Effects of Adverse Childhood Experiences on Pain Interference and Anxiety in an Integrative Chronic Pain Clinic

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Effects of Adverse Childhood Experiences

on Pain Interference and Anxiety in an Integrative Chronic Pain Clinic

Kerrin Doran Kunze

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Abstract

One in four children in the United States will experience abuse or neglect before the age of 18-years-old. Adverse childhood experiences increase the risk for chronic pain disorders and maladaptive coping strategies that can intensify patients’ experience of pain and disrupt or prolong treatment. Current research encourages a biopsychosocial approach to understanding and treating chronic pain, one that acknowledges the influence of childhood trauma and works to restore health by treating pain of the body, mind, and spirit. This retrospective study examined self-reported measures in a convenience sample of 162 individuals seeking treatment for chronic pain at an integrative care center. The purpose was to compare the prevalence and magnitude of adverse childhood experiences in this chronic pain population to the general population and to explore the physical and psychological health-related quality of life, specifically pain interference and anxiety, of the sample. The results showed that patients seeking treatment for chronic pain were more likely to report four or more adverse childhood experiences than the general population. Within the sample, patients with a history of childhood trauma had higher baseline anxiety levels at intake than individuals who had no history of childhood trauma. These findings support the need for integrative approaches to chronic pain including the adoption of trauma-informed care as a beneficial model for individualized, collaborative, patient-centered treatment for intractable chronic pain disorders.

Keywords: adverse childhood experiences, child abuse and neglect, chronic pain, biopsychosocial model, pain interference, anxiety, integrative care, health-related quality of life
Introduction and Background

The long-term health impact of child abuse and neglect are a significant public health problem in the United States. In 2016, one in four children had experienced some form of abuse or neglect before the age of 18-years-old, and one in seven children had been abused or neglected in the last year (Centers for Disease Control and Prevention, Child Abuse and Neglect Prevention, 2016). The effects of abuse and neglect in early childhood, whether a single incident, habitual occurrence, or multigenerational event, cause lifelong physical, psychological, social, and emotional trauma that can have lasting adverse effects on adult health and wellbeing (Anda et al., 2006; Bereiter, 2016; Felitti et al., 1998; Hughes et al., 2017; Sachs-Ericsson, Sheffler, Stanley, Piazza, & Preacher, 2017).

The landmark epidemiological CDC-Kaiser Permanente Adverse Childhood Experiences (ACEs) Study contributed a valid, reliable method to retrospectively measure the incidence and prevalence of self-reported ACEs that could be standardized to the general population. Findings demonstrated that around two-thirds of the sample population had experienced one or more ACE categories; and a dose-response relationship existed between the degree of exposure to childhood trauma and risk factors that contribute to major health conditions that serve as the leading causes of death in adulthood (Felitti et al, 1998). This discovery generated the need for a shift in the way in which common chronic diseases, including pain, were identified, understood, and effectively managed (Anda et al., 2006; Felitti et al., 1998). The decades that have followed the initial publication have given rise to a greater awareness and a more thoughtful approach to planning and managing care for patients who are living with complex chronic illness in the context of their trauma history (Bereiter, 2016; Czabafy, 2017).
Emerging literature on chronic pain and addiction acknowledges a strong relationship between ACEs and poor health outcomes in adulthood, including an increased risk for both chronic pain disorders and maladaptive coping strategies that lead to ineffective pain control and management (Brennenstuhl & Fuller-Thomson, 2015; Davis, Leucken, & Zautra, 2005; Felitti et al., 1998; Hughes et al., 2017; Nelson, Raishevich Cunningham, & Kashikar-Zuck, 2017). The multidimensional and intractable nature of chronic pain, in tandem with the sociopolitical landscape of an epidemic of opioid dependence, forces researchers and practitioners to approach the care of patients with chronic pain with caution, creativity, and innovative treatment methods (Huang et al., 2014; Jongen et al., 2017; Nelson et al., 2017). Medical management must go beyond customary measures, such as daily medication for pain relief, and acknowledge how the underlying presence of ACEs may complicate and confound therapeutic efforts (Czabafy, 2017; DiPietro, 2017; Goodman, 2017).

Knowledge of the comprehensive impact of ACEs strongly supports the need for further research and a more nuanced understanding of the relationships that exist between trauma in early childhood and the biopsychosocial constructs of chronic pain (Bereiter, 2016; Burke, Finn, McGuire, & Roche, 2016; DiPietro, 2017; Hughes et al., 2017; Sara & Lappin, 2017). Interdisciplinary, integrative approaches to chronic pain blend traditional pharmacologic symptom management with non-pharmacological treatment methods to manage a multitude of pain-related symptoms on the biopsychosocial continuum (Gardiner et al., 2017; Institute of Medicine, 2010). These integrative treatment regimens create opportunities for supportive measures that improve health and wellbeing by addressing physical symptoms, enhancing social function, decreasing the interference of pain in daily life, and supporting positive coping with the psychological complications of living with chronic pain (Edwards, Dworkin, Sullivan, Turk, &

**Problem Statement**

While a relationship has been established between ACEs and risk for a myriad of chronic diseases, including chronic pain syndromes, the biopsychosocial dynamics of chronic pain and how they may vary based on a patient’s history of ACEs remains poorly understood.

**Purpose**

This scholarly project seeks to answer two clinical research questions. The first question asks how a history of childhood trauma in the general population compares to a history of childhood trauma in a sample of patients engaged in integrative care for chronic pain. The second question asks whether a history of childhood trauma affects health-related quality of life (HRQoL), specifically pain interference and anxiety, for this sample of patients.

It is hypothesized that the presence and quantity of ACEs will be positively related to self-reported pain interference and anxiety in a sample of new patients presenting for care at an integrative medicine clinic for chronic pain. Exploring the relationship between these constructs may inform efforts to improve chronic pain management in patients with a history of childhood trauma.

**Review of Evidence**

**Adverse Childhood Experiences: Definition and Prevalence**

Child abuse, which involves an act of physical, sexual, or psychological abuse, is defined as words or overt actions that cause harm, potential harm, or threat of harm (Centers for Disease Control and Prevention, Violence Prevention, 2016). Neglect is defined as failure to provide
physical or psychological needs or failure to protect from harm or potential harm (Centers for Disease Control and Prevention, Violence Prevention, 2016).

The experience of child abuse and neglect, termed adverse childhood experiences or ACEs, are classified as physical abuse or neglect, sexual abuse, emotional abuse or neglect, and general household dysfunction (Bereiter, 2016; Felitti et al., 1998; Graeber, Helitzer, La Noue, & Fawcett, 2013). The CDC-Kaiser Permanente ACEs Study further defined household dysfunction as a violent home environment, household substance abuse, exposure to mental illness in a caregiver, parental separation or divorce, and incarceration of a member of the household (Felitti et al., 1998).

The act of child abuse or neglect can lead to varying levels of trauma which are dependent on the frequency and severity of maltreatment, as well as the presence or absence of secure attachment, positive role models, self-confidence, family stability and cohesiveness, social support, healthy relationships, religious belief, cultural identity, and effective coping mechanisms (Burr-Harris, 2012). Acute trauma is defined as a single event, such as a serious car accident or natural disaster (Burr-Harris, 2012). If a traumatic event occurs repeatedly or for an extended period, such as with domestic violence, abuse, or war, it is defined as chronic trauma (Burr-Harris, 2012). Complex trauma further expands the definition to include exposure to sequential or simultaneous chronic, interpersonal abuse, often by a trusted caregiver, that has a direct, pervasive impact on development resulting in physical and psychological stress reactions, emotional dysregulation, biological and cognitive dysfunction, and an overall loss of safety and control (Bereiter, 2016; Burr-Harris, 2012; Center for Substance Abuse Treatment, 2014; National Child Traumatic Stress Network, 2013).
According to the Substance Abuse and Mental Health Services Administration (SAMHSA), trauma can affect any race, gender, ethnicity, age, sexual orientation, socioeconomic or psychological background, and geographic location (Center for Substance Abuse Treatment, 2014). The severity of trauma related to an event is based on the individual’s experience, as well as their distinct biopsychosocial and cultural influences; this offers an explanation as to why two individuals, even when exposed to the same traumatic experience, can have very different evaluations and interpretations of the event (Center for Substance Abuse Treatment, 2014; Gatchel, Peng, Peters, Fuchs, & Turk, 2007). Most individuals demonstrate a temporary response and strong resiliency against the lasting effects of trauma, yet some suffer from prolonged consequences that manifest as persistent mental health conditions, such as post-traumatic stress disorder, anxiety, or substance abuse, and medical problems, such as arthritis, headaches, and chronic pain syndromes (Anda et al., 2006; Center for Substance Abuse Treatment, 2014; Gatchel et al., 2007; Hughes et al., 2017; Huang et al., 2014; Schulman & Menschner, 2018).

