

A scoping review of the potential relationship between adverse childhood experiences and chronic pain in adulthood.

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Date: 11/11/2022

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Abstract:

In previous years, adverse childhood experiences (ACEs) have been identified as having a potential relationship with poor health outcomes. Chronic pain is one health outcome that has a high prevalence worldwide and the numbers are continuing to grow. Thus, the aim of this scoping review was to review what the current research posited about the potential relationship between ACEs and chronic pain in adulthood. Using a combination of PRISMA-ScR and Arksey and O'Malley's (2005) scoping review frameworks, five databases were searched. Overall, 66 articles were included and further analysed by using a thematic analysis. From this thematic analysis, three themes were identified: there is a potential relationship between ACEs and chronic pain in adulthood; the relationship between ACEs and chronic pain is complex; and there is more that needs to be done to understand the relationship between adverse childhood experiences and adult chronic pain. Depression, anxiety and resilience emerged as mediating factors in the relationship between ACEs and chronic pain but do require further clarification. This scoping review did not identify any relevant studies within a New Zealand/Aotearoa context and recommendations include validating the ACE questionnaire for the New Zealand/Aotearoa population and identifying whether the ACE domains are relevant, and culturally sensitive and appropriate. This scoping review contributes to the understanding of the relationship between ACEs and chronic pain in adulthood in order to develop treatment options which might in turn contribute to reduction in negative health outcomes and an increase in healthcare utilization

Chapter One: Introduction

This chapter will provide a brief overview of adverse childhood experiences (ACEs), the relationship between ACEs and future health outcomes, and the economic cost of ACEs around the world. This will be followed by an overview of chronic pain and finally a brief discussion of the relationship between ACEs and chronic pain.

1.1 Adverse Childhood Experiences and Allostatic Load

Adverse childhood experiences can be defined as events that cause trauma to a child or adolescent (first 18 years of life), often resulting in negative long-term impacts (Boullier & Blair, 2018). Felitti and colleagues (1998) noticed a growing awareness within the medical research field of the association between ACEs and debilitating health outcomes. Allostatic load is a concept which is used to understand the impact of chronic adversity on health behaviours and illnesses. The human body has evolved to work as a smooth-running machine, where certain parts of the brain (for example the amygdala) are stimulated in response to environmental or psychosocial stressors, usually to aid survival. This is called allostasis (Danese & McEwen, 2012). In an ideal situation, the brain will recognise that the environment has become safe again and will return to equilibrium. However, in the case where the environmental or psychosocial stressors are continuous and do not allow the body to return to a relaxed state, the body will be at risk of an allostatic load. Danese & McEwen (2012) draw upon previous research to describe allostatic load as the chronic activation of the nervous, endocrine (hypothalamic-pituitary-adrenal axis), and immune systems. With the combination of environmental stress overload which overwhelms the brain's ability to adapt to these environmental stressors (neural plasticity), physiological changes can occur. This can result in hypersensitivity to similar or the same environmental stimuli and further, increased pain (Kendall-Tackett, Marshall, & Ness, 2003).

1.1.1. Adverse Childhood Experience Study (ACE-S)

The scale and tool to screen for ACEs is the Adverse Childhood Experiences Questionnaire (ACE-Q) which was created to assess the potential of allostatic load due to environmental or psychosocial stressors in the Adverse Childhood Experiences Study (ACE-S; Felitti et al., 1998). The ACE-S took place within the Kaiser Permanente's San Diego Health Appraisal Clinic (United States of America), with 9,508 participants taking part in the survey (Felitti et al., 1998).

The study developed seven domains of adverse experiences and based the ACE-Q off items from the Conflicts Tactics Scale (Straus et al., 1990), Wyatts Sexual History Questionnaire (Wyatt, 1985) and the National Health Interview Survey (Schoenborn, 1988). The domains are physical, emotional and sexual abuse, and household dysfunction which has the sub-domains, substance abuse, mental illness or criminal behaviour within the household, or a mother figure treated violently. Since the original ACE-S study, research and knowledge has developed around ACEs, therefore other domains of divorce or separation, and physical and emotional neglect have been added (Finkelhor et al., 2015).

The study found that the most common ACE was exposure to substance abuse within the household, and the least common was criminal behaviour within the household. This relates back to allostatic load, in that substance abuse is rarely an isolated event, but continuously occurring. Out of the respondents, 52% had experienced more than one ACE and only 6.2% had experienced more than four ACEs. Further the ACE-S found sufficient evidence of a graded relationship between the number of ACEs experienced by a respondent, and health outcomes later in life. It is assumed that the accumulation of ACEs means that they are occurring frequently, rather than one isolated event, again indicating a risk for allostatic load.

1.1.2. Critique of ACE-S

One of the studies that looked at the need for more domains in the screening for ACEs was conducted by Finkelhor et al., (2013), who critiqued the ACE-S for omitting childhood adversities that are known to predict health outcomes. The article interviewed 2030 children in the United States of America, between the ages of 10 and 17 (Finkelhor et al., 2013). After the interviews, the authors were able to discern which of the original domains were not significant and which of the added domains were significant. From this, Finkelhor and colleagues (2013) created a revised scale with an added nine domains and revoking four domains. In a subsequent study the authors used the additional domains of peer victimisation, isolation and peer rejection, community violence, and low socioeconomic status (Finkelhor et al., 2015). It was confirmed that these new domains could predict health outcomes later in life and thus could be classified as ACEs (Finkelhor et al., 2015). These studies highlight the importance to review and update scales and tools in response to new literature and changes in context.

Boullier & Blair (2018) also criticised the ACE-S, as the respondents of the original study were white and college educated, thus the results might not be generalised to other ethnicities and subpopulations. One study, carried out by Cronholm et al. (2015), held focus groups for those living in Philadelphia residences, where at least 20% of the residents lived under or at the federal poverty

line (United States of America). Participants were from homeless youth shelters, after-school and mentoring programmes, health clinics, and community development corporations. The ethnicities included white (38.8%), black (36.1%), Latino (11.4%), Asian (6.2%) and other (7.4%). During these focus groups, participants were asked to describe their top five childhood stressors. The second most common domain the respondents discussed was the effect of community stressors. This included neighbourhood crime, death, violence, negative adult behaviour, and nonviolent crime. Yet community stressors are not a domain for the original ACE-Q. The other identified domains were economic hardship, peer relationships, discrimination, within school environments, health, and less commonly child welfare/juvenile justice and media/technology. The ACE-Q had already covered family relationships and personal victimisation which were also in the top three stressors for this study (Cronholm et al., 2015). This study highlights that majority of the literature is based internationally and biased towards the educated white American. Within New Zealand, there is one current study assessing the prevalence of ACEs in a community population (Walsh et al., 2019).

