or staged process for teaching these interoceptive awareness skills is used in the MABT approach (see explanatory model, **Table 1**). Integral to the development of interoceptive awareness is the development of mindfulness, specifically the capacity to be in, and maintain attention to present-moment experience with an attitude of openness, curiosity, and self-compassion (Kabat-Zinn, 1990; Bishop et al., 2004). Mindfulness increases tolerance of one’s thoughts and feelings, particularly uncomfortable ones, and facilitates the unlinking of uncomfortable observations from scripted unregulated responses.

While MABT and other mindfulness approaches involve both bottom-up and top-down processes (Taylor et al., 2010), MABT is unique in its strong focus on bottom-up learning processes involving a focus on sensation guided by the use of touch to support learning interoceptive awareness. Linked to emotion regulation, interoceptive awareness is affected by one’s

TABLE 1 | Mindful awareness in body-oriented therapy (MABT) explanatory model.

Interoceptive awareness component	MABT key processes	Related health outcomes
Awareness	Body literacy	Improved sensory awareness
Access	Training Interoceptive awareness exercises	Reduced distress and improved well-being
Appraisal	Mindful body awareness practice	Improved regulation and resilience

previous experiences of stress – suggesting that interoceptive processes are one way in which stress can alter the capacity to tune into emotion and hence regulate emotion (Schulz and Voge, 2015). Even if there is some ability to access interoceptive awareness, the capacity to maintain awareness, or move back and forth between cognitive oversight and bodily awareness may be undeveloped. The gentle, coached MABT approach is thus used to facilitate learning, and also helps to build trust and comfort with the material, slowly increasing sensitivity to internal states and awareness of complex internal responses that can shape awareness, self-understanding, decision making processes, and behavior that underlie regulation. MABT research in community settings demonstrates the feasibility, acceptability, and safety of MABT (Price, 2005, 2006; Price et al., 2007, 2012, 2013; Price and Crowell, 2016). These studies involved samples with co-occurring conditions and extensive trauma histories, highlighting the acceptability of MABT teaching processes among highly distressed populations. This section describes each of the MABT stages and includes a clinical example of the therapeutic processes involved.

LEARNING INTEROCEPTIVE AWARENESS: MABT PROCESSES AND CLINICAL EXAMPLES

Awareness

To access awareness of inner body sensation one needs to know how to perceive internal sensations. The ability to do so, however, can be unfamiliar or challenging. This is often due to avoidance of sensations (often characterized as being defended from feeling), or due to derealization/depersonalization, a type of dissociative response that is very common among those with high stress or chronic pain (Zaman et al., 2015), as well as among those with a history of trauma (Herman, 1997; Frewen et al., 2008). Often there is little to no knowledge on the client's part that there are sensations that could be brought into awareness, as the patterns of conscious attention are so strongly set. Thus there can be multiple types of barriers to overcome that all require the development of fundamental skills of awareness. MABT begins by teaching the clients to identify body sensations, this is called *body literacy*, the ability to identify and articulate sensory experience. The naming of sensation is secondary to experiencing sensations, and the complex and nuanced awareness that sensation conveys

may be unnamed, particularly when first encountering new sensory experiences. However, the ability to identify and describe sensation is fundamental for interoceptive awareness as it provides a pathway for relating or associating to the body, and thus facilitates perceived linkages between experiences of sensation (i.e., links between physical and emotional awareness, for example increased muscular tension and anger) and linkages between sensation and environmental triggers.

In MABT, body literacy is taught by asking the client what is noticed in response to physical pressure on an area where there is expected sensation, for example an area of physical tension or apparent discomfort. Physical pressure, through client self-touch or by the therapist on an area of the body (e.g., top of shoulder), can be used to guide client awareness to body sensation. Reflective listening techniques and follow-up questions are used to promote finer descriptions of sensory experience. When a client has difficulty finding words to describe sensation, the therapist provides a list of options to see if any match the client's experience and may also describe what he or she feels tactilely; this models body literacy and can help to teach the client how to engage in the process.

Clinical Example

A client receiving his first session MABT session will be asked about where he holds tension in his body. He says he holds tension in his shoulders. During body literacy training, the therapist will put moderate pressure on the top of the client's shoulders and ask the client to describe how his shoulders feel. The client says that his shoulders feel "fine." It is not uncommon, particularly individuals who avoid attention to sensation, to reply without answering the question due to the unfamiliarity of identifying and articulating sensory awareness. The therapist repeats the question with more specificity by asking the client how his shoulders feel in the area being pressed. The client replies that his shoulders feel "tight." The therapist uses reflective listening, repeating the client's words to promote deeper attention to the sensation by the client, and then asks if he can describe the tightness – for example the quality of the tightness (e.g., ropey, knotty, etc.). The client, responds saying, "hmm... I guess the tightness actually has a sharpness to it – like a burning sensation." He then adds, "I never realized how much my shoulders hurt. The longer I pay attention, the more aware I am of how the tightness travels up into my neck and also down between my shoulder blades." He spontaneously takes some deep breaths and then says "I really don't like feeling this way – which is why I decided to come see you. I'm just holding on to too much stress, I think." The therapist says, "You think you're holding on to too much stress. . ." The client says, "Yea – I work too much and I don't know how to let go. I can get pretty worked up." The therapist says, "You just took a couple deep breaths a minute ago and I noticed that your shoulders relaxed a bit. Did you notice that too?" The client: "Not in my shoulders, but I feel a little more relaxed overall." The therapist: "Good noticing and I'm glad to hear that."

The therapist continues in the session to ask the client to describe sensation in various places (back, arms, legs, etc.) in

order to help the client to attend to sensory awareness and to increase awareness of where he holds tension and what that feels like. The take-home practice focuses on the client practicing this on his own, for example putting pressure on his neck and shoulders and noticing the related sensations in his body. He is encouraged to take deep breaths if the area feels tight and to notice how his body and his shoulders feel when he focuses on breathing deeply. Being more aware of sensation – and the quality of sensation (reflected in how one might describe it) – helps the client to pay attention to bodily experience and may stimulate self-awareness and behavior change (i.e., self-care). In this clinical example, the client came into the 2nd session saying that his take home practice (which he did twice daily, once at work and once after arriving home in the evening) helped to keep the tension from increasing throughout the day and that he was in a better mood in the evenings. He said, “I didn’t realize that my body can tell me how I’m feeling! I guess I need to learn to listen to it more...”

The identification of sensory awareness is used in all aspects of subsequent interoceptive training and practice, as it is the fundamental perception of sensation. The ability to identify sensations is also necessary for engaging in the other aspects of interoceptive awareness (access, sustained attention, and appraisal). Verbally identifying and describing sensory experience facilitates awareness of the links between physical and emotional sensations and the internal cues related to one’s individual responses to stress. Importantly, participant verbalization of sensory experience in the sessions ensures that the therapist is informed about client experience and this helps the therapist to guide the educational and therapeutic process.

Integral to MABT, is a take-home practice. At the end of each session the client/therapist collaboratively come up with the home practice for the interim week based on the session (what was learned), what is most helpful for the client, and what can be feasibly practiced (see **Table 2** MABT Key Components). Client self-touch is used to facilitate the ability to engage in interoceptive awareness at home. Practice is critical for integration of interoceptive awareness skills into daily life. With practice, the client can develop comfort bringing mindful attention to the body and be responsive to interoceptive signals, thus facilitating the recalibration of the SRS maladaptive ‘set-points’ that underlie regulation.

Accessing

The next step in the development of interoceptive awareness is learning to bring attention to inner body experience. This involves learning to focus attention *inside* the body. Since this is often an unfamiliar concept, we teach multiple strategies to provide different experiences and pathways for accessing interoceptive experience. These strategies include: (a) attending to and feeling the sensation and flow of exhaled breath through the body, (b) using intention to feel the softening of areas of muscular tension, and (c) bringing attention to a specific area of internal body (e.g., inside chest, shoulder girdle, abdomen, etc.) We begin with exercises that focus on the movement of breath (strategy a) and intentionally attending to softening in an area that is holding tension (strategy b). These exercises, directed by the therapist, create the initial experience of *feeling* internal sensation, similar to the mindfulness meditation practice of attending to the sensations of breathing. Then, we teach the client to bring mindful attention inside a specific internal space in the body (strategy c). To do this, the therapist provides verbal and tactile guidance to promote the client’s mindful attention to a specific area of the inner body; typically we start with the upper chest as it is a relatively easy area to access and then move to areas that may be more problematic for the client (e.g., an area of discomfort). For all these initial accessing strategies, the therapist assesses whether or not the client is successful in bringing attention to the regions of the body and processes used (e.g., flow of breath), and whether more instruction is needed. This assessment thus guides the therapist’s teaching strategies and attention to potential challenges the client may experience in learning to access interoceptive awareness. These various exercises often become well-used strategies for self-care that are incorporated into daily life to facilitate self-care and regulation, as found in numerous MABT studies highlighting the frequent use of MABT skills in daily life and the perceived helpfulness of these skills/practices (Price, 2005; Price et al., 2011, 2012; Price and Smith-DiJulio, 2016).

Clinical Example

The ability to access interoceptive awareness varies greatly from person to person; for some it is relatively easy and little guidance is needed and for others, it can take training and practice. This example is of a client for whom access is challenging and describes the process of disengagement and reengagement that is typical in the learning process with clients for whom the SRS system is downregulated, reflecting a lack of awareness and tolerance for experiencing internal states. The client is a 40-year-old woman with chronic low back pain and depressed mood. She naturally avoids and distracts herself from her pain as much as possible as a coping mechanism to help her function throughout the day. In the past she took pain management classes that were also focused on distraction techniques. She is coming to MABT sessions to learn new ways to relate to pain because her pain levels have remained constant and her ability to manage the pain has decreased, causing her to feel easily irritated, depressed, and to increase use of pain medications. She describes herself as someone who puts others first and has trouble taking time for

TABLE 2 | MABT key interoceptive training processes.

Awareness – stage 1 Body literacy	Access – stage 2 Interoceptive awareness exercises	Appraisal – stage 3 Mindful body awareness practice
Identify body sensations	Breath flow exercise	Capacity to sustain awareness
Articulate body sensations	Tissue softening exercise	Noticing internal shifts
	Internal body attention practice	Re/appraisal based on experiential awareness and insight
Take home practice	Take home practice	Take home practice

herself or to attend to her emotional needs; that she is just focused on getting through the day and taking care of her family.

It is the client's 4th MABT session. In prior sessions she has been introduced to various exercises focused on accessing interoceptive awareness. In this session the aim is to facilitate her ability to bring her awareness into her low back region to increase interaction with, and gain information about, this region of the body that is the source of her pain and likely related to her depressed mood.

To start, the therapist and client talk together for 20 min about how the client is feeling and about her experience with the MABT home practice. On this particular day the client describes her back pain as moderate, and says she is coping well and managing her work and family life. She describes her success in using deep breathing to help her relax and reduce the build-up of tension throughout the day. However, she feels tentative about using breath to target the painful areas of her low back as she is afraid that this will cause spasms and increased discomfort. To assist her with bringing attention to her low back, the therapist asks the client to lie prone on the treatment table and places her hands around (one hand in back and one hand in front) the area of the client's low back, to provide the physical focus for the client's mindful attention. The therapist then offers verbal coaching to guide the client's attention inward to the area of her low back. The client, after multiple tries, is able to bring her attention to the space inside her torso. But each time, as her attention comes toward her lower back region, she finds herself thinking about something else. The therapist asks her to notice where in her body this shift "out" occurs. The client is able to identify disengagement from mindful attention at the point just below her lower thoracic spine – a bit above the primary location of her pain. In response, the therapist moves her hands to up to the lower thoracic region and asks the client to see if she can rest her attention there. The client is then able to maintain her focus in her body. She relaxes, and the therapist notices a deepening of attention or presence in this area of the body. The therapist asks the client what she notices, and the client describes the sensation in this area of her back as "achy." The therapist suggests that the client simply continue to attend to this area of her body for a little longer. The client is able to be present with her sensory experience in her back for many more minutes and as she does so, she feels her throat tighten and tears come to her eyes. The therapist asks what she is noticing, and she says "I just feel so sad." At this point her attention shifts out of her body and she opens her eyes.

The therapist encourages the client to stay with the feelings of sadness and the client is able to do so, crying quietly with her eyes closed. The client explains that she is remembering her brother who died 2 years ago, shortly after the birth of her second child, and how sad she is that he is no longer alive. She says that she's not had a chance to really mourn: "I feel like I just need cry and let him go. I miss him so much."

When they move to sit in chairs toward the end of the session, the client reports that the achiness in her back has subsided and she feels stronger somehow. She says that she hadn't been aware of how much sadness she was holding inside. She says, "I feel like I've been doing my best to just keep going after he died. But I think I just didn't want to feel how bad it hurt to

have him gone." She reflects further on when her pain started and continues: "I've been trying my best to ignore my back pain and here I am remembering my brother and how much I miss him." She wonders out loud about whether her avoidant coping style may further distance her from knowing how she feels about aspects of her life. The client and therapist discuss the challenges of accessing and staying connected to inner experience. The client is encouraged that she was able to bring her inner attention to her lower back without feeling panicky. She realizes that she has not had this experience before and that having the firm touch of the therapist helped her to stay calm and refocus her attention whenever she noticed herself thinking about other things. Intrigued by the new sensory information that suggests a relationship between the sad feelings, the memory and loss of her brother, and her back pain, she is eager to practice this process at home as it did not trigger anxiety (like she experienced in practicing targeted breathing). The therapist asks her if she feels comfortable exploring the sadness on her own and she says she does. Collaboratively they develop a take home practice for the week involving a similar process of bring her attention to her lower back, using a small towel under her back (in lieu of touch) to help focus her attention there.

This clinical vignette is an example of how accessing interoceptive awareness can facilitate engagement with sensations, and links between sensations, that were not previously in awareness and that can be important to increase self-understanding and recovery (in this case, the need to acknowledge, attend to and accept her grief). The somatization of this client's emotional pain, experienced as back pain, reflect the complex physiological and psychological interactions that can occur with a prolonged maladaptive stress response – in this case presenting as depression.

