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Tracie Abbott

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Adverse Childhood Experiences, Neuroadaptation, and Resilience: Does Trauma Focused

Cognitive Behavioral Therapy go far Enough?

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Tracie Abbott, MA
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APPROVED:



Judith E. Fox, PhD, Chair



Apryl Alexander, PsyD



Kathleen M. Devlin, PhD

Abstract

Adverse childhood experiences (ACEs) pose a significant public health risk. Current literature suggests ACEs have the potential to significantly disrupt sensitive periods of neurodevelopment. These neuroadaptations can result in social, emotional, and cognitive impairments that place a child at a significantly greater risk for adopting health risk behaviors and lifestyle factors that lead to the major causes of disease, disability, social problems, and early death in adults. Mental health clinicians have a unique opportunity to intervene by working with families to alter the trajectories of the child's health risk behaviors and lifestyle factors. Trauma Focused Cognitive Behavioral Therapy (TF-CBT), a common trauma treatment modality for children will be reviewed for its efficacy and limitations in promoting long-term pro-health outcomes. Finally, implications for clinical practice will be identified including recommendations that emphasize the development and maintenance of skills and strategies that increase resilience. Recommendations will be provided in the context of promoting long-term pro-health outcomes through the implementation of TF-CBT, in order to aid mental health clinicians in meeting the unique needs of children and families recovering from adversity.

Keywords: adverse childhood experiences, neuroadaptation, resilience, trauma focused cognitive behavioral therapy

Introduction

Children and families seeking mental health services are often motivated to engage in treatment to address the significant distress and impairments they are facing. The family's presence and motivation provide mental health clinicians with a unique opportunity to intervene by working with the family to alter the trajectories of the child's current health risk behaviors and lifestyle factors. Upon presenting for treatment, experiences of adversity, including abuse, neglect, and household challenges, are often disclosed as the precipitating events that have led to the child's distress and impairments. Therefore, it is important that service providers have a clear understanding of the significant role childhood adversity can play in both the short- and long-term health outcomes of their clients. The goal of this paper was to review the current literature on the impact of adverse childhood experiences (ACEs) on long-term health outcomes and neurodevelopment to identify the unique needs and experiences of children and families seeking services in the mental health setting. The review was designed to identify the specific risks and impairments children presenting for treatment with a past or current history of adversity may face, as well as the efficacy and limitations of a common evidence-based treatment modality, trauma-focused cognitive behavioral therapy (TF-CBT) used within mental health settings to address these concerns. The paper concludes with an in-depth discussion and recommendations as to how clinicians can maximize the potential TF-CBT. Recommendations are included which emphasize the development and maintenance of skills and strategies that increase resilience in order to address current treatment limitations in meeting the unique needs of children and families recovering from adversity.

Adverse Childhood Experiences (ACEs)

In the early 1990s, Kaiser Permanente of San Diego, California, and the Centers for Disease Control and Prevention in Atlanta conducted one of the largest studies of its kind, indicating a link between adverse experiences in childhood and the leading causes of adult morbidity and mortality in the United States (Felitti et al., 1998). The ACE study, as well as subsequent research, revealed that adverse experiences in childhood have the potential to significantly disrupt sensitive periods of neurodevelopment. These neuroadaptations can result in social, emotional, and cognitive impairments that place individuals at a significantly greater risk for developing the leading causes of disease, disability, social problems, and early death by adopting health risk behaviors and lifestyle factors (Anda et al., 2006).

Felitti et al. (1998) identified 10 categories of ACEs that affect long-term health outcomes that can be broken into three groups of (a) abuse, including emotional, physical, and sexual abuse; (b) neglect, including both physical and emotional neglect; and (c) household challenges, including witnessing violence against the mother, substance abuse in the household, mental illness in the household, parental separation or divorce, or an incarcerated household member (Centers for Disease Control and Prevention, 2019). Evidence of the magnitude and prevalence of ACEs has been documented in multiple studies, including one conducted by Dong et al. (2004) in which the researchers analyzed data from 8,629 Kaiser Health Plan subscribers seeking preventive health care. Of the total participants, 68% of subscribers indicated experiencing at least one of the 10 aforementioned categories of ACEs, with 16% indicating childhood exposure to four to six of the 10 categories of ACEs. There is a growing body of research to support that ACEs pose a significant public health risk and that both their prevalence

and cumulative impact appear to place a tremendous strain on the nation's health care systems (Fang, Brown, Florence, & Mercy, 2012; Peterson, Florence, & Klevens, 2018).

In addition to high prevalence rates, researchers have found ACEs to be interrelated, indicating each ACE does not often occur independently of one another. For example, Dong et al. (2004) found that as the frequency of childhood exposure to violence against a mother increased, so did the risk for direct exposure to emotional, physical, and sexual abuse. Though it is perhaps not surprising to imagine that a child exposed to domestic violence would also be at an increased risk for abuse, Dong et al. found similar relationships across each of the 10 categories of adversities. Exposure to any one category of ACE significantly increased the risk for exposure to any of the other nine categories. In fact, the results indicated that out of the individuals who endorsed experiencing one ACE, 87% reported experiencing at least one additional category of childhood adversity. This implies that not only are ACEs prevalent, children who experience them often do not experience these adversities as an isolated event, rather these events appear to overlap significantly across categories of exposure.