The impact of ACEs can be quantified using the ACE questionnaire, a retrospective, self-report inventory that records an individual’s trauma history (Felitti et al., 1998). The questionnaire uses yes or no questions to recognize the 10 most commonly identified forms of childhood abuse, five of which are personal and include physical abuse, verbal abuse, sexual abuse, physical neglect, and emotional neglect, and five of which are related to the actions of family members and include caregiver substance abuse, domestic violence towards a mother or stepmother, criminal behavior by a family member, mental illness, and the separation or loss of a caregiver due to divorce, death, or abandonment (Felitti et al., 1998). Counting each “yes” answer as one, an overall ACE score can range from zero to 10 and is determined based on the
total number of “yes” responses which represent exposure to individual abuse categories (Felitti et al., 1998; Sachs-Ericsson et al., 2017).

In 1998, at least two-thirds of the sample population involved in the CDC-Kaiser Permanente ACEs Study had a history of exposure to one ACE category; if a person had exposure to one ACE category, the probability of exposure to a second ACE category was 65% - 93% (median 80%) and the probability of exposure to two or more ACE categories was 40% - 74% (median 54.5%) (Felitti et al., 1998). The study also demonstrated the connection between exposure to multiple ACE categories and an increased risk for chronic diseases, substance abuse, mental illness, violence, lost productivity, and decreased longevity (Anda et al., 2006; Bereiter, 2016; Felitti et al., 1998; Graeber et al., 2013). More recently, 2016 data trends in the United States showed that 59% of adults and 46% of children experience at least one ACE in their lifetime and 9% of adults experience five or more (Bereiter, 2016).

A substantial graded dose-response relationship exists between the number of abuse categories experienced and the severity of ACE exposure and adult health risk behaviors and chronic disease states; individuals who experienced four or more categories had a four-to-twelve-fold increase for poor health outcomes as compared to individuals who experienced three or less ACEs (Felitti et al., 1998; Graeber et al., 2013; Hughes et al., 2017; Merrick et al., 2017). Furthermore, individuals with six or more ACEs died an average of 19 years earlier than those without ACEs; this is roughly 25.2 expected years of life lost, which is three times greater than those without ACEs (Brown et al., 2009).

The Connection Between ACEs and Health

While the psychological alterations and behavioral modifications caused by cumulative ACEs may begin early in development, the significant consequences to physical health may not
occur until decades later (Sachs-Ericsson et al., 2017). These early modifications place an individual at risk of for maladaptive coping strategies that increase vulnerability to other forms of stress across the lifespan which affect overall health as one ages (Bereiter, 2016; Graeber et al., 2013; Ogden, Minton, & Pain, 2006).

Current research has furthered and strengthened the depth and breadth of the connection between ACEs and chronic activation of the human stress response, which results in critical alterations in nervous, endocrine, immune system development, and epigenetics (Bereiter, 2016; Hughes et al., 2017; Sara & Lappin, 2017). Altered neurodevelopment grossly changes the individual’s perception of their surroundings, and therefore, they are unable to appropriately sort and process data in the same way as a non-traumatized person (Ogden et al., 2006). Adults with a history of childhood trauma are more likely to engage in unhealthy or dangerous behaviors, such as smoking, violence, risky sexual practices, or substance abuse, are more likely to suffer emotional problems, such as depression, anxiety, post-traumatic stress disorder, or hallucinations, to struggle with social problems, such as sexual assault, domestic violence, unintended pregnancy, or impaired work function, and be diagnosed with and experience complications from one or more chronic adult diseases.

Subsequent studies have applied key findings from the original Felitti et al. (1998) study to link ACEs to depressive symptoms including depressive affect, suicidality, drug and alcohol use, and impaired work performance (Anda et al., 2006; Burke et al., 2016; Clark, Caldwell, Power, & Stansfield, 2010; Edwards et al., 2016; Ogden et al., 2006). A retrospective, longitudinal study examined the long-term trajectories of depressive symptoms of 2,451 adult men with similar sociodemographic characteristics both with and without a history of childhood sexual abuse (Easton, Kong, Gregas, Shen, & Shafer, 2017). Findings strengthened existing
evidence of a significant association between cumulative ACEs and mental health risks across the lifespan (Easton et al., 2017; Graeber et al., 2013; Turner, Taillieu, Cheung, & Afifi, 2017).

Hughes et al. (2017) developed a thorough systematic review and meta-analysis for cross-sectional, case-control, or cohort studies that focus on the risks of health outcomes related to substance use, sexual abuse, mental illness, weight and physical exercise, violent behaviors, and chronic physical conditions associated with an ACE score of four or more; results included review and synthesis of 37 published reports. It found a weak/modest association between a cumulative ACE score of less than two and physical inactivity, obesity, and diabetes, a moderate association between a cumulative ACE score of two to three and smoking, heavy alcohol use, poor self-reported health, cancer, heart disease, and respiratory disease, a strong association between a cumulative ACE score of three to six and sexual risk-taking, mental ill health, and problematic alcohol use, and the strongest association between a cumulative ACE score of seven or more and problematic drug use and interpersonal and self-directed violence (Goodman, 2017; Hughes et al., 2017). The findings offer a warning that violence, mental illness, and problematic substance abuse related to strong associations to cumulative ACE scores can lead to future exposure to parental domestic violence, mental illness, and substance abuse which have dangerous multigenerational consequences that can lock families into cycles of adversity, poverty, and poor health outcomes (Hughes et al., 2017; Merrick et al., 2017; Sara & Lappin, 2017).

The Biopsychosocial Response to Chronic Pain

Like trauma, chronic pain includes both a physical and emotional component that, if left untreated, can have adverse effects on a person’s well-being, function, and quality of life (Allred, 2016). Historically, the concept of pain was dependent on identifiable tissue injury; however,
when a source of pain was not evident, the assumed pathology was explained through psychogenic causes (Turk et al., 2016). Research conducted over the last several decades has revealed that pain can best be examined through a biopsychosocial lens that accounts for the subjective physical, cognitive, behavioral, and emotional constructs and processes of an individual’s experience of pain and its impact on their life (Jongen et al., 2017). In this view, a chronic pain condition affects the patient on a physical level, but also leaves a lasting impact on one’s mental and social health. When pain is understood and treated as a one-dimensional, physical experience, the psychological influence of pain is neglected. This oversight may compound the patient’s experience of pain, complicate the management of their physical, psychological, social, and emotional symptoms, and lead to insufficiently-managed pain, over-prescription or abuse of prescribed opioid medications, and compromise of the patient-provider therapeutic alliance (Brennenstuhl & Fuller-Thomson, 2015; Edwards et al., 2016; Simons, Elman, & Borsook, 2014; Williams, 2013). In the context of a social history that includes abuse and neglect, a health systems neglect of a patient’s experience of pain may constitute its own kind of trauma, triggering feelings of abandonment and neglect by those who are supposed to be in caring, protecting roles.

The Biopsychosocial Model of Pain and Consequences on the Quality of Life is an adaptation of Engel’s Biopsychosocial Model (Dueñas, Ojeda, Salazar, Mico, & Failde, 2016; Engel, 1977; Engel, 1980). It demonstrates the interconnected nature of the biological, psychological, and social domains of chronic pain with dynamic movement between all three (Dueñas et al., 2016). The model posits that the pain experience is unique to the individual and can involve one or all of the biopsychosocial components; and each individual’s experience of
pain can be expressed through limitations that disrupt physical functioning, daily life activities, mental health, and social and family functioning (Dueñas et al., 2016; Gatchel & Howard, 2018).

Constructs housed within the biological domain of the model include nociception, injury, trauma, infection, illness, cancer, and nerve damage (Dueñas et al., 2016). These components cover the physical causes of pain that stem from and directly impact the functioning of the individual’s body (Fava & Sonino, 2017).

Constructs housed within the psychological domain of the model include sleep disturbance, fear, anxiety, depression, and coping skills (Dueñas et al., 2016). The psychological aspects of chronic pain are a collection of negative emotions, thoughts, and catastrophizing behaviors; research validates a strong connection between this negative affect and long-term consequences of chronic pain such as physical disability, work disability, overall healthcare costs, mortality, and suicide (Edwards et al., 2016; Howe, Robinson, & Sullivan, 2015).

