Adverse Childhood Experiences, Brain Development, and Mental Health: A Call for Neurocounseling

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The Adverse Childhood Experiences (ACE) Study provided compelling evidence that abuse, neglect, and other ACEs are the most potent risk factors for the development of health, mental health, and substance use problems. Such negative health-related outcomes parallel the cumulative exposure of the developing brain to the stress response, with resulting impairment in multiple brain structures and functions. Collectively, these sequelae can manifest during childhood, adolescence, or adulthood. We and others have posited that counseling and other psychotherapeutic interventions need to address the individual’s multilayered ecology (i.e., biological, psychological, social, cultural/contextual). Neurocounseling can provide a heuristic framework to more effectively assess, conceptualize, and counsel people with a history of ACEs. We provide an update of the clinical neuroscience of ACEs and its implications for counseling, including how contemporary interventions (e.g., mindfulness) can potentially have positive benefits for such individuals.

The term adverse childhood experiences (ACEs) was first used to capture the combined experiences of child abuse and household dysfunction: for example, drug abuse, spousal violence, and criminal activity (Felitti et al., 1998). Scientific inquiry into the consequences of ACEs has resulted in a copious body of evidence indicating that ACEs serve as potent risk factors for the development of many physical and mental health problems. One key aspect of neurocounseling is increasing the neuroscientific knowledge base of counselors (Russell-Chapin, 2016). The mere accrual of new knowledge, however, is insufficient. Rather, the ultimate goal of neurocounseling is better treatment...
outcomes that reflect a genuine infusion of neuroscience into counseling practices (Beeson & Field, 2017). We argue that clinical mental health counselors, and in fact all counselors, require a fundamental understanding of the ACE literature for the work that they do with individuals whose backgrounds include ACEs. Thus, the goal of this paper is twofold: (1) to enhance counselors’ knowledge of ACEs and their consequences and (2) to link such knowledge to clinical application of case conceptualization strategies and interventions appropriate for clients who have ACE histories.

ADVERSE CHILDHOOD EXPERIENCES STUDY

The ACE Study is an ongoing landmark research project conducted by a collaborative group of investigators from the U.S. Centers for Disease Control and Prevention and Kaiser Permanente, a large health maintenance organization in the state of California. The overarching objective of the study is to assess the impact of ACEs on adult health behaviors and outcomes as well as healthcare utilization (Felitti et al., 1998). Initial findings indicated that more than 50% of the participants reported at least one ACE, and about 25% reported two or more (Felitti et al., 1998). Compared to participants who experienced no ACEs, those individuals who reported four or more ACEs had increased risks for several mental health problems, such as substance use disorder, depression, suicide attempts, and risky sexual behavior. A dose-dependent relationship emerged between the number of ACEs and various adult health conditions, including ischemic heart disease, cancer, lung disease, skeletal fractures, and liver disease. These findings are deeply troubling, given that most of these problems are among the leading causes of adult mortality. Other major effects of ACEs on adult outcomes include memory impairment (Brown et al., 2007), rates of psychotropic prescriptions (Anda et al., 2007), psychosis (Whitfield, Dube, Felitti, & Anda, 2005), poor work performance (Anda et al., 2004), teen and unintended adult pregnancy (Dietz et al., 1999; Hillis et al., 2004), sleep disturbance (Chapman et al., 2011), obesity (Williamson, Thompson, Anda, Dietz, & Felitti, 2002), and smoking (Anda et al., 1999). Foege (1998) concluded that this phenomenon is a national public health problem requiring a public health response, including primary and secondary prevention efforts.