1.1.3. New Zealand prevalence data

The Growing Up in New Zealand (GUiNZ) study (2019) assessed the prevalence of ACEs in a community population. The participants were assessed at four and a half years of age (n = 5562) by looking at the ACEs of substance abuse in the home, violence towards mother figure, parental depression, criminal conviction of parent, parental divorce, or physical or emotional abuse (sexual abuse was left out of the GUiNZ data collection; Walsh et al., 2019). Consistent with the Felitti et al. (1998) study, by the four-and-a-half-year data collection, more than half of the participants had experienced at least one ACE, which mainly consisted of either physical or emotional abuse. The GUiNZ is considered to be generalisable to the New Zealand/Aotearoa population, with representative samples from both urban and rural living areas, different income levels, ethnicity and genders (Morton et al., 2012), though it was recommended for further testing of subgroups within New Zealand/Aotearoa populations (Walsh et al., 2019).

1.1.4. ACEs and Health Outcomes

In addition to research focused on defining ACEs and establishing prevalence, there is also research exploring the potential relationship between ACEs and health outcomes. Health outcomes refer to negative chronic health conditions, such as chronic pain; behaviours causing risk to health, such as smoking; disruptions in development, such as homelessness; and lastly an increase in accessing primary health care (Kalmakis & Chandler, 2015). The findings of studies in the area are at times contradictory, this may be explained by researchers using different measurements or tools for

ACEs. Kendall-Tackett et al. (2003) claimed that experiencing a traumatic event in childhood does not increase the risk of chronic pain symptoms. In their study, they found that there was no significant difference in health outcomes between those who experienced trauma in childhood compared to those who experienced it in adulthood. The findings are underpinned by the notion that the child's brain is still extremely malleable, and it is therefore plausible that the meaning of the experience can change or even be forgotten (Kendall-Tackett et al., 2003). However, Danese & McEwen (2012) stated that during childhood, the chronic activation of the nervous, endocrine (hypothalamic-pituitary-adrenal axis), and immune systems can prove to be more detrimental as the stressors can have longer lasting effects due to the sensitivity of the developmental stage.

Kalmakis and Chandler (2015) systematically reviewed 41 studies to assess the association between ACEs and health outcomes, such as physical, psychiatric, health risk behaviours, developmental disruption, and healthcare utilisation. All studies that were reviewed showed significant associations. However, only one of these articles included chronic medical conditions (Greenfield & Marks, 2009). Kalmakis & Chandler confirm, with their review, that the more ACEs a child is exposed to, the greater the impact is on their health. Although the reviewed studies did not indicate if some ACE domains were more severe in their impact than others, certain domains may have more of an association with certain health outcomes. A few of the studies also indicated that the timing of the ACEs was important and would lead to different consequences if they occurred at different developmental stages, for example early childhood versus adolescence (Kalmakis & Chandler, 2015).

The argument of whether ACEs affect health outcomes based on the specific domain or the cumulative impact is still contested today (Giano et al., 2020; Negriff, 2020). This current project aims to systematically review evidence that ACEs have a potential relationship with health outcomes later in life.

1.1.5 ACEs and Health Care Utilisation

With an increase in negative health outcomes, it can be expected that an increase in the use of health care services such as outpatient care, hospitalization and surgeries would occur. A longitudinal study carried out in Australia (n = 608,540) found that children who had been involved with Child Protection Services, specifically those who had experienced out-of-home care, had the highest number of hospitalisations for every age (Gnanamanickama et al., 2020). Gnanamanickama and colleagues (2020) also noted that mental health, injury, and negative drug use were common causes for these hospitalisations. Not only does ACEs influence an increase in hospital visits but can impact the rate of success in surgeries. One previous study found that those who had experienced

more than three types of abuse (e.g., emotional, sexual, physical, parental substance abuse and abandonment) had an increased failure rate in lumbar surgery, compared to those who had experienced less than three traumas (Schofferman et al., 1992). Every year the physical health care system places pressure on the economy (Barlow, Durand & Hofmann, 2020), from hospitalisations for injuries, or illness compensation packages. In one systematic review, Bellis et al. (2019) found that within North America and Europe, over \$1 trillion (US\$748 billion and US\$581 billion respectively) is being spent on health care that can be linked back to ACEs. These studies highlight the long-term economic impact the potential ACEs and health outcomes relationship can have.

1.2 Pain and Chronic Pain

One of the most common health outcomes that is impacting the health care system and thus the economy, is chronic pain (Wilson et al., 2015; Duenas et al., 2016; Ministry of Health, 2021). There are three types of chronic pain under the International Association of the Study of Pain (IASP). Nociceptive, which does not occur from disease or injury and shows no evidence of tissue damage, for example fibromyalgia, irritable bowel syndrome or regional somatic pain. Nociceptive pain involves having an increase in sensory processes and decreased inhibitory pathways (Cohen, Vase & Hooten, 2021). Secondly, neuropathic pain, occurs from disease or injuries impacting the nervous systems, for example spinal cord injury, diabetes, Parkinson's disease, multiple sclerosis, or infections. Lastly, nociceptive pain, which is from tissue damage or the potential of tissue damage, for example bone fractures, cancer, osteoarthritis, postoperative pain or angina (Cohen, Vase & Hooten, 2021).

The experience of pain signals is beneficial to individuals as it offers feedback to the body that there has been a failure of protection from injury and changes are required to make the situation tolerable (Apkarian, 2019). Apkarian (2019) uses this behavioural perspective to define the experience of pain as one of the outcomes of a continuous and conscious evaluation of the environment. He adds that the nociceptive pain process (as opposed to the neuropathic pain process) is an ongoing assessment of pain signals as a result of injury and aids in the control of behaviour to protect the human body from adverse environments (Apkarian, 2019).

The experience of pain is considered chronic when it is incessant, present for more than three months (Treede et al., 2015), when treatments no longer reduce the pain, and it results in pain behaviours, such as changing body posture or avoiding activities (Barlow, Durand & Hofmann, 2020). It is also considered chronic when it no longer benefits the feedback process (Cohen, Vase & Hooten, 2021; Apkarian, 2019).

1.2.1 Prevalence

Chronic pain has a higher prevalence in women, older individuals, those from lower socioeconomic backgrounds (Mills et al., 2019), military veterans and those living in rural areas (Cohen, Vase & Hooten, 2021). Research gives mixed answers to which ethnicities have the highest prevalence, with some stating that non-Hispanic white people have higher prevalence (Dahlhamer et al., 2016), and others stating indigenous and ethnic minorities having higher prevalence (Cohen, Vase & Hooten, 2021). The prevalence of chronic pain in New Zealand/Aotearoa has steadily increased from 2011 (Ministry of Health, 2021). In the most recent national health survey (2020/21), the Ministry of Health reported that 19.7% of adult service users had experienced some form of chronic pain. Within this group, the 75+ age bracket had the highest percentage of those who experienced chronic pain (31.6%), and females experienced chronic pain more than males in every age group. Māori and European/Other ethnicities had the highest percentages, with only 1.9% difference between them (23.2% and 21.3% respectively). Again, females had higher percentages within each ethnicity group, except Pasifika males (19.8%) who experienced more chronic pain than Pasifika females (17.1%). The final important subgroup showed those living in more deprived areas experienced chronic pain to a greater extent (23.9%), again with females being the highest percentage within each of the five quintiles (Ministry of Health, 2021). Higher prevalence rates in certain groups may be related to differences in cultural understanding of chronic pain and sensitivity to pain, and further reduced access to quality health care (Cohen, Vase & Hooten, 2021).