Constructs housed within the social domain of the model include work, family, and social network (Dueñas et al., 2016). Chronic pain in adulthood and the physical and mental health consequences reviewed above carry the potential to isolate individuals socially, negatively influencing or limiting social interactions, which often triggers the development of ineffective coping strategies (Nelson et al., 2017). Such negative outcomes include restricted contact with family and friends, an inability to participate in social roles and activities, and the development of negative emotions, irritability, and anger that can further disrupt personal relationships and cause increased stress and anxiety within the family dynamic (Dueñas et al., 2016; Edwards et al., 2016).
The Connection Between ACEs and Chronic Pain

Population-based studies have validated a connection between early childhood trauma and abuse and an increased risk for subsequent chronic pain in adulthood, including severe or intractable migraines, chronic pelvic pain (CPP), chronic low-back pain (CLBP), and other debilitating musculoskeletal conditions that remain difficult to effectively treat with traditional therapies alone (Anda, Tietjen, Schulman, Felitti, & Croft, 2010; Brennenstuhl & Fuller-Thomson, 2015; Lampe et al., 2003; Nelson et al., 2017). Longitudinal research has found that physical, sexual, and emotional abuse and neglect are related to inflammation in perimenopausal women between the ages of 42-52 years through a dose-response relationship, thereby increasing the risk for the development of multiple chronic diseases that have an inflammatory pathophysiology including chronic pain conditions such as osteoarthritis, rheumatoid arthritis, chronic spinal pain of the back or neck, CLBP, chronic pelvic pain, and fibromyalgia (Davis et al., 2005; Matthews, Chang, Thurston, & Bromberger, 2014).

A meta-analysis reported that an individual with a trauma history is 2.7 times more likely to develop a chronic pain condition in adulthood (Afari et al., 2014). A cross-sectional study that included research from 10 countries found a dose-response relationship between physical abuse in childhood and the subsequent onset of chronic physical conditions, as well as a higher likelihood of patients who suffer from chronic pain to report childhood abuse or neglect than healthy controls (Davis et al., 2005). Scott et al. (2011) also established a dose-response relationship between three-or-more self-reported ACEs and a higher prevalence of early-onset psychological disorders, including major depressive disorder, post-traumatic stress disorder (PTSD), and panic disorder. The psychological stress that accompanies exposure to early childhood trauma also shows consistent association with functional somatic syndromes including
fibromyalgia, chronic widespread pain, chronic fatigue syndrome, and irritable bowel syndrome (Afari et al., 2014; Nelson et al., 2017). A similar finding in children and adolescents suggests that ACEs are more often reported by those with pain syndromes, such as migraines headaches and fibromyalgia, than their non-traumatized peers (Nelson et al., 2017).

Traditional pain assessments attempt to quantify a patient’s pain based on subjective intensity alone, however, contemporary research supports the idea of a biopsychosocial approach that goes beyond the patient’s physical function to emphasize and further discuss how living with chronic pain impacts one’s social and emotional wellbeing, which in turn, directly influences patient outcomes associated with effective pain management (Brennenstuhl & Fuller-Thomson, 2015; Hughes et al., 2017; Jongen et al., 2017). The biopsychosocial approach offers an integrative view of pain that incorporates the biological, psychological, and social properties of pain, including a careful assessment of how a trauma history that includes ACEs might influence a patient’s experience of pain, and perception of and response to a variety of treatment modalities (Burke et al., 2016; Corso, Edwards, Fang, & Mercy, 2008; DiPietro, 2017; Nelson et al., 2017).

The associated functional and psychosocial effects can directly impact the individual’s unique experience of pain, their level of active participation to adopt a therapeutic regimen, and their overall response to treatment (Edwards et al., 2016; Turk et al., 2016). The negative consequences of such a diagnosis ultimately lead to a reduction in one’s health-related quality of life (Corso et al., 2008; Graeber, Helitzer, Fawcett, & La Noue, 2013; Jongen et al., 2017). This may include functional impairment, pain interference, fatigue, anxiety, depression, an inability to participate in social activities, isolation, and sleep disturbances (Jongen et al., 2017; Health Measures, 2018).
ADVERSE CHILDHOOD EXPERIENCES AND HRQoL

**Trauma-Informed Care Approach in Integrative Medicine**

Despite the availability of a multitude of treatment options for chronic pain disorders, many patients living with pain say that they are undertreated, they suffer from relationship problems with their support partner, and most experience some degree of anxiety, distress, or depression associated with their condition (Brennenstuhl & Fuller-Thomson, 2015; Burke et al., 2016; DiPietro, 2017). Further, the public health crisis involving over-prescription and dose escalation of opioid medications for chronic pain calls for novel, non-pharmacological treatment regimens that reduce pain, improve depressive symptoms, and facilitate patient self-efficacy and improved self-management (Czabafy, 2017; Gardiner et al., 2017). Given the clear and compelling relationship between multiple ACEs and poor health, routine screening for the underlying presence of ACEs has been encouraged (Gatchel et al., 2007; Herman, 2015; Schulman & Menschner, 2018).

A trauma-informed care approach to chronic pain management recognizes how a history of childhood trauma can impact an individual’s physical, psychological, social, and emotional health and wellbeing, including relationships and the ability to adopt healthy lifestyle choices and behaviors (Schulman & Menschner, 2018). The focus of modern research aims to address the adverse effects of trauma while diminishing the possible re-traumatization that is characteristic of treatment (Czabafy, 2017; Herman, 2015; Huang et al., 2014; Schulman & Menschner, 2018). This approach is central to integrative medicine, which balances pharmacological treatment methods with non-pharmacological treatment methods to achieve individual goals that consider the unique biopsychosocial manifestations of chronic pain (Bereiter, 2016; Gardiner et al., 2017).
The National Center for Trauma-Informed Care, part of the Substance Abuse and Mental Health Services Administration (SAMHSA), emphasizes six key principles that guide the trauma-informed care model to facilitate healing (Goodman, 2017; Huang et al., 2014). These principles include (1) safety, (2) trustworthiness and transparency, (3) peer support, (4) collaboration and mutuality, (5) empowerment, voice, and choice, and (6) cultural, historical, and gender issues (Goodman, 2017; Huang et al., 2014). This resilience-based approach is necessary for the individual to regain self-control and develop strategic coping strategies to overcome past traumatic experiences (Czabafy, 2017; Schulman & Menschner, 2018). Similarly, integrative medicine utilizes an interdisciplinary approach to healthcare so that patient-centered collaboration transpires that is supportive of individual wants and needs and follows the six principles set forth by SAMHSA (Czabafy, 2017; Goodman, 2017; Huang et al., 2014). Findings regarding the implementation of trauma-informed care demonstrate improved patient outcomes including compliance, self-efficacy, self-advocacy, adherence to treatment regimens, and improved patient satisfaction (Bereiter, 2016; Czabafy, 2017; Gardiner et al., 2017; Jongen et al., 2017; Williams, 2013).

Despite a growing knowledge base for the harmful, lifelong effects of ACEs, the development and implementation of preventative systems to screen for, monitor, and appropriately respond to childhood trauma in adult and child patients alike has been slow. Given the clear and compelling relationship between multiple ACEs and poor health, public health interventions that identify ACEs early and then intervene quickly to build resilience can serve to prevent the compounding impact of additional trauma and then support healing and recovery from known trauma before it translates into a myriad of poor health outcomes (Goodman, 2017; Hughes et al., 2017; Nelson et al., 2017).
Theoretical Model

The application of the Biopsychosocial Model of Pain and Consequences on the Quality of Life is a strong theoretical representation of the multidimensional nature of chronic pain (see Figure 1) (Dueñas et al., 2016). It acknowledges the complex biological, psychological and social dimensions of pain, while integrating the underlying presence of ACEs and one’s subsequent health-related quality of life. Pain interference, which measures the impact of self-reported pain symptoms on an individual’s ability to participate in physical, social, cognitive, emotional, and recreational activities, was selected as a marker of the biological dimension of chronic pain; and self-reported anxiety, which measures the impact of self-reported fear, worry, and restlessness, as well as the somatic symptoms related to hyperarousal (racing heart, dizziness) over the past seven days was selected as a marker of the psychological dimension of chronic pain (PROMIS Adult Profile Instruments, 2015). The model supports the hypothesis that the presence of ACEs will be positively related to pain interference and anxiety in a sample of chronic pain patients from an integrative medicine clinic. Furthermore, it encourages a comprehensive, multidisciplinary approach that emphasizes integrated pharmacological and non-pharmacological treatment regimens to address all aspects of the biopsychosocial continuum of chronic pain.