Replications of the ACE Study continue to validate and extend the findings. Pynoos et al. (2014), for example, documented that the original ACEs were the most prevalent adversities in their sample of children and adolescents (i.e., traumatic loss/bereavement/separation, domestic violence, impaired caregiver, emotional abuse, neglect, physical abuse, sexual abuse). Putnam, Harris, and Putnam (2013) also found a dose-dependent relationship between ACEs and a host of mental health problems, including mood, anxiety, substance use, and impulse control disorders. Perhaps most troublesome are recent findings indicating that poor physical health outcomes associated with ACEs can be present well before adulthood (Bethell, Newacheck, Hawes, & Halfon, 2014; Flaherty et al., 2013; Layne et al., 2014).
Evidence of risk for ACEs comes from studies of both children and adults. The Fourth National Incidence Study of Child Abuse and Neglect (Sedlak et al., 2010), for example, demonstrated that exposure to child abuse and neglect is associated with the child’s sex (i.e., girls are sexually abused more often than boys), with older age (across most abuse and neglect categories), with race/ethnicity (i.e., rates for Black children are significantly higher than those for White and Hispanic children), with disability status (e.g., children with confirmed disabilities have lower rates of physical abuse but higher rates of emotional neglect), with school enrollment (e.g., non-enrolled children are sexually abused more often than enrolled children), with parents’ unemployment, with low socioeconomic status, with family structure/living arrangement (e.g., children whose single parent has a live-in partner have higher rates overall compared to children living with married biological parents), with family size (e.g., rates are highest for children in the largest families), and with county metropolitan status (i.e., children from rural counties have a higher rate overall). In a recent study of adults (Cronholm et al., 2015), demographic characteristics associated with higher risk for ACEs included those who reported a race of “other” (versus White), were living with a partner (versus married), were work-disabled (versus working full-time), were of younger age, and/or were separated from their partner (versus married). Such findings have implications for both preventive interventions and social justice. Primary prevention efforts, for example, include preventing ACEs so that children (especially those with marginalized backgrounds) grow up with less adversity and are less likely to have their own children exposed to ACEs (Oral et al., 2016).

THE NEUROBIOLOGY OF ADVERSE CHILDHOOD EXPERIENCES

ACE Study investigators hypothesized that dysfunction in the hippocampus, amygdala, medial prefrontal cortex, and other limbic structures believed to mediate anxiety and mood dysregulation following early abuse coincides with the dose-dependent relationship between ACEs and the affective symptoms and unexplained periods of panic among their study participants (Anda et al., 2006). A decade ago, we developed an expanded model by couching the neurobiological consequences of ACEs in an evolutionary framework that incorporates the types of sensory and perceptual stimulation that are experienced as well as windows of sensitivity (Navalta, Tomoda, & Teicher, 2008). The following four postulates encapsulate the model: (1) The brain goes through one or more sensitive periods in postnatal life when exposure to high levels of stress hormones selects for an alternative pathway of neurodevelopment; (2) the ensuing developmental trajectory is an adaptive one; (3) exposure to corticosteroids is a keystone element in organizing the brain to develop in this manner; and (4) disparate brain systems are affected by different types of ACEs, particularly the primary and secondary sensory systems that may be especially involved in perceiving or recalling the adversities. Regarding sensitive periods, recent research on depression across species has demonstrated that early life stress more strongly influences anxiety, mood, and anhedonia, whereas later
life stress has greater effects on externalizing behaviors (Andersen, 2015). Such windows are likely controlled by a genetic lifespan calendar (Skene, Roy, & Grant, 2017).

Recently, Teicher and Samson (2016) conducted a comprehensive review of the literature on the association between ACEs and brain structure, function, and connectivity. First, they found that ACEs are associated with (1) morphological changes in the anterior cingulate, dorsolateral prefrontal and orbitofrontal cortex, corpus callosum, and adult hippocampus and (2) functional changes, such as enhanced amygdala response to emotional faces and diminished striatal response to anticipated rewards. Second, they found that specific ACEs selectively target sensory systems and pathways. For example, exposure to severe parental verbal abuse correlates with grey matter volume alterations in the left auditory cortex, as well as with reduced integrity of a specific language pathway, the left arcuate fasciculus (Choi, Jeong, Rohan, Polcari, & Teicher, 2009; Tomoda et al., 2011). Third, the evidence to date indicates that several brain regions possess sensitive periods for the impact of ACEs, including the hippocampus, amygdala, prefrontal cortex, occipital cortex, and inferior longitudinal fasciculus; the timing between exposure and brain changes is unclear. Fourth, gender differences are apparent; for example, ACEs are associated with a relatively smaller corpus callosum and hippocampus in boys than in girls. Overall, the abovementioned brain regions and pathways that are reported to differ in people with ACEs underlie the regulation of detecting threat and anticipating reward (Teicher & Samson, 2016).

One major unresolved issue is whether the documented brain alterations are due to ACEs, the associated mental health conditions, or a combination of or interaction between the two (Hart & Rubia, 2012). Conversely, ACEs' prepotent influence on brain development has been statistically or methodologically uncontrolled in almost all mental health neuroimaging studies (Teicher & Samson, 2016). The better controlled earlier studies, however, indicated that the most prominent deficits associated with ACEs are in the lateral and ventromedial fronto-limbic brain areas and networks that mediate behavior and emotion regulation (Hart & Rubia, 2012).