A number of therapeutic elements were critically important for this client to successfully engage in accessing interoceptive awareness. The first was trust in the client/therapist relationship ~ which was built by the therapist listening carefully to the client's experience. The therapist knew from earlier communication that the client could easily feel anxious about encountering her pain. The therapist did not push the client to interoceptively access the area of her low back when it was clear that the client would have difficulty sustaining awareness in this area. Second, it was important to stay within the "therapeutic window" (i.e., stretching into new places without becoming overwhelmed). The therapist assessed that the client was unable to stay connected and to access interoceptive experience below the region of her thoracic spine. In response, the therapist moved her hands and thus the 'targeted area' for interoceptive awareness shifted to the region of the body closest to the back pain that the client could *successfully access*. Third, facilitating the client's ability to interoceptively re-engage (after disengaging or coming "out" of connection with the body) involves the therapist's ability to assess presence in the body. This is a critical skill needed to teach interoceptive or mindful body awareness practices using MABT, as it allows the therapist to consistently gauge whether the client is attending to inner bodily experience. In this vignette, the therapist assessed disengagement (also known as 'mindwandering') (Smallwood and Schooler, 2006) and where

in the body disengagement occurred. The therapist accomplished this by noticing when the client's attention was no longer in her body, typically experienced as an energetic shift that is reflected in a tangible change in tissue quality. The therapist can confirm this by asking the client about her experience. As shown in this vignette, the client was aware her shift "out" of the body. The therapist then facilitated the client's ability to notice where in the body disengagement occurred, and to "catch" this happening in the moment so that the client learns to refocus attention and reengage in interoceptive access and awareness processes. Learning to return attention to the body is critical for successful engagement in accessing and sustaining interoceptive awareness, and typically improves with practice, and the concomitant ability to tolerate uncomfortable sensations ~ reflecting a reduction in buffering or protection that underlie SRS set-points. In this example, the client accessed her inner body and noticed the kinesthetic sensation of achiness and with increased presence, the sensation of sadness. The interface with this new but intriguing material, combined with an increased sense of well-being, invoked the client's curiosity and motivated engagement in take-home practice even when, as in this case, accessing interoceptive awareness presented potential challenges requiring time, skill, and patience.

Sustaining Awareness

The ability to sustain awareness of inner body sensations is critical for receiving, i.e., noticing or being aware, of sensory information. MABT sessions thus build on the body literacy and access skills already learned, by coaching clients in the practice of maintaining awareness and learning to deepen their attentive presence in the body, as exemplified above. MABT research indicates that individuals are able to increase their capacity to sustain awareness as they receive more coaching and practice in mindful body awareness (stage 3 of the intervention process) (Price and Graham, 2016). Importantly, the ability to sustain awareness is associated with increased awareness of physical and emotional states and the links to behavior and environmental and/or interpersonal stressors (Price and Graham, 2016). Results from this same clinical trial also demonstrate that exposure to stage three of MABT is associated with greater improvements in interoceptive awareness, emotion regulation, and reduced affective distress compared to those who are exposed to only MABT stages 1 or 2, demonstrating the importance of sustained mindful attention and appraisal processes in the MABT approach (Price et al., 2017).

Also, it is in the state of sustained mindful attention that individuals most commonly experience new awareness or insight about themselves or a situation (for example, the new awareness of sadness in vignette above). Insight is understood as a change in consciousness that includes a shift in understanding (Kounios and Beeman, 2014), a psychological process thought to inform well-being in meditation practice (Dahl et al., 2015). Such shifts self-understanding often include new awareness of the links between physical and emotional sensations, involving metacognitive awareness processes (Fernandez-Duque et al., 2000) that underlie cognitive appraisal of bodily experiences (e.g., back pain and grief in vignette above), and appear to be critically

important for insight, integration of interoceptive experience into self-understanding (i.e., sense-of-self), and the ability to better regulate emotion (Mehling, 2016; Khalsa et al., 2018).

Reappraisal

Cognitive reappraisal involves reevaluation of a situation or experience such that our response to the situation or experience is altered (Gross, 2001) and when positive, stressful events or experiences can be reconstrued as meaningful or growthful (Lazarus and Folkman, 1984). Developing the capacity for interoceptive awareness is thought to facilitate positive and adaptive reappraisal processes (Garland et al., 2015), a critical aspect of emotion regulation (Webb et al., 2012). In MABT, the therapist coaches the client to attend to the array of possible accessible sensory experiences in order to facilitate appraisal and reappraisal processes. This includes noticing whether shifts in internal experience occur during the session, and noticing the sensory qualities of these shifts. At the end of the session the client is asked to verbally review the session highlights to facilitate cognitive integration of the session material. This review process also facilitates cognitive reappraisal of session experiences in ways that further motivate continued use of interoceptive awareness practices and integration into daily life (Price and Smith-DiJulio, 2016).

Clinical Example

The client is a single woman in her late 30s. She has a history of childhood sexual trauma, and has had extensive psychotherapy to aid in her recovery. She works in an extremely stressful job as an executive at a large company. Easily overwhelmed, she finds herself often anxious and extremely stressed about work demands. The client sought MABT because she her elevated stress was triggering recurrent body memories related to her abuse; these memories were interfering with her sleep and her comfort with intimacy with others. Her sense of disconnection from her body was heightened and she wanted to explore a more somatic therapeutic approach for her self-care.

It is the client's 6th MABT session. She has a high level of emotional awareness, and is quite facile at accessing interoceptive awareness. However, her practice of MABT skills has been limited, in part due to her long work days and in part due to her long-time pattern of avoiding sensory material as a strategy to protect or buffer her from uncomfortable emotions. At the beginning of this session, the therapist guides her through a seated body scan and the client reports noticing a feeling of heaviness in her abdomen, an area that is often uncomfortable when she is anxious or feeling fearful. The therapist and client agree to focus on interoceptive attention to the client's abdominal region during the session. The therapist and client continue their therapeutic work on the massage table. The therapist has her hands on either side of the client's abdomen – one on the front and one on the back – and is able to assess through changes in the client's tissue quality when the client has successfully dropped her attention into, or accessed, her abdominal region. The therapist asks simple guiding questions to facilitate client attention to the sensations within her abdomen. The client initially notices that her abdominal region feels small and closed. The therapist

asks if she is aware of any other sensations. The client says that she is aware of the heaviness she mentioned during the body scan. The therapist asks how she would describe the heaviness. At this point the client's attention immediately shifts out of presence in her body. She fidgets on the table and says "I'm not in there anymore." The therapist asks what she's noticing now and the client says she was thinking about some work event. The therapist asks if she'd like to try again and after hearing "yes," she coaches her again through the process of returning her attention to her abdominal region. The therapist then coaches the client to sink her attention deeply into the heavy sensation in her abdomen; suggesting that she simply be with herself in this small space, to maintain her attention there without needing to do or change anything. The client is able to maintain attention in her abdominal area for a sustained period (about 15 min). The therapist checks in during this time, asking what is noticed. The client replies, indicating that the space is changing, while maintaining mindful presence in her body. The therapist asks if she can describe how it is changing. The client says that it is bigger and feels somewhat lighter. The therapist, using reflective listening, repeats "it is bigger and lighter." There is a long pause, after which the client continues by adding, "and there is some yellow, like a stream of sunshine coming in from the side." The therapist asks what else she is noticing. The client, after a long pause responds, saying, "I feel very peaceful." The client then adds that it's been a long time since she's felt so calm inside. The therapist asks her to notice the entire state of her internal body in this experience of calm and peace. The client responds by saying she feels a sense of continuity from her head to her feet; a sense of being whole. She continues noticing her interoceptive experience and says, in a surprised voice, "I have no worries, it is as though my entire being is calm." After a couple more minutes, the therapist asks her to maintain this state of calm as she slowly returns from this deep internal place of attention, taking her time to open her eyes.

Once seated, they review the client's experience to facilitate the client's cognitive integration of the material. The therapist asks the client to notice how her body is feeling while seated, and the client's most immediate response is that she feels light and relaxed, that her abdomen feels no heaviness inside – just 'normal' and good. She continues to reflect on her experience. She looks up at the therapist she says with tears in her eyes that she is amazed that she was able to stay connected inside for so long – and that this experience gives her a new sense of herself and a new sense of hope. In response to the therapist asking her about what she means by "hope," she replies: "I really want to feel I can continue to feel my body as a safe place; to not feel so anxious and off-center especially when I'm triggered." The therapist asks her to again notice and to make a strong mental note of her bodily experience of calm and safety, pointing out that this is an important experience of wholeness and safety, one that is not easily accessible when she is feeling anxious and so all the more important that she know that this is possible for her and that she has the capacity to come back to this peaceful and 'whole' experience of her body.

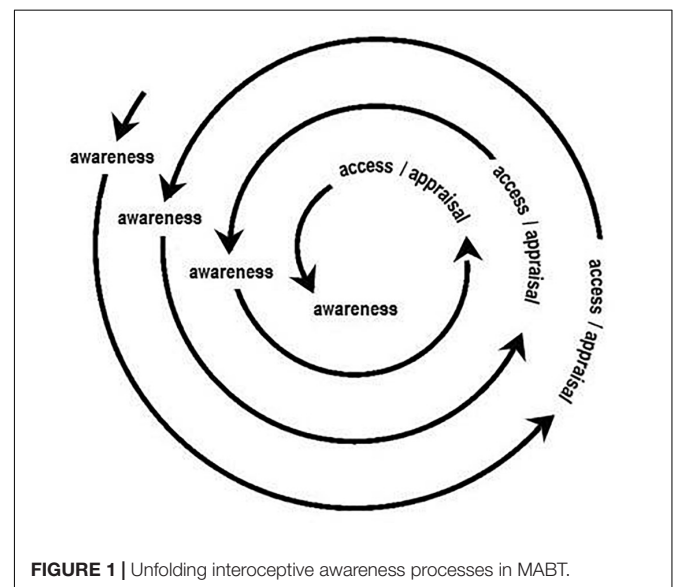
As this example illustrates, to support the client's *appraisal* of interoceptive awareness, MABT is focused on providing the

client with individualized training to gain sufficient comfort and skill accessing interoceptive awareness and sustaining awareness to facilitate noticing experiential shifts during mindful awareness practice. These can be profound fundamental shifts in sense-of-self, as in this case involving both positive physical and emotional shifts that reflect recalibration of the SRS set-points. The client's experience of somatic well-being and embodiment is a significant shift that facilitates trust of her body (i.e., connecting to her body and her emotions can feel safe). Such a positive experience can motivate an individual to engage in further therapeutic work and can lead to further access to, and development of, inner resources for daily life and increased emotion regulation.

MABT Description Summary

The vignettes illustrate the processes involved in learning interoceptive awareness through MABT. As described, skills are taught incrementally to develop, access, sustain, and appraise interoceptive awareness. As a therapeutic approach, however, MABT is more than simply a strategy for learning interoception. Like other therapeutic approaches, MABT can be provided as the primary modality or in conjunction with other therapeutic or intervention approaches. Thus in clinical care, once basic interoceptive awareness skills are learned, the related therapeutic processes unfold not in a step-by-step linear fashion, but in a way that resembles an ever deepening spiral of awareness, access/sustained attention, and appraisal processes. As illustrated in **Figure 1**, awareness facilitates access, generating deeper awareness, and out of this comes appraisal, which can lead to new awareness and insight. Using MABT skills in daily life to support self-care and bodily connection contributes to the development of life-long practices that promote well-being, embodiment, and emotion regulation.

The MABT learning and therapeutic trajectories vary by individual, thus the teaching and coaching processes must align with the needs of the client. As described, there can



be multiple challenges or barriers to bringing attention to the body. These include difficulty knowing where to bring one's attention, the tendency to engage in thinking vs. feeling, a lack of vocabulary to identify or express sensation, not knowing *how* to bring attention into the body, unfamiliarity with maintaining mindful (i.e., present-moment and compassionate) attention in the body, and anxiety related to encountering uncomfortable physical or emotional sensations. Every person has their own ease or challenges learning these skills. Because being with oneself on the inside is inherently an experience of deep self-connection, the client's sense of safety is paramount. For this reason, an individualized coaching approach allows the therapist to appropriately pace and vary the teaching strategies to support the learning processes and needs of each client. Also, attending to inner bodily sensations can be experienced as a vulnerable activity, particularly if there are challenges involved that touch on feelings of failure due to having trouble engaging in the skills being taught (especially if there is high experiential avoidance), or feelings of fear due to anxiety about contact with unpleasant sensations or emotions (especially if dissociative coping patterns are well-developed). In these types of instances, when engaging in interoceptive awareness can be destabilizing, it is critically important that the therapist has the skills to help the client return to a more stable place, normalizing their experience and serving as a guide to compassionately support the client's process involving both staying within the 'therapeutic window' for any therapeutic work and also recognizing if or when the client may not be ready to pursue this type of therapeutic work. It is thus also important that the therapist has the skills and support to negotiate any related transference and countertransference experiences that may emerge (Pearlman and Saakvitne, 1995; Blackburn and Price, 2007).

In MABT research our experience and findings show that development of interoceptive awareness skills comes more easily to those with familiarity and comfort attending to physical and emotional experience. Nonetheless, research findings from studies with individuals who have with little prior sensory awareness such as populations with chronic illness (HIV) (Price et al., 2013), female veterans with comorbid chronic pain and PTSD (Price et al., 2007), and women in treatment for SUDs who have extensive histories of interpersonal trauma (Price et al., 2012, 2017; Price and Smith-DiJulio, 2016) highlight the accessibility of MABT, and that this relatively brief intervention (delivered once/week across 8 weeks) individuals with little prior sensory awareness can learn interoceptive awareness skills and related practices to increase their ability to emotionally regulate, to manage symptoms of stress, and support their well-being. MABT research demonstrates increased interoceptive awareness skills and concomitant improvements in emotion regulation (self-report and psychophysiology) and reductions in psychological distress for those who receive MABT compared to control and active control conditions ($N = 187$) (Price et al., 2017), suggesting that interoceptive awareness may be the key underlying mechanism supporting these improved health outcomes.