Project Design

A retrospective project design involving secondary analysis of primary data was used to establish the baseline prevalence of ACEs in a population of new patients enrolled in integrative care for chronic pain management at the Osher Center for Integrative Medicine at Vanderbilt (OCIM) between July 2015 and October 2017. Additionally, the relationship between ACEs and health-related quality of life were explored in this sample population. This project was approved
by the Vanderbilt University Institutional Review Board and exemption was also verified by Belmont University’s Institutional Review Board.

**Clinical Setting**

The Osher Center for Integrative Medicine at Vanderbilt (OCIM) is an integrative care center in Nashville, Tennessee that provides a mind-body approach to health through collaborative, interdisciplinary care by a team of allied health and wellness professionals. Practitioners at OCIM seek to provide patient-centered care that is both evidence-based and holistic, and they engage and empower patients to reach their optimal level of physical, mental, and social functioning (The Osher Center for Integrative Medicine, n.d.). OCIM provides care for a variety of primary and secondary health conditions and symptoms such as depression, stress, diabetes, and insomnia, but the predominant complaint is related to complications from chronic pain from a variety of sources including arthritis, cancer, depression, fibromyalgia, headaches, migraines, neuropathy, and weight issues (Abrams et al., 2015a; Abrams et al., 2015b; The Osher Center for Integrative Medicine, n.d.).

OCIM is part of the Bravewell Collaborative, a community of leading integrative care professionals who are dedicated to shifting the focus of the current healthcare system to prevention and health maintenance (The Bravewell Collaborative, 2015). With vision and strategy, the collaborative created BraveNet, a practice-based research network that allows for improved communication between various integrative medicine clinics (The Bravewell Collaborative, 2015). In 2013, BraveNet launched Patients Receiving Integrative Medicine Interventions Effectiveness Registry (PRIMIER), a multi-institutional, practice-based project to compile patient-reported outcomes (PROs) and data from electronic health records (EHRs) into a national registry designed to establish a framework for evidence-based practice in the field of
integrative medicine (Abrams et al., 2015b; Dusek et al., 2016). The PRIMIER study gathers data at baseline and then continues to solicit patient-reported outcomes over the course of two years at two-month intervals for the first six months, then every six months until the completion of year two (Abrams et al., 2015a; Dusek et al., 2016). PRIMIER uses the REDCap (Research Electronic Data Capture) electronic platform to organize patient-reported outcomes from several data collection measures including the Perceived Stress Scale (PSS-4), the Patient Activation Measure (PAM), and the Patient-Reported Outcomes Measurement Information System (PROMIS-29) (Abrams et al., 2015a; REDCap, n.d).

One important difference between the PRIMIER study at OCIM and other participating integrative care clinics within BraveNet is that the baseline intake form also includes the ACEs questionnaire. This instrument is unique to OCIM and was added in January 2016 due to the identified need to capture the prevalence and magnitude of childhood abuse and neglect within their patient population from an open-ended question regarding the patient’s perceived history of trauma or life stressors. Data generated from OCIM has the potential to support the use of a trauma-informed care model for patients suffering from the debilitating effects of chronic pain.

Project Population

Data for this scholarly project was extracted from de-identified clinical patient records collected from the PRIMIER study at OCIM between July 2015 and October 2017. Inclusion criteria for data extraction for this scholarly project was limited to baseline information reported at intake and patient records were eligible if they contained (1) informed consent for research participation, (2) self-reported chronic pain either as a primary condition or a primary symptom, or self-reported pain lasting three months or longer, (3) completion of the ACE questionnaire, and (4) completion of the pain interference and anxiety subscales from the PROMIS-29 tool. All
pain diagnoses were included in this query, and if a patient record was missing any of the specified elements, it was excluded from data analysis.

**Sources of Data & Data Collection Instruments**

The PRIMIER study was designed and securely stored in REDCap (Research Electronic Data Capture), a secure online management tool designed for capturing patient-reported research data (REDCap, n.d.). Specific variables from the primary PRIMIER dataset compiled at OCIM were extracted to create the secondary dataset used for this scholarly project. Extraction included sociodemographic information, a completed ACEs questionnaire, and completed pain interference and anxiety subscales from the PROMIS-29 tool.

**Sociodemographic Variables.** Sociodemographic information obtained on the baseline intake form is filled out online via a provided link or in the office prior to the patient’s first clinical appointment. General sociodemographic variables collected for analysis in this scholarly project included age, sex, ethnicity, race, level of formal education, marital status, current employment status, annual household income, and primary health insurance. Data was also extracted to evaluate the primary condition and primary symptom that prompted enrollment in care at OCIM. Open-ended questions that were extracted included (1) a question related to current pain experience self-rated as a four-or-greater on a scale of zero-to-10 lasting longer than three months and (2) a question that asked whether the patient had ever experienced any stressors or trauma in their lifetime (See Appendix A).

**Adverse Childhood Experiences (ACEs) Questionnaire.** The history of childhood trauma was reflected by the cumulative ACE score, a measure calculated from completion of the ACEs questionnaire, a retrospective 10-point survey that measures ACEs before the age of 18 years of life (See Appendix B) (Dube, Williamson, Thompson, Felitti, & Anda, 2004). The ACE
score can range from “0,” meaning that the individual has not been exposed to any of the 10 categories of child abuse and trauma included in the study, to “10,” meaning that the individual has been exposed to all 10 categories of child abuse and trauma. A high ACE score is defined as four or more self-reported ACEs (Anda et al., 2006; Bereiter, 2016; Felitti et al., 1998; Hughes et al., 2017; Sachs-Ericsson et al., 2017). Of the 10 items in the scale, five are concerned with personal child maltreatment, including physical abuse, psychological abuse, sexual abuse, physical neglect, and emotional neglect (Dube et al., 2004). The remaining five items are concerned with parental or family incapacities, including parental loss through divorce, death, abandonment, imprisonment, mental illness, substance abuse, and witnessed violence against the mother (Dube et al., 2004).

The test-retest reliability of the ACE scale has been validated using the Cohen’s kappa coefficient to control for chance. Results show that kappa statistics are in the range of .52-.72, where a kappa value of ≥.75 represents excellent agreement, values <.40 represent poor agreement, and values between .40 and .75 represent good agreement (Dube et al., 2004). Therefore, the ACE score is a reliable, valid, and stable method of measuring retrospective reports of serious dysfunction in early childhood.

The PROMIS-29 Tool. The PROMIS-29 tool captures patient-reported outcomes across three principle domains of physical health, mental health, and social health that are divided into seven subscale domains of fatigue, pain interference, physical function, sleep disturbance, anxiety, depression, and ability to participate in social roles and activities (See Appendix C) (PROMIS Adult Profile Instruments, 2015). The PROMIS-29 tool is intended for adults over the age of 18 years and assesses each of the seven domains with four five-level universal questions. Each domain focuses on the past seven days except for physical function, which does not have a
ADVERSE CHILDHOOD EXPERIENCES AND HRQoL

timeframe. Pain intensity is measured separately using an 11-point numeric rating scale that fluctuates between no pain (0) and the worst pain imaginable (10) (Craig et al., 2014). The PROMIS-29 has consistently been shown to have appropriate internal consistency and reliability (Craig et al., 2014; Health Measures, 2018; PROMIS Adult Profile Instruments, 2015).

The PROMIS-29 tool quantifies pain interference and anxiety on separate subscales, and the tool is measured using the t-score metric. Higher PROMIS scores relate to more of what is being measured, which can be positive or negative depending on the applied subscale. The reference sample for both the pain interference and the anxiety subscale is the general population where the mean score is 50 with a standard deviation (SD) of 10 (PROMIS Adult Profile Instruments, 2015). Therefore, if a patient has a mean score of 60, they are one SD worse than the general population, but if a patient has a mean score of 40, they are one SD better than the general population. The PROMIS-29 tool also categorizes gender and age range norms for the adult domain measures based on the United States General 2000 Census which may be helpful with descriptive statistics to form a baseline for the study population.

The PROMIS measures have been well-established with population-level validation by the National Institutes of Health (NIH) (Kroenke, Yu, Wu, Kean, & Monahan, 2014). The PROMIS-29 tool is scored using standardized Item Response Theory (IRT) which is a group of statistical models that relate individual items to an underlying trait or concept represented by items in the item bank (PROMIS Adult Profile Instruments, 2015). Each domain is scored individually, and the pain intensity scale is reported in its raw form.