In addition to documenting the prevalence and interrelated nature of ACEs, a growing body of research is now demonstrating the relationship between adversities in childhood and the major causes of disease, disability, and early death (Anda et al., 2006; Brown et al., 2009; Dube et al., 2001; Dube et al., 2009). Specifically, researchers have found a strong dose-response relationship between the total number of adverse experiences of abuse, neglect, and household challenges in childhood and an increased risk for the following outcomes: (a) injury, including traumatic brain injury, fractures, and burns; (b) mental health problems, including depression, anxiety, suicide, and posttraumatic stress disorder (PTSD); (c) maternal health problems, including unintended pregnancy, pregnancy complications, and fetal death; (d) infectious

disease, including human immunodeficiency virus (HIV) and sexually transmitted diseases (STDs); (e) chronic disease, including cancer, autoimmune diseases, diabetes, and heart disease; (f) risky behaviors, including smoking, alcohol and illicit drug abuse, and unsafe sex; and (g) loss of opportunities, including education, occupation, and income (Centers for Disease Control and Prevention, 2019).

The cumulative body of research documenting the impact of ACEs has important implications for clinical practice within mental health settings. As research indicates children presenting for mental health treatment who disclose even a single ACE are at a significantly greater risk for both experiencing future adversities in childhood and developing the major causes of disease, disability, and early death in adulthood, it is imperative that mental health clinicians be aware of these risks to appropriately tailor therapeutic interventions to address these risks. For example, ACE studies have demonstrated a strong, graded relationship between childhood adversity and prevalence and risk of attempted suicide in both childhood and adolescence and adulthood. Dube et al. (2001) found that the endorsement of any one category of ACEs increased the risk for attempting suicide by two to five times. Moreover, individuals who had endorsed three categories of ACE were almost nine times more likely to attempt suicide in adolescence than were individuals who had an ACE score of 0. This risk appears to increase dramatically with each additional ACE, as individuals who endorsed seven or more categories of ACEs were a little over 50 times more likely to attempt suicide in adolescence (Dube et al., 2001). Individuals in Dube et al.'s study with an ACE score of 4 or more were also 7.2, 1.8, 4.5, and 11.1 times more likely to endorse alcoholism (increasing the risk for liver disease), smoking (increasing the risk of chronic obstructive pulmonary disease and other lung diseases), illicit drug

use (increasing the risk for injury and further abuse), and injected drug use (increasing the risk of HIV), respectively (Anda et al., 2006; Dong et al., 2004; Felitti et al., 1998).

Impact of ACEs on Neurodevelopment

ACEs can have significant implications for neuroadaptations and long-term health outcomes that often far surpass the initial incidents of abuse. The impact of stress on a child's developing brain can result in significant social, emotional, and cognitive impairments that if allowed to progress without intervention, can have detrimental health consequences. To understand the impact of ACEs can have on health outcomes, it is important to understand how the experience of overwhelming stress in childhood affects typical neurodevelopment.

Corpus Callosum.

An area of the brain that has proven to be susceptible to adaptations in response to adverse experiences in childhood is the corpus callosum. When the corpus callosum develops typically (i.e., in a way that promotes pro-health adaptations), it is responsible for the crucial task of connecting the left and right brain hemispheres. It comprises a network of thick nerve fibers that aid in transmitting information between the two brain hemispheres. The right brain hemisphere specializes in receiving in-the-moment sensory input from lower brain structures. This provides a quick and more direct method for creating context through increased awareness of the current environment and the world (Siegel, 2012). Meanwhile, the left hemisphere of the brain is typically considered to be concerned with higher-level processing and analysis. As the left hemisphere receives less sensory input directly from the body, it instead works to categorize and make meaning of perceptions based on prior experiences (Siegel, 2012). To facilitate this process, the left brain relies heavily on the use of language to process past and current experiences, which allows an individual to create novel combinations of associations and engage

in increasingly complex cognitive processing. As the corpus callosum develops, neural pathways that are activated in response to repeated experiences are strengthened and reinforced. This leads to the development of rich connections between brain networks that allow children to develop increasingly controlled and complex associations and behaviors.

Though repeated experience increases the density and complexity of these pathways, prolonged disuse or exposure to toxic stress hormones can result in significant neuronal pruning or cell death, resulting in the elimination or weakening of pathways (Siegel, 2012). Research has shown the corpus callosum is particularly vulnerable to the impact of adverse experiences because of its extended development throughout childhood. Teicher et al. (2011) suggested that when a child is exposed to excessive levels of stress hormones in response to adversity, cell division and myelination are impaired. Myelination is the process by which neurons are coated with fat to increase the speed and strength of nerve conduction (Siegel, 2012). As both myelination and cell division are crucial to the development of rich connections between brain networks in the corpus callosum, exposure to excessive levels of stress can significantly disrupt a child's ability to develop increasingly controlled and complex behaviors.

Exposure to excessive levels of stress hormones during sensitive periods of neurodevelopment is correlated with a reduced size of the corpus callosum in children and animals that have experienced a history of abuse. Results of one study showed male monkeys raised in isolation had stunted corpus callosum growth and the diminished size of the corpus callosum was associated with impairments in learning (Sánchez, Hearn, Do, Rilling, & Herndon, 1998). DeBellis et al. (1999) found that maltreated children had smaller intracranial and cerebral volumes when compared to controls. In addition, multiple studies have demonstrated a greater effect size on the corpus callosum in maltreated males than females (DeBellis et al., 1999;

Teicher et al., 2004) and identified that males are increasingly affected by the effects of neglect, whereas females are increasingly affected by the effects of sexual abuse (Teicher et al., 2004).