These study findings have important clinical implications, including the potential application of interoceptive awareness

training for various health conditions, and the potential for interoceptive awareness skills to be taught and integrated within multiple clinical disciplines (e.g., nursing, social work, psychology, massage therapy, physical therapy, occupational therapy, medicine), settings (e.g., clinics, hospitals, service agencies), and health care conditions (e.g., mental health, chronic pain, chronic illness, and palliative care). The use of touch-based approaches for teaching interoceptive awareness skills, as outlined in this paper, requires appropriate licensure and skills to establish and maintain safety, as well as appropriate training and skills for working with mental health concerns. Relatedly, MABT can be modified so that client self-touch is used in situations which, or by clinicians for whom, touch is not appropriate. It is important to point out that MABT is not specific to those who have difficulties with emotion regulation or for those with serious physical or mental health challenges. Life is inherently stressful (Ellis et al., 2013), and having tools and increased capacity for interoceptive awareness for emotion regulation is useful for most everyone.

Mindful awareness in body-oriented therapy has many features that overlap with mental health approaches that include a focus on mindful attention to the body (such as Hakomi, Sensorimotor Therapy, and Somatic Experiencing). Critically, MABT is primarily focused on teaching therapists *how* to develop client interoceptive awareness skills and thus offers a unique and highly relevant complementary training for therapists in multiple disciplines as well as for psychotherapists interested in incorporating this focus in their practice, whether they have trained in the body-centered approaches like those mentioned above, or in more conventional psychotherapeutic approaches (e.g., cognitive behavior therapy).

OVERALL SUMMARY

Individual ability to detect interoceptive signals may be influenced by stress and adverse life experiences that negatively affect willingness, tolerance, interest, and practice with attending to the language of the body. People who have experienced undue stress, chronic pain, or trauma may have ceased to trust or listen to their bodily cues, making it difficult for them to predict their emotional responses and to regulate them. Furthermore, such stress histories appear to affect the magnitude of the interoceptive response, complicating how this important internal information is accessed, processed, and interpreted. The emphasis in MABT on mindful attention to inner body awareness, or interoceptive experience, reconnects the individual to deep bodily states of equilibrium, helping to override and rescript maladaptive stress responses and automatic patterns. The integrated learning processes involved in MABT meld mindfulness practice with active, hands-on coaching, teaching clients to tune-in to the subtleties of physiological sensation and developing interoceptive awareness capacity and related appraisal processes. These interoceptive awareness skills facilitate optimal emotional responding and the individual's ability to process and interpret feelings, or to plan ahead and strategize at the onset of small cues before becoming overwhelmed or entering an

unmanageable situation, thus recalibrating the SRS and providing clients with self-care skills critical for emotion regulation.

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CP and CH made substantial contributions to the conception, writing, final approval and agree that they are both accountable for the contents of this manuscript.

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Mentalization based treatment for borderline personality disorder

ANTHONY BATEMAN¹, PETER FONAGY²

¹Barnet, Enfield and Haringey Mental Health NHS Trust, Halliwick Psychological Therapies Service, St. Ann's Hospital, St. Ann's Road, London N15 3TH, UK

²Psychoanalysis Unit, University College London, Gower Street, London WC1E 6BT, UK

Mentalizing is the process by which we make sense of each other and ourselves, implicitly and explicitly, in terms of subjective states and mental processes. It is a profoundly social construct in the sense that we are attentive to the mental states of those we are with, physically or psychologically. Given the generality of this definition, most mental disorders will inevitably involve some difficulties with mentalization, but it is the application of the concept to the treatment of borderline personality disorder (BPD), a common psychiatric condition with important implications for public health, that has received the most attention. Patients with BPD show reduced capacities to mentalize, which leads to problems with emotional regulation and difficulties in managing impulsivity, especially in the context of interpersonal interactions. Mentalization based treatment (MBT) is a time-limited treatment which structures interventions that promote the further development of mentalizing. It has been tested in research trials and found to be an effective treatment for BPD when delivered by mental health professionals given limited additional training and with moderate levels of supervision. This supports the general utility of MBT in the treatment of BPD within generic mental health services.

Key words: Mentalization, borderline personality disorder, attachment, psychotherapy

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Borderline personality disorder (BPD) is a complex and serious mental disorder characterized by a pervasive pattern of difficulties with emotion regulation and impulse control, and instability both in relationships and in self-image (1). It represents a serious public health problem, because it is associated with suicide attempts and self harm, both of which are consistent targets of mental health services. Recurrent suicidal behaviour is reported in 69-80% of patients with BPD, and suicide rates are estimated to be up to 10% (2).

BPD is a common condition that is thought to occur globally with a prevalence of 0.2-1.8% in the general population (3). Higher prevalence rates are found in clinical populations. Moran et al (4) found a prevalence rate of 4-6% among primary care attenders, suggesting that people with BPD are more likely to visit their general practitioner. Chanen et al (5) reported a prevalence rate of 11% in adolescent outpatients and 49% in adolescent inpatients. The highest prevalence has been found in people requiring the most intensive level of care, with a rate of 60-80% among patients in forensic services (6,7).

The high prevalence and increased suicide rate in patients with BPD make an unassailable argument that effective treatment needs to be developed and that treatment has to be widely available. Whilst a number of treatments for BPD have been shown to be moderately effective in randomized controlled trials, it remains of considerable concern that most of them require extensive training, making them unavailable to most patients. Mentalization based treatment (MBT) was developed with this in mind. It requires relatively little additional training on top of general mental health training, and has been implemented in research studies by community mental health professionals, primarily nurses, with limited training given modest levels of supervision.

WHAT IS MENTALIZATION?

The term mentalization grew out of the Ecole Psychosomatique de Paris and to some extent was operationalized by developmental researchers investigating theory of mind (8). It was first used by Fonagy in 1989 (9) in a broader way and has since been developed in relation to understanding a number of mental disorders.

Mentalization, or better mentalizing, is the process by which we make sense of each other and ourselves, implicitly and explicitly, in terms of subjective states and mental processes. It is a profoundly social construct in the sense that we are attentive to the mental states of those we are with, physically or psychologically. Given the generality of this definition, most mental disorders will inevitably involve some difficulties with mentalization. In fact, we can conceive of most mental disorder as the mind misinterpreting its own experience of itself, thus ultimately a disorder of mentalization. However, the key issue is whether the dysfunction is core to the disorder and/or a focus on mentalization is heuristically valid, i.e. provides an appropriate domain for therapeutic intervention.

While mentalizing theory is being applied to a number of disorders (e.g., post-traumatic stress disorder (10), eating disorders (11) and depression (12)), in a number of contexts (e.g., inpatient, partial hospital, and outpatient facilities), and in different groups of patients (e.g., adolescents, families, substance abusers), the treatment method is most clearly organized as a therapy for BPD (13). It is only in this condition that clear empirical support with randomized controlled trials (14,15) is available.

In BPD, a fragile mentalizing capacity vulnerable to social and interpersonal interaction is considered a core feature of the disorder. If a treatment is to be successful, it must either



have mentalization as its focus or at the very least stimulate development of mentalizing as an epiphenomenon.

The failure of adult mental processing in borderline states had been apparent to most clinicians, but none had identified the primary difficulty as a loss of mentalizing arising from early development. The simple basic suggestion we made was that representing self and others as thinking, believing, wishing or desiring did not arrive at age 4 as a consequence of maturation, but rather was a developmental achievement that was profoundly rooted in the quality of early object relations. Its predictable vulnerability to disappearance under stress in borderline conditions was seen as an appropriate focus for psychodynamically oriented psychological intervention, even though concerns had been expressed over many decades about the use of psychodynamic therapy in the treatment of BPD. These began as long ago as 1938, when an American psychoanalyst, Adolph Stern, identified a group of patients, now considered to have had BPD, who did not respond to classical psychoanalytic treatment (16). He later described modifications of psychotherapy for his borderline group that remain relevant today (17).

THE DEVELOPMENT OF MENTALIZING

Mentalizing theory is rooted in Bowlby's attachment theory and its elaboration by contemporary developmental psychologists, whilst paying attention to constitutional vulnerabilities. There is suggestive evidence that borderline patients have a history of disorganized attachment, which leads to problems in affect regulation, attention and self control (18,19). It is our suggestion that these problems are mediated through a failure to develop a robust mentalizing capacity.

Our understanding of others critically depends on whether as infants our own mental states were adequately understood by caring, attentive, non-threatening adults. The most important cause of disruption in mentalizing is psychological trauma early or late in childhood, which undermines the capacity to think about mental states or the ability to give narrative accounts of one's past relationships. Building on the accumulating evidence from developmental psychopathology, the mentalization theory of BPD first suggests that individuals are constitutionally vulnerable and/or exposed to psychological trauma; second, that both these factors can undermine the development of social/cognitive capacities necessary for mentalization via neglect in early relationships (20), especially where the contingency between their emotional experience and the caregiver's mirroring is non-congruent (21); third, that this results in an hypersensitive attachment system within interpersonal contexts; and fourth, that this leads to the development of an enfeebled ability to represent affect and effortfully control attentional capacity (22).

Given the known continuity of attachment styles over time, residues of attachment problems of childhood might be expected to be apparent in adulthood. The adult attachment literature in relation to BPD has been reviewed by

Levy (23). While the relationship between BPD diagnosis and a specific attachment category is not obvious, there is little doubt that BPD is strongly associated with insecure attachment (only 6-8% of BPD patients are coded as secure). It appears that early attachment insecurity is a relatively stable characteristic of BPD patients, particularly in conjunction with subsequent negative life events (24).

MENTALIZATION BASED TREATMENT

The focus in treatment of BPD needs to be on stabilizing the sense of self and helping the patient maintain an optimal level of arousal in the context of a well-managed, i.e. not too intense and yet not too detached, attachment relationship between patient and therapist. The patient with BPD is exquisitely sensitive to all interpersonal interactions. So, the therapist needs to be aware that therapy, an interpersonal interaction, inevitably will provoke anxiety related to loss of a sense of self and that the ensuing emotional experiences will rapidly threaten to overwhelm the patient's mental capacities, leading to escalating emotions and inability to accurately understand others' motives. Psychiatrists and other mental health professionals also need to be aware of this sensitivity if they are to avoid iatrogenic interactions with patients with BPD. Inpatient hospital admission, for example, is an intense emotional experience for all patients and, unless carefully managed, will make patients with BPD worse by overstimulating their attachment processes. This overstimulation in treatment may account for the poor long-term outcomes of patients with BPD when unmodified intensive treatments were offered (25).

Patients with BPD have a vulnerability in regulating emotional responses and generating effective strategies for controlling their thoughts and feelings, which challenges their capacity for thinking about their own actions in terms of subtle understandings of their thoughts and feelings. They slip into what superficially could be described as a kind of mindless state, both in relation to others and to themselves. Of course, the story turns out to be more complicated than this, because these incapacities, palpable at certain times, are not always evident. But, at moments of emotional distress, particularly distress triggered by actual or threatened loss, the capacity for mentalization is most likely to apparently evaporate. The question is how this understanding and the clinical observations can usefully be translated into a therapeutic approach that could be helpful given the prevalence and severity of this clinical problem within a public healthcare system.

To this end, we defined some core underpinning techniques to be used in the context of group and individual therapy and labeled them MBT (13,26). Only three important aspects of treatment will be considered here, namely the aim of interventions, the therapeutic stance, and mentalizing the transference.





Aims of interventions in MBT

The initial task in MBT is to stabilize emotional expression, because without improved control of affect there can be no serious consideration of internal representations. Although the converse is also true, identification and expression of affect are targeted first because they represent an immediate threat to continuity of therapy as well as potentially to the patient's life. Uncontrolled affect leads to impulsivity, and only once this affect is under control is it possible to focus on internal representations and to strengthen the patient's sense of self.

The aim and the actual outcome of an intervention are more important in MBT than the type of intervention itself. The primary aim of any intervention has to be to re-instate mentalizing when it is lost or to help to maintain it in circumstances when it might be lost or is being lost. Any intervention that succeeds in these aims may be used in MBT. As a result of this, MBT takes a more permissive approach to interventions than most other therapies, giving it a plurality in terms of technique which might account for its popularity and appeal to practitioners from different schools as well as the limited amount of training required before practitioners begin using it in their everyday practice. We do not ask that practitioners learn a new model of therapy from the beginning, but that they modify their current practice focusing on mentalizing rather than behaviours, cognitions, or insight. We do, however, ask that they undertake to develop a particular therapeutic stance and implement a series of steps to try to engage the patient in a process of mentalizing, firstly using some generic psychotherapy techniques such as empathy, support and clarification, and then moving on to other interventions specifically designed to "stress" the attachment relationship within controlled conditions, which includes a focus on the patient-therapist relationship through "mentalizing the transference".

Therapeutic stance

The therapist's mentalizing therapeutic stance should include: a) humility deriving from a sense of "not-knowing"; b) patience in taking time to identify differences in perspectives; c) legitimizing and accepting different perspectives; d) actively questioning the patient about his/her experience – asking for detailed descriptions of experience ("what questions") rather than explanations ("why questions"); e) careful eschewing of the need to understand what makes no sense (i.e., saying explicitly that something is unclear). An important component of this stance is monitoring one's own mentalizing failures as a therapist. In this context, it is important to be aware that the therapist is constantly at risk of losing his/her capacity to mentalize in the face of a non-mentalizing patient. Consequently, we consider therapists' occasional enactments as an acceptable concomitant of the therapeutic alliance, something that simply has to be owned

up to. As with other instances of breaks in mentalizing, such incidents require that the process is "rewound and the incident explored". Hence, in this collaborative patient-therapist relationship, the two partners involved have a joint responsibility to understand mental processes underpinning events both within and without therapy.

Mentalizing the transference

We caution about the use of transference interpretation in the treatment of BPD because it assumes a level of mentalizing capacity of the patient that he/she often does not possess. This may have led to the suggestion that we "specifically eschew transference interpretation" (27). We do not. In fact we specifically employ transference interpretation, give indicators about when it can be used and carefully define six essential components. But equally we caution practitioners firstly about the commonly stated aim of transference interpretation, namely to provide insight, and secondly about genetic aspects, such as linking current experience to the past, because of their potential iatrogenic effects.