**Pain Interference Subscale.** The PROMIS-29 tool defines pain interference (PI) as a measure of the extent to which pain inhibits the proper physical, cognitive, and emotional function, and its effect on recreational activities, including sleep and quality of life (Craig et al.,
The PI subscale consists of four questions with Likert style responses. For each question, a value of one represents an answer of “not at all,” a value of two represents an answer of “a little bit,” a value of three represents an answer of “somewhat,” a value of four represents an answer of “quite a bit,” and a value of five represents an answer of “very much.” It is scored using item-level calibration. To find the total raw score for this short-form Pain Interference 4a – Adult v1.0 subscale, all questions must first be answered and then the values of the responses to each question are summed (Pain Interference Instrument, 2018). The lowest possible raw score is four and the highest possible raw score is twenty. Next, the researcher must use the applicable score conversion table which allows for translation of the total raw score into a t-score for each patient record. This conversion scales the total raw score into a standardized score with a mean of 50 and a SD of 10 that is based on calibration testing that was performed on a significant sample of the general population (Pain Interference Instrument, 2018).

The psychometric properties of the PROMIS-PI subscale have been validated with internal reliability equivalent to 0.96-0.99 and construct validity that is supported by patterns of correlations with other reported health outcomes (Amtmann et al., 2010).

ANO Anxiety Subscale. The PROMIS-29 tool defines anxiety as emotional distress that is represented as fear (fearfulness, panic), anxious misery (worry, dread), hyperarousal (tension, nervousness, restlessness), and somatic symptoms related to arousal (racing heart, dizziness) (Craig et al., 2014; Health Measures, 2018). The anxiety subscale consists of four questions with Likert style responses. For each question, a value of one represents an answer of “never,” a value of two represents an answer of “rarely,” a value of three represents an answer of “sometimes,” a value of four represents an answer of “often,” and a value of five represents an answer of
“always.” It is scored using item-level calibration. To find the total raw score for the short-form Anxiety 4a – Adult v1.0 subscale, all questions must first be answered and then the values of the responses to each question are summed (Anxiety Instrument, 2018). The lowest possible raw score is four and the highest possible raw score is twenty. Next, the researcher must use the applicable score conversion table which allows for translation of the total raw score into a t-score for each patient record. This conversion scales the total raw score into a standardized score with a mean of 50 and a $SD$ of 10 that is based on calibration testing that was performed on a significant sample of the general population (Anxiety Instrument, 2018).

The psychometric properties of the PROMIS-Anxiety subscale have been validated with internal reliability equivalent to 0.89 and construct validity that is supported by patterns of correlations with other reported health outcomes and a subsequent general mental health measure (Craig et al., 2014; Kroenke et al., 2014).

**Data Collection Process & Procedures**

The primary investigator for the PRIMIER study at OCIM is Kathryn Hansen, ANP-BC, and she is the practitioner who first incorporated the ACE questionnaire into the intake form. Vanderbilt Institutional Review Board approval was granted at the onset of the original study launch; protocol allowed for the student researcher to be added to the original PRIMIER study protocol by Kathryn Hansen as “key study personnel” after completion of Collaborative Institutional Training Initiative (CITI) training to ensure good clinical and ethical practice guidelines were upheld. All patients whose records were included in this scholarly project gave consent for their information to be used for research purposes.

Patient records were de-identified and exported from REDCap to Microsoft Excel to protect patient confidentiality and to comply with HIPAA regulations. Patient records were given
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a unique numerical record identification number. The data was coded using the provided REDcap codebook and one duplicate patient record was removed. Any patient record where the primary condition or symptom was listed as “other” was reviewed by hand to evaluate inclusion criteria. Cleaned patient records that met all inclusion criteria were assembled into one Excel spreadsheet and then exported to IBM SPSS 25.0 statistical analysis software for analysis.

**Results**

At the time of data extraction in October 2018, 773 patient records existed, and 166 met criteria for inclusion. Four were removed because specified age was less than 18-years-old. The final sample population included 162 complete patient records.

**Sociodemographic Data**

Sociodemographic characteristics for the sample are presented in Table 1. The age range was 18 to 81 years ($M=43.6$, $SD=15.8$) and was predominantly composed of married Caucasian females whose spouse lives in the household. 58.0% ($n=94$) had completed a college degree or higher and 56.8% ($n=92$) reported their annual household income as less than $100,000. The sample population included 43.8% ($n=71$) patients who reported working full-time or part-time, 12.7% ($n=21$) who reported no employment due to other responsibilities such as raising children or attending school, and 31.5% ($n=51$) who reported being unemployed, on medical leave, or retired. The majority (82.1%) had private health insurance other than Medicare or Medicaid while only two patients reported no health insurance.

The majority of the sample population (84.6%, $n=137$) reported “yes” when asked whether they were currently experiencing chronic pain, defined as pain rated a four or greater on a scale of zero-to-10 that had been present for three months or longer. Nearly three-quarters ($n=119$) answered “yes” to experiencing major stressors or trauma in their lifetime while 26.5%
(n=43) answered “no.” Nearly half of patients (46.9%, n=76) listed chronic pain as the primary condition for seeking treatment at OCIM, while a majority of the remaining patients had chief complaints related to other pain disorders including headaches/migraines, fibromyalgia/myofascial pain, arthritis, neuropathy, and anxiety. In a separate, more specific question about the primary symptoms for seeking treatment at OCIM, more than half reported pain (59.9%, n=97), and the remaining patients were experiencing symptoms related to neuropathy, anxiety, insomnia, wellness, and other.

**Adverse Childhood Experiences (ACE) Questionnaire Scores**

The mean ACE score of the total sample population was 2.14 (SD=2.26). The ACE scores ranged from a minimum score of zero to a maximum score of 10 with a mode of zero. Self-reported ACE questionnaire scores were further divided into two groups (see Table 3). The first group contained self-reported low scores that ranged from zero to three and were comprised of 75.9% (n=123) of the total sample population; the mean ACE score was 1.07 (SD=1.06) and the group included 91 females and 32 males. The second group contained self-reported high scores of four or more and were comprised of 24.1% (n=39) of the total sample population; the mean ACE score was 5.54 (SD=1.56) and the group included 30 females and nine males. Of those that fell into the second high-risk group, 12 patients had an ACE score of four, 10 patients had an ACE score of five, nine patients had an ACE score of six, three patients had an ACE score of seven, three patients had an ACE score of eight, one patient had an ACE score of nine, and one patient had an ACE score of 10. The prevalence of individual ACE abuse categories within the sample population at OCIM is represented in Figure 3. The most frequent ACE abuse category experienced was divorce or separation of parents (n=62, 38.3%) followed by household
substance abuse \((n=52, 32.1\%)\), mental health issues, depression, and suicide \((n=50, 30.9\%)\), and psychological abuse including insults or humiliation \((n=46, 25.4\%)\).

Table 2 represents ACE questionnaire scores of the general population. This table was intentionally incorporated into this scholarly project for comparison between ACE prevalence in the sample population at OCIM and the general population \((n=53,784)\) in the United States as reported by the CDC in the Behavioral Risk Factor Surveillance System Survey (BRFSS) in 2010 (Gilbert et al., 2014). This data was also dichotomized into two groups. The first group contained self-reported low scores between zero and three and were comprised of 85.7\% \((n=46,093)\) of the population. The second group contained self-reported high scores of four or more and were comprised of 14.3\% \((n=7,691)\) of the population. Therefore, it was determined that the relative risk of having a self-reported ACE score of four or more was more likely in the sample population at OCIM than in the general population \((OR=1.64, 95\% CI=1.24, 2.15)\). The relative risk for women was 1.43 \((95\% CI=1.03, 1.97)\) and the relative risk for men was 1.63 \((95\% CI=.92, 2.95)\).

**PROMIS-29 Scores**

The recommended t-score metric for reporting PROMIS-29 scores for both pain interference and anxiety subscales were used to compare population norms for analysis and interpretation of the second research question. Two independent-samples t-tests were conducted to see if a difference existed in the mean pain interference scores and mean anxiety scores depending on the self-reported degree of childhood trauma, which was separated into low ACE scores ranging from zero to three and high ACE scores of four or more.

**Pain Interference Subscale.** The scores from the Pain Interference 4a – Adult v1.0 subscale were translated from the total raw score to a t-score using the appropriate conversion
The t-scores from the first group of patients with a low ACE score between zero to three ranged from 41.6 to 75.6 ($M=63.18$, $SD=8.02$, 95% CI=59.65, 66.71). Participants with a low ACE score had worse pain interference at baseline than the general population when compared to the average t-score metric of the PI subscale ($M=50$, $SD=10$). The t-scores from the second group of patients with a high ACE score of four or more ranged from 52 to 75.6 ($M=64.93$, $SD=6.93$, 95% CI=61.4, 68.46). All participants with a high ACE score had worse pain interference at baseline than the general population when compared to the average t-score metric of the PI subscale ($M=50$, $SD=10$).