1.3. Relationship Between Adverse Childhood Experiences and Chronic Pain

Research focused on the potential relationship between ACEs and adulthood chronic pain has found mixed results with some studies providing support for such a relationship while others reported the opposite.

The studies that support a relationship between ACE and chronic pain include Nelson et al. (2017), which indicate that children who have experienced ACEs are 21% more likely to go through a chronic medical illness, such as chronic pain. A second finding (in the 2017 study) indicated that children who experience chronic pain are more likely to report a higher number of ACEs (Nelson et al., 2017), which further adds evidence to the development of allostatic load. Nelson et al. (2019) also found that approximately 59% of the cohort (n=305) had experienced at least one ACE and of this population 21% had experienced more than two ACEs (Nelson et al., 2019). However, this was lower than a previous study which reported 80% of children had experienced more than one ACE (Nelson et al., 2018). A more recent study on a national (United States of America) sample of

children (n=48,567) had parents reporting 49.8% of the children had experienced at least one ACE, and 8.2% of the children had experienced chronic pain (Groenewald, Murray & Palermo, 2020). When the ACEs and chronic pain data was combined, the children who had experienced at least one ACE had a chronic pain prevalence of 8.7%. Further, those who were reported to have experienced more than four ACEs had a chronic pain prevalence of 18.4%. (Groenewald et al., 2020). This study provides evidence for the graded relationship Felitti et al. (1998) posited. These four studies (Nelson et al., 2017; Nelson et al., 2018; Nelson et al., 2019; and Groenewald et al., 2020) indicate the high prevalence of ACEs within children experiencing chronic pain. As the articles do not assess chronic pain in adults, it is possible to hypothesise that the relationship between ACE and chronic pain might also be applicable to adults experiencing chronic pain. This scoping review would review the evidence for this.

A narrative review by Mills et al. (2019) examined the epidemiology and associated factors in relation to chronic pain in adulthood. The authors found evidence that experiencing ACEs increased the risk of experiencing chronic pain in adulthood. Additionally, Mills and colleagues (2019) briefly mentioned regardless of age, if an individual experienced violence or abuse (public or domestic), they were more likely to experience chronic pain. This again highlights the potential of allostatic load in the aetiology of chronic pain. However, this review was not focused on the specific relationship between ACEs and adulthood chronic pain, therefore only a fraction of studies provided evidence to this theory.

Other studies did not find evidence for a relationship between ACE and chronic pain. For example, Raphael et al. (2001) used prospective reports of childhood victimisation and followed the children into young adulthood, to then assess pain levels. Prospective reports of ACEs, refers to identifying participants levels of ACEs through documented reports, either through court records (Raphael et al., 2001), CPS records (Jones et al., 2009) or interviews with children (van Tilburg et al., 2010). Often these studies are longitudinal, which are considered the ideal method to assess this relationship as it can provide a valid causal relationship, whereas retrospective methods are susceptible to recall bias (Raphael et al., 2001). Raphael and colleagues (2001) did not find a significant relationship between prospective reports of childhood abuse or neglect and pain in young adulthood. As Raphael and colleague's (2001) study was written over 20 years ago, a scoping review may uncover further evidence of prospective studies showing (or not showing) a relationship between ACEs and chronic pain in adulthood.

In summary, literature has shown the potential for a relationship between chronic pain and ACEs. However, gaps emerged, for example a lack of longitudinal prospective studies which would add to the evidence for a causal relationship; the emergence of studies discussing chronic pain in childhood,

with relation to ACEs, may lead to less research in adults with chronic pain; and there is currently no known review that focused on ACEs and chronic pain in adults specifically.

1.4. Objective

The objective of this proposed scoping literature review is to identify and summarise the recent literature on a potential relationship between ACEs and the experience of chronic pain in adulthood. Further, any gaps that may exist in this area of study will be identified. Based upon the preliminary review of the literature, it is recognised chronic pain is increasing throughout New Zealand/Aotearoa communities and there is growing recognition of the impact ACEs have on physical health outcomes. Therefore, it is hoped that this review will provide an appraisal and synthesis of the research in this area in order to highlight the current knowledge base, alongside areas for further research in understanding the relationship between ACEs and chronic pain.

Chapter Two: Method Design

A scoping review was chosen to draw upon previous research in a critical manner, thus providing an overview of the volume of current knowledge around the research question and any areas that require more research. A scoping review allows the question to remain broad, for more specific questions to arise from the findings (Munn et al., 2018). Another strength of a scoping review is that it includes expansive study designs rather than only using empirical research. This broadens the range of literature produced, therefore highlighting different types of methods used in the field (Munn et al., 2018). Lastly, scoping reviews are not used to critique the available literature, thus providing an unbiased summary (Pham et al. 2014). From this scoping review, conclusions can be made about key concepts, which may influence more research to take place (Arksey & O'Malley, 2007).

2.1. Framework

This scoping review has been written in accordance with the five-stage methodological framework for scoping reviews outlined by Arksey and O'Malley (2005) and the Preferred Reporting Items for Systematic Reviews and Meta-analysis extension for scoping reviews (PRISMA-ScR) statement (Tricco et al., 2018).

The PRISMA-ScR statement was used to report the findings of this review. This allowed for consistency with other scoping reviews and to create structure for reporting the methods, results, and discussion, thus adding to the quality and transparency of how the scoping review was conducted and reported (Tricco et al., 2018). The checklist was also beneficial for time management.

The method used for this scoping review was based on the framework developed by Arksey & O'Malley (2007) which included the following five steps:

1. Identifying the research question was an important step as it guided the search of the studies, specifically, identifying the key words that were used for the search. The question also gave context to the key words, so that in the next step the search was narrowed to the most relevant studies. Further, an important sub-step of identifying the research question was defining the key words. Again, this allowed the search to be further narrowed. As the point of this scoping review was to summarise current literature and identify existing gaps, it was important the definitions were broad to find the gaps but still specific to use relevant literature when answering the question (Arksey & O'Malley, 2007).
2. Identifying relevant studies entailed distinguishing which databases were used and the limits which were added to the search. This involved an initial search to gauge whether the database

will produce enough studies for the real search. The date and the language of the literature were the main limits added to the searches, as they set the basis of literature coverage.