Our first step is the validation of the transference feeling, that is establishing the patient's perspective. Of course this is not the same as agreeing with the patient, but it must be evident to the patient that the therapist has at least understood his/her point of view. The danger of the genetic approach to the transference is that it might implicitly invalidate the patient's experience. The second step is exploration. The events which generated the transference feelings must be identified. The behaviours that the thoughts or feelings are tied to need to be made explicit, sometimes in painful detail. The third step is accepting enactment on the part of the therapist. Most experiences of the patient in the transference are likely to be based on reality, even if on a very partial connection to it. Mostly this means that the therapist has been drawn into the transference and acted in some way consistent with the patient's perception of him/her. It may be easy to attribute this to the patient, but this would be completely unhelpful. On the contrary, the therapist should initially explicitly acknowledge even partial enactments of the transference as inexplicable voluntary actions that he/she accepts agency for, rather than identifying them as a distortion of the patient. Drawing attention to such therapist components may be particularly significant in modeling to the patient that one can accept agency for involuntary acts and that such acts do not invalidate the general attitude which the therapist tries to convey. Only then can distortions be explored. Step four is collaboration in arriving at an interpretation. Transference interpretations must be arrived at in the same spirit of collaboration as any other form of interpretive mentalizing. The metaphor we use in training is that the therapist must imagine sitting side-by-side with the patient, not opposite. They sit side-by-side looking at the patient's thoughts and feelings, where possible both adopting the inquisitive stance. The fifth step is for the therapist to present an alternative per-





spective and the final step is to monitor carefully the patient's reaction as well as one's own.

We suggest these steps are taken in sequence and we talk about mentalizing the transference to distinguish the process from transference interpretation, which is commonly viewed as a technique to provide insight. Mentalizing the transference is a shorthand term for encouraging patients to think about the relationship they are in at the current moment (the therapist relationship) with the aim to focus their attention on another mind, the mind of a therapist, and to assist them in the task of contrasting their own perception of themselves with how they are perceived by another, by the therapist or indeed by members of a therapeutic group.

Whilst we might point to similarities in patterns of relationships in the therapy and in childhood or currently outside of the therapy, the aim of this is not to provide the patients with an explanation (insight) that they might be able to use to control their behaviour pattern, but far more simply to highlight one other puzzling phenomenon that requires thought and contemplation, part of our general therapeutic stance aimed to facilitate the recovery of mentalization which we see as the overall aim of treatment.

EFFECTIVENESS OF MENTALIZATION BASED TREATMENT

Our initial study of MBT (14) compared its effectiveness in the context of a partial hospital program with routine general psychiatric care for patients with BPD. Treatment took place within a routine clinical service and was implemented by mental health professionals without full psychotherapy training who were offered expert supervision. Results showed that patients in the partial hospital program showed a statistically significant decrease on all measures, in contrast with the control group, which showed limited change or deterioration over the same period. Improvement in depressive symptoms, decrease in suicidal and self-mutilatory acts, reduced inpatient days, and better social and interpersonal function began after 6 months and continued to the end of treatment at 18 months.

The 44 patients who participated in the original study were assessed at 3 month intervals after completion of the trial using the same battery of outcome measures (15). Results demonstrated that patients who had received partial hospital treatment not only maintained their substantial gains, but also showed a statistically significant continued improvement on most measures, in contrast with the control group of patients who showed only limited change during the same period. Because of continued improvement in social and interpersonal function, these findings suggest that longer-term rehabilitative changes were stimulated.

Finally, an attempt was made to assess health care costs associated with partial hospital treatment compared with treatment within general psychiatric services (28). Health care utilization of all patients who participated in the trial was assessed using information from case notes and service

providers. Costs were compared 6 months prior to treatment, during 18 months of treatment, and at 18-month follow-up. No cost differences were found between the groups during pre-treatment or treatment. During the treatment period, the costs of partial hospital treatment were offset by less psychiatric inpatient care and reduced emergency department treatment. The trend for costs to decrease in the experimental group during follow-up was not duplicated in the control group, suggesting that specialist partial hospital treatment for BPD is no more expensive than general psychiatric care and leads to considerable cost savings after the completion of 18-month treatment.

All patients who participated in the partial hospital treatment trial have now been followed up 8 years after initial randomization (29). The primary outcome for this long-term follow-up study was number of suicide attempts. However, in the light of the limited improvement related to social adjustment in follow-along studies, we were concerned to establish whether the social and interpersonal improvements found at the end of 36 months had been maintained and whether additional gains in the area of vocational achievement had been made in either group. Patients treated in the MBT program remained better than those receiving treatment as usual, but, although maintaining their initial gains at the end of treatment, their general social function remained somewhat impaired. Nevertheless, many more were in employment or full time education than the comparison group, and only 14% still met diagnostic criteria for BPD compared to 87% of the patients in the comparison group who were available for interview.

A further randomized controlled trial of MBT in an outpatient setting (MBT-OP) has recently been completed. One hundred thirty-four patients were randomly allocated to MBT-OP or structured clinical management representing best current practice. Substantial improvements were observed in both conditions across all outcome variables. Patients randomized to MBT-OP showed a steeper decline of both self-reported and clinically significant problems, including suicide attempts and hospitalization (30).

Further research studies are underway, including randomized controlled trials on patients with substance use disorders and patients with eating disorders. A partial replication study of the original partial hospital trial has also been completed by an independent group in the Netherlands, showing that good results are achievable within mental health services away from the instigators of the treatment.

CONCLUSIONS

MBT may not be radically different from other forms of intervention widely practiced by psychotherapists and other mental health professionals in the various contexts in which individuals with BPD are being treated. We claim no originality for the intervention. MBT represents the relatively





unadulterated implementation of a combination of developmental processes readily identified in all our histories: a) the establishment of an intense (attachment) relationship based on attempts to engage the patients in a process of understanding their mental states, and b) the coherent re-presentation of their feelings and thoughts, so that patients are able to identify themselves as thinking and feeling in the context of powerful bonds and high levels of emotional arousal. In turn, the recovery of mentalization helps patients regulate their thoughts and feelings, which then makes relationships and self-regulation a realistic possibility.

Although we would claim to have identified a particular method that makes the delivery of this therapeutic process possible, we make no claims of uniqueness. Many situations can likely bring about symptomatic and personality change by this mechanism and hence our permissiveness of technique. The goal of further research is to identify increasingly effective and cost-effective methods for generating change in this excessively problematic group.

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Purpose in Life as a Predictor of Mortality across Adulthood

Patrick L. Hill¹ and Nicholas A. Turiano²

¹Department of Psychology, Carleton University, Ottawa, ON, Canada

²Department of Psychiatry, University of Rochester Medical Center, Rochester, NY, United States

Abstract

Having a purpose in life has been nominated consistently as an indicator of healthy aging for several reasons including its potential for reducing mortality risk. The current study sought to extend these findings by examining whether purpose promotes longevity across the adult years, using data from the longitudinal MIDUS sample (mean age = 46.92 years, $SD = 12.94$).

Proportional hazard models demonstrated that purposeful individuals lived longer than their counterparts during the 14 years after assessment, even when controlling for other markers of psychological and affective well-being. Moreover, these longevity benefits do not appear to be conditional on either the participants' age, how long they lived, or whether they had retired from the workforce. In other words, having a purpose appears to widely buffer against mortality risk across the adult years.

Accruing evidence suggests that finding a purpose for your life may add years to it. Indeed, studies have found that purposeful older adults experience a diminished mortality risk in American samples (Krause, 2009), even when controlling for known predictors of longevity (Boyle, Barnes, Buchman, & Bennett, 2009). Moreover, these benefits are not culture-specific, as work has demonstrated similar effects in a Japanese sample with respect to a sense of *ikigai*, or a “life worth living” (Sone, Nakaya, Ohmori, et al., 2008). However, these studies have focused on late middle age and older adults (all samples had mean ages > 60 years), leaving the need to examine whether similar findings exist for younger adults.

It is valuable to investigate whether the longevity benefits of purpose extend across the adult years for at least three reasons. First, individuals face very different mortality risks across adulthood, and it is uncertain whether purpose serves to help “buffer” individuals against those associated with early mortality. Second, with the onset of retirement comes increased health risks (Moon, Glymour, Subramanian, Avendaño, & Kawachi, 2012), and thus purpose may prove more beneficial later in life by combating the loss of life structure and organization that employment provides. Third, having a purpose suggests that one has committed to a set of clear goals for life (e.g., Hill, Burrow, Brandenberger, Lapsley, & Quaranto, 2010; McKnight & Kashdan, 2009). Given that the content or character of individuals' goals differs with age and the amount of perceived time remaining in life (e.g.,

Lang & Carstensen, 2002), it is of interest to examine whether purpose imbues similar longevity benefits even in the face of potential changes to goal structures.

The current study examined whether purpose imbues similar longevity benefits for young, middle, and older adults, using data from the Mid-Life in the United States (MIDUS) sample (age range: 20–75 years). First, we sought to replicate past findings suggesting that purpose in life predicts longevity, and to increase their generalizability by using a younger sample. Second, we extended this work by controlling for psychosocial variables known to correlate with purpose, in order to demonstrate that the effects were unique to purpose. Third, we tested two interaction effects that examine possible developmental fluctuations in the influence purpose has on longevity across the 14-year follow-up of the study. Toward this end, we tested both age at death and retirement status as potential moderators. Taken together, these tests allow us to better understand whether purpose influences mortality risk similarly across developmental and life structural boundaries.

Method

Sample

Participants were drawn from the Midlife in the United States survey (MIDUS), a national longitudinal study of health and well-being (for review see Brim, Ryff, & Kessler, 2004). Beginning in 1994–95, 7,108 participants were recruited from a nationally representative random-digit-dialing sample of non-institutionalized adults between the ages 20–75 ($M = 46.92$ years, $SD = 12.94$). We employed the full archived data file available to researchers, where recruitment was based on the study's original goals. Once they consented to the study, participants complete a phone questionnaire as well as a self-administered questionnaire completed at home. To be included in the current analysis, participants needed to complete demographic information, such as age, sex, race, education, work status, as well as the purpose in life scale. Comparing participants with missing versus full data ($N = 6,163$) revealed that participants with missing data were significantly younger ($t = 10.19$; $p < .05$), were more likely to be male ($\chi^2 = 17.03$; $p < .05$), retired ($\chi^2 = 22.16$, $p < .05$), and had lower levels of education ($t = 6.48$; $p < .05$).

The sex distribution was generally balanced with 52% being female. Education was coded based on the highest level obtained as of 1995–96. A 12-point scale was constructed ranging from 1 (no schooling or some grade school) to 12 (professional degrees such as Ph.D. or M.D.). Given that 91% of the sample identified as Caucasian (white), a dummy variable was constructed to contrast whites against all other races in the analyses. Retirement status was assessed by asking participants, “As of right now, are you retired?”; 14% reported being currently retired.

Purpose in Life

Purpose in life was captured by three questions from the psychological well-being scale (Ryff, 1989; Ryff & Keyes, 1995). Participants used a Likert scale ranging from 1 (Strongly Disagree) to 7 (Strongly Agree) to provide answers to the following items: “Some people wander aimlessly through life, but I am not one of them”; “I live life one day at a time and

don't really think about the future"; and "I sometimes feel as if I've done all there is to do in life" ($M = 5.50$; $SD = 1.21$; range = 1–7; $\alpha = .36$).

Other Psychosocial Variables

Three additional psychosocial variables were added to the models to examine the unique influence of purpose in life. Having positive relations with others was assessed using three additional items from the psychological well-being scale. Using the same Likert scale, participants responded to the following questions: "Maintaining close relationships has been difficult and frustrating for me"; "People would describe me as a giving person, willing to share my time with others"; and "I have not experienced many warm and trusting relationships with others" ($M = 5.40$; $SD = 1.36$; range = 1–7; $\alpha = 0.59$). Positive and negative affect was captured with 12 total questions (Mroczek & Kolarz, 1998). Participants used a Likert scale ranging from 1 (All of the time) to 5 (None of the time) to answer the following questions for positive affect: "During the past 30 days, how much of the time did you feel: cheerful, in good spirits, extremely happy, calm and peaceful, satisfied, and full of life?" ($M = 3.39$; $SD = 0.73$; range = 1–5; $\alpha = 0.91$). For negative affect: "During the past 30 days, how much of the time did you feel: so sad nothing could cheer you up, nervous, restless or fidgety, hopeless, that everything was an effort, and worthless?" ($M = 1.54$; $SD = 0.62$; range = 1–5; $\alpha = 0.87$). Responses were coded so that higher scores indicated more positive or negative affect.

Our selection process for covariates was informed by three primary directives. First, we focused on variables known to correlate with purpose in life, to rule out some of the most meaningful and likely alternative explanations. While previous work has examined the role of purpose on mortality, unique from negative emotionality (Boyle et al., 2008), the current work is novel in controlling for both positive and negative emotions concurrently. In addition, no research to our knowledge has examined whether purposeful individuals live longer while controlling for other aspects of psychological well-being. Along this front, we focused on positive relations with others, because some have suggested that pursuing one's purpose in life necessitates the inclusion of others (Damon, 2008). Second, again to focus on likely alternatives, we chose those correlates of purpose that are known influences on longevity. Previous reviews have outlined the potential associations between mortality risk and positive affect (Pressman & Cohen, 2005), negative affect (Kiecolt-Glaser, McGuire, Robles, & Glaser, 2002), and social relationships (Holt-Lunstad & Smith, 2012). Third, in explaining the potential role of purpose on longevity, previous research has tended to focus on explanations involving physical health or disability, with mixed results (Boyle et al., 2008; Krause, 2009). As such, we focused instead on emotional and psychological well-being, to increase the relative novelty of the current investigation.

Vital Status

Mortality data on participants was obtained through a National Death Index (NDI) search through January 2010. Survival time with delayed entry consisted of each participant's age at entry into the study (i.e., age at MIDUS 1) and the age the participant died. Due to reasons of confidentiality, only the month and year of death were provided to MIDUS investigators. Participants that were still alive at the end of the follow-up were censored and their age at

this point was utilized. The mean survival time for decedents was 8.01 years ($SD = 3.90$; range = 2 months to 14 years).