Pain interference level was assumed normal as Levene’s Test for Equality of Variances ($p=0.426$) returned a non-significant $p$-value, and no outliers were present. There was not a significant difference in pain interference between the scores for low ACEs, as defined by an ACE score between zero to three ($M=63.18$, $SD=8.02$) and high ACEs, as defined by an ACE score of four or more ($M=64.93$, $SD=6.93$), $t(160) = -1.23$, $p=0.221$) (see Tables 4 and 5). There is not enough statistical evidence to suggest that a high ACE score is associated with higher pain interference in a population of chronic pain patients seeking treatment at an integrative care center.

**Anxiety Subscale.** The scores from the Anxiety 4a – Adult v1.0 subscale were translated from the total raw score to a t-score using the appropriate conversion table (Anxiety Instrument, 2018). The t-scores from the first group of patients with a low ACE between zero to three ranged from 40.3 to 75.4 ($M=56.68$, $SD=9.16$, 95% CI=51.39, 61.97). Participants with a low ACE score had worse anxiety at baseline than the general population when compared to the average t-score metric of the anxiety subscale ($M=50$, $SD=10$). The t-scores from the second group of patients with a high ACE score of four or more ranged from 40.3 to 81.6 ($M=61.77$, $SD=9.46$, 95% CI=56.48, 67.06).
Participants with a high ACE score had worse anxiety at baseline than the general population when compared to the average t-score metric of the anxiety subscale ($M=50, SD=10$).

Anxiety level was assumed normal as Levene’s Test for Equality of Variances ($p=0.794$) returned a non-significant $p$-value, and no outliers were present. There was a significant difference in anxiety between the scores for low ACEs, as defined by an ACE score between zero to three ($M=56.68, SD=9.16$), and high ACEs, as defined by an ACE score of four or more ($M=61.77, SD=9.46$), $t(160) = -3.00, p=0.003$ (see Tables 4 and 5). Therefore, patients with a high ACE score, who also suffer from chronic pain, reported significantly higher baseline anxiety levels than patients with no history of childhood trauma or a low ACE score.

**Discussion**

The purpose of this scholarly project was to consider whether the biopsychosocial dynamics of chronic pain vary in patients seeking integrative care based on their individual history of childhood trauma. This scholarly project included two research questions. The first question compared the history of childhood trauma in the general population to the history of childhood trauma in a sample of patients with chronic pain engaged in integrative care at OCIM. The second question identified whether a history of childhood trauma affected the health-related quality of life, specifically pain interference and anxiety, in this sample of patients.

The relationship between ACEs and adult comorbidities, such as chronic pain syndromes, is well established in the literature (Edwards et al., 2016). While the CDC-Kaiser Permanente ACEs Study originally demonstrated the prevalence of ACEs in the general population and the link to comorbid conditions that are difficult to treat, there have been numerous subsequent studies that have confirmed these statistics nationwide (Felitti et al., 1998; Turner et al., 2017;
Wade et al., 2016). The results of this scholarly project add to existing knowledge to reveal that the probability of finding a social history that includes significant childhood trauma is greater in a population of patients seeking care for chronic pain than in the general population. This finding supports results from a recent meta-analysis in which individuals with a history of psychological trauma, unrelated of the type of trauma, were almost three times more likely to have chronic pain than those with no trauma history (Afari et al, 2014). Graeber et al. (2013) also revealed a higher risk of developing a multitude of physical, psychological, and social health risk consequences with higher ACE scores, regardless of what ACE categories were experienced, which directly impacts the patient’s self-reported HRQoL. Future research should take a more nuanced approach to understanding the potential consequences of ACEs to consider the perceived impact of each ACE category on the individual HRQoL.

HRQoL has become an important measure of patient-reported health and wellbeing in the treatment of chronic conditions. Patients with chronic pain are more likely to suffer from complications of depression or anxiety than people with no pain, and there is a significantly increased likelihood of reporting these psychological symptoms as pain severity intensifies (Burke et al., 2016). Data also shows an inverse relationship between the psychological domain of one’s HRQoL and the patient’s pain severity; the average psychological wellbeing score for both men and women living with severe chronic pain is equivalent to the level of the lowest scoring 10% of people who live pain-free (Jongen et al., 2017). In turn, improvements in depression or anxiety symptoms may improve chronic pain severity and enhance one’s overall HRQoL.

It is common for a patient suffering from chronic pain to consider pain interference as the primary limiting factor that prevents them from engaging in physical and social activities
(Karayannis et al., 2017). Results from this scholarly project found that the average patient in the sample population with a low ACE score between zero to three experienced worse pain interference than the general population, yet all patients with a high ACE score of four or more experienced worse pain interference than the general population. While there was no support for the hypothesis that pain interference would be worse in patients with a history of childhood trauma, this finding can best be explained by the fact that the primary condition that prompted patients to seek care at OCIM was related to chronic pain or a chronic pain syndrome. As pain interference was measured at intake, before there had been any intervention, it is not surprising that there was not a significant difference between the groups. Comparison of sustained pain interference between groups after the initiation of treatment would make for a more interesting finding.

A biopsychosocial approach to chronic pain management serves as a valid alternative to traditional treatment regimens such as a prescription for analgesic medication. It is of the utmost importance that the provider considers more than just a patient’s physical function to grasp the complex, pervasive, multidimensional nature of chronic pain on whole-person health. Specifically, a patient who has a history of childhood trauma may continue to experience poor and compounding health outcomes and worsening pain interference and anxiety if the psychological and social domains of chronic pain are neglected. Negative affect related to chronic pain outcomes, specifically depression and anxiety, are the most commonly evaluated psychological factors in patients suffering from chronic pain. Previous studies have established that chronic pain patients are more likely to struggle from mental health issues, such as depression and anxiety, relative to pain-free controls (Burke, Mathias, & Denson, 2015; Corso et al., 2008; Easton et al., 2017; Howe et al., 2015; Jongen et al., 2017).
Baseline anxiety in the sample population was higher than baseline anxiety in the general population, independent of ACE score and trauma history. Additional analysis supported the hypothesis that patients with a history of childhood trauma had higher baseline anxiety than their peers who did not have a trauma history. The presence of anxiety in the context of chronic pain has important implications for therapeutic strategy and can influence treatment outcomes. Prospective studies propose that premorbid psychological dysfunction actually serves as a risk factor for the development of various chronic pain syndromes (Diatchenko, Fillingim, Smith, & Maixner, 2013; Fillingim et al., 2013; Linton et al., 2011). Research has also established that higher psychological distress levels, including anxiety, were prospectively related to a higher likelihood of transition from acute to chronic pain, with distinct adverse effects on HRQoL, functional impairment, and treatment response (Diatchenko et al., 2013; Kroenke et al., 2013).

The nature of integrative medicine builds on the biomedical model to focus on the interconnected dimensions of chronic pain. In the United States, the CDC has updated guidelines for prescribing opioids for chronic pain to recommend non-opioid therapy as the preferred treatment regimen (Dowell, Haegerich, & Chou, 2016). Recommendations go even further to consider the individualized nature of chronic pain as it pertains to the needs of each patient; clinical decision-making regarding the initiation of opioid therapy should be based on a trusting relationship between the patient and provider. This provides a unique opportunity for chronic pain patients, with or without a history of childhood trauma, to seek patient-centered healthcare through integrative medicine that combines pharmacological and non-pharmacological treatment modalities to reduce pain and pain interference, improve anxiety and depressive symptoms, and enable patient activation, promote engagement and involvement in treatment, and encourage resiliency through essential coping mechanisms.
Implications for Practice

This scholarly project supports the need for a biopsychosocial approach to chronic pain that includes recognition and thoughtful consideration of the effects of childhood trauma on patient health outcomes. Exploring the complex relationship between biological, psychological, and social constructs supports the need for improved chronic pain management through a trauma-informed care model. Education and training for healthcare providers concerning methods to effectively screen for and assess trauma and stress exposure in childhood should be integrated early into clinical curricula as well as offered to current providers through continuing education. Practitioners can incorporate the ACE questionnaire into intake forms that screen all patients for the presence of childhood trauma which would facilitate identification and the potential for early intervention for patients at risk for negative health outcomes related to trauma. Providers should also advocate for the organizational implementation of a trauma-informed care model to improve patient health outcomes.