A neurocounseling approach strives to enhance counseling interventions by grounding the work in a fundamental understanding of the neuroscientific underpinnings of the targeted mental health problem or disorder. Given what we now know about the impact of ACEs on health and the brain, we now turn to the evidence base regarding the treatment of individuals who are negatively impacted by such experiences.

EVIDENCE-BASED TREATMENTS

Children and Adolescents

The current clinical literature provides strong empirical evidence for certain interventions crafted for children and adolescents with a history of ACEs. Specifically, individual cognitive-behavioral therapy (CBT); individual CBT with parental involvement, such as trauma-focused CBT (TF-CBT); and
group CBT, such as Cognitive Behavioral Intervention for Trauma in Schools (CBITS), are considered well-established interventions (Dorsey et al., 2017). TF-CBT and CBITS embrace several key elements that are captured by the acronym PRACTICE: Psychoeducation, Relaxation skills, Affective modulation skills, Cognitive processing skills, Trauma narrative and cognitive processing, In vivo mastery of trauma reminders, Conjoint parent–child sessions, and Enhancing safety (Cohen & Mannarino, 2014).

Play therapy has been a traditional mainstay in the counseling field (Landreth, 2012). In particular, child-centered play therapy has received relatively strong empirical support, such as probably efficacious status for children with disruptive behaviors (Kaminski & Claussen, 2017). However, the treatment was designated as “experimental” (Dorsey et al., 2017, p. 322) for children and teens with trauma histories because, although clinical studies of the approach were identified, the evidence base was insufficient to meet higher designations. Thus, child-centered play therapy is but one of several promising approaches that may prove to be effective for this population.

To our knowledge, no studies have been conducted to date on the neurobiological effects of CBT in children and adolescents with histories of ACEs. Potential areas in need of further inquiry include event-related potentials (i.e., P1 and N2 components as indices of treatment outcome and response, respectively; Hum, Manassis, & Lewis, 2013) and magnetic resonance spectroscopy to probe putative metabolic effects of CBT on brain structures of interest (O’Neill et al., 2012).

Adults

To date, interventions with the strongest empirical support for trauma-related symptoms in adults include CBT, cognitive processing therapy (CPT), cognitive therapy (CT), and prolonged exposure (PE) therapy (American Psychological Association [APA], 2017). The evidence base is also fairly strong for brief eclectic psychotherapy, eye movement desensitization and reprocessing, and narrative exposure therapy (APA, 2017). From the field of complementary and alternative medicine, meditation and yoga are two interventions with increasing evidence to support their efficacy (Gallegos, Crean, Pigeon, & Heffner, 2017; Hilton et al., 2017; Macy, Jones, Graham, & Roach, 2018). Moreover, a relatively new treatment approach, neurofeedback, has received recent empirical support. For example, van der Kolk et al. (2016) and Gapen et al. (2016) reported preliminary findings that neurofeedback can result in improvements in posttraumatic stress disorder (PTSD) symptoms and affect regulation capacities. This intervention may prove to be a useful one in conjunction with more traditional counseling approaches (Fragedakis & Toriello, 2014).

Of the aforementioned treatments, CBT has the most robust support in the neuroimaging literature. Studies have consistently associated CBT with changes in activity in the anterior cingulate cortex, posterior cingulate, ventromedial prefrontal cortex/orbitofrontal cortex, amygdala, insula, and hippo-
Collectively, CBT has been linked to improvements in trauma-related symptoms with changes in activation of the inhibitory control network via left dorsal striatal and frontal network activation (Brooks & Stein, 2015). Researchers have theorized that the brain changes associated with practicing CBT skills strengthen the individual’s capacity for “top-down” emotion regulation (Franklin et al., 2016; Quidé, Witteveen, El-Hage, Veltman, & Olff, 2012).