A reduced size of the corpus callosum is, in turn, associated with increased hemispheric laterality and decreased hemispheric integration (Teicher et al., 2011). As has been discussed, the corpus callosum serves as the main connection between the left and right cerebral hemispheres. In hemispheric laterality, in-the-moment sensory information received by the right hemisphere no longer receives input from the left brain's higher-level processing and analysis. In addition, the right brain's unique connection to lower brain structures indicates the information being received will reflect more negatively attributed emotion states as the lower brain structures are increasingly concerned with stimuli signaling threat. This indicates that when hemispheric laterality occurs, not only is the right hemisphere receiving minimal information from the left, the information it is receiving is biased toward negative associations. This can have significant implications for a child's behavioral control and result in an increased risk that developmental milestones, such as the ability to integrate rational ideas when in a highly emotional state, may be compromised.

Typical neurodevelopment relies on the ability of the left and right brain hemispheres to work independently of one another (so each can perform its respective processing specializations) while at the same time working together to maintain a continuous feedback loop of information so the healthy integration of experience can occur. As stated by Siegel (2012):

We've seen that from the view of science, the linkage of differentiated elements of a system produces a harmonious flow of that system. The characteristics of this flow are that it's flexible, adaptive, coherent, energized, and stable (FACES). When a system is not differentiating its parts, and/or is not linking them, then the system is not integrated

and tends to move toward either chaos or rigidity, or some combination of the two. (p. 336).

DeBellis et al. (1999) supported the claim that ACEs lead to impairments in integrative systems. The researchers examined symptom presentation and brain development in children with maltreatment-related PTSD in comparison to a matched control group. Results indicated brain volume “robustly” and positively correlated with the age of onset of maltreatment-related PTSD and negatively correlated with the duration of the abuse experienced. In addition, “Symptoms of intrusive thoughts, avoidance, hyperarousal or dissociation correlated positively with ventricular volume, and negatively with brain volume and total corpus callosum and regional measures” (DeBellis et al., 1999, p. 1271). This supports that the severity of PTSD symptomology is correlated with the size of the corpus callosum. As the PTSD symptoms described above represent the inability to successfully integrate past experiences (of trauma) with current experiences (of safety after trauma) to produce pro-health outcomes (i.e., successful functioning in social, emotional, and cognitive domains), this supports the suggestion that disruptions in the development of neuronal pathways between hemispheres impair the brain’s ability to effectively integrate information (thereby inhibiting the creation of new pathways for increasingly complex processes).

Hippocampus.

Much like the corpus callosum, the hippocampus is also vulnerable to the impacts of stress throughout sensitive periods of development. The hippocampus is part of the larger limbic system, which is responsible for aiding in the integration of basic mental processes such as the activation of emotion, the processing of social signals, the appraisal of meaning, and the integration of memory and engagement of the attachment system (Siegel, 2012). More

specifically, the hippocampus functions as the index of the brain and is charged with the task of encoding information that is consciously perceived in order to form explicit memories. Once memories are formed and stored, the memories are then called upon to provide feedback to confirm or alter initial responses to sensory input. In addition, the hippocampus is charged with the task of initiating the signal that inhibits the body's stress response (Kim & Diamond, 2002).

ACEs have the potential to affect both short- and long-term hippocampal functioning by impairing its ability to accurately process and store information. In response to a perceived threat, activation of the amygdala engages the hypothalamic-pituitary-adrenal axis (HPA-axis), thereby initiating the process by which stress hormones are released throughout the body's sympathetic nervous system to prepare for basic survival responses (e.g., fight, flight, or freeze; Siegel, 2012; van der Kolk, 2014). The release of stress hormones suppresses hippocampal functioning and the formation of explicit memories as the body's resources are directed toward core survival mechanisms (e.g., increased heart rate, blood pressure, and breath; Rothschild, 2000). When stressful conditions overwhelm the body's response systems, as is often the case in childhood trauma, this can result in immediate consequences for trauma memory formation. As stated by van der Kolk (2014), high emotional arousal:

Disconnects other brain areas necessary for the proper storage and integration of incoming information, such as the hippocampus and the thalamus. As a result, the imprints of traumatic experiences are organized not as coherent logical narratives but in fragmented sensory and emotional traces: images, sounds, and physical sensations. (p.

176)

If stressful conditions are not resolved and the stress response is experienced over prolonged periods of time, this can lead to long-term deterioration of memory function. As noted by Siegel

(2012), “Not only do high levels of stress transiently block hippocampal functioning, but excessive and chronic exposure to stress hormones may lead to neuronal death in this region—possibly producing decreased hippocampal volume, as found in patients with chronic PTSD” (p. 75).

In a meta-analysis, Woon and Hedges (2008) reviewed research on hippocampal and amygdala volumes in adults and children with a diagnosis of PTSD related to childhood maltreatment. Results of their meta-analysis demonstrated a significant reduction in bilateral hippocampal volume in adults with childhood maltreatment-related PTSD in comparison to non-maltreated controls, but did not indicate the same reduction in hippocampal volume in studies of children with maltreatment-related PTSD. This supports that exposure to excessive levels of stress hormones during hippocampal development may have a gradual, latent effect that does not fully manifest until adulthood. In addition, adverse experiences in childhood appear to have possible long-term consequences for memory storage and retrieval. Anda et al. (2006) reported, “Consistent with deficits in hippocampal function are deficits in verbal declarative memory and failure of hippocampal activation with memory tasks in adult women with early abuse-related PTSD” (p. 175). This is consistent with ACE research that has shown there is a strong graded relationship between ACEs and the prevalence and risk of an impaired memory of childhood (Dube et al., 2001).