Strengths, Limitations, and Future Directions

Strengths of this scholarly project included a strong sample size and validated measurement tools. 162 patients were evaluated, and no missing data had to be managed during statistical analysis. The ACE questionnaire and the PROMIS-29 subscales of pain interference and anxiety have been repeatedly tested and supported as valid and reliable measures. Also, few studies have focused on the biopsychosocial dynamics of chronic pain and the effects of a history of childhood trauma on the health-related quality of life of patients suffering with chronic pain. The results of this study demonstrated the importance of screening for ACEs due to the potential lifelong consequences of childhood trauma that can directly impact adult health outcomes, disease management, and longevity.
Several limitations were present in this scholarly project and must be considered when interpreting outcomes. The secondary dataset was compiled through convenience sampling that included retrospective, cross-sectional data. No randomization occurred, and the sociodemographic characteristics of the sample were homogeneous and reflect the experience of patients who were opting into an integrative care model for treatment of their chronic pain. Therefore, results are not generalizable to all individuals living with or seeking treatment for chronic pain. It is important to note that the ACE questionnaire and the PROMIS-29 tool rely on self-report of past experiences and are therefore subject to recall bias, although studies exist that have substantiated the reliability and stability of self-reports of childhood abuse and household dysfunction over time (Dube et al., 2004; Pinto, Correia, & Maia, 2014).

The authors recommend the implementation of the ACE questionnaire as a standard marker at intake for all patients seeking care for chronic pain. A study of this nature has the potential to bolster the call for an integrative, trauma-informed approach to chronic pain management, and there is a need for deeper exploration of the feasibility, effectiveness, and sustainability of an integrative medical approach to chronic pain to promote organizational adoption of a trauma-informed care model (Gardiner et al., 2017).

As the recognition and collection of ACEs becomes more routine in clinical practice, future research should focus on conducting studies that randomize individuals with known childhood trauma to a variety of trauma-informed interventions to help identify which of these modalities are most effective in the treatment of major chronic health conditions that comprise the leading causes of death in adulthood. While a substantial amount of evidence has contributed to a better understanding of the physical nature of chronic pain, more emphasis must be placed on appreciating the psychological dynamics of chronic pain. Individualized integrative medicine
treatment plans have been shown to yield longer-lasting, comprehensive results by addressing pain-related disability and dysfunction, which may only produce a minor decrease in pain intensity ratings, but positively impact an individual’s HRQoL (Sullivan & Ballantyne, 2016).

There is also a need for better understanding the role that social determinants of health play on the physical, psychological, and social health outcomes of individuals with a history of childhood trauma. Modern pediatric research focuses on further developing the very definition of an adverse childhood experience to include community-level stressors such as racism and bullying, living in foster homes, living in unsafe neighborhoods, and witnessing violence and death (Wade, Shea, Rubin, & Wood, 2014). This expanded version is not yet incorporated into the ACE questionnaire, but it seeks to appreciate socioeconomic disparities amongst a racially and socially-diverse population and is supported through cross-sectional surveys of 1,784 inner city adults assessing conventional ACEs, expanded ACEs, and health outcomes (Finkelhor, Shattuck, Turner, & Hamby, 2015; Wade et al., 2016). Additional emphasis should focus on children and adolescents to establish a preventative approach to ACEs to better understand the actual incidence and nature of childhood trauma, which could decrease the difficulty associated with recall bias in ACEs research (Nelson, Raishevich Cunningham, & Kashikar-Zuck, 2017).

**Conclusion**

Existing research indicates that the physical, psychological, and social domains of chronic pain have a significant impact on the health-related quality of life of patients with chronic pain (Jongen et al., 2017). When combined with a history of unresolved childhood trauma, these patients can experience worsening health outcomes in adulthood that can increase the likelihood of developing chronic comorbid physical and psychological conditions, high-risk behaviors, social dysfunction and inadaptability, and a significant overall reduction in lifespan.
(Campbell, Walker, & Egede, 2016). Effective assessment and treatment of chronic pain syndromes should include an evaluation of underlying childhood trauma as a standard of care. Doing so routinely may prevent the compounding health consequences and social costs of poorly managed pain in patients who have already suffered the short- and long-term health impacts of their unresolved trauma. The biopsychosocial approach that is central to integrative medicine presents a unique opportunity for healing the injuries that have caused and complicated the pain and suffering of the mind, body, and spirit.
References


Figures

Figure 1: The Biopsychosocial Model of Pain and Consequences on the Quality of Life (Dueñas et al., 2016).
Figure 2: Comparison of ACE Score Prevalence between the CDC and OCIM.
Figure 3: Prevalence of ACE Abuse Categories at OCIM.
Tables

Table 1: Socioeconomic Characteristics of Secondary Dataset.

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<tr>
<th>Characteristics</th>
<th>Values</th>
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<td>Age in years (mean ± SD)</td>
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<td>Unemployed – looking for work</td>
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<td>Other</td>
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### Annual Household Income ($n$)

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</tr>
<tr>
<td>Prefer not to respond</td>
<td>32</td>
</tr>
</tbody>
</table>

### Primary Health Insurance ($n$)

<table>
<thead>
<tr>
<th>Insurance Type</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medicare</td>
<td>25</td>
</tr>
<tr>
<td>Medicaid</td>
<td>2</td>
</tr>
<tr>
<td>Other Insurance</td>
<td>133</td>
</tr>
<tr>
<td>No insurance</td>
<td>2</td>
</tr>
</tbody>
</table>

### Primary or Main Condition ($n$)

<table>
<thead>
<tr>
<th>Condition</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety</td>
<td>3</td>
</tr>
<tr>
<td>Arthritis</td>
<td>8</td>
</tr>
<tr>
<td>Cancer</td>
<td>1</td>
</tr>
<tr>
<td>Chronic pain</td>
<td>76</td>
</tr>
<tr>
<td>Depression/Bipolar disorder</td>
<td>1</td>
</tr>
<tr>
<td>Fibromyalgia/myofascial pain</td>
<td>19</td>
</tr>
<tr>
<td>Headaches/migraines</td>
<td>21</td>
</tr>
<tr>
<td>Inflammatory bowel disease</td>
<td>1</td>
</tr>
<tr>
<td>Irritable bowel</td>
<td>1</td>
</tr>
<tr>
<td>Neuropathy</td>
<td>7</td>
</tr>
<tr>
<td>Sleeping disorder (other than insomnia)</td>
<td>1</td>
</tr>
<tr>
<td>Smoking cessation</td>
<td>1</td>
</tr>
<tr>
<td>Stress</td>
<td>1</td>
</tr>
<tr>
<td>Wellness visit</td>
<td>1</td>
</tr>
<tr>
<td>Other _______________________</td>
<td>20</td>
</tr>
</tbody>
</table>

### Primary or Main Symptom ($n$)

<table>
<thead>
<tr>
<th>Symptom</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety</td>
<td>9</td>
</tr>
<tr>
<td>Constipation</td>
<td>1</td>
</tr>
<tr>
<td>Depression</td>
<td>1</td>
</tr>
<tr>
<td>Dizziness</td>
<td>1</td>
</tr>
<tr>
<td>Fatigue</td>
<td>11</td>
</tr>
<tr>
<td>Insomnia</td>
<td>2</td>
</tr>
<tr>
<td>Nausea</td>
<td>1</td>
</tr>
<tr>
<td>Neuropathy</td>
<td>10</td>
</tr>
<tr>
<td>Pain</td>
<td>97</td>
</tr>
<tr>
<td>Weight loss</td>
<td>1</td>
</tr>
<tr>
<td>Wellness</td>
<td>4</td>
</tr>
<tr>
<td>Other _______________________</td>
<td>24</td>
</tr>
</tbody>
</table>
Current pain $\geq 4$ that has lasted longer than three months $(n)$

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>137</td>
</tr>
<tr>
<td>No</td>
<td>25</td>
</tr>
</tbody>
</table>

Have you ever experienced any stressors or trauma?

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>119</td>
</tr>
<tr>
<td>No</td>
<td>43</td>
</tr>
</tbody>
</table>
Table 2: Adverse Childhood Experiences (ACE) Questionnaire Scores Reported by the CDC in 2010.

<table>
<thead>
<tr>
<th>Number of ACEs (ACE Score)</th>
<th>Women Percent (n=32,539)</th>
<th>Men Percent (n=21,245)</th>
<th>Total Percent (n=53,784)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>40.0%</td>
<td>41.4%</td>
<td>40.7%</td>
</tr>
<tr>
<td>1</td>
<td>22.4%</td>
<td>24.9%</td>
<td>23.6%</td>
</tr>
<tr>
<td>2</td>
<td>13.4%</td>
<td>13.2%</td>
<td>13.3%</td>
</tr>
<tr>
<td>3</td>
<td>8.0%</td>
<td>8.1%</td>
<td>8.1%</td>
</tr>
<tr>
<td>4+</td>
<td>16.2%</td>
<td>12.4%</td>
<td>14.3%</td>
</tr>
</tbody>
</table>


Table 3: ACE Score Prevalence for the Osher Center for Integrative Medicine (OCIM).