Research on brain activity changes associated with CPT, CT, and PE is much more limited. Preliminary findings suggested that CT may also affect limbic and prefrontal cortex systems (DeRubeis, Siegle, & Flollon, 2008). In a recent randomized, controlled study of PE for individuals with PTSD, more robust changes in brain activity were observed in the prefrontal, rather than the limbic, system during purposeful emotion regulation (Fonzo et al., 2017). The investigators speculated that these changes were due to increased connectivity between the lateral frontopolar cortex and the ventromedial prefrontal cortex/ventral striatum (Fonzo et al., 2017). Although researchers have recently questioned the evidentiary support for cognitive-behavioral treatment of mental health problems in general (Leichsenring & Steinert, 2017), the approach remains the most researched form of counseling and psychotherapy, with the largest evidence base to back its efficacy (David, Cristea, & Hofmann, 2018). Overall, the intervention has earned its status as a gold standard, or viable benchmark to which other therapies can be compared (David et al., 2018). Such comparisons will ultimately move the field forward by identifying and verifying interventions that equal or surpass CBT’s ability to improve the lives of people with mental health and substance use problems.

FUTURE DIRECTIONS FOR INTERVENTIONS

Mindfulness Interventions

Mindfulness is the ability to notice, without judgment, one’s present-moment experience with openness and acceptance. Observation and acceptance are the most commonly shared features among the current literature’s definition of mindfulness (Quaglia, Brown, Lindsay, Creswell, & Goodman, 2015). Mindfulness as a psychological construct has risen in popularity due to its central role in mindfulness-based stress reduction (MBSR) programs, mindfulness-based cognitive approaches, dialectical behavior therapy, and acceptance and commitment therapy (Davis & Hayes, 2011). Practitioners of mindfulness are theorized to develop metacognition skills that neurologically disengage the brain’s previously learned, automatic pathways, thus enabling input from the present moment to be integrated in novel ways (Siegel, 2007). Thus, mindfulness is hypothesized to harness the skills of attentional control, emotion regulation, and self-awareness to improve well-being. In fact, recent neuroscience evidence suggests that similar brain areas are involved in mindfulness processing and emotion regulation (Wheeler, Arnkoff, & Glass, 2017).

In general, mindfulness-based programs provide training in present-moment focusing, decentering, and accepting one’s experience (Crane et al.,
MBSR is the first mindfulness program adapted for Western use and the most researched (Kabat-Zinn, 2013). MBSR programs include activities intended to develop mindfulness capabilities: for example, mindfulness meditation, mindful awareness during yoga, and preparation for applying mindfulness in everyday situations (Grossman, Niemann, Schmidt, & Walach, 2004). At the neural level, preliminary evidence indicated that MBSR is associated with activity in the medial prefrontal cortex and a network specific to the right hemisphere (i.e., lateral prefrontal cortex, insula, secondary somatosensory cortex, and inferior parietal lobe; Farb et al., 2010; Farb et al., 2007). Despite the popularity of MBSR, updated studies on the neural correlates of this intervention are limited, and the mechanisms are poorly understood (van der Velden & Roepstorff, 2015). The varied mindfulness-based approaches can include ancient Buddhist meditations, modern standardized group-based meditation practices (e.g., MBSR), and several counseling and psychotherapy interventions (Chiesa & Malinowski, 2017). The following brain regions are consistently altered among mindfulness meditators: (1) frontopolar cortex, (2) sensory cortices and insula, (3) hippocampus, (4) anterior cingulate cortex, (5) midcingulate cortex and orbitofrontal cortex, and (6) superior longitudinal fasciculus and corpus callosum (Tang, Holzel, & Posner, 2015). Many of these areas are negatively impacted by ACEs.

Motivational Interviewing

Motivational interviewing (MI) is a human-centered counseling approach designed to resolve feelings of ambivalence within an individual, thereby strengthening their desire to change (Miller & Rollnick, 2012). In recent years, MI has demonstrated efficacy in the fields of substance use disorder treatment (Lundahl, Kunz, Brownell, Tollefson, & Burke, 2010) and behavioral medicine (Martins & McNeil, 2009). ACEs have been found to predict risky behavior, such as substance use, high-risk sexual behavior, and aggression toward intimate partners, as well as negative health consequences (e.g., obesity, somatic symptoms/disorders, sleep problems). Therefore, many survivors of ACEs will likely encounter MI at some point in their lives.