As research has shown, if left unchecked, chronic stress can have significant long-term consequences for hippocampal growth, increasing the risk for impairments in memory and learning into adulthood. In addition, a child’s acute stress reactions following a traumatic event can impair hippocampal functioning and result in increased behavioral difficulties. As noted by Rothschild (2000), “Some individuals with PTSD recall their traumatic experiences as highly

disturbing emotional and sensory states, lacking the time and space context that is facilitated by hippocampal function” (pp. 21-22). This indicates maltreated children with impaired hippocampal functioning are likely to experience distressing emotions without the ability to understand the context or meaning surrounding those emotions. These findings have significant implications for clinical practice.

The suppression of hippocampal functioning not only prevents a child from forming a conscious understanding of distressing emotion states, it also inhibits feedback between the hippocampus and amygdala that allows for both learning (through the pairing of new associations) and emotion regulation (through the inhibition of the amygdala’s initial reflexes to sensory input). This implies that not only would a child then have significant difficulty controlling initial impulses, his or her ability to learn through recalling ways in which he or she has resolved past emotion states is also compromised and without intervention. The ACE research indicates these children will attempt increasingly risky methods of resolving these emotion states (e.g., substance use, unsafe sexual behaviors, self-harm, etc.).

Amygdala.

Another region of the limbic system that is susceptible to neuroadaptations in response to excessive stress exposure is the amygdala. Like the hippocampus, the amygdala plays a central role in learning, memory, and emotions. Where the hippocampus works to process emotions that are consciously perceived, the amygdala is responsible for activating and processing unconscious autonomic responses. Particularly sensitive to sensory information signaling threat, the amygdala produces implicit memories with high emotional content that are called upon reflexively in response to associated stimuli in the future. This process of memory storage and recall for

experiences signaling threat plays an important adaptive function, as it enables humans to use prior experiences to learn and respond effectively to signs of danger within their environments.

The amygdala's specialized attunement to stimuli signaling threat makes the development of this area of the brain particularly sensitive to the effects of adverse experiences. The amygdaloid nuclei, for instance, are particularly sensitive to the emergence of kindling, a process by which repeated intermittent stimulation produces increasingly greater alteration in neuronal excitability. As excessive stress hormones compromise the development of gamma-aminobutyric acid (GABA) receptors, which aid in moderating neuronal excitability (Teicher et al., 2011), kindling in response to repeated threat-inducing stimuli can result in significant neuroadaptations in the amygdala.

Over time, unmitigated kindling in response to high emotion states can result in neuroadaptations in the amygdala's sensitivity to threat appraisal (Dannowski et al., 2012; Seigel, 2012). For example, in a study of adults with a history of childhood maltreatment, individuals who endorsed greater levels of childhood maltreatment also demonstrated greater amygdala reactivity to threat-related facial expressions (Dannowski et al., 2012). As the amygdala's sensitivity to threat heightens, its repeated activation also alters the threshold required for the release of stress hormones through the HPA-axis. Studies have shown ACEs may be associated with abnormalities in the release of cortisol in response to daily life events (de Kloet, Joëls, & Holsboer, 2006; Heim et al., 2000, 2002). In addition, abnormalities in the development of the amygdala can result in temporal lobe or limbic seizure-like activity with one study revealing that psychiatrically hospitalized children with a history of abuse experienced incidences of clinically significant electroencephalograph (EEG) abnormalities at double the rate of control populations (Ito, Teicher, & Glod, 1993).

Neuroadaptations in the amygdala in response to a traumatic experience can have significant implications for a child's behavioral control, as is seen in the mental health setting. Without the aid of the hippocampus and higher level brain structures, a child will have difficulty controlling impulses and understanding emotions. According to Rothschild (2000):

It appears that traumatic events are more easily recorded in implicit memory because the amygdala does not succumb to the stress hormones that suppress the activity of the hippocampus. No matter how high the arousal, it appears that the amygdala continues to function. In some cases, upsetting emotions, disturbing body sensations, and confusing behavioral impulses can all exist in implicit memories without access to information about the context in which they arose or what they are about. (p. 31)

As noted in the research, if the experience of overwhelming stress is prolonged and repeated, the resulting neuroadaptations in the amygdala can lead to an altered threshold for threat detection, meaning a child may become more easily dysregulated in response to minor provocations. This is consistent with the ACE research that showed individuals endorsing four or more categories of adversity were 2.5, 2.4, and 2.7 times more likely to endorse panic reactions, anxiety, and hallucinations, respectively (Dube et al., 2001). Not only may these resulting behavioral difficulties lead to increasingly risky coping mechanisms as noted previously, an overwhelming body of evidence beyond the scope of this paper has documented that behavior problems in childhood increase the risk for poor academic achievement and difficulty making and maintaining a social network, consequences that are likely to lead to increased life stressors and the reinforced use of coping mechanisms that promote poor health outcomes.

As demonstrated above, ACEs often have significant implications for neuroadaptations and long-term health outcomes. As it relates to the corpus callosum, impairments can be noted in

a child's ability to integrate information between brain hemispheres, which may compromise progress toward developmental milestones, such as the ability to integrate rational ideas when in a highly emotional state. With regard to the hippocampus, stress hormones activated in response to threat appear to impair the effective storage of and feedback from explicit memories. As a result, children may have difficulty understanding the context and meaning surrounding their emotion states and the resulting impairment in learning indicates they are likely to demonstrate repeated patterns of maladaptive attempts to resolve overwhelming emotion states. Finally, in the amygdala, heightened threat states and unmitigated kindling lead to increasingly greater alteration in neuronal excitability, which increases the risk of significant emotional and behavior management problems. If allowed to progress, these impairments can have serious health implications for a child's lifetime development.