Data Analysis

A series of proportional hazards models (Cox, 1972) were conducted to examine the association between purpose in life and mortality risk using SAS statistical software (SAS Institute Inc., 2002–2004). For the time metric, a delayed entry method was employed which utilizes both age at baseline data and attained age over the follow-up period. This technique is beneficial because it only includes participants in the ‘risk set’ that actually have a risk of dying at a certain point during the follow-up. For example, when examining the hazard of dying at age 40, any participant older than 40 at baseline (i.e., when they completed the MIDUS 1 questionnaire) would be removed from the analysis and not included in this specific risk set.

To examine whether the effects of purpose were constant across all ages of adulthood, we conducted three tests to assess the proportionality of the purpose variable. First, the most definitive test of proportionality is to examine the significance of a purpose by death-age interaction included in the proportional hazard model. A significant interaction would indicate non-proportionality and the hazard of dying could be plotted against death-age to illustrate how the hazard of dying associated with purpose in life varies as a function of time. Using a delayed entry method in the time metric is especially important when investigating death-age interaction effects because it removes individuals from the risk set who are not young/old enough or alive to be included in the calculation of the hazard of dying during a specified time. Thus, this method allows for a more nuanced estimation of the hazard of dying at a given age and allows for an estimation of more intra-individual/longitudinal change in the effects purpose has on mortality risk.

We also assessed proportionality of purpose effects by estimating martingale residuals (Lin, Wei, & Yang, 1993) based on 1000 random simulations that compare the observed residuals for purpose against the simulated residuals for purpose. If the residuals display markedly different patterns the Kolmogorov-Smirnov type test would be statistically significant ($p < 0.05$) and would also provide evidence of non-proportionality. Lastly, Schoenfeld residuals were estimated by computing the difference between the values of purpose for each person who died minus the expected value for each person who died. If the correlations between the Schoenfeld residual and death-age are significant, there would be additional evidence of non-proportionality.

Results

Over the 14-year follow-up, 569 participants died (approximately 9% of the sample). Broken down by age group, 8 died between 28–39 years of age, 38 between 40–49, 93 between 50–59, 156 between 60–69, 194 between 70–79, and 80 died at age 80 or beyond. Tests of differences between survivors and deceased showed that the deceased were significantly older ($t = 29.28$; $p < .05$), more likely to be male ($\chi^2 = 9.82$; $p < .05$), less educated ($t = 7.88$; $p < .05$), less likely to be employed ($\chi^2 = 547.53$, $p < .05$), but did not differ in race ($\chi^2 = 0.45$; $p = .49$). Importantly, deceased individuals scored lower on purpose

in life ($t = 10.65$; $p < .05$) and positive relations with others ($t = 3.13$, $p < .05$), but did not differ on positive or negative affect (both p 's $> .05$).

Results from the proportional hazards model are presented in Table 1. All predictors were standardized before entry for ease of interpretation. Model 1 presents the model results without any moderation. By including baseline age as a covariate, the effect of age is removed as it is absorbed into the unspecified baseline hazard. Thus, the model is accounting for the strong baseline age differences in mortality risk ($HR = 2.03$) so that the effects of purpose are net of baseline age effects, as well as the other covariates included in the model. Results replicate the previous work, demonstrating that purpose predicted a lower mortality risk ($HR = 0.85$, $CI: 0.78\text{--}0.93$) net of covariates. In other words, for every one standard deviation increase in purpose, the risk of dying over the next 14 years diminished by 15%.¹

Since Model 1 basically represents the 'averaged effect' of purpose across all death-ages included in the 14 year follow-up period, we next examined whether the hazards of purposelessness (or benefits of purposefulness) differed across the follow-up by including the purpose by death-age interaction term (Model 2). This interaction failed to reach significance ($HR = 1.00$, $CI: 1.00\text{--}1.01$, $p = 0.32$). Additional analyses confirmed the pattern of proportionality since the martingale residuals did not show a pattern of marked deviance as indicated by the non-significance of the Kolmogorov-Smirnov type test ($p = 0.70$). Likewise, all correlations between the Schoenfeld residuals and death-age were non-significant. In other words, purpose attenuated the risk of mortality relatively proportionally for younger, middle, and older adults across the 14-year follow-up period.

Finally, we investigated the role of purpose during retirement by including a purpose by retirement status interaction term in the model. Results are presented in Model 3. This interaction also failed to reach significance ($HR = 1.00$, $CI: 0.97\text{--}1.03$, $p = 0.97$). Therefore, again purpose appears to hold similar benefits across different adult groups.

Discussion

Recent research has focused on whether finding a purpose may promote greater longevity (Boyle et al., 2009; Krause, 2009; Sone et al., 2008). The current study added to this literature in four important ways. First, we again demonstrate that purpose predicts greater longevity in adulthood, using a more representative sample across adult ages allowing for greater generalizability. Second, we show that the benefits of purpose cannot be explained by indicators of psychological and affective well-being, underscoring the unique role that purpose may play in this process. Indeed, even when selecting variables known to be relevant for understanding mortality risk in general and in this sample, we find that the benefits of purpose hold true. Third, from a theoretical perspective we find that endorsing a strong purpose in life continues to have meaningful reductions in the risk of dying and that maintaining a stronger purpose in life can be equally important during younger ages as it is

¹We performed the same analysis separately for each of the purpose in life items. Two items were marginal predictors of mortality ($HR: 0.95$ ($CI: 0.90\text{--}1.01$) and $HR: 0.96$ ($CI: 0.92\text{--}1.00$), both p 's $< .09$), and the third was a significant predictor ($HR: 0.95$ ($CI: 0.91\text{--}1.00$), $p < .05$). Therefore, the results were similar across all single-item purpose indicators.

at much older ages. Fourth, our results suggest that the benefits of purpose are not conditional on retirement status.

These findings suggest the importance of establishing a direction for life as early as possible (see also Hill, Burrow, & Sumner, 2013). Similarly, research has demonstrated that increasing goal commitment during college can have effects on well-being into middle adulthood (Hill, Jackson, Roberts, Brandenberger, & Lapsley, 2011). However, it remains a question for future research whether the pathways by which purpose influences mortality risk fluctuate across the adult years, given that the risk factors for early mortality differ greatly from those present in older adulthood.

The current study is limited in key respects that should serve as directions for future work. First, our sample was predominantly white, limiting our ability to examine the effects of purpose across racial and ethnic groups. However, previous work does suggest that the longevity benefits associated with purpose are not conditional on race (Boyle et al., 2009). Second, it would be valuable to include a more comprehensive measure of purpose in life, to improve the reliability of the construct. That said, the predictive value of the brief measure is now clear given the current and previous (Ryff & Keyes, 1995) findings. Moreover, in line with past work (Boyle et al., 2009; Sone et al., 2008), purpose continued to predict mortality risk even when looking at the single indicators (see footnote). Third, while the current sample was not ideal for testing potential mediators, such tests may be possible in the future with additional assessments, and a longer timeframe for the study.

In conclusion, the current study adds significantly to the literature, underscoring the potential for purpose to influence healthy aging across adulthood. As such, this work points to the need for further investigation on why finding a purpose may add years to your life. For instance, given the link between purpose and agency (Hill et al., 2013), it may be important to examine daily physical activity and goal achievement as pathways linking purpose to healthy aging. Therefore, just like a purpose, the current study should provide researchers with a direction on where to go, rather than providing a final endpoint or conclusion.

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Table 1

Predicting mortality risk from purpose in life, control variables, and the age by purpose interaction.

	Model 1	Model 2	Model 3
Predictors	<i>Hazard Ratio (CI)</i>	<i>Hazard Ratio (CI)</i>	<i>Hazard Ratio (CI)</i>
Age	2.03* (1.51–2.71)	2.02* (1.51–2.71)	2.02* (1.51–2.71)
Sex (Male)	1.50* (1.26–1.78)	1.49* (1.25–1.77)	1.50* (1.26–1.78)
Minority (Other)	1.19 (0.87–1.62)	1.19 (0.88–1.63)	1.19 (0.87–1.62)
Education	0.88* (0.81–0.96)	0.88* (0.81–0.96)	0.88* (0.81–0.96)
Retirement	1.28* (1.02–1.59)	1.27* (1.02–1.59)	1.45 (0.19–11.19)
Positive Relations	0.97 (0.88–1.06)	0.97 (0.88–1.07)	0.97 (0.88–1.06)
Positive Affect	0.96 (0.86–1.07)	0.96 (0.86–1.07)	0.96 (0.86–1.07)
Negative Affect	1.09 (0.99–1.22)	1.09 (0.98–1.21)	1.09 (0.98–1.22)
Purpose	0.85* (0.78–0.93)	0.67 (0.41–1.08)	0.85* (0.78–0.93)
Age x Purpose	-	1.01 (1.00–1.01)	-
Retire x Purpose	-	-	1.00 (0.97–1.03)
-2 LL	7680.00	7679.00	7680.00
AIC	7698.00	7699.00	7700.00

Note:

* indicates $p < .05$.

CI indicates a 95% confidence interval around the hazard ratio. Purpose, positive relations with others, positive affect, and negative affect were all standardized prior to entry.

STUDY PROTOCOL

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Action steps using ACEs and trauma-informed care: a resilience model

Laurie Leitch

Abstract

This paper 1) discusses two important contributions that are shaping work with vulnerable and under-resourced populations: Kaiser Permanente's (1998) Adverse Childhood Experiences Study (ACE) which includes the impact of adverse experiences in childhood on adult health and health behaviors and the more recent advent of what has come to be known as Trauma-Informed Care (TIC), programs which incorporate knowledge of the impact of early trauma into policies and programs. 2) Despite many positive benefits that have come from both contributions there are unintended consequences, described in the paper, that have an impact on research and program evaluation as well as social policies and programs. 3) Three key neuroscience concepts are recommended for inclusion in Trauma-Informed Care programs and practices in ways that can enrich program design and guide the development of practical, resilience-oriented interventions that can be evaluated for outcomes. 4) Finally, a resilience-oriented approach to TIC is recommended that moves from trauma *information* to neuroscience-based *action* with practical skills to build greater capacity for self-regulation and self-care in both service providers and clients. Examples from criminal justice are used.

Keywords: Neuroscience, Neuroplasticity, ACE study, Trauma Informed Care (TIC), Resilience, Self-regulation skills

Background

The work of clinicians and other service providers who design and implement programs for vulnerable populations has been greatly enhanced by the incorporation of two building blocks of understanding: Kaiser Permanente's (1998) Adverse Childhood Experiences study (ACE) and the growing use and refinement of a values-based orientation to individuals that draws upon ACE findings called Trauma-Informed Care (TIC).

The ACE study and TIC have generated important strides in helping service providers as well as clients better understand the impact of distressing and traumatic events on a wide range of health indicators and behaviors. Incorporating findings from the ACE study into TIC can reduce the pathologizing of symptomatic behavior by viewing symptoms as normal reactions to abnormal experiences (Evans and Coccoma 2014; Van der Kolk 2014), foster screenings for trauma history during intakes (Harris and Fallot 2001), shape staff practices that strengthen relationships between providers and clients, enhance personal safety, create a sense of welcome

and respect in service delivery spaces (Elliott et al. 2005; Harris and Fallot 2001) and inspire delivery of preventive services to vulnerable individuals and families as early as possible.

There are, however, unintended consequences that can be seen in the ways that the ACE study and Trauma-Informed Care have shaped research and service delivery. This article presents a brief overview of these two important contributions and discusses the unintended consequences that can influence practices and programs to the detriment of the very individuals they intend to serve. Recommendations are discussed that include: incorporating key neuroscience concepts into TIC, the use of neuroscience-based self-regulation skills for staff and clients, and a specific framework for designing information gathering processes including research and evaluation as well as client intakes. The framework includes attention to protective experiences and characteristics and promotes research and evaluation design in a way that explicitly is intended to create a rhythm or pattern of questioning that enhances resilience and decreases distress and potential re-traumatization.

Correspondence: Leitch@thresholdglobalworks.com
Threshold GlobalWorks, New York, NY, USA

Methods

The paper presents a rationale for expanding TIC to include key neuroscience concepts that can contribute to intake and evaluation processes and skills-based interventions. The intent is translational science that describes the movement of science information into social services and then expands that science from enriched information to concrete skills-based action.

The Adverse Childhood Experiences (ACE) study

From 1995 to 1997 Kaiser Permanente's Health Appraisal Clinic, in collaboration with Centers for Disease Control and Prevention, implemented one of the largest studies ever conducted on the origins of risk factors that have negative health and social consequences and the cumulative incidence and influence of psychological and physical abuse including: neglect, sexual abuse, witnessing violence, exposure to substance abuse, mental illness, suicidal behavior, and imprisonment of a family member (independent variables) on dependent variables that were measures of both mental health (depression, suicidality) and physical health (heart disease, cancer, chronic lung disease, skeletal fractures, liver disease, obesity) and health-related behaviors (alcoholism, drug abuse, smoking, high numbers of sexual partners) and poor self-rated health (Felitti et al. 1998).

The ACE questionnaire was constructed using selected questions from published surveys (American Journal of Preventive Medicine 2017). Prior to the survey there had been little study of the relationship between early childhood adverse experiences and adult medical problems and behaviors (Felitti et al. 1998).

The ACE survey data was collected by mail from two waves of a sample of 17,000 adult members of Kaiser's Health Maintenance Organization in San Diego, California between 1995 and 1997. The sample size itself was impressive. The release of the study findings was shocking to many when they showed the extent to which adverse childhood events negatively shaped future social and physical health outcomes, including life expectancy.

Perhaps less surprising, the findings showed that the more negative events a child experienced the higher the likelihood s/he had as an adult of suffering an array of health and behavior problems including alcoholism, chronic pulmonary disease, depression, illicit drug use, liver disease, adolescent pregnancy and many more (Centers for Disease Control and Prevention 2014a, b). Further, adults with the highest level of ACEs had a life expectancy 20 years less than those without high levels of ACEs. The study sample did not consist primarily of low-income minority adults, a demographic often found to be "at risk." It was mainly comprised of white, middle and upper income employed people; people who might be expected to have had more stable

childhood environments because of parents' employment and income.

