

2020

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January 2020

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Recommended Citation

Whitney, R. (2020). Self-Regulation as Key Factor in Protection Against the Harmful Effects of Adverse Childhood Experiences: Critical Role for Occupational Therapists. *The Open Journal of Occupational Therapy*, 8(1), 1-9. <https://doi.org/10.15453/2168-6408.1622>

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Self-Regulation as Key Factor in Protection Against the Harmful Effects of Adverse Childhood Experiences: Critical Role for Occupational Therapists

Comments

The author reports that they have no conflicts of interest to disclose.

Keywords

Adverse Childhood Experiences (ACEs), co-regulation, self-regulation, resilience, family quality of life, mother-child health

Credentials Display and Country

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DOI: 10.15453/2168-6408.1622

What if I told you that the research community has discovered the single most potent predictor of mental and physical disease processes for all people and across the lifespan? In this article, I argue for the importance of operationalizing the variables related to self-regulation and co-regulation and that doing so is critically important to developing intervention and outcome measures. Unifying terminology and formally operationalizing variables would provide a way to both facilitate and monitor the early building blocks of lifelong health. Furthermore, doing so would advance occupational science's unique contribution to the reduction of the effects of early life stress on disability and disease. I present three related constructs that are components, but not full measures, of co-regulation. The first relates to the work of Felitti et al. (1998) and the Adverse Childhood Experiences (ACE) Study that has promulgated the understanding of how early life stress predicts lifelong mental and physical disease processes. The second is reflected in the literature that discusses the effects of early child dysregulation on maternal stress and family quality of life. The third relates to the operationalized variables of co-synchrony of maternal-child regulation and family quality of life as variables that are best supported by the body of knowledge in the scientific community of occupational therapy. I present a summary of the evidence supporting protective factors that are available but, as of yet, poorly advantaged.

Studies related to ACEs show that a whole host of adult health issues occur at a much higher rate for those with high ACE scores. Despite this, there are mitigating factors; some adults with high ACE scores have good health. I argue that it is squarely in the practice domain of occupational therapists to develop and strengthen these mitigating factors. In other words, occupational therapists, by working with children (and parents) in their regular practice settings, have the potential to dramatically reduce the number of ACEs that occur in the first place (prevention), as well as to provide mitigation (treatment) to those children who do experience ACEs to reduce their likelihood of poor adult health outcomes. It is unfortunate that many professionals who work with children with high ACE scores, such as teachers, doctors, and social workers, are unaware of the impactful role occupational therapists can fulfill with these children. Further, I claim that a key leverage point for achieving these mitigating factors is strengthening caregiver-child co-regulation, a foundational but understudied element of family cohesion and function. Therefore, this article concludes with a two-part call to action:

1. Occupational therapists can reach out to other professionals who work with at-risk children to educate them about the beneficial role of occupational therapy (OT).
2. More research is needed that focuses on caregiver-child co-regulation and its role in influencing how children, mothers, and families experience stress and adapt to it.

What Are ACEs?

In 1998, Felitti et al. (1998) operationalized the notion of ACEs that can have a lasting, negative impact on a person's health by devising a 10-question survey (see Table 1). The ACE score is determined by giving one ACE point for each of the 10 topic area traumas that have occurred prior to a person's 18th birthday. Thus, ACE scores range from zero to 10. These scores, derived from Felitti et al.'s 1998 survey, establish a measure of the psychosocial origins of health. Ten types of adverse childhood experiences are measured by the ACE survey; five relate to what personally happened to a child (abuse and neglect) and five relate to what happened to family members (mental illness, substance abuse incarceration, parental conflict).

Table 1*Topic Areas from the ACE Survey*

-
1. Frequent insults, humiliation, or fear of physical harm at home.
 2. Frequent physical violence at home.
 3. Sexual abuse.
 4. Frequent feelings of not belonging to one's family.
 5. Frequent feelings of neglect.
 6. Parents divorced or separated.
 7. One parent abused the other.
 8. Substance abuse by a family member.
 9. Mentally ill family member.
 10. Incarcerated family member.
-

Note. Adapted from "Relationship of Childhood Abuse and Household Dysfunction to Many of the Leading Causes of Death in Adults: The Adverse Childhood Experiences (ACE) Study," by V. J. Felitti, R. F. Anda, D. Nordenberg, D. F. Williamson, A. M. Spitz, V. Edwards, . . . J. S. Marks, 1998, *American Journal of Preventive Medicine*, 14(4), 245-258.