Trauma-Focused Cognitive Behavioral Therapy Strengths and Limitations

In the mental health setting, the implications of childhood adversity can be seen in the form of social, emotional, and cognitive impairments that result in repeated patterns of health risk behaviors. In addition, the behaviors (and the reinforcement of neural pathways promoting these behaviors) have been repeated so often or with such severity that they have escalated to a level that has impaired the child in major areas of functioning. As a result, it is imperative that mental health providers increase their understanding of ACEs, their impact on typical neurodevelopment, and how to adjust treatment to account for this population's unique needs.

Trauma focused-cognitive behavioral therapy (TF-CBT) is one of the most commonly used trauma treatment modalities for children and families seeking mental health services because of its strong evidence base, flexible and time-feasible application, and clear implementation guidelines. The modality has been widely researched and has some of the

strongest empirical evidence for its effectiveness in treating symptoms of PTSD, with particular strength in terms of treatment outcomes for children who have experienced sexual abuse.

Ramirez de Arellano et al. (2014) conducted a meta-analysis in which they assessed the evidence base for TF-CBT by reviewing meta-analyses, reviews, and individual studies from 1995 to 2013 that included the five core elements of TF-CBT: psychoeducation, coping strategies (relaxation, identification of feelings, and cognitive coping), gradual exposure (in-vivo exposure), cognitive processing, and caregiver participation. The researchers endorsed the model's use as a covered service in health plans after identifying 10 randomized control studies (three of which were conducted independently of the model's developers) with research designs suggesting a high level of confidence in the evidence supporting the model's efficacy in reducing symptoms of PTSD. In addition, organizations focused on promoting the effective implementation of evidence-based practices for children and families involved with the child welfare system, such as the California Evidence-Based Clearinghouse for Child Welfare, support the use of TF-CBT because of the strong evidence for its efficacy and sustained outcomes 1 year post-treatment (California Evidence-Based Clearinghouse for Child Welfare, n.d.). Its flexibility allows for implementation with children ages 3 to 18 with a recommended duration of 12 to 18 weeks. The model's guidelines are clear, with a specific administrative approach to allow for consistent application by clinicians of varying experience levels (Ramirez de Arellano et al., 2014) and within variable settings (e.g., school, home, clinic). As noted above, TF-CBT effectively helps traumatized children reduce the symptoms of PTSD. Its ongoing use is therefore recommended for children and families seeking services in the mental health setting and, given the model's flexibility, evaluations can be made as to whether additional adaptations are necessary to address the unique concerns of children with multiple categories of adversity.

One specific data point that supports the need for growth within the model is the dropout rate for individuals who have experienced multiple forms of abuse. Multiple studies have shown there is a correlation between the number of traumatic events endorsed by a participant and dropout rates for TF-CBT, with children who have endorsed multiple trauma demonstrating an increased risk for dropout (Jensen et al., 2013; Wamser-Nanney & Steinzor, 2017). This supports that children who have endorsed multiple categories of adversity are not only not receiving the benefit of treatment, their rates of dropout may also indicate a risk for exclusion from other studies supporting the efficacy of TF-CBT, indicating a significant gap in the current literature. The developers of TF-CBT originally created the model to address symptoms of PTSD in children recovering from sexual abuse. It has since been modified and shown to be effective in reducing trauma symptoms related to multiple forms of abuse and traumatic experiences. As noted by Ramirez de Arellano et al. (2014), however, few researchers have looked at TF-CBT's efficacy in addressing symptoms related to mixed or complex traumas involving multiple categories of adversity. Given what we have learned from the ACE research and the significant interrelatedness of ACEs, adapting the model to meet the needs of clients who have experienced interrelated traumas appears to be a significant area in need of growth.

The growing understanding of the significant and complex short- and long-term impacts of adverse experiences on a child's health outcomes leads to questions surrounding whether TF-CBT's relatively short treatment length and focus on acute trauma symptom reduction go far enough in mitigating the effects of childhood adversity. Though TF-CBT helps clients manage current symptoms of distress related to past events, the model may not prepare clients sufficiently for future adversities in a way that promotes long-term pro-health outcomes. Cary and McMillen (2012) reviewed 14 studies using CBT (six using TF-CBT) principles to address

childhood trauma and found a significant reduction in PTSD symptoms, depression, and problem behaviors immediately following treatment. When treatment outcomes were reviewed 1 year post-treatment, however, the researchers found that though a reduction in PTSD symptoms was maintained, depression and problem behaviors had increased, indicating treatment effects were only partially sustained. This indicates a reduction in acute trauma symptoms alone may not sufficiently mitigate the effects of childhood adversity. This highlights an area of growth within the model in the sustainability of treatment effects. Given what is known of the unique health risks faced by this population should patterns of health risk behaviors persist, addressing this shortcoming in therapeutic interventions becomes particularly important.

Although TF-CBT remains the recommended treatment for reducing symptoms of PTSD, a focus solely on trauma symptom reduction in response to past adversities in mental health treatment does not appear to adequately address the need for both the promotion and maintenance of pro-health patterns of behavior into adulthood. Increasing a child's ability to sustain immediate treatment outcomes is therefore an area for growth within the model.