<table>
<thead>
<tr>
<th>Number of ACEs (ACE Score)</th>
<th>Women Percent (n=121, 74.7%)</th>
<th>Men Percent (n=41, 25.3%)</th>
<th>Total Percent (n=162)</th>
<th>Total ACEs of Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>34, 28.1%</td>
<td>14, 34.1%</td>
<td>29.6%</td>
<td>48</td>
</tr>
<tr>
<td>1</td>
<td>28, 23.1%</td>
<td>8, 19.5%</td>
<td>22.2%</td>
<td>36</td>
</tr>
<tr>
<td>2</td>
<td>17, 14.0%</td>
<td>5, 12.2%</td>
<td>13.6%</td>
<td>22</td>
</tr>
<tr>
<td>3</td>
<td>12, 9.9%</td>
<td>5, 12.2%</td>
<td>10.5%</td>
<td>17</td>
</tr>
<tr>
<td>4+</td>
<td>30, 24.8%</td>
<td>9, 22.0%</td>
<td>24.1%</td>
<td>39</td>
</tr>
</tbody>
</table>
Table 4: PROMIS-29 Subscales (Pain Interference and Anxiety) Group Statistics.

<table>
<thead>
<tr>
<th></th>
<th>Pain Interference</th>
<th>Anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group 1: ACE between 0-3</td>
<td>Group 2: ACE of 4 or more</td>
</tr>
<tr>
<td>Mean</td>
<td>63.18</td>
<td>64.93</td>
</tr>
<tr>
<td>SD</td>
<td>± 8.02</td>
<td>± 6.93</td>
</tr>
<tr>
<td>p-value</td>
<td>0.221</td>
<td>0.003*</td>
</tr>
</tbody>
</table>

*Significant at p < 0.05

Table 5: Independent-Samples t-test Output.

<table>
<thead>
<tr>
<th></th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
<th>Mean Difference</th>
<th>95% Confidence Interval (CI) of the Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower</td>
</tr>
<tr>
<td>Pain Interference</td>
<td>-1.229</td>
<td>160</td>
<td>0.221</td>
<td>-1.7561</td>
<td>-4.5782</td>
</tr>
<tr>
<td>Anxiety</td>
<td>-3.000</td>
<td>160</td>
<td>0.003*</td>
<td>-5.0920</td>
<td>-8.4438</td>
</tr>
</tbody>
</table>

*Significant at p < 0.05
Appendices

Appendix A: Sociodemographic Variables.

Record ID: __________
Age: __________
Sex: __________

Ethnicity:
- Not Hispanic or Latino __________
- Hispanic or Latino

Race:
- American Indian or Alaskan Native
- Asian
- Black or African-American
- Native Hawaiian or other Pacific Islander
- White
- Other __________

How much formal education have you received?
- No high school diploma
- High school or Equivalent diploma
- Education beyond high school, but have not completed a bachelor’s degree
- College degree
- Graduate or professional degree

What is your marital status?
- Married -spouse in household
- Married – spouse not in household
- Significant other or Partner
- Widowed
- Divorced
- Separated
- Never married

What is your current employment status?
- Working full-time
- Working part-time
- Not employed due to other responsibilities (e.g. raising children, keeping house, student)
- Retired
- On medical leave or disabled
- Unemployed – looking for work
- Other
What is the annual income of your household?
- Less than $20,000
- $20,000 to $50,000
- $50,000 to $100,000
- $100,000 to $150,000
- More than $150,000
- Prefer not to respond

Which of the following is your primary health insurance?
- Medicare
- Medicaid
- Other insurance
- No insurance

For what PRIMARY or MAIN condition were you seeking treatment at your most recent visit to the integrative medicine clinic?
- Acute Pain
- Allergies/allergic rhinitis
- Anxiety
- Arthritis
- Asthma
- Cancer
- Chronic pain
- COPD
- Depression/Bipolar disorder
- Diabetes/Metabolic syndrome
- Fatigue/chronic fatigue
- Fibromyalgia/Myofascial pain
- GERD
- Headaches/migraines
- Heart disease
- HIV/AIDS
- Hyperlipidemia
- Hypertension
- Infertility
- Inflammatory bowel disease
- Insomnia
- Irritable bowel
- Liver disease
- Menopause/peri-menopause
- Neuropathy
- Skin condition
- Sleeping disorder (other than insomnia)
- Smoking cessation
- Stress
- Stroke
- Substance abuse
- Weight
- Wellness visit
- Other __________

For what PRIMARY or MAIN symptom were you seeking treatment at your most recent visit to the integrative medicine clinic?
- Anorexia
- Anxiety
- Constipation
- Cough
- Depression
- Diarrhea
- Dizziness
- Difficulty concentrating
- Dyspnea (shortness of breath)
- Fatigue
- Insomnia
- Nausea
- Neuropathy
- Pain
- Vomiting
- Weight gain
- Weight loss
- Wellness
- Other __________
Are you currently experiencing any pain that you would rate as 4 or greater on a scale of 0 to 10 (where 0 is no pain and 10 is the worst pain), and that you have had for 3 months or longer?

- Yes
- No

Have you ever experienced any stressors or trauma in your lifetime?

- Yes
- No
Appendix B: Adverse Childhood Experiences (ACE) Questionnaire (Centers for Disease Control and Prevention, Violence Prevention, 2016).

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

1. Did a parent or other adult in the household **often or very often**…
   - Swear at you, insult you, put you down, or humiliate you?
     - or
   - Act in a way that made you afraid that you might be physically hurt?
     *Yes*  *No*  *If yes enter 1 ________*

2. Did a parent or other adult in the household **often or very often**…
   - Push, grab, slap, or throw something at you?
     - or
   - **Ever** hit you so hard that you had marks or were injured?
     *Yes*  *No*  *If yes enter 1 ________*

3. Did an adult or person at least 5 years older than you **ever**…
   - Touch or fondle you or have you touch their body in a sexual way?
     - or
   - Attempt or actually have oral, anal, or vaginal intercourse with you?
     *Yes*  *No*  *If yes enter 1 ________*

4. Did you **often or very often** feel that …
   - No one in your family loved you or thought you were important or special?
     - or
   - Your family didn’t look out for each other, feel close to each other, or support each other?
     *Yes*  *No*  *If yes enter 1 ________*

5. Did you **often or very often** feel that …
   - You didn’t have enough to eat, had to wear dirty clothes, and had no one to protect you?
     - or
   - Your parents were too drunk or high to take care of you or take you to the doctor if you needed it?
     *Yes*  *No*  *If yes enter 1 ________*

6. Were your parents **ever** separated or divorced?
   *Yes*  *No*  *If yes enter 1 ________*
7. Was your mother or stepmother:
   - **Often or very often** pushed, grabbed, slapped, or had something thrown at her?
   - **or**
   - **Sometimes, often, or very often** kicked, bitten, hit with a fist, or hit with something hard?
   - **or**
   - **Ever** repeatedly hit at least a few minutes or threatened with a gun or knife?
   Yes    No    If yes enter 1 ________

8. Did you live with anyone who was a problem drinker or alcoholic or who used street drugs?
   Yes    No    If yes enter 1 ________

9. Was a household member depressed or mentally ill, or did a household member attempt suicide?
   Yes    No    If yes enter 1 ________

10. Did a household member go to prison?
    Yes    No    If yes enter 1 ________

**Now add up your “Yes” answers: _______ This is your ACE Score.**
Appendix C: PROMIS-29 Profile v2.1 – PI and Anxiety subscales (PROMIS Health Organization, 2018).

Please respond to each question or statement by marking one box per row.

<table>
<thead>
<tr>
<th>Anxiety</th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>In the past 7 days…</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EDANX01</td>
<td>I felt fearful</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>EDANX40</td>
<td>I found it hard to focus on anything other than my anxiety</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>EDANX41</td>
<td>My worries overwhelmed me</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>EDANX53</td>
<td>I felt uneasy</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pain Interference</th>
<th>Not at all</th>
<th>A little bit</th>
<th>Somewhat</th>
<th>Quite a bit</th>
<th>Very much</th>
</tr>
</thead>
<tbody>
<tr>
<td>In the past 7 days…</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAININ9</td>
<td>How much did pain interfere with your day to day activities?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>PAININ22</td>
<td>How much did pain interfere with work around the home?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>PAININ31</td>
<td>How much did pain interfere with your ability to participate in social activities?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>PAININ34</td>
<td>How much did pain interfere with your household chores?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>