ACE scores are surprisingly effective predictors of adult health (Centers for Disease Control and Prevention [CDC], 2012). As ACE scores increase, so do the incidences and severity of poor physical and mental health across the lifespan. People who have an ACE score of four or more were 2.4 times more likely to later be diagnosed with hepatitis, 3.9 times more likely to have chronic obstructive pulmonary disease (emphysema or chronic bronchitis), and were nearly twice as likely to contract heart disease or cancer. The predictive power of ACEs extends to virtually all areas of adult health. Those with four or more ACEs are twice as likely to be smokers, 12 times more likely to have attempted suicide, seven times more likely to be an alcoholic, and 10 times more likely to have injected street drugs. People with high ACE scores are more likely to be violent, have more marriages, have more broken bones, use more drug prescriptions, experience more depression, suffer more auto-immune diseases, and experience obesity and more work absences (Stevens, 2012).

The original ACE study was published in 1998 (Felitti et al., 1998) based on a sample of 17,000 people who belonged to the Kaiser Permanente health maintenance organization in the San Diego area. Since then, dozens of additional ACE studies have been conducted, with a wide variety of demographic groups, all producing similar results (ACES Too High News, n.d.). A key feature of these study results is the dose-response relationship between the number of ACEs and the risk of any particular poor health outcome (CDC, 2016). The more ACEs a person has (the dose), the greater the risk they will have the poor health outcome (the response). This fact increases the persuasiveness of the argument that adverse experiences in childhood can impact health in adulthood.

High ACE Scores are Indicators but not Determinants of Health

Not everyone with a high ACE score is destined for a life of disease, violence, or substance abuse. Some individuals prove to be resilient and able to bounce back from childhood traumas. However, while the term resilience is well defined, the measure of resilience is after the fact, once it is present. During development, researchers point to the importance of a caring other, one who competently cares for the needs of a child (Brooks & Goldstein, 2001; Goldstein & Brooks, 2013; Masten, 2014). Masten defines resilience as the ability to bounce back from threats in the environment. Resilience is both a developmental and adaptive response that arises when a child experiences a sense of protection at the most basic level in relationships with competent, caring adults (Masten, 2014).

Goldstein and Brooks' seminal work refers to these individuals as "charismatic others" (2013). Still, the question remains, what specifically would be a way to assess a child's sense of having his or her basic needs met? In occupational science, ACEs are considered specific examples of Early Life Stress (ELS). Much research exists about ELS and associated risk factors and mitigating factors. The concept of resilience can be explored by examining the mitigating factors found in ELS research, especially factors related to family quality of life.

Maternal well-being as a mitigating factor. When children experience overwhelming stress or trauma, they typically come to the mother or primary caregiver for comfort and for help making sense of their experiences. For this to be effective, the mother must be healthy and available. If the caregiver is ill or unavailable because of substance abuse or her own overpowering stress, then she will not be able to help the child regulate arousal. Instead, the child will be left to use his or her own immature strategies to try to make sense of their experiences in a coherent fashion (Whitney, 2018). Even more fundamentally, caregiver-child attachment must be present as the foundation for a nurturing relationship. Thus, attachment between the mother and child is a primary protection against early stress, and maternal stress interrupts attachment (Shah & Stewart-Brown, 2018). The ability of a mother to comfort and modulate the arousal of her child is known as caregiver-child co-regulation and is an empirically supported mediator of early life stress. When the child-caregiver relationship is the source of early stress or is profoundly affected by parenting or a child with disruptive behavior, the dyadic system is compromised. Parents of children with autism, attention-deficit hyperactivity disorder (ADHD), and difficulties in sensory processing have significantly more self-regulatory difficulties. Parents frequently report dysregulation and poor co-regulation as their first indicators of pediatric psychopathology (Gomez & Baird, 2005).

Family interaction as a mitigating factor. Mothers of children with mental, behavioral, and development disorders (MBDD) experience social isolation, burnout, self-doubt, high levels of stress, depression, and the loss of competence in their role of mother (Lee et al., 2009; Lee, Harrington, Louie, & Newschaffer, 2008). The mother, the caregiver who assumes the role of primary care provider, the person who attends to the early needs of the child, appears to be both uniquely vulnerable to parental stress and uniquely able to navigate a child to optimal well-being. Thus, the grandparent, a male caregiver, or other adult in the role of primary caregiver is both the effect of ELS and can, through his or her own stress, be a catalyst for childhood adverse life experiences. Mothers establish and manage the fulcrum and direct the leverage for time-sensitive intervention that can, through caretaking patterns, shape early regulation in the child (Whitney & Smith, 2015). High maternal stress impedes a mother's ability to cope with daily occupations, erodes her feelings of competence, and reduces the potent protective agency innate to the caregiver-child relationship (Lee et al., 2009). High maternal stress even reduces a child's capacity to benefit from early rehabilitation aimed at symptom reduction (Osborne, McHugh, Saunders, & Reed, 2008). Psychosocial risks in pregnancy are also linked to the transmission of maternal ACEs and poor child development (Racine, Plamondon, Madigan, McDonald, & Tough, 2018).