Treatment Considerations: Resilience

As the field of trauma-informed care has expanded, researchers have sought to better understand what leads some individuals to recover more effectively (with pro-health outcomes) following an adverse experience than others. Why do some clients appear to thrive following trauma treatment and others continue to struggle? The current literature supports that there are numerous factors that can influence an individual's response to an adverse event. These factors include the individual's biological and psychological organization, current experiences, active choices, the social context, the timing of adverse events and experiences, and the developmental history of the individual (Cicchetti, 2012). The interplay of these factors creates a dynamic

balance between risk and protective factors that determines whether a person responds with pro-health or health risk adaptations following an adverse experience (Alvord, Zucker, & Grados, 2011; Cicchetti, 2012). When an individual's balance of risk and protective factors leads to pro-health adaptations and outcomes in the face of adverse experiences, this is referred to as resilience. McCrea, Guthrie, and Bulanda (2016) defined resilience as "the ability to thrive despite adversity or, psychologically speaking, the capacity to experience trauma and loss, and yet sustain intact adaptive well-being" (p. 6). Kent, Davis, and Reich (2014) expanded the definition to include a sustained effort promoting long-term learning and growth, identifying resilience as "a sustained adaptive effort that prevails despite challenge, as a bouncing back and recovery from a challenge, and as a process of learning and growth that expands understanding, new knowledge, and new skills" (p. xii).

Though the majority of this paper has addressed the risk factors that typically inhibit adaptive functioning following adversity, a large body of research has also been conducted to identify specific protective factors that help increase an individual's resilience. These factors include internal resources such as self-regulation (including the use of effective coping skills and emotion regulation strategies), interpretation of experiences, IQ, and self-determination (including competence, autonomy, and hope; Alvord & Grados, 2005; Alvord et al., 2011; Marriott, Hamilton-Giachritsis, & Harrop, 2013). This supports that a child's ability to regulate overwhelming emotion states (i.e., suppressing amygdala activation) in order to engage in effective cognitive appraisal (i.e., activate higher level thinking) that leads to the development of a positive working view of self as capable and worthy (i.e., integration of self) will aid in protecting the child from the detrimental effects of adversity. In addition, external assets such as proactive parenting, healthy relationships and attachments, school achievement and involvement,

development of special interests and talents, and engagement with community supports (e.g., religious community, sports teams) play an important role in a child's ability to thrive in the face of adversity (Alvord & Grados, 2005; Alvord et al., 2011; Marriott et al., 2013). Therefore, the development and engagement of both internal and external resources are necessary factors to consider when selecting treatment interventions for this population.

Though the developers of TF-CBT recommended a strength-based approach that highlights opportunities to build a client's sense of self-control and capacity, a more direct focus on the building of resilient mindset factors may go a long way in helping children maintain pro-health treatment effects after the completion of therapeutic services. Literature on resilience also points to the impact of mindset and its influence on adaptive outcomes. MacConville and Rae (2012) stated, "Resilient individuals believe that the world is a changeable place over which they can exert influence and transform the world from being a hostile, frightening place to a place of opportunity" (p. 24). This belief in self and one's capacity to effectively take action to influence one's context is what Alvord et al. (2011) referred to as a proactive orientation toward life. Children who have difficulty with resilience tend to respond to life's struggles in rigid, inflexible, or passive ways (Wiener, 2003). As a result, these children are more likely to feel powerless to influence themselves and the world around them. When excessive stress is coupled with feelings of powerlessness that persist over prolonged periods of time, children are at an increasingly greater risk of developing maladaptive patterns of functioning.

Implications for Clinical Practice

Children and families who have experienced adversity make a significant step in taking back their power when they initiate engagement in mental health services. The current TF-CBT model has significant evidence supporting its efficacy in reducing symptoms of PTSD. The

prolonged impacts of childhood adversity, however, may surpass the criteria of the diagnostic category of PTSD. Multiple areas of functioning are affected by these adverse experiences, including socio-emotional and cognitive skills and behaviors relevant to long-term health outcomes. Research regarding the model's sustained treatment effects for other difficulties related to childhood adversity such as depression and problem behaviors also indicates the current model of TF-CBT may not go far enough in establishing sustainable patterns of pro-health behaviors. It is clear from the literature that children seeking mental health services following multiple adverse experiences will require interventions designed to both reduce the symptoms of acute distress and lay the foundation for patterns of pro-health behaviors that can be sustained post-treatment. Efforts made to address only one side of that equation in treatment, such as the acute symptoms of distress, seem inherently inadequate. It is therefore recommended that TF-CBT be adjusted to boost resilient outcomes to accommodate the unique needs of children who have experienced multiple adversities. Recommendations center on the five core elements of the TF-CBT model identified by Ramirez de Arellano et al. (2014), including psychoeducation, coping strategies (relaxation, identification of feelings, and cognitive coping), gradual exposure (in-vivo exposure), cognitive processing, and caregiver participation.

Psychoeducation

The first component of TF-CBT, psychoeducation, is intended to reduce initial distress through informing and normalizing the experiences of both the client and caregiver. This process is facilitated by the clinician who provides general knowledge to the client and caregiver on the traumatic event, common emotional and behavioral responses to trauma, and specific information regarding symptoms and diagnoses endorsed by the client and caregiver (Cohen & Deblinger, 2017). In doing so, the psychoeducation component of TF-CBT appears to shift the

primary area of the brain with which the traumatic event is being experienced from lower, reactive brain structures such as the amygdala to higher, reflective structures such as the hippocampus. As noted, this aids in providing contextual details in the form of facts and information about the traumatic experience and is likely to increase hippocampal activation as the brain works to categorize and store the new information, which, in turn, shifts activation away from the amygdala and more reactive lower-level brain structures.