3. To select the most relevant studies, Arksey & O'Malley (2007) discuss the importance of defining the key words before the search, that way irrelevant studies are efficiently screened out. As mentioned, this was done in the first step. Further, the authors discuss their use of inclusion and exclusion criteria and how they developed this criterion after becoming familiar with the literature. These criteria were developed with clinical thresholds and the ACE-S in mind and discussed further in chapter 2.2 and 2.3.
4. Data was then charted, specifically important methods, results, and conclusions. Important methods were added as the Arksey & O'Malley (2007) reasoned that it gave the results context. This step also helped in familiarisation of the articles.
5. Collating, summarising and reporting the results was the final step in the framework. This is a critical step, as there are often many studies to present in a clear format. Arksey & O'Malley (2007) state that they found the best way to present the studies was in tables and charts, which allowed for gaps in the literature to be shown. The PRISMA-ScR was used in combination with this method, by using the checklist to guide which specific points needed to be discussed (Tricco et al., 2018). Clarke and Braun's (2012) framework for a thematic analysis was used to help summarise the findings, by identifying common themes within the reviewed articles.

2.2 Eligibility Criteria

Eligibility criteria was created using the Participants, Interventions, Comparisons, Outcomes and Study Design (PICOS) framework of the Joanna Briggs Institute (Aromataris & Munn, 2017). In defining the inclusion and exclusion criteria, the following parameters were set:

The eligibility criteria included only articles that are peer reviewed, published from 2012 to 2022, open access, and written in English. This is to ensure that the most current and accurate literature is used and limits the articles due to the timeframe this review had to be finished within. For the purpose of the search, chronic pain was defined as any pain condition that lasted longer than three months. The majority of studies often explicitly stated the pain was chronic. ACEs were based off the domains currently listed and defined on the Center for Disease Control website (National Center for Injury Prevention and Control, Division of Violence Prevention, 2021). As mentioned by Arksey & O'Malley (2007), the criterion was developed post hoc as more knowledge was gained around the subject, and familiarity was developed with the articles being produced. For example, articles that discussed childhood trauma or maltreatment and used measurement tools other than the ACE-Q,

such as the childhood trauma questionnaire (CTQ; Bernstein & Fink, 1998), were included if the study's criterion was the same or similar to the ACEs criteria

2.3 Information Sources

To identify relevant studies, a systematic search was done, using CINHAL, Medline, Ovid Emcare, PsychInfo, and Scopus databases. The databases had to be available to access with an Auckland University of Technology (AUT) login. The information sources were from databases that covered the eligibility criteria. The most recent search was carried out on July 28th, 2022.

2.4 Search terms

An advanced search used the keywords:

- "Chronic pain" or "fibromyalgia" or "widespread pain" or "irritable bowel syndrome" or "IBS" or "CWP" or "neuropathic pain" or "nociceptive pain" or "nociplastic pain" AND
- "Adverse childhood experiences" or "child maltreatment" or "child* trauma*" or "childhood sexual abuse" or "ACE" or "childhood physical abuse" or "household dysfunction"

2.5. Study Selection

A shortlist was made by screening the titles and abstracts. The criteria required the articles to indicate the research was exploring the relationship, by using chronic pain and ACEs measures. The second and third requirements were the chronic pain had to be experienced in adulthood, and the adverse experience had occurred in childhood. From here, the articles were downloaded to EndNote for ease of access. A full text screen was then conducted for each article to cross-check against the exclusion criteria and ensure the most appropriate articles were included.

2.6. Data charting and Thematic Analysis

Once the studies were selected, they were entered onto an Excel spreadsheet. The general information included on the spreadsheet was the author(s), year of publication, location of study, relevant results, methods, the measurement tools employed, average age and ethnicity of the study participants, and the author's recommendations.

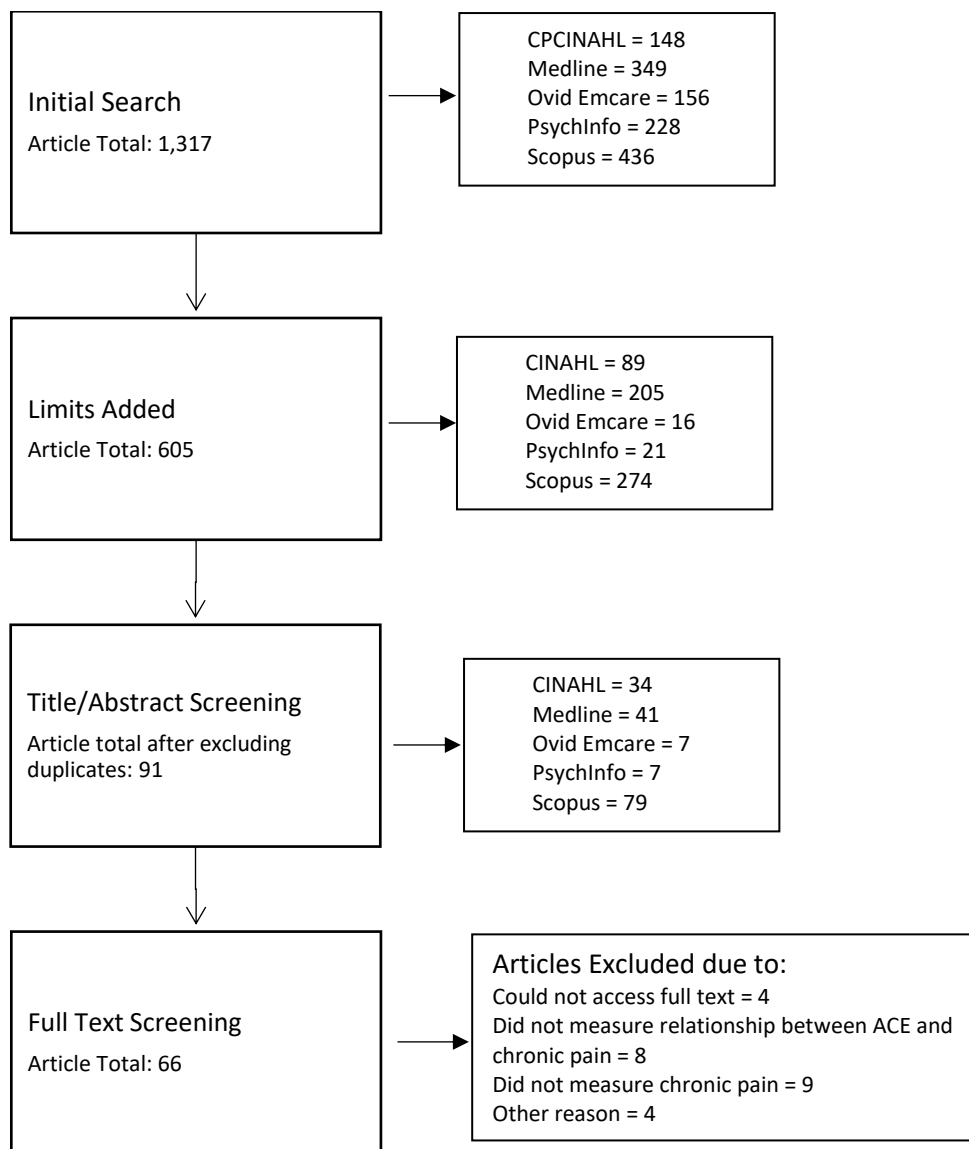


Figure 1: Flow diagram showing the search strategy and the number of articles included after each step.