The original ACE study has generated more than 70 scientific articles, scores of conference presentations, and has shaped the design of research and as well as social programs. It is beyond the scope of this article to present a comprehensive review of the studies of the ACE survey, but ACEs Too High (2017) provides a list of ACE studies by year.

Studies using the ACE questionnaire have expanded beyond Kaiser's sample of white, HMO patients to include, for example, special populations such as children of alcoholics (Dube et al. 2001), and children with an incarcerated parent (Geller et al. 2009) and have found higher prevalences of ACEs than in the original Kaiser sample.

ACE Studies of justice-involved populations (Baglivio et al. 2014; Messina and Grella 2006; Miller and Najavits 2012; Reavis et al. 2013) including juvenile justice-involved youth (Dierkhising et al. 2013) are raising awareness of the association of early childhood trauma and offender behaviors and needs, as are studies of justice-involved samples that include a focus on childhood trauma without using the ACE questionnaire (Wolff and Shi 2012). The studies consistently find elevated rates of childhood trauma in incarcerated populations and offender groups. For example, the Reavis et al. study (2013) of incarcerated males found ACE scores above 4 to be four times higher than in a normative male population.

By bringing attention to the powerful impact that negative childhood experiences have on future health and functioning, the ACE study demonstrates the importance of gathering information early in the lives of children and their families and designing early intervention programs that target violence and neglect. It also points to the importance of collecting trauma histories from clients and highlights the essential role of prevention in program design. A particularly important contribution the ACE survey has made to offender and incarcerated groups is to emphasize the importance of trauma-targeted interventions in jails and prisons as well as in diversion programs.

The ACE study has inspired other large-scale, risk-oriented CDC-sponsored health surveys such as The Family Health History and Health Appraisal Questionnaires and The Behavioral Risk Factor Surveillance System (BRFSS) that focus on childhood maltreatment and household dysfunction. The BRFSS is now conducted by telephone in all 50 states, the District of Columbia and 3 U.S. territories, making it the "largest continuously conducted health survey in the world" (CDC 2014b).

Trauma Informed Care (TIC)

Drawing on the ACE survey findings and those of many other childhood trauma studies, an orientation to service

delivery has gained momentum that uses childhood trauma as a lens to understand the range of cognitive, emotional, physical, and behavioral symptoms seen when individuals enter systems of care. TIC comes from a values base of client safety and empowerment as well as an orientation to strong working alliances between clients and providers. DeCandia and Guarino (2015) have written a comprehensive review of the history and ongoing development of the TIC orientation.

The Substance Abuse and Mental Health Services Administration (SAMHSA 2015) has defined four main points defining Trauma-Informed Care:

- 1) Realizing that trauma has a widespread impact on individuals, families, groups, organizations, and communities and has an understanding of paths to recovery;
- 2) Ability to recognize the signs and symptoms of trauma in clients, staff, and others in the system;
- 3) Integration of trauma knowledge into policies, programs, and practices;
- 4) Seeks to avoid re-traumatization

SAMHSA's involvement in explicating TIC has raised awareness about the importance of a values-oriented approach to policies, practices and programs that help depathologize problematic behaviors. It offers strategies for creating service delivery climates of empathy and respect in work with individuals and families who have experienced traumatic events.

More recently, the contribution of neuroscience research has made its way into the social and behavioral health arenas by informing practitioners across disciplines about the impact of early trauma on the brain. Neuroimaging techniques such as magnetic resonance imaging (MRI) offer new understanding and validation of the impact of early traumatic events by focusing on brain development. Bridging the gap between academic studies and more popular publications, trauma-oriented, neuroscience-based information focuses on the neurobiology of distressing events and the subsequent detrimental impact they can have on social functioning (Child Welfare Gateway 2009). Early trauma has been found to cause changes in certain structures in the brain as well as alterations in chemical activity and these changes can result in heightened reactivity and impaired relational capacity (Phillips and Shonkoff, 2000).

Due, in part, to the varying attitudes about mental health disorders as well as mistrust of diagnostic labels Trauma Informed Care orientations have not been easily incorporated across cultures (Evans and Coccoma 2014). Studies assessing outcomes of TIC have also been lacking. A search of the literature for evaluation studies of TIC found one (Clark et al. 2008) that was a comparison

of “consumer” attitudes toward social services that used a TIC orientation in the design of space and service delivery (called the “integrated condition”) and clients receiving care as usual. The analysis found that clients who received the “integrated condition” were more likely to report that services were trauma informed and that relationships with the service providers were more positive and characterized by respect for cultural identity. While the authors emphasize that the results are not predictive of treatment outcomes such as reduction of symptoms the positive experiences, particularly with the providers, can be a first step in healing.

There are risk assessment models currently in use in correctional facilities that do not explicitly focus on traumatic experience. The Risk, Need, Responsivity Model (RNR), for example, is an intervention that tabulates risk/needs factors as well as other attitudes and behaviors considered criminogenic (Andrews 2006). Unfortunately, the RNR model does not incorporate current neuroscience research that indicates the reactivity, impulsivity, and need for excitement that can result from early or even recent trauma. Instead, individuals with these symptoms are labeled in the RNR model as having an antisocial personality pattern (Bonta and Andrews 2007). Neuroscience research on the adolescent brain describes the drive for intense experience without regard for future consequences that so often characterizes adolescents to be the result, not of characterological or personality deficits, but of the mix of a combination of an increased number of dopamine receptors and surges in sex hormones (Steinberg 2014). Since so many incarcerated individuals are sentenced for crimes committed during adolescence it is important that neuroscience contributions become more widely incorporated in courtrooms and correctional facilities.

One probable reason for the lack of outcome studies that focus on symptom reduction in TIC-specific interventions is that TIC, as it currently exists, is primarily a set of information and values about working with individuals who have experienced trauma. This is an important framework that has promoted better working alliances and an empowerment focus but has not provided enough intervention-oriented guidance that would allow for outcome evaluation.

Unintended consequences

The awareness brought by the ACE study and subsequent studies of early childhood trauma have been important and the benefits of incorporating Trauma-informed Care into services have shaped the environments in which services are delivered and heightened attention to the imperative to build client-provider relationships that build trust and a sense of empowerment. However, there are some serious issues that also arise with the attention they

have brought by their focus on the impact of traumatic events. These issues are discussed below.

1. Over-attention to the negative

The ACE study and many, not all, of the studies that flow from it have a sole focus on the negative experiences of childhood. And the ACE survey of negative events was limited in the scope of types of adverse experiences it included. No data was collected in the ACE survey on protective or strength-oriented factors that may have been part of the lives of those in the sample. The consequence of attention to risks and problems to the omission of resilience and protective factors is a lopsided understanding of clients and this view becomes a limiting factor that can shape intakes, service delivery and research.

The powerful impact of the ACE study has generated other surveys that are also limited to risk factors. The CDC's Behavioral Risk Factor Surveillance System (BRFSS) (2014a, b), for example, which is conducted throughout all 50 states in the U.S., the District of Columbia, as well as three territories, asks only one question that could be considered even slightly positive. Question 32b on the Women's Version of BRFSS asks, "How many close friends or relatives would help you with your emotional problems or feelings, if needed?" This could be considered positive because it asks about close friends or relatives. Unfortunately, the question is oriented toward having a problem. A different version of the question or a separate question could be, "How many close friends or relatives do you have supportive relationships with?"

No matter how vulnerable a person or family is they also have strengths, they have dreams for the future, they have bounced back from challenges. It is not that the exclusion of strength-based or resilience information is an intentional omission in so many programs. It is that the Trauma Orientation seems to create a single-point focus that overrides or edges out an inclusion of and attention to strength-based information in many research studies and other information-gathering programs.

A factor that contributes to this Trauma Orientation in intakes is that most social service workers are in organizations that are under-resourced in terms of time and staff. This time/staff squeeze contributes to an urgency to get "to the heart of the matter," which is the problematic events that have happened or are still happening to a client. And, clients are expecting that focus. But, the true "heart of the matter" is the resilience that a person retains in the face of many challenges. Those factors that contribute to resilience are the factors it is important to know about. They have shaped resilience and can help amplify it when enlisted during service delivery.

Inclusion of strength-based questions is important in many ways: 1) It allows the person responding to the form or interview to feel known in more ways than just the negative events of life and the corresponding problems; 2) it gives a fuller picture to staff so that the likelihood of "armoring," the hard shell that workers can develop when faced with client problems that seem insurmountable, is diminished and a sense of manageability increases; 3) it increases the likelihood that the strengths can be used during the service delivery process; 4) in research it provides richer understanding of the relationship between the independent and dependent research variables and can increase the explanatory power of the analysis. For example, in the ACE study not all individuals with higher ACE scores experienced the many health risks, some didn't. It would be helpful to know if the reason for the difference is the protective factors in their early lives. How many protective factors, or which ones, diminish the effect of adverse experiences? Those factors, unfortunately, were not collected.

The type of protective questions that could enrich the ACE survey includes, "In your childhood was there a person or persons in your family who took a positive interest in you?" Or "Did some people in your family look out for and support each other sometimes?" Or "Were there some things as a family you enjoyed doing together?" They would include questions beyond the family since they, too, can contribute to resilience: "In your childhood was there a person or persons outside the family who supported you? Motivated you? Seemed to appreciate your strengths?" Questions such as these can be interspersed with questions about adversity (Leitch 2015).

Fortunately, more recent risk assessment instruments move beyond a Trauma Orientation to include positive or protective factors (Rains and McLinn 2013). Thompson (2010), in a doctoral thesis, discusses the history of and theoretical models guiding resilience-oriented surveys, including definitional issues and domains. And, some surveys have moved beyond an exclusive focus on family experiences to include a much richer focus that captures school and community experiences as well. For example, The Annie E. Casey Foundation's Evidence2Success Youth Experience Survey (2013) outlines key risk and protective factors specifically developed for assessment and intervention by communities. The survey includes risk questions such as, "How wrong do your parents feel it would be for you to smoke marijuana?" and, "How many times have you changed homes since kindergarten?" and, "In the past year (12 months), how often have you been treated badly because of your race?"

Examples of protective questions include: "Do you share your thoughts and feelings with your mother (or the person who is like a mother to you)?" and, "How

often do your parents (or caregivers) tell you they're proud of you for something you've done?" and, "In the past year how many of your best friends have participated in clubs, organizations, or activities at school?" The Evidence2Success is an example of a survey that focuses on the ecology of a child's life; including questions and statements about school and community relationships in addition to a family focus.

Collecting resilience information in addition to adverse experiences can increase the richness of studies measuring the impact of program interventions. It can guide analyses that examine the mediating effect of protective factors on adverse events. It can refine analyses by examining whether there are "windows of opportunity" when protective factors have a larger impact or whether there differential effects of some protective factors (e.g., family factors, community factors, peer factors). And, when attrition from a study or program is reduced because participants feel better understood there will be a more reliable understanding of what should be replicated in program design and a far better knowledge base about the characteristics of clients that appear associated with better or worse outcomes.

2. Ethical issues

In collecting data from anyone, but particularly from individuals who are vulnerable, it is essential to pay attention to the potential for re-traumatization during information gathering. The method of data collection and the content of the items are dimensions of human subjects protection that must be considered.

The ACE survey and the BRFSS, are both large surveys that collect only trauma-specific data, and are not administered face-to-face. The ACE survey was collected by mail and the BRFSS as a telephone survey. What is the effect on research participants when only questions about risk factors (spanking, suicidal thoughts, sexual abuse, etc.) are the focus? If a respondent is upset after receiving the ACE form by mail or the BRFSS call who would know? Is there a follow-up call if the information triggers intense feelings and memories? Is there a procedure for checking back with respondents to find out?

SAMHSA guidelines emphasize avoiding the re-traumatization of clients (SAMHSA 2015). Institutional Review Boards (IRB) must consider the potential for re-traumatization when only emotionally charged questions are used in a mail or telephone survey. No information on follow-up with respondents could be located on this important human protections issue. Research is needed that examines the impact of trauma-oriented surveys on respondents, including on sample attrition.

3. Relationship and manageability

It can be a challenge to attract and maintain vulnerable individuals in services who are not court-ordered.

Clients might present once and not return or, after a telephone intake, they may not come in for an initial session. Over-attention to negative symptoms and the exclusion of positive qualities and protective events that characterizes so many intake processes may be a contributing factor.

For example, if a teen client has been a run-away since age 10, trafficked for sex since she was 12 years old, raped numerous times, bears the tattoos of "pimp ownership" on the back of her neck, and is alternately hostile and withdrawn a worker can feel anxious, overwhelmed, and even adversarial. As mentioned earlier, neurobiological studies of childhood trauma highlight the relational difficulties of many trauma survivors. And these relational challenges can be seen in the ways a trafficked teen presents during intake and early services.

When the intake form for an agency working to engage sex-trafficked teens in services was changed to include questions about positives, workers began to feel a sense of hope and believed the teens were more likely to return for a second meeting (Leitch and Snow 2010). An example of a question asked in the revised intake to build more complete knowledge of the teen was, "If your good friend was here with us today and I asked her what she likes best about you, what would she say?" Questions like this one can change the quality of the exchange, decrease suspicion and hostility, and remind both the client and the worker that she is more than a sex-trafficked person with multiple arrests.

Bessel van der Kolk (2014) highlights the need to look at the *ecology* of lives as a richer way to understand individuals, moving beyond an over-focus on the negative. When the emotionally challenging details of the traumatic experiences, which are required in order to convict a sex-trafficking perpetrator, can be balanced with strength-oriented questions about the teen trust and safety can slowly be built and worker overwhelm and defensive amoring decreases. These, in turn, can enhance the stability of both the teen and provider.

4. Generating and reinforcing dysregulation

Another compelling reason for intentionally weaving strengths into both research and practice comes from what neuroscience research has found about the human nervous system and its powerful role in the regulation of physical, emotional, and cognitive functioning (Cozolino 2002; van der Kolk 2014).