As we have reviewed, children who have experienced one ACE are at a significant risk for experiencing a second category of adversity. This indicates skills need to be acquired and honed not just in response to current or past adversities, but also within the context of building adaptive and sustainable skills that can aid in avoiding or mitigating future adversities. It is therefore recommended that clinicians adjust the psychoeducation component of TF-CBT to include an additional focus on factors that promote resilience and pro-health outcomes to lay the foundation for skill acquisition in the context of both current and future needs. One way a clinician might make alterations to this component would be to not only include general information about the traumatic event and common responses to trauma, but to emphasize opportunities for posttraumatic growth (PTG) as well as highlight factors that are known to increase resilience, thereby promoting short- and long-term pro-health outcomes. For example, in a study of 397 adolescent survivors of the Ya'an earthquake in China, Zhou, Wu, and Zhen (2018) found that social support reduced symptoms of PTSD through the specific pathway of enhancing adolescents' self-esteem. Self-esteem increased hope among the adolescents, which Zhou et al. defined as an individual's belief in his or her ability to reach goals as well as the means to derive pathways to desired goals. In turn, the researchers found that social support positively predicted PTG through the influence of self-esteem on hope. This indicates social

support and connection following childhood adversity can increase an adolescent's self-esteem, creating a context in which the adolescent is more likely to succeed in both the belief and ability to adopt effective strategies to reach goals.

Learning about the tremendous benefits of social supports that encourage positive self-regard and hope for the future allows both the caregiver and child to recognize the importance of building safe and healthy attachments throughout the treatment process while also providing a specific action-oriented step that can increase a sense of capacity and control. In turn, this allows the client and caregiver to not only see the short-term benefit of active participation in treatment, but also to begin developing an understanding of the stepping stones that lead to long-term pro-health lifestyle strategies and behaviors. These additions to the current TF-CBT model also provide the clinician an opportunity to build rapport and engagement in treatment directly and indirectly through both communicating an understanding of current and past adversities (as indicated in the current psychoeducation treatment component) and building hope through confidence in identifying factors shown to have a positive influence on PTG. Imagine for a moment how a client and caregiver approaching trauma treatment from a place of hope and engagement and motivation as opposed to fear and avoidance might affect short- and long-term treatment outcomes.

Coping Strategies

As we have learned, ACEs can have a significant impact on the development of a child's stress response system that can result in the over production and release of stress hormones as well as faulty or oversensitive threat appraisal systems (e.g., thinking a threat is present when one is not). In addition, children with higher ACE scores are at an even greater risk of lasting impairments and health risk outcomes as a result of these neuroadaptations. It is therefore

imperative that treatment interventions such as TF-CBT emphasize client mastery of appropriately regulating the stress response systems to produce long-term adaptive pro-health outcomes.

The second core component of TF-CBT, coping strategies, is designed to increase the child's ability to manage the distressing physical, emotional, and cognitive symptoms of trauma. The current model provides psychoeducation on the body's response system under stress, including the physiological responses to stress and PTSD such as increased startle response, hypervigilance, agitation, difficulty sleeping, restlessness and irritability, and anger/rage reactions (Cohen & Deblinger, 2017). To maximize treatment outcomes, it is also recommended that the clinician highlight and provide psychoeducation on how the body can build new responses and ways of successfully adapting to adverse events. As noted by Tabibnia and Radecki (2018), "Understanding how fears are learned and how they can be overcome, or extinguished, is critical for coping and resilience" (p. 61). A clinician might, for example, provide specific information on how experience shapes neural pathways, specifically that the pathways that are activated in response to repeated experiences are strengthened and reinforced in the brain (e.g., taking a deep breath in response to the experience of stress). This information aids children and families in not only addressing trauma responses, but in increasing their understanding of the mechanics of how healthy patterns of behavior can be developed and maintained. It can also reinforce the necessity of practicing skills outside of the therapeutic setting to develop successful and sustainable treatment outcomes.

Labeling and expressing emotions effectively will promote the activation of neural pathways in the corpus callosum that transfer information between the left and right brain hemispheres. This occurs through the right brain's focus on in-the-moment sensory experiences

and the left brain's focus on analysis of experience through language. The process of labeling emotions aids in mitigating the release of toxic stress hormones while also working to develop new pathways for increasingly complex processes. Though the current model of TF-CBT addresses this component in relation to a child's traumatic experience, it is recommended that clinicians work to increase psychoeducation and the generalization of emotion identification skills to promote the continuation of language development post-treatment. It is the hope that more specific psychoeducation as to how language development benefits a child's growing brain and future success (e.g., in academic and social spheres) will increase both child and caregiver engagement in skill acquisition. In addition, generalizing the use of language development to include experiences outside of the traumatic event is likely to not only reduce ambivalence, which can hinder skill acquisition, but to promote the benefit of continued language development even after the acute symptoms of PTSD have been mitigated.

A final recommendation for the coping component is to boost a child's adaptive pathways through the encouraged use of active versus passive coping skills. Simply teaching a child to voice the intention of engaging in the coping skill out loud allows for the engagement (and therefore strengthening) of neural pathways that associate distressing states with healthy coping as opposed to deflective avoidance. Active intent takes the act of coping out of the unconscious experience of lower brain structures and into higher-order thinking systems. This, in turn, boosts learning and effective coping through the development and storage of explicit memories that can be recalled in the future in response to similar affect states. Increasing a child's ability to learn from past experiences and to build mastery over affective states increases resilience.

Gradual Exposure

The core component of gradual exposure in TF-CBT is intended to increase a child's acclimation to the traumatic event in order to increase his or her capacity to manage symptoms of distress related to the trauma. A significant goal of this component is to increase the client's ability to discuss traumatic events and his or her comfort and ability to manage trauma reminders without becoming overwhelmed by emotions. This enables a child to feel empowered to manage and discuss difficult emotion states, should he or she desire, as opposed to reflexively deflecting to avoidant strategies. A recommendation for this component is to include direct encouragement and psychoeducation on the benefits of attempting to face situations that provoke fear directly as opposed to deflecting to avoidant strategies to cope. This includes encouragement for facing fears in non-trauma related contexts, such as actively seeking to speak with a teacher about a poor grade as opposed to passively attempting to hide a poor grade from caregivers. Therapists are encouraged to work with the child to identify manageable stress hierarchies the child will practice facing. It is tremendously important to encourage the use of regulating coping skills when fear arises to begin pairing the mind's associations between stress and the capacity to regulate stress. As noted previously, making an active choice increases a child's ability to exert control and gain mastery through novel experiences. Novel experiences, such as effectively regulating a high emotion state, allow for the building of explicit memories available to the child for recall in the future when the need arises.

Cognitive Processing

Another core component of TF-CBT, cognitive processing, contains a focus on helping the child identify inaccurate and unhelpful thoughts and beliefs related to the traumatic experience. This process is facilitated by working to unlink thoughts and reminders of the

traumatic experience from overwhelming emotions (e.g., terror, rage, extreme helplessness, avoidance, anxiety, or shame) through supporting the client in identifying, challenging, and correcting cognitive distortions related to the traumatic event (Cohen & Deblinger, 2017).

Similar to the process of affect labeling, cognitive reappraisal works to activate higher-level brain processes that, in turn, dampen amygdala activation in response to trauma memory. This will promote long-term health outcomes through the creation and maintenance of increasingly complex integrative neurological pathways between lower and higher brain structures. As noted by Tabibnia and Radecki (2018):

In the laboratory, participants who use cognitive reappraisal during a negative experience report less negative emotion and show lower autonomic arousal; similarly, people who report frequently using reappraisal experience less negative emotion in negative situations and exhibit better psychological health. (p. 70)

Clients who can develop this skill will be better equipped to handle life's future adversities through the use of cognitive processing skills.

Caregiver Participation

As previously mentioned, social support can have a significant impact on a child's recovery following adversity. Though strengthening the caregiver-child relationship is a focus throughout TF-CBT, the model's current structure of waiting to introduce conjoint parent-child sessions toward the end of treatment inhibits the development of relational skills necessary for resilience and ongoing health. It is therefore recommended that adjustments be made to the model, when appropriate, to increase caregiver engagement and interaction with the child throughout treatment. Important to note, however, is that caregivers may present with their own history of childhood adversity. Therefore, it may be necessary to assess whether special focus

should be placed on increasing the caregiver's ability to regulate their own emotional states before encouraging direct engagement with the child in sessions. Not only can direct engagement between caregiver and child in sessions aid in creating a corrective interpersonal experience for children, it also allows the therapist to provide feedback to the child and caregiver in real time on ways they can improve their relational skills. Increasing conjoint sessions in treatment will also increase a caregiver's ability to learn, model, and implement skills with the child in a context most resembling dynamics outside of the therapeutic setting, while also reducing barriers to treatment such as a lack of childcare for separate caregiver sessions. Research overwhelmingly supports the importance of proactive caregiver involvement in the immediate aftermath of a traumatic event (supported by the current TF-CBT model), though it is equally as important that the caregiver help the child develop ongoing skills and attachments that promote resilience (Alvord & Grados, 2005; Alvord et al., 2011; Marriott et al., 2013; van der Kolk, 2005). Having the caregiver engage with the child throughout treatment with the assistance of feedback from the clinician will go a long way in promoting this goal.

Enhancing Future Safety and Development

Finally, just as with conjoint sessions, it is recommended that the current model of TF-CBT be adjusted to include elements of safety and development throughout the curriculum as opposed to waiting until the end of treatment to address this topic. As children presenting for services in response to an adverse experience are both at a heightened risk for experiencing future adversities as well as inaccurate perceptions of threat (resulting in a lack of felt safety), ensuring safety in the child's environment and developing skills that will allow the child to seek and maintain safety throughout treatment will go a long way toward regulating the brain structures necessary for the successful implementation of other TF-CBT components. In

addition, results of a meta-analysis by Marriott et al. (2013) showed one of the most consistent factors in promoting resilience in multiple studies was stability within family relationships and the environment. Therefore, further psychoeducation may be provided to families on the role of stability within the child's family system and environment (including housing and education) in increasing opportunities for resilience.

Conclusions and Future Areas of Research

We have learned that trauma has a significant impact on a child's neurodevelopment. These neuroadaptations place a child at a significantly greater risk for developing health risk behaviors that lead to the major causes of disease, disability, and early death in adulthood. As a result, mental health clinicians are ideally placed to address the acute symptoms of distress as well as to support laying the foundation for sustainable patterns of pro-health behaviors. Though current treatment modalities such as TF-CBT support the first goal, infusions of resilience principles can ensure the ongoing maintenance of pro-health adaptations. Future research is needed on how a child's ACE score affects TF-CBT treatment outcomes as well as on whether or not treatment has been shown to impact long-term health outcomes into adulthood. Current research indicates acute symptom reduction alone is not enough to mitigate the impact of stress on the brain, meaning treatment addressing childhood adversity must not only focus on short-term recovery, but also on the development of sustainable patterns of pro-health behaviors.

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