A thematic analysis (TA) was used to systematically identify patterns between the data (Braun & Clarke, 2012). The TA was from a deductive approach, as a research question had been posed. Further, a theoretical approach was used, as there is background information from the ACE-S (Felitti et al., 1998) that indicated a graded relationship between ACEs and chronic diseases, thus chronic pain, and this informed the research question. It was also the main theme searched for in the literature. This was done by six steps of:

1. Familiarisation of data, where each of the articles were read in full and the main information was tabled, as mentioned above.
2. Codes were created that represented features within the text that were believed to partially answer the research question. Examples of codes used are, *article provided a significant*

association; article claimed an association, but it was not significant; article did not have a significant association. Overall, 26 descriptive codes were created. Text, within the article, that was relevant to the codes were highlighted in representative colours for clarity.

3. Themes were generated by collation of codes (Figure 2). To aid this process, article codes were compiled and additionally compared to see if any overlapped, thus the codes could be combined to help identify themes.
4. Themes were reviewed against data to assess accuracy. This involved going back to the initial table with general information and frequently going back to the articles to continually cross-check the themes.
5. Definitions of themes were refined (Figures 3 and 4). This required setting the boundaries of the themes. This was to ensure that while the main themes related to each other, they remained independent.
6. Writing the findings with Braun and Clarke (2006) as a guide was a reminder to allow the themes to tell a story of what the current literature was demonstrating.
(Braun & Clarke, 2006)

2.7 Quality and Rigour

To ensure the thematic analysis and reporting methods were kept to a high standard, reliability and validity steps were taken. In this section reliability and validity methods will be discussed, as they are imperative to create trustworthy findings (Roberts & Priest, 2006).

2.7.1 Reliability

Reliability refers to the reproducibility of the results if the same methods were to be used over time (Chetwynd, 2022). To increase the reliability of this scoping review the PRISMA-ScR checklist and Arksey and O'Malley (2005) framework were followed and documented in detail. This documentation allows for other researchers to follow the same methods to replicate the study and compare the results. Braun and Clarke's (2006) TA process were also followed and clearly stated for replication. These three frameworks have also been replicated by many other scoping reviews and are considered reliable when applied with rigour (Chetwynd, 2022).

Interterm consistency refers to the consistency of results between different articles (Fitzner, 2007), and was used to assess the strength of the relationship between ACEs and chronic pain. The more articles that provided evidence for a potential relationship, the stronger the relationship was deemed. This was supported by the authors reporting statistically significant data, most often the

difference in reporting chronic pain between those who had reported ACEs and those who had not reported ACEs.

2.7.2 Validity

Validity refers to whether the measurement scale is measuring what it is meant to measure (Bannigan & Watson, 2009; Burton et al., 2018). For example, in this study, inclusion and exclusion criteria were set, based on a pilot search, and previously read literature. This ensured that the articles that were being reviewed were the most appropriate articles to answer the research question. This is a form of content validity and is a minimum requirement for accepting a study's results (Bannigan & Watson, 2009). Defining the key words within the research question was another important step, as it reduced the ambiguity of the words (Weber, 1990).

Regarding the reviewed articles, predictive validity is an important element to answering the research question. The ideal method to measure this would have been longitudinal studies that used prospective reports of ACEs. This would allow the researchers to predict a likelihood for those who had experienced ACEs to then experience chronic pain in adulthood, thus finding a strong relationship. In turn, this prediction can be transferred into more research and eventually real-life situations (Weber, 1990).

2.8 Risk of Bias

Finally, the risk of bias in the scoping review will be discussed. This includes acknowledgement of the lack of critical appraisal of individual sources of evidence and further, reflexivity will be discussed, to provide an overview of the researcher's positionality and how reflexivity was maintained throughout the research process (Finlay, 2002).

2.8.1 Critical Appraisal

The PRISMA-ScR checklist includes a step to carry out a critical appraisal of individual sources of evidence, this was not done for this scoping review. Critical appraisals are often used to assess the internal validity of the individual article providing the data, and the conclusions the author makes of that data (MacDermid et al., 2009). As this scoping review's aim was to summarise the available literature and find any gaps (Arksey and O'Malley, 2007), assessing the validity was not a priority. However, to reduce the risk of bias, only peer-reviewed articles were included; any confounding factors to the relationship were noted (mediators); and the method design of the studies were documented, this included whether the participants were from a community or clinical setting, therefore acknowledging whom the conclusion of the data was relevant to. If this study were to be

replicated in the future, it would be recommended to carry out this method to retain trustworthiness of the findings, not only in the reviewed articles but in this scoping review also.

2.8.2 Reflexivity

In an attempt to reduce bias as much as possible, this final section will discuss how my positionality plays into the current study. Finlay (1998) defines reflexivity as a critical self-reflection and evaluation of our subjective responses and research methods. Further, the author states that acknowledging your own subjectivity adds to the validity of the research.

I developed an interest in how early life experiences can impact one's behaviour and cognition through a five-day intensive group therapy and after reading Bessel van der Kolk's renowned book *The Body Keeps the Score* (2014).

Growing up, pain seemed to be something that was always in the background, present but never making a sound. As I became older, it seemed a normal thing to complain about, that it was just a part of ageing. There were ailments within my direct family, and I have recurrent pain symptoms. Within my family in law, there were more ailments again. Yet, I and those around me would never make a connection between what happened early in life and the pain we were suffering today. Therefore, it was important for me to keep an open mind while reading the articles. Though I was aware of my own experience, it did not mean that it was the truth for everyone. Here, I was able to use an interpretivist paradigm to remove any bias but acknowledge that I could not separate myself from the findings.

Part of the deductive TA process involves using current knowledge of theories to shape the research question. However, this knowledge mainly came from literature, rather than from my own experiences. Using the coding method within TA allowed me to bracket my own experience and stay present to the texts I was reviewing, as I was only highlighting features of the text and not looking into depth of what the features of the text meant. Further, if I found something that I thought was interesting but not relevant, specifically if it felt relevant to me but not the research question, it was highlighted in a unique colour. This step in the process required constant reflection of not only the research question but my positionality also. Additionally, I had to actively turn away from any of my presumptions. As mentioned by Finlay (1998), this allowed me to approach each article genuinely. Finally, once the themes had been identified, it was important to reflect on what the results meant to me personally. However, I was careful to not let the findings dictate how I would perceive my own or other's journeys with developing and coping with chronic pain.

Finally, I would like to acknowledge the three principles of Te Tiriti o Waitangi (The Treaty of Waitangi), partnership, participation, and protection (Hudson & Russell, 2009). During the period of

carrying out this study there was no need to directly address these principles. However, the protection of tangata whenua (people of New Zealand/Aotearoa) always sat close to my reflections of the findings. Specifically, are the ACE rates within the Māori population significantly higher, as a result of continual systematic oppression through post-colonialism. Further, what health outcomes, such as chronic pain, can be related back to ACEs?