Parenting. Several studies document the involvement of sensory perception in emotional processes. The long-term consequences of traumatic experiences have been well demonstrated. Still, the role of extreme sensory processing patterns, traumatic childhood experiences, and caregiver-child occupational performance patterns have not been thoroughly examined in infant mental health and early life stress literature. One study (Serafini et al., 2016) demonstrated that parenting practices of

individuals with mental health disorders were associated with higher physical neglect, emotional abuse, and emotional neglect of the children. Correlations between parental sensory processing patterns and increased childhood adverse experiences impaired family quality of life. More, these early life experiences predict a lifetime of poor mental and physical health for the children in these families.

Family physical/material well-being as a mitigating factor. Parental well-being, the ability to maintain employment, earn a livable wage, and access needed resources for one's family, are measured indicators of ACEs. The family's inability to gain control over day-to-day routines such, as school, grocery shopping, or dinner, because of intermittent outbursts of non-engaging behaviors prevents the family from developing normalized patterns in the ebb and flow of daily life and is reported as one of the primary causes of familial stress when raising a child with MBDD. MBDD affect a significant number of children and adolescents worldwide, with mental health prevalence reported at 13.4%, anxiety disorder at 6.5%, depressive disorder at 2.6%, ADHD at 3.4% and any disruptive disorder at 5.7% (Polanczyk, Salum, Sugaya, Caye, & Rohde, 2015). Reducing child maltreatment has great potential to reduce both human and economic costs to society (CDC, 2012). The effects of early life stress can be identified temporally in child symptoms, family routines, and parenting stress (Lange, Callinan, & Smith, 2019; Sciaraffa, Zeanah, & Zeanah, 2018).

Family quality of life (FQoL) research attempts to document the experience of families as a system. FQoL describes the condition whereby family members have the chance to do things that are important to them without barriers, have their needs as a family met, and enjoy life, together, as a family (Turnbull, Summers, Lee, & Kyzar, 2007). Understanding how adverse childhood experiences and mental, behavioral, and developmental disability impacts overall well-being or quality of the family's life may provide a framework for gauging the impact on the ecological system of a family in ways that are not apparent by examining symptoms alone. Identifying ACEs early in the occupational profile of a family environment documents and supports the development of health routines and occupational roles in the family system (Berg et al., 2017). This improved awareness is essential to effective early intervention. Perry and Isaacs (2015) discuss the International Family Quality of Life Survey (FQoLS-2006) as a means to collect data on nine areas of family life: health, finances, family relationships, support from other people, support from disability-related services, influence of values, careers and planning for careers, leisure and recreation, and community interaction. This survey provides a way of measuring social support, which appears to buffer the effect of ACEs and protect against the harmful effects of early life traumas.

Mitigating ACE Effects is the Work of Occupational Therapists

Over half of occupational therapists work in pediatric settings (American Occupational Therapy Association, 2016). Symptoms of ELS for children 0-8 years of age are recognizable (Sciaraffa et al., 2018) and include changes in behavior, emotional regulation, cognition, social interactions, developmental (i.e., regression), and physical symptoms (eating, sleep, over- or under-reactions to minor stressors). These symptoms are routinely assessed in the occupational profile (American Occupational Therapy Association, 2017) and therapists who are aware of the developmental sequelae of early stress exposure will be better prepared to critically identify early signs of stress and have the potential to mitigate a lifetime of disability for that child. Many parents understand the effects in their own lives of ACE and are interested in changing the pattern of adversity for their children (Sciaraffa et al., 2018). Programs that specifically prioritize identifying occupational performance patterns (habits, routines, role competency, rituals) that are dysfunctional and provide remediation are both highly effective and highly

desired by families, school systems, and mental health practices. Substantial evidence is available for therapists who wish to demonstrate the cost effectiveness of these intervention programs (AOTA, 2016; CDC, 2012).