Essential to the practice of MI is the concept of change talk, or the language that underscores an individual's desire, ability, or need to change. Relative to sustain talk, or language maintaining current behavior, listening to one's own change talk has been associated with significant activation in the inferior frontal gyrus, insula, and superior temporal cortex (Houck, Moyers, & Tesche, 2013). These regions are hypothesized to be involved in self-perception, cognitive dissonance, and attitude change and are likely activated whenever change-talk language is evoked (Lee & Konstadina, 2015). This activation may provide opportunities to craft new attitudes that increase clients' motivation toward meaningful behavior change. In addition, some evidence indicates that eliciting change talk dampens the reward circuitry that is implicated in addiction. For example, Feldstein Ewing et al. (2011) found that subjects in a change-talk condition did not display activation in reward processing areas in
the face of an alcohol cue. Regardless of the true neural mechanism(s) underlying MI, counselors working with people with substance use problems and other harmful behavior should be encouraged to focus on client-driven change talk as a facilitator of behavior change. Survivors of ACEs form a substantial sector of this population.

**Implications for Case Conceptualization and Treatment Planning**

ACEs alter the typical trajectory of the developing brain, resulting in increased risk for a plethora of health-related problems and associated functional impairment and distress. The complexity of these interrelated problems can be overwhelming to counselors. In this section, we describe how to integrate case conceptualization to address clients’ problems resulting from ACEs, in a sequential manner that can best support counselors when working with these clients.

The foundation for any case conceptualization begins with the identification and definition of the client’s primary problems, namely those symptoms, problems, and/or issues that are targeted at present rather than in the future. The steps necessary for a complete case conceptualization, adapted from Falender and Shafranske (2012), are as follows: (1) Identify and define the primary problem(s). This process is based on the functional impairment or clinical distress associated with the problem and to its importance, meaningfulness, or value to the client. No more than four primary problems should be targeted. (2) Identify the “3 P’s” or “Triple P’s.” These factors are those that predisposed, precipitated, and currently perpetuate the primary problem(s). (3) Apply one or more theories of human behavior and functioning as the conceptual glue for linking varied clinical information into a meaningful whole. (4) Identify treatment-related strengths, resources, and problems.

In this framework, identification of the 3 P’s is vital and theoretically can emanate from biological, psychological, social, and cultural/contextual domains. For individuals with histories of ACEs who have mental health and/or substance use problems, the evidence base reviewed above informs us that neurobiological factors most likely predisposed or precipitated the development of the problems. In addition, those factors perpetuate the problems if they are still present and not ameliorated by prior interventions. Although not readily measurable in clinical practice, these neurobiological anomalies can be presumed with great confidence to exist in such individuals.

For example, a child client with an ACE history can present with generalized anxiety that is triggered by numerous sources of perceived threat and overall uncertainty. Behaviorally, the anxiety can manifest itself as getting caught in ruts, staying upset for a long time after something goes wrong, and avoiding changes in routine. Neurobiologically, disruption in emotion regulation feedback loops involving the amygdala, hippocampus, and prefrontal cortex, comparing past versus present contexts and downregulating arousal when appropriate, is hypothesized. Thus, clinically indicated counseling interventions would include (1) teaching the client to identify new contingencies
in the environment and to understand safe versus threatening situations and (2) training the client in emotion regulation skills. In many ways, this case conceptualization is consistent with the neurosequential model of therapeutics (Perry & Dobson, 2013).

Finally, treatment-related strengths and resources need to be identified prior to intervening. These strengths and resources often include protective and promotive factors. Protective factors buffer the adverse effects of ACEs and their stressful aftermath (e.g., high self-esteem), whereas promotive factors enhance children’s positive adjustment regardless of whether risk factors are present (e.g., reliable adult mentors). In all, our perspective is that counselors need to capitalize on these intrinsic and extrinsic strengths and assets that the children possess so that treatment outcomes can be maximized.

Previously, we recommended that counseling and other psychotherapeutic interventions for individuals with histories of ACEs need to address their multilayered ecologies (i.e., biological, psychological, social, cultural/contextual; Navalta, 2011). Similarly, neurocounseling endeavors to improve people’s lives by intervening along the entire brain-context continuum. Thus, the mandate for counselors who work from a neurocounseling framework is to assess for a history of ACEs in all clients, because such adversities can set the stage for an altered neurodevelopmental trajectory leading to behavioral, emotional, cognitive, and/or interpersonal impairment. Thus, counseling interventions for clients need to align with this perspective. Perhaps such alignment might pave the way for neurocounseling to spearhead efforts to address what van der Kolk (2016) stated is counseling’s “great challenge” (p. 269), that is, to learn to use the brain’s plasticity to reorganize deficient brain circuits in those individuals who have been negatively impacted by ACEs. Until then, our clients with histories of ACEs will have quite challenging and shortened lives.
REFERENCES


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