Chapter Three: Results

The following chapter gives an overview of the reviewed articles, including a summary of the reviewed articles results in table form, and a discussion of the themes identified in the thematic analysis. These themes include “there is a potential relationship between ACEs and chronic pain in adulthood”, “the ACE and chronic pain relationship is complex”, and finally “there is more that needs to be done”. This is followed by a synthesis of results.

3.1 Selection of Sources

Figure 1 in the previous chapter provides a flow chart of the number of articles found at each stage and within each database. After the title and abstract screening, 168 articles were identified as being potentially suitable. These were downloaded onto EndNote, where 77 duplicates were removed. After the full text screening 66 articles remained. Four articles were removed as they could not be accessed either in full text or in English. Eight articles were removed because the authors did not discuss a relationship between chronic pain and ACEs. Nine articles were removed because the pain measured was not chronic. One article was removed as it was a proposal for a systematic review, and another two were removed as they were not research articles.

3.2 Characteristics of Sources

For the 66 articles that met the inclusion criteria, the year and location of study, methods, measurement tools and major results were reviewed and analysed to identify themes within the research. Twenty-four studies were conducted in North America (United States of America and Canada), however there was a good spread across the European continent (n = 21). Nine articles were based within the Asian continent also (China, Japan, Turkey, Saudi Arabia, and Israel). It is important to note that no studies were carried out in New Zealand/Aotearoa.

The majority of the studies’ participants were mainly or only females, as females were more likely to suffer from chronic pain conditions. There was a good mix of community and clinical studies, with two articles comparing community and clinical samples. Of the studies that reported ethnicity, the majority of participants were Caucasian. The average age for all the studies was 43.75 years.

Sixty-one studies were quantitative, cross-sectional, and retrospective in nature and one study was a narrative review, one was a systematic review on articles using prospective ACE reports, and three were qualitative studies with a small sample.

3.2.1 Measurement tools

ACE measurement tools. The studies used a range of measurement tools for ACEs. The CTQ (23) and the ACE-Q (five) were the most common tools used. The differences between the tools are, in the ACE-Q it is either a yes or no answer to whether an ACE was experienced, compared to the CTQ which uses a Likert scale (1 = never true, 5 = very often true). The CTQ would provide more context as to how frequent the ACE was experienced. Items that had been isolated and used from other questionnaires were another common method of assessing ACEs. For example, one study used an item from the Battery for Health Improvement 2 (BHI2) to affirm whether participants had been sexually abused as a child (Fishbain et al. 2014). In another study, one isolated item from the Canadian Community Health Survey – Mental Health (CCHS-MH) asked "how many times did an adult force you or attempt to force you into any unwanted sexual activity, by threatening you, holding you down or hurting you in some way?" (p. 737, Fuller-Thomson et al., 2020). A second common method was asking participants in interviews whether they had experienced ACEs. In one semi-structured interview, participants were asked "What were the most memorable events in your life?" (p. 2, Borini et al., 2021). This led to a deep conversation with the participants and gave qualitative data for the study.

Chronic Pain Measurement Tools. The range of measurement tools for chronic pain were much greater than the ACEs measurement tools. This could be due to the range of different chronic pain conditions covered in this scoping review. Isolated questionnaire items were a common measurement tool, especially for general chronic pain (GCP), chronic widespread pain (CWP), and chronic musculoskeletal pain (CMP). For example, one study questionnaire asked, "Have you ever been told by a doctor that you have chronic pain?" (p. 2, Daily et al., 2022). A second example is whether the participants had experienced "chronic neck or back problems, arthritis or rheumatism, frequent or severe headaches, or any other chronic pain over the last 12 months" (p. 4, Fowler et al., 2020).

The American College of Rheumatology criteria (ACR) was one of the most common tools used for fibromyalgia (FM) participants and the three studies that included rheumatoid arthritis (RA) participants. Another common measurement tool for FM and RA participants is the visual analogue scale (VAS).

To measure irritable bowel syndrome (IBS), the Rome III criteria was the most common tool used. Followed by the bowel syndrome questionnaire (BSQ) and the IBS symptom severity survey (IBS-SSS).

Other common measurement tools were the numeric pain scale, which was used for migraines, CWP and CMP. A question during interviews with participants, such as questions from the short form

health survey (Hauser et al., 2019) or “Could you tell me when and how your pain started?” (p. 2, Borini et al., 2021). Lastly, physician diagnosis was a common way to confirm chronic pain diagnosis.

3.2.2 Relationship between ACE and Chronic Pain

Table 1 reports the characteristics of the reviewed articles using the Arksey and O’Malley (2005) framework, which provided evidence for a significant relationship between ACEs and chronic pain in adulthood.

Table 1:

Reviewed articles that claimed a significant relationship between ACEs and chronic pain in adulthood.

Author, Year	Subjects	Results
Achenbach et al., 2022	Clinical FM and MSD patients	ACEs had significant direct effect on MSD ($p < 0.0001$). Also, significantly mediated by leptin levels ($p = 0.0491$).
Alciati et al., 2017	Clinical FM patients	There were no significant differences between FM patients who had MDD and those who didn't have MDD. Authors claimed that this suggested that ACEs are related to FM directly, not through mediation.
Alciati et al., 2021	Clinical FM and RA with SFM patients	PN was independent risk factor for PFM (OR = 5.246). PFM reported significantly higher rates of SA than SFM ($p = 0.005$).
Alsubaie et al., 2022	Clinical IBS patients	Weak, significant correlation between total ACEs score and IBS severity ($r = 0.195$, $p = 0.043$) and abdominal pain ($r = 0.240$, $p = 0.012$).
Bayram & Erol, 2014	Clinical FM and RA patients	EA was significantly higher in FM ($p = 0.014$) and RA ($p = 0.043$) groups than the control group.
Berens et al., 2020	Clinical IBS patients	IBS patients had a significantly higher prevalence of ACEs (OR = 1.33, $p = 0.02$) compared to HCs.
Bradford et al., 2012	Community IBS participants	IBS patients had a significantly higher prevalence of ACEs ($p < 0.001$) compared the HCs.
Craner et al., 2022	Clinical FM, CWP, CBP, and migraine patients	Patients who reported more than 4 ACEs had greater pain ($p = 0.004$) and pain interference ($p < 0.001$).
Daily et al., 2022	Clinical GCP patients	Patients with GCP had an AOR of 1.61 for reporting ACEs ($p \leq 0.01$).
Fowler et al., 2020	Community GCP participants	Those who reported 3 or more ACEs had an AOR of 3.28 ($p < 0.01$).
Fuller-Thomson et al., 2020	Community GCP participants	SA was directly associated with GCP ($b = 0.23$, $p < 0.001$).
Generaal et al., 2016	Community GCP participants	CMP had OR of 1.56 ($p < 0.001$) of experiencing GCP.
Gonzalez et al., 2012	Community CBP and CHM participants	PA had OR of 1.86 ($p < 0.05$) of experiencing CBP/CHM. When comorbid with depression OR was 3.92 ($p < 0.05$).
Gunduz et al., 2018	Clinical FM patients	FM patients reported significantly more ACES ($p < 0.001$) compared to MPS and HCs.
Halland et al., 2014	Clinical IBS patients	IBS patients had an OR of 1.56 ($p = 0.008$) for experiencing general trauma and OR of 1.70 ($p < 0.001$) for EA, compared to controls.
Hellou et al., 2017	Clinical FM and RA patients	FM patients reported significantly more EA ($p = 0.003$), EN ($p = 0.01$) and PN ($p = 0.04$) than RA patients.