Information gathering processes can be developed in a way that mimic the rhythm of the Autonomic Nervous System when it is in a healthy, regulated balance. This means creating a rhythm of calming and activating questions throughout the process: ask a few questions that generate Parasympathetic calming followed by a couple of questions that might be activating, followed by a

calming question, and so on. Workers can learn to track the patterns of activation and calming by noticing such sensory details as breathing, muscle tension or relaxation, facial coloration, posture and gestures. This sensory information can help guide the decision to shift from activating to calming questions and decrease the potential for dysregulation.

5. Information is not enough

Sensitivity to the impact of traumatic events that flows from TIC, while helping to reduce pathologizing and enhance relationship, does not always help workers know what to *do* beyond that. Another way to describe this is that TIC provides information on the kinds of experiences that result in dysregulation and the corresponding array of symptoms but usually does not provide enough specificity about how the mind-body system is designed to respond to threat and fear (as well as the potential for resilience). This limits service providers' ability to design trauma and resilience-informed interventions that link the mind and the body that can decrease reactivity. Particularly lacking are interventions that use practical skills to promote the capacity for self-regulation. An essential building block of wellbeing as well as mastery and dignity is knowing how to modulate your own reactivity. This is true for providers as well as clients.

6. Lack of neuroscience-based information in understanding trauma

Too few interventions that are designed for rehabilitating offenders, who are often susceptible to poor impulse control and the corresponding attitudes and behaviors, have incorporated recent research from neuroscience about the impact of trauma on the mind-body system. When these symptoms and behaviors are viewed from a neurobiological lens that highlights how the human nervous system is wired to respond to threat and fear the use of negative labels decreases and the focus is on finding ways to bring the nervous system back into balance.

The incorporation of neurobiological knowledge facilitates the design of skills-based interventions suitable across cultures and with groups that may stigmatize or not have access to or willingness for counseling, since all humans, regardless of culture, gender, race/ethnicity, are wired similarly in their response to perceived threat and fear. These interventions target regulation of the nervous system rather than putting a primacy on insight and emotion. (Levine 1997; Ogden et al. 2006; Leitch et al. 2009; van der Kolk 2014). Cognitions and emotions are included in these approaches but are secondary.

Further evolution of TIC can be greatly enriched by the incorporation of findings from neuroscience research that currently are absent in most approaches. Expanding the TIC knowledge base enables the design of a wider

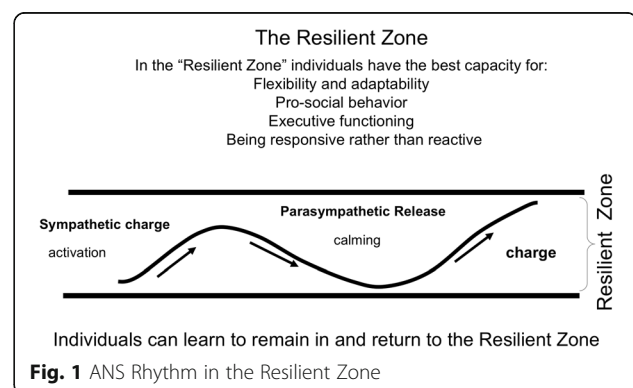
more culturally-sensitive range of intervention, including teaching self-regulation skills for use in self-care as well as peer-to-peer. Three of these key concepts from neuroscience that could enhance TIC are described below.

a. Autonomic Nervous System (ANS)

Information about the Autonomic Nervous is a core element in understanding of how the mind-body system responds to threat and fear as well as how to amplify resilience. Like many aspects of nature that have rhythms and cycles, the human body also has them. One rhythm in particular that is accessible to intervention and extremely potent in its influence on health and wellbeing is the rhythm between the two branches of the Autonomic Nervous System (ANS), the Sympathetic and Parasympathetic branches.

With the advent of increasingly sophisticated fMRI techniques and interpretation of results the past decade there has been increasing information about the ANS and its two branches. They work in a rhythm with each other; most simply put, the Sympathetic is the activator and the Parasympathetic is the calmer. When the two are in an optimal rhythm or balance the individual can be responsive to life events rather than reactive to them. When the ANS is in a healthy balance, which can be called the Resilient Zone, there is access to a conscious system of information processing in which stress chemicals do not block access to the cortex, or thinking part of the brain. This promotes better capacity for problem-solving and strategic thinking in stressful situations rather than reactivity (Roosendaal, McEwen, & Chartarji (2009) as well as the ability to engage in pro-social behaviors. Figure 1 below illustrates ANS rhythm when it is in the balance:

The Autonomic Nervous System (ANS) influences all of the organs in the body (Schmidt and Thews 1989). That is one reason why distressing events, such as those from the ACE study, are associated with mental and physical health problems. When stressful, distressing, and traumatic events bounce an individual out of the Resilient Zone the dysregulation that occurs can lead to



physical, emotional, cognitive, and behavioral symptoms that affect health and well-being in many negative ways (Scaer 2005; van der Kolk 2014).

And, when individuals experience a repetitive or cumulative series of negative experiences it can “wire in” the dysregulated rhythm (Scaer 2005), leaving them reactive and stuck in a state of either hyperarousal (being bumped above the Resilient Zone) or hypoarousal (stuck below the Resilient Zone) or oscillation between the two extremes as the nervous system attempts to find balance Fig. 2.

The graphic above shows the disrupted rhythm of the ANS and examples of what can happen when someone is stuck on “high” or “low.” In addition to the symptoms in the chart that can result from being outside the Resilient Zone, stress has an impact on memory. Neurochemicals such as adrenalin, which are generated in response to perceived threat, help to etch a distressing or traumatic event into memory. However, “high arousal disconnects brain areas necessary for proper storage and integration of information” (van der Kolk 2014:176). The result can be fragmented and distorted memory.

Intake processes, courtroom testimony, evocative and intense interventions such as Prolonged Exposure Therapy, and research questionnaires that focus only on adverse experiences and symptoms have the potential to bump people into states of reactivity. Neuroscience research has shown that when individuals are in these states of dysregulation memory, concentration, and attention are negatively affected (Lutz et al. 2008).

The implications of this information should be considered in courtrooms where the legal process is designed to be adversarial. It can help understand why a rape survivor, when under cross-examination, may change details in the story of what happened, have trouble identifying the accused, and describing other specifics of a crime that shape jury decisions.

Behavior is also shaped by physiological reactivity. There tends to be a decrease in pro-social behaviors

such as collaboration and kindness in individuals when bounced outside the Resilient Zone since those usually require full cognitive capacity and the corresponding ability to *respond* rather than *react* to life events. When ANS rhythm is outside the Resilient Zone there can be increases in such behaviors as substance abuse, self-harming, family violence, poor school and work performance, bullying, and social disengagement, to mention only a few.

Graphics like the two above help clients and caregivers understand the reason for their responses to stress, distress, and trauma. The information, which can be referred to as neuroeducation because of its focus on education about the neurobiology of threat, fear, and resilience, can be useful in motivating individuals to pay attention to the body’s signals of distress and calming and to motivate practice of self-regulation skills. It becomes a way for those who have been cut-off from the body’s signals of distress to pay attention at this essential sensory, “bottom-up” level and use skills to return to balance.

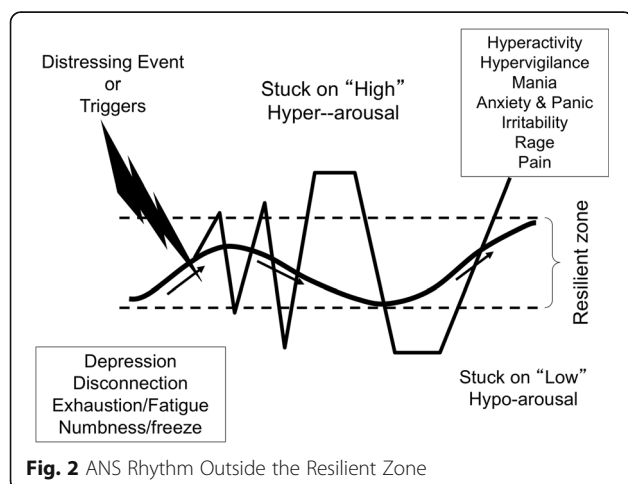
The graphics can be shared with individuals (clients and staff) and used in creating resilience-oriented policies, programs, and, most importantly, actions. The information in the graphics can be used in work with clients, work teams, and communities to provide a rationale for the use of self-regulation skills.

Neuroeducation helps individuals understand what was happening in the nervous system when they reacted to a threat in a way that got them into trouble. It focuses on biology rather than pathology. The neuroeducation can also motivate individuals to learn and practice skills-based approaches to self-regulate so their reactivity diminishes and they have a deeper “Resilient Zone” due to neuroplasticity. Inside the Resilient Zone there is greater potential for pro-social behaviors such as collaboration, empathic responses, future-oriented planning, etc.

b. The fast and slow systems of information processing

A second important concept from the neuroscience labs that can amplify the contribution of TIC is that every individual is wired with defensive responses (Fight, Flight, Freeze, and Tend and Befriend) that can be automatically and unconsciously triggered by even the *perception* of threat. This appraisal of threat takes place initially below the level of consciousness and is entirely subjective. What one person would perceive as threatening another might perceive as an exciting challenge. And, because individuals are quite elegantly wired to maximize survival, the brain has two processing speeds that function to make sense of in-coming information and to take action in behalf of survival: the “fast system” and the “slow system” (Kahneman 2013).

In the fast system, problem-solving processes are blocked by neurochemicals in order to save valuable



seconds and increase survival chances. If, for example, a speeding car jumps the curb and comes at someone on the sidewalk the time to think about escape options may result in injury or death. Instead, the individual is automatically launched into flight mode, instantly leaping out of the way. This is the fast system in action, protecting survival.

However, fast system processing can cause problems when an individual is triggered by an event from the past. For example, if a correction officer is triggered (due to his own previous trauma) by the sound of a scuffle behind him and instinctively goes into a defensive response of fight by hitting a handcuffed prisoner, that fast system of processing can result in career-risking behavior. And, if nearby officers go into fast system processing and shut down, they can be deemed “psychologically” unprepared and also be subject to disciplinary action.

In the slow system the threat is unconsciously appraised as manageable and cortical thinking is not blocked by neurochemicals. Conscious problem-solving and decision-making can then occur from inside the Resilient Zone. Perceived threat generates fast system processing and *re-activity* (Kahneman 2013). In some cases the fast system of processing protects survival but in other situations it leads to risky or shame inducing behaviors.

Neuroeducation about the fast and slow systems of processing can help reduce acute distress in, for example, a Correction Officer who is filled with shame because he froze during a lethal situation and his buddy was badly wounded as a result. It can help understand why a police officer may have shot 16 times at a youth who was running away. The information does not release individuals from the need to take responsibility for the impact or outcome of these fast-system actions; but it can help understand the neurobiological dynamic behind the action and reduce the labeling of the behavior as characterological.

And, when neuroeducation is channeled into action it can change organizational practices. For example, by using neuroeducation, the process leading up to invasive body-checks with incarcerated people can be redesigned in a way that decreases the likelihood of the prisoner going into fast system reactivity that gets him or her into additional trouble.

c. Neuroplasticity and self-regulation

Another neuroscience finding that can contribute to a shift from information to action in TIC is the ability of the brain to change. In the past, the belief was that the brain was fully developed by early adulthood. It is now broadly recognized that the brain is able to change over the lifespan, for better or for worse (Doidge 2007). And, what neuroscience has shown makes the difference in whether the plasticity change is beneficial or not is how and to what we pay attention.

Neuroplasticity, can be enlisted in building pro-social behavior as well as emotional and physical well-being by skills that teach self-directed attention. New neurons are generated (neurogenesis) and reinforced (neuroplasticity) during learning and practice; and a key element of learning comes from attention (Citri and Malenka 2008). Self-directed attention practices, including but not limited to various forms of meditation, have been found in hundreds of studies to promote improved health, compassion and collaboration, and a range of other well-being indicators (Grossman et al. 2004; Jacobs et al. 2011).

A key driver of neural connectivity that can enhance neuroplasticity in ways that deepen resilience has been found to be the monitoring and training of attentional focus (Lutz et al. 2008; Tang et al. 2007; Tang et al. 2014). The majority of studies showing ways to enhance connectivity using attention-based networks comes from meditation studies. Understanding the neural mechanisms underlying attentional practices has been steadily growing. However, a limitation in the research is the lack of studies that discriminate between different forms of attention-based practice (Chiesa 2012) whether in a meditation-based model or in attention training, like the self-regulation skills training proposed in this paper, that don't require meditation. Like meditation, self-regulation skills train attention and teach people how to redirect and sustain attention in particular ways that can be used prior to and during challenging events as well as practiced over time to build deeper nervous system balance via neuroplasticity.

Self-regulation skills do not focus on insight or clinical interpretation (Levine 1997; Ogden et al. 2006; Leitch et al. 2009). The skills rely on the individual directing attention to patterns of activation and calming in the body. The focus is on the rhythm of the Autonomic Nervous System as reflected in such sensory experiences as, for example, quality of breath, heart rate, and muscle tension and relaxation patterns. When activation goes outside the Resilient Zone particular skills are used to return to the Resilient Zone and to reinforce the experience of balance.

The two primary objectives of self-regulation skills are 1) to have a practical, immediate way to manage and reduce states of distress and activation that can be used independently as well as in clinical intervention and 2) to use neuroeducation to help understand symptoms and behaviors and to motivate practice of the skills in order to utilize neuroplasticity to wire-in greater resilience and decrease the power of stressors to trigger reactivity. The skills explicitly incorporate strengths and protective factors in the process of self-regulation and generate a sense of mastery and efficacy. They can be used for provider self-care as well as in work with clients. They can also be used peer-to-peer.

Neuroplasticity is a hidden asset in human potential. It can be accessed by an individual's conscious or

unconscious patterns of attention. An old adage says, “Where your attention goes, energy flows, and that’s what grows.” Knowledge about neuroplasticity has been an underutilized mechanism of positive change in most social services approaches, both for provider self-care and in work with others. Developing self-regulation skills that can be practiced independently by providers and clients alike can decrease reactivity and increase slow system processing in addition to building a sense of mastery and self-control.