Core protective systems that promote functional adaptive responses to early stress (resilience) include generation of self-efficacy, attachment, a sense of belonging, and feeling one is part of a supportive community (Sciaraffa et al., 2018). Articulating the function-dysfunction continua for the child, the environment and the performance of occupations in the ecological system has yet to be presented in the literature. Occupational therapists often face complex questions about novel conditions and the need to make reasoned decisions using clinical reasoning or problem-solving approaches (Cronin, 2018). Occupational therapists do have empirically supported protocols to mitigate the risks of ELS. One core tenant of occupational therapy practice is that intervention must be theoretically based, grounded in the specific needs of the child, and not determined by the diagnosis (Kramer, Hinojosa, & Howe, 2019). These protocols are guided by several theories, including Ayres Sensory Integration (ASI); ecological theories, such as Person, Environment, and Occupation (PEO); and others. Using an ecological model, the following outlines an occupation-based intervention (see Table 2).

Table 2

Ecological Model (PEO) to Consider Occupation-Based Intervention to Mitigate Effects of Adverse Childhood Experiences

Person (child) Person (caregiver-child dyad)	Build resilience	<ul style="list-style-type: none"> – Self-regulation – Co-regulation 	<ul style="list-style-type: none"> – Teach mindfulness. – Assess and treat challenges of Sensory Processing and integration/modulation. – Promote the development of frustration tolerance. – Provide occupation-based intervention to reduce parenting stress. – Promote health family routines. – Understand the domains of family quality of life, use as measure of effective intervention. – Monitor attachment patterns and provide strategies for occupational engagement that promote strong parent-child bonds.
Environment	Sense of belonging	<ul style="list-style-type: none"> – Reduce barriers due to client factors – Identify and broker safe and healthy environments for play and exploration 	<ul style="list-style-type: none"> – Provide parent education to promote positive parenting (confidence and competence in the role of parent). – Promote participation. – Reduce occupational deprivation. – Monitor barriers to occupational justice.
Occupation	Identity comes through occupation	<ul style="list-style-type: none"> – Promote adaptive performance patterns (habits, routines, roles) 	<ul style="list-style-type: none"> – Build competency and confidence in the role of parent. – Promote and foster habits of self-determination. – Promote habits of persistence and perseverance.

It is unfortunate that many professionals who work with at-risk children are too often unaware of the training and toolkit of interventions that occupational therapists could bring to bear to prevent ACEs and to minimize the downstream health ill effects. ACE study author Williamson enumerates the professions he thinks of as having a role to play in addressing the public health crisis caused by high levels of ACEs, but makes no mention of occupational therapists. He summed up the importance of the

ACE study findings by saying the problems are not problems to be solved by the social worker, psychologist, pediatrician, or juvenile court judge but, in fact, are multifaceted problems that will require everyone to come together to create effective solutions (Stevens, 2012). Given that many of the problems related to adverse childhood experiences are occupation-based, the role of occupational therapy remains underused but cannot be overemphasized.

Caregiver-Child Co-Regulation is a Key Lever for Mitigating Stress

One primary area of intervention available to and uniquely evidenced in the profession of occupational therapy is the concept of self-regulation. The field has generated a wide body of evidence-based interventions supported by sensory integration, sensory processing, and occupational performance that teach children self-regulation (Martini, Cramm, Egan, & Sikora, 2016). Works such as Zones of Regulation are highly regarded as helpful strategies for self-regulation and modulation. The caregiver-child system, if viewed as one system, benefits from strategies of regulation and can be constructed as co-regulation. Co-regulation is cultivated as mothers and children move through the day-to-day occupations of caregiver and child. Adaptive strategies of quality of life in the family (positive parenting, positive interactions, access to physical and behavioral health services, financial well-being, and person mental and physical health and well-being). FQoL, strengthened through performance patterns in the family's habits, routines, and occupation roles, create patterns of regulation or resilience. There is ambiguity in the literature regarding the mechanism of self-regulation. However, there is conceptual agreement that self-regulation is the ability to regulate one's own state (Martini et al., 2016). Self-regulation, then, is a real-time measurable construct of the more abstract post-hoc variable known as resilience. Self-regulation and co-regulation can be conceptualized as early protection against the harmful effects of early life stressors.