Author(s), Year	Method	Results
Johnson et al., 2020	Clinical FM and GCP	SA, PA and neglect were associated with pain severity ($p < 0.01$). PA and neglect were correlated with widespread pain ($p < 0.05$). Only neglect correlated with continuous pain ($p < 0.01$).
Ju et al., 2020	Clinical IBS patients	IBS patients an OR of 1.36 ($p < 0.001$) of experiencing two or more ACEs, compared to healthy controls.
Kascakova et al., 2020	Community vs clinical GCP participants	EA, EN and PN were more common in the community sample with pain and anxiety compared to health controls (all = $p < 0.001$) and community participants with other chronic health conditions (EN and PN = $p < 0.001$; EA = $p < 0.05$). EA, PA, PN, EN were more common in the clinical sample compared to the healthy controls (EA, PA, EN = $p < 0.001$; PN = $p < 0.01$) and community participants with other chronic conditions (EA, PA, EN = $p < 0.001$; PN = $p < 0.01$). EA ($p < 0.01$), EN ($p < 0.01$) and PA ($p < 0.001$) were more common in the clinical sample than the community participants reporting anxiety and pain.
Kizilkurt et al., 2021	Clinical FM patients	FM severity was correlated with EA ($p < 0.05$), PA ($p < 0.01$) and PN ($p < 0.01$). However, after mediation of resilience, PN was indirectly associated with FM severity ($p = 0.006$) and lost significant direct association.
Krantz et al., 2019	Clinical CPP patients	There was a significant association between all ACEs (except mental illness, parental separation or divorce, and incarcerated family member in the household) and CPP ($p < 0.05$).
Liu et al., 2014	Community IBS participants	IBS students reported more ACEs than non-IBS students. However only EN was significantly higher ($p = 0.045$).
Lobo et al., 2022	Community CMP participants	Participants with higher reported ACEs, hippocampal volume and FKBP5rs3800373 genetic risk were associated with more CMP ($p = 0.047$).
Loevinger et al., 2012	Community FM participants	Those who reported more ACEs reported more pain ($p < 0.05$) compared to other groups (positive outlook, dysregulated biology and normal biology).
Macedo et al., 2019	Clinical GCP patients	Those with chronic pain reported more ACEs than the group without pain (OR = 3.75, $p = 0.05$).
McCall-Hosenfeld et al., 2014	Clinical GCP patients	Women who reported more than three ACEs had an OR of 2.8 for experiencing more severe somatic symptoms. OR was not significant in males.
Olivieri et al., 2012	Clinical vs community FM patients	FM patients had significantly higher reports of EA, PA, SA and mental illness in the household ($p < 0.001$).
Oshima et al., 2015	Dyspepsia patients	Un-investigated dyspepsia patients reported more ACEs than HCs ($p < 0.01$). IBS symptoms were more common in dyspepsia patients with ACEs compared to those without ACEs.
Park et al., 2016	Community IBS participants	ACEs were correlated with IBS symptom severity ($p = 0.036$) and abdominal pain ($p = 0.015$). Reporting ACEs had an OR of 2.05 for having IBS, compared to HCs ($p = 0.008$).
Piontek et al., 2021	Clinical CPPS patients	There was a significant association between ACEs and pain intensity ($p = 0.010$).
Poli-Neto et al., 2018	Clinical CPP patients	CPP patients more commonly reported more than 4 ACEs, compared to HCs ($p = 0.02$). EN was the only significant higher ACE within the CPP group, compared to HCs ($p = 0.04$).
Prangnell et al., 2019	Clinical GCP patients	Reporting EA gave a AOR of 1.25 for experiencing chronic pain in people who inject drugs.
Rosenblat et al., 2020	Clinical IBS patients	Reports of SA were associated with increased rates of IBS (OR = 2.63, $p = 0.002$).
Sach-Ericsson et al., 2017	Community mixed CP participants	EA and SA ($p < 0.001$), and parental loss ($p = 0.014$) were related to the number of pain related medical conditions at a 10-year follow-up.

Author(s), Year	Method	Results
Salonsalmi et al., 2022	Community GCP participants	Parental divorce (OR = 1.26) and mental illness (1.24) had a weak association with chronic pain. Substance abuse had an OR of 1.34 for experiencing chronic pain.
Sansone & Sansone, 2015	Review	Eight studies gave evidence for an association between SA and IBS patients; 2 studies giving evidence for association between EA and IBS, 1 study did not; 2 studies gave evidence for association between PA and IBS, 4 studies did not; 1 study gave evidence for association between combined ACEs and IBS, 2 did not.
Semiz et al., 2014	Clinical FM and RA patients	FM patients had significantly higher ACEs than RA patients ($p = 0.018$). ACEs were correlated with FM patients with trauma experiences ($p = 0.01$).
Spiegel et al., 2015	Review	FM, IBS, CPP, CBP, CH all have evidence of a significant association with SA.
Sprang et al., 2020	Community GCP participants	SA and PA had a PRR of 1.56 for experiencing pain limitations.
Stickley et al., 2015	Community CBP participants	PA (OR = 1.88) and SA (OR = 2.84) had higher odds of experiencing CBP. Reporting more than 3 ACEs had an OR of 2.83 for any chronic pain.
Taghian et al., 2021	Clinical GCP patients	Those who reported SA (OR = 2.15) and PA (OR = 2.04) had greater likelihood of experiencing chronic pain (both $p < 0.001$).
Tesarz et al., 2016	Clinical CBP patients	EA ($p = 0.007$) and SA ($p < 0.001$) were both significantly more reported in the CBP patients than those without CBP.
Tidmarsh et al., 2022	Review	Reviewers found that those with ACEs are more likely to experience greater pain intensity, interference and likelihood of having CP.
Varinen et al., 2017	Community FM participants	FM had an OR of 2.15 for experiencing 3-6 ACEs compared to those who experienced none.
Vera Cruz et al., 2022	Clinical FM patients	Using mean decrease accuracy plots, of the top 10 predictors of FM, four are ACEs (mistreatment, abandoned by one parent, parental conflict and sexual abuse (strong association). Mistreatment had an OR of 18.92 ($p < 0.001$).
You et al., 2019	Community GCP, GBP and CHM students	Model 1 gave an OR of 1.22 for ACEs predicting any chronic pain ($p < 0.001$) and OR of 1.31 for ACEs predicting CBP ($p < 0.001$). Model 2 gave an OR of 1.18 for ACEs predicting any chronic pain ($p < 0.05$), and a OR of 1.50 for general trauma predicting any chronic pain ($p < 0.01$)

Note: abbreviations as follows: ACEs = adverse childhood experiences; FM = fibromyalgia; MSD = multisomataform disorder; MDD = major depressive disorder; SFM = secondary fibromyalgia; IBS = irritable bowel syndrome; RA = rheumatoid arthritis; CMP = chronic musculoskeletal pain; CWP = chronic widespread pain; CBP = back pain; GCP = general chronic pain; CPP = chronic pelvic pain; AP = acute pain; CHM = chronic headache/migraines; MPS = myofascial pain syndrome; CPPS = chronic pelvic pain syndrome; CP = chronic pain; CH = chronic headache; SA = sexual abuse; PA = physical abuse; EA = emotional abuse; EN = emotional neglect; PN = physical neglect; OR = odds ratio; AOR = adjusted odds ratio; PRR = prevalence rate ratio; HCs = healthy controls.

Table 2 reports on the reviewed articles that gave mixed results for a relationship between ACEs and chronic pain in adulthood.

Table 2:

Reviewed articles that gave mixed results for a relationship between ACEs and chronic pain in adulthood.

Author, Year	Subjects	Results
Borsini et al., 2014	Narrative review	All papers, bar 2 (Ciccone et al., 2005; van Houdenhove et al., 2001), showed a relationship between ACE and CFS and FM. 2 studies also showed a relationship between ACE and pain symptoms in FM patients (Sigurdardottir & Halldorsdottir, 2013; Walker et al. 1997).
Coppens et al., 2017	Clinical FM and CWP patients	FM/CWP had significantly higher reports of ACEs ($p < 0.006$), compared to FD and achalasia. However, there was no significant association between ACEs and pain in FM/CWP, nor a dose-response relationship between ACEs and FM/CWP pain.
Craner & Lake, 2021	Clinical FM, CWP, BP, and migraine patients	There were higher reports of chronic pain in those who had experienced more than three ACEs, however no statistical significance analysis was reported.
De Roa et al., 2018	Clinical FM and migraine patients	PA was the only domain that had a significant difference between FM and migraines ($p < 0.01$). Chronicity was not included in the migraines criteria, however there was no correlational statistics reported.
Filippon et al., 2013	Clinical FM patients	Regression model showed a significant association between loss of functionality and trauma scores, especially within clients with no depression. Though clients with depression had higher FIQ scores. No correlational statistics were reported.
Kamiya et al., 2016	Community GCP participants	Those who reported SA had OR of 1.23 for experiencing chronic pain all over body. However, after adjusting for depression and anxiety, the association was no longer significant.
Kascakova et al., 2020	Community migraine and GCP participants	ACEs had a direct effect on reporting migraines ($p = 0.010$) but not on other chronic pain conditions. However, after adjusting for adult attachment, ACEs had indirect effect and lost significance for a direct effect on migraine reports.
McKernan et al., 2019	Clinical IC/BPS patients	IC/BPS reported more ACEs than other chronic pain conditions, however it was not significant.
Mehta et al., 2027	Clinical GCP patients	SA had indirect effect on pain disability through psychological distress ($p < 0.05$).
Nacak et al., 2017	Clinical SPD patients	ACEs were significantly higher in SPD patients ($p < 0.05$), however after multiple binary logistic regression analysis, there was no longer a significant association.
Schrepf et al., 2018	Clinical CPP patients	CPP participants reported more ACEs and greater ACE severity, than HCs (both $p < 0.001$). However, the significance was lost after mediation analysis.
Sweeney et al., 2015	Clinical GCP and CHM patients	Those who reported ACEs were more likely to experience chronic pain than those who did not report ACEs ($p < 0.001$). However, after secondary analysis, significance was lost.
Yeung et al., 2016	Community FM participants	EN and PN were associated with less cortisol change over time, which predicts pain in FM ($p < 0.05$). However, SA, PA and EA had no significant association.

Note: abbreviations as follows: ACEs = adverse childhood experiences; FM = fibromyalgia; CFS = chronic fatigue syndrome; FD = functional dyspepsia; CWP = chronic widespread pain; FIQ = fibromyalgia impact questionnaire; IC/BPS = interstitial cystitis, bladder pain syndrome; SPD = somatoform pain disorder; CPP = chronic pelvic pain; HCs = healthy controls; SA = sexual abuse; PA = physical abuse; EA = emotional abuse; EN = emotional neglect; PN = physical neglect; OR = odds ratio.

Table 3 reports the reviewed articles that could not claim a relationship between ACEs and chronic pain in adulthood.

Table 3:

Reviewed articles that could not claim a relationship between ACEs and chronic pain in adulthood.

Author, Year	Subjects	Results
Fishbain et al., 2014	Clinical GCP and AP vs community participants, with and without GCP	SA was not significantly associated with chronic pain in females.
Hauser et al., 2019	Community chronic noncancer pain patients	There was no significant association of any GCP and disabling GCP with any ACE, compared to non-pain controls. There was a large effect between any GCP and disabling GCP with > 65 years of age.
Marin et al., 2021	Systematic Review	Three articles gave low quality evidence for a significant association between maltreatment and pain. However, after adjusting for covariates two of the studies no longer had a significant association. Mixed low-quality evidence for maltreatment types having more of an association than others. Overall, no evident association between pain and maltreatment.
Waller et al., 2016	Clinical FM patients	There was a significant correlation between FIQ scores and PA scores in FM patients. But overall, the data could not support a relationship between self-reported ACEs (specifically PA and SA) on health outcomes. EA had significant correlation with depression scores in FM patients.

Note: abbreviations as follows: ACEs = adverse childhood experiences; FM = fibromyalgia; CWP = chronic widespread pain; CBP = back pain; GCP = general chronic pain; AP = acute pain; SA = sexual abuse; PA = physical abuse; EA = emotional abuse.

Table 4 reports on the three reviewed articles that used a qualitative method design to investigate the relationship between ACEs and chronic pain in adulthood.

Table 4:

Reviewed qualitative articles.

Author, Year	Method	Results
Borini et al., 2021	Unstructured interviews with clinical CMP patients	A qualitative overview of 20 participants lives, describing adverse childhood experiences.
Sigurdardottir & Halldorsdottir, 2013	Semi structured interviews with clinical GCP and FM patients	Seven women, all had experienced SA before the age of 12, from multiple people. All experienced some form of chronic pain (abdominal and pelvic). Six had been diagnosed with FM.
Sigurdardottir & Halldorsdottir, 2018	Clinical single patient, mixed CP	One woman's experience with repeated sexual trauma from a young age to adulthood. Chronic comorbidity with various chronic illnesses (CWP, FM, ovarian pain, CMP in adulthood)