Using ACE findings and neuroscience: moving from information to action

The neuroscience concepts above help shed light on how cumulative adverse childhood experiences can maintain the brain in a threat-oriented mode which, over time (through neuroplasticity), can wire in a level of physiological reactivity; a reactivity that can last throughout adulthood, creating physical and emotional health problems and repeatedly cause problematic behaviors. A vicious cycle is put in place and reinforced. This reinforcement process has been described as the body re-setting itself in a way that the world is experienced as a dangerous place (van der Kolk 2014).

The prison system is an example of the ways undigested trauma from early childhood experiences can join with the conditions of harshness and violence in many of our U.S. prisons and contribute to reinforcing a cycle of reactivity in both Correction Officers and prisoners. The correctional system is rife with challenges to the health and well being of Correction Officers (COs) as well as prisoners. Suicide rates of COs are more than double that of police officers as well as for the national average (Steele 2009) and their average life expectancy is 59 years old (Cheek and Miller 1982; Steele 2009). How much is due to adverse childhood experiences? How much is due to our system of incarceration, which can create a culture of violence in which both the imprisoned and those in charge of them must operate in a perpetual state of hypervigilance and wired-in reactivity? Practices throughout the criminal justice process can benefit from information from neuroscience as well as the skills that are based on this information to create environments and approaches that enrich rather than deplete the ability of both COs and inmates to self-regulate as a core practice. Practical self-regulation skills that are based on neuroscience research belong in police and CO training academies, and with other first responder groups as a tool to build resilience and decrease reactivity during stressful situations.

Conclusion

The ACE Study and Trauma-Informed Care have made a strong and positive contribution to understanding the powerful role and negative health effects of adverse

events in childhood. The effects of early negative childhood experiences are found to carry on throughout adulthood, even affecting life expectancy. The two contributions have helped sensitize service providers to the risk factors that shape behaviors and health, have helped policy makers and service providers shift away from a characterological lens of human behavior to one that recognizes the impact of early and traumatic experiences, and have highlighted the importance of early childhood prevention programs and family support.

The unintended consequences, however, have contributed to an over-focus on negative events to the neglect of protective and positive factors. This over-focus, while not characterizing all policies and programs, is still too common, nevertheless. It has shaped research as well as social programs. During service delivery, collection of the adverse details about people’s lives is often *necessary but it is not sufficient*. A focus on individuals’ strengths and competencies is essential. And, Trauma-Informed Care is also *necessary but not sufficient*. Policy makers and providers must know what to do with the information, what actions are needed. Action-oriented interventions will facilitate evaluation studies of outcomes. This will advance the field of TIC.

Current neuroscience-based information (“neuroeducation”) has an important role to play in the field of criminal justice including 1) redesigning information gathering processes to decrease re-traumatization, 2) decreasing the use of labels such as “anti-social” that do not take into account the neurobiological effects of trauma on the nervous system, 3) the incorporation of self-regulation skills training for providers and clients, and 4) facilitating outcome evaluations of trauma and resilience oriented skills-based programs. Drawing on neuroeducation about nervous system activation and calming as well as slow and fast systems of information processing can decrease the potential of both data collection and social programs to re-traumatize clients and research subjects and can help reinforce nervous system stabilization.

Practical skills, based upon key concepts from neuroscience can, as a next step, move Trauma-Informed Care beyond *information to action* by building the capacity for self-regulation. Greater attention to strengths and protective factors as well as challenges can reorient the way that researchers and practitioners collect information, design interventions, conduct data analyses, and support the dignity and trust of clients.

Using non-clinical, skills-based approaches individuals (clients as well as service providers) can learn to assess the state of their nervous systems and direct their attention using practical skills that promote self-regulation and deepen resilience. And, researchers can adapt the idea of reinforcing a Resilient Zone nervous system

rhythm when designing the patterns of questions in surveys and interviews.

The increased attention to traumatic experiences from the ACE study and the expansion of attention in more recent surveys to collect protective factors as well as risk factors has offered an essential understanding about the power of experience to affect health, behavior, and well being. When that knowledge is combined with neuroscience-based skills, trauma informed approaches will move from information to measurable action.

Competing interests

The author declares there are no competing interests.

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Adverse Childhood Experience (ACE) Questionnaire

Finding your ACE Score ra hbr 10 24 06

While you were growing up, during your first 18 years of life:

1. Did a parent or other adult in the household **often** ...
Swear at you, insult you, put you down, or humiliate you?
or
Act in a way that made you afraid that you might be physically hurt?
Yes No If yes enter 1 _____
2. Did a parent or other adult in the household **often** ...
Push, grab, slap, or throw something at you?
or
Ever hit you so hard that you had marks or were injured?
Yes No If yes enter 1 _____
3. Did an adult or person at least 5 years older than you **ever**...
Touch or fondle you or have you touch their body in a sexual way?
or
Try to or actually have oral, anal, or vaginal sex with you?
Yes No If yes enter 1 _____
4. Did you **often** feel that ...
No one in your family loved you or thought you were important or special?
or
Your family didn't look out for each other, feel close to each other, or support each other?
Yes No If yes enter 1 _____
5. Did you **often** feel that ...
You didn't have enough to eat, had to wear dirty clothes, and had no one to protect you?
or
Your parents were too drunk or high to take care of you or take you to the doctor if you needed it?
Yes No If yes enter 1 _____
6. Were your parents **ever** separated or divorced?
Yes No If yes enter 1 _____
7. Was your mother or stepmother:
Often pushed, grabbed, slapped, or had something thrown at her?
or
Sometimes or often kicked, bitten, hit with a fist, or hit with something hard?
or
Ever repeatedly hit over at least a few minutes or threatened with a gun or knife?
Yes No If yes enter 1 _____
8. Did you live with anyone who was a problem drinker or alcoholic or who used street drugs?
Yes No If yes enter 1 _____
9. Was a household member depressed or mentally ill or did a household member attempt suicide?
Yes No If yes enter 1 _____
10. Did a household member go to prison?
Yes No If yes enter 1 _____

Now add up your "Yes" answers: _____ This is your ACE Score

Note to service provider:

PACES (Positive and Adverse Childhood Experiences Survey) is a brief questionnaire designed as an alternative to the ACE Survey. It includes questions about protective factors. These protective factor questions are interspersed with the items from the ACE Survey in a way that can help to decrease the potential for re-traumatization, maintain a balance between activating and calming questions, and help provide a richer understanding of the client's family experiences.

PACES was developed as an example of how questionnaire construction can be done in a way that gathers information needed for delivery of trauma intervention/prevention services and also highlights client resilience. Since PACES is not a standardized questionnaire, questions can be changed to better fit the agency needs. It is the interspersing of protective questions that highlight client resilience that the questionnaire demonstrates.

Introducing PACES to a client

To the Individuals in Our Practice Seeking _____ Care:

The families that each of us grows up in as well as our early childhood experiences can have an effect on our parenting/behaviors/health/well being. Most of us have some memories of our early life that are positive...people who cared about us, positive experiences that made us confident, etc. But there are also childhood experiences that are harmful to children and can continue to affect us even as adults.

Here at _____ it helps us understand how to better support you during our work with you to know some of the positive experiences and also the hard things you experienced during childhood. For example, parents who didn't have enough to eat as children tell us that it is hard to know how much their child should eat at any given age.

We also know that events that happen when you get older can also have an effect on how easy it is to bounce back after distressing experiences.

On the form below are some questions about your own early experiences. The questions mostly focus on your family experiences. Your answers to these questions can help us know how to support you and they can also help us better understand others and the services that would be helpful for our clinic to offer.

Thank you for sharing this information. It will be kept confidential and will be used to help us help you as well as to develop services that can benefit many other individuals as well. It is completely ok to skip items or to decide not to fill out this questionnaire. It will not affect your ability to receive services from our agency.

Screening Questionnaire:

date: _____

P.A.C.E.S

Before your 18th birthday:

1. Was there an adult in your family who took an interest in you in a positive way? Y N
2. Was there someone in your family that really seemed to understand the good things about you? Y N
3. Not including spanking did any adult in your home ever physically hurt you (by hitting, kicking, etc)? Y N
4. Did anyone in your home often swear at you, insult you, put you down or humiliate you? Y N
5. Was there an adult outside the family who took an interest in you? Y N
6. Did anyone at least 5 years older than you sexually abuse you, including unwanted touch? Y N
7. Did your family look out for each other and support each other most of the time? Y N
8. Did you often or very often feel that no one in your family loved you or thought you were special? Y N
9. Were there groups you belonged to outside your family that made you feel good about yourself? Y N circle any that made you feel good: school club team, gang church other
10. Did you often or very often feel you didn't have enough to eat, had to wear dirty clothes, or were left alone or with other young children without an adult in the house? Y N
11. Did any adults that lived with you use drugs or get drunk in front of you so much that they couldn't care for your needs? Y N
12. Did you experience death of a parent, abandonment, or divorce? Y N
13. If hard things were happening in your life did you have positive ways to help yourself feel safe or better? Y N

14. Was there violence in your house such as hitting, throwing things, kicking, threatening with a weapon such as gun or knife? Y N
15. Did anyone in your home get arrested or go to jail/prison? Y N
16. Did your family have things they liked to do together? Y N
17. Was anyone in your home depressed, mentally ill or suicidal? Y N
18. Was there someone in your home who gave you guidance or good advice? Y N
19. Was there someone at home who paid attention to how you were doing in school? Y N
20. Did you have physical activities that you regularly did? Y N

Refrigerator Sheet:
The Whole-Brain Child
by Daniel J. Siegel and Tina Payne Bryson

Introduction

- **Survive AND thrive:** Watch for ways to take the difficult parenting moments when you're simply trying to *survive*, and turn them into opportunities for your children to *thrive*.
- **Integration → Health and success:** The brain performs at its best when its different parts work together in a coordinated and balanced way. An integrated brain results in improved decision-making, better control of body and emotions, fuller self-understanding, stronger relationships, and success in school.
- **The River of Well-being:** The more integrated our kids are, the more they can remain in the river of well-being, avoiding the bank of chaos on one side, and the bank of rigidity on the other.

Chapter 1: Integrating the Left and Right Brain

- **Left + right = clarity and understanding:** Help your kids use both the logical left brain and the emotional right brain so they can live balanced, meaningful, and creative lives full of connected relationships.
- **What You Can Do: Helping your child work from both sides of the brain**
 - *Connect and Redirect:* When your child is upset, connect first emotionally, right brain to right brain. Then, once your child is more in control and receptive, bring in the left-brain lessons and discipline.
 - *Name it to Tame It:* When big, right-brain emotions are raging out of control, help your kids tell the story about what's upsetting them. In doing so, they'll use their left brain to make sense of their experience and feel more in control.

Chapter 2: Integrating the Upstairs Brain and the Downstairs Brain

- **Be patient with the upstairs brain:** Unlike the primitive downstairs brain, which is intact at birth, the sophisticated upstairs brain is "under construction" during childhood and adolescence. Plus, it's especially vulnerable to being "hi-jacked" by the downstairs brain, especially in high-emotion situations. So don't expect your children to make good decisions all the time, or to remain in control of their emotions and actions.
- **What You Can Do: Helping develop and integrate your child's upstairs brain**
 - *Engage, don't enrage:* In high-stress situations, engage your child's upstairs brain, rather than triggering the downstairs brain. Don't immediately play the "Because I said so!" card. Instead, appeal to your child's higher-order thinking skills. Ask questions, ask for alternatives, even negotiate.
 - *Use it or lose it:* Provide lots of opportunities to exercise the upstairs brain so it can be strong and integrated with the downstairs brain and the body. Play "What would you do?" games and present them with dilemmas. Avoid rescuing them from difficult decisions.
 - *Move it or lose it:* When a child has lost touch with his upstairs brain, a powerful way to help him regain balance is to have him move his body.

Chapter 3: Integrating Memory

- **Make the implicit explicit:** Help your kids make their implicit memories explicit, so that past experiences don't affect them in debilitating ways. By narrating past events they can look at what's happened and make good, intentional decisions about how to handle those memories.
- **What You Can Do: Helping your child integrate implicit and explicit memories**
 - *Use the remote of the mind:* After a painful event, a child may be reluctant to narrate what happened. The internal remote lets her pause, rewind, and fast-forward a story as she tells it, so she can maintain control over how much of it she views.
 - *Remember to remember:* Help your kids exercise their memory by giving them lots of practice at remembering. In the car, at the dinner table, wherever: help your kids talk about their experiences, so they can integrate their implicit and explicit memories.

Chapter 4: Integrating the Many Parts of Myself

- **The Wheel of awareness:** Sometimes our kids get stuck on one particular point on the rim of their wheel of awareness, and lose sight of the many other parts of themselves. We need to give them mindsight, so they can be aware of what's happening in their own mind. Then they can choose where they focus their attention, integrating the different aspects of themselves and gaining more control over how they feel.
- **What You Can Do: Introducing your child to the wheel of awareness**
 - *Let the clouds of emotion roll by:* Remind kids that feelings come and go. Fear and frustration and loneliness are temporary states, not enduring traits.
 - *SIFT:* Help your children pay attention to the Sensations, Images, Feelings, and Thoughts within them. They can't understand and change their inner experiences until they are first aware of what's going on inside.
 - *Exercise mindsight:* Mindsight practices teach children to calm themselves and focus their attention where they want.

Chapter 5: Integrating Self and Other

- **Wired for "we":** Watch for ways to capitalize on the brain's built-in capacity for social interaction, especially by being intentional about creating positive mental models of relationships. Parents and other important caregivers create children's expectations about relationships that will affect and guide them throughout their lives. Help them develop mindsight, which offers them insight into themselves as individuals, and empathy for and connection with those around them.
- **What You Can Do: Helping your child integrate self and other**
 - *Enjoy each other:* Build fun into the family, so that your kids enjoy positive and satisfying experiences with the people they're with the most.
 - *Connect through conflict:* Try not to view conflict as merely an obstacle to avoid. Instead, use it as an opportunity to teach your kids essential relationship skills, like seeing other people's perspectives, reading nonverbal cues, and making amends.