Co-Regulation

Given the co-occurring and self-referential nature of maternal and child stress, understanding the regulatory nature of stress seems critical to the study of both early child stress and lifelong health and well-being. Yet, this co-regulatory system in the caregiver-child dyad is poorly operationalized, has not yet been adequately or consistently described in science, and few measures are available to monitor the synchronicity of caregiver-child attunement. The important co-variance of maternal stress, early life stress, FQoL, and healthy people can effectively encourage the elaboration and extension of the construct of co-regulation. High maternal stress signals to the child's developing stress-system that the environment is dangerous and high vigilance is required for survival. Disruptive child behaviors associated with early childhood psychopathology predict maternal stress and maternal stress, in turn, is a mediator of child outcomes and FQoL. The impact of a high stress environment produced by a child's own mother is recognized as a serious risk factor for ELS yet solutions to mediating the impact on the child is a novel area of study. As parents engage in the day-to-day occupations associated with caregiving, parent, and child co-create a biobehavioral synchrony that sculpts the parent-infant social bond, establishing the framework for the infant's social-emotional development (Albers, Riksen-Walraven, Sweep, & de Weerth, 2008; Tarullo, St. John, & Meyer, 2017). The interdependence between the caregiver-child interaction and development of self-regulation in childhood is well established and affects all domains of development (cognitive, social-emotional, and educational) with effects lasting across the lifespan (Hamoudi, Murray, Sorensen, & Fontaine, 2015; Lee et al., 2008). My previous work determined maternal stress and caregiver-child relationship is malleable to short term, telehealth intervention and that mothers can be effective agents of change of their own and their child's health status. While the caregiver-child relationship is fundamental to healthy brain development, investigation into what supports adaptive co-regulation is in the early stages and, at best, is limited. Even though co-regulation is well documented as important, the construct of co-regulation has yet to be well operationalized. Given the importance of this mechanism, co-regulation warrants an experimentally concretized approach to theoretically classify and describe the variable. Mapping the function-dysfunction of ELS, maternal stress, and co-regulation in the caregiver-child dyad during the critical

period of early intervention is urgent, as it offers our best hope to ensure optimal health and well-being for present and future generations.

The purpose of this review is to highlight mounting empirical support for the FSM consistent with these recommended additional tests of the model.

What Can Occupational Therapists Do?

Activism through published additional research on the contribution of occupational therapy to adverse childhood experience, resilience building, and FQoL is urgent. A few suggestions include:

1. Publish collaborative and widely: We have the information we need to significantly impact the health and well-being of our society, but we have isolated knowledge in silos. State of ACE in *American Journal of Occupational Therapy*.
2. Connect the science of occupation with identified needs of society, broadening the scholarship of integration (scholarly work that aggregates disparate information from across many disciplines).
3. Actively work to inform and develop communities of practice that are aware of the solutions we offer and of our science. Make it clear we ARE at the table (sometimes in the office next door) and ensure evidence-based practice is used to provide and evaluate the use of self-regulation strategies.
4. Connect ACE to the science of occupation, using the terminology of the wider profession of health science to make it clear to others that our interventions are evidenced and follow familiar theory of change models that translate across professions.
5. Measure the physiological and behavioral changes of intervention specifically related to self-regulation and co-regulation and uniquely in the areas of ELS, maternal stress, and FQoL. This falls in the TOC for ACE prevention, but we put this in silos.
6. Use function/dysfunction, clinical reasoning, and profile the theory of change; make this clinical process public through presentations, publications, and community activism.
7. Operationalize variables related to ACE, such as trauma-informed care to build this body of knowledge in the profession.

Advocate for Role of OT in ACE

Our research has a contribution. For example, while we can measure regulation, we do not have valid measures for mindfulness or resiliency or flow. Still, these variables are integrated in the professional knowledge of occupational therapy. We have increasing evidence that occupational therapy services result in reduced cost to third party reimbursement while improving health outcomes.

Working on client factors can blind clinicians to the toxicity of stress in early childhood. ELS is perhaps one of the single most important public health concerns. Stress events cause developmental trauma, have reputedly been shown to directly predict poor cardiac health, reduced cognitive function, impaired brain development, lack of emotional resilience, and increased psychopathology. ELS predicts high-risk behaviors and dampens the development of inhibitory control and reward-processing later in life, and all these changes are transmitted, genetically, epigenetically. One of the most potent protections against early life stress is having a mother who responds to the child's needs and who promotes self-resilience and self-regulation. Maternal stress is one of the most potent exacerbations of ELS. What if mothers could be activated as instruments of health, warriors of self-regulation and resilience? Could we change the trajectory of poor health and economic disparity by empowering parents who are determined not to pass on high-risk environmental stressors to their children?

Rondalyn Whitney, PhD, OTR/L, FAOTA, is an associate professor and director of faculty scholarship and development at West Virginia University. Her scholarship focuses on maternal stress and mother-child interactions when raising a child with a mental, behavioral, or developmental disorder. Focusing on the co-regulation of the child, the story of adverse childhood experience, and family quality of life and occupational deprivation is a unique perspective in her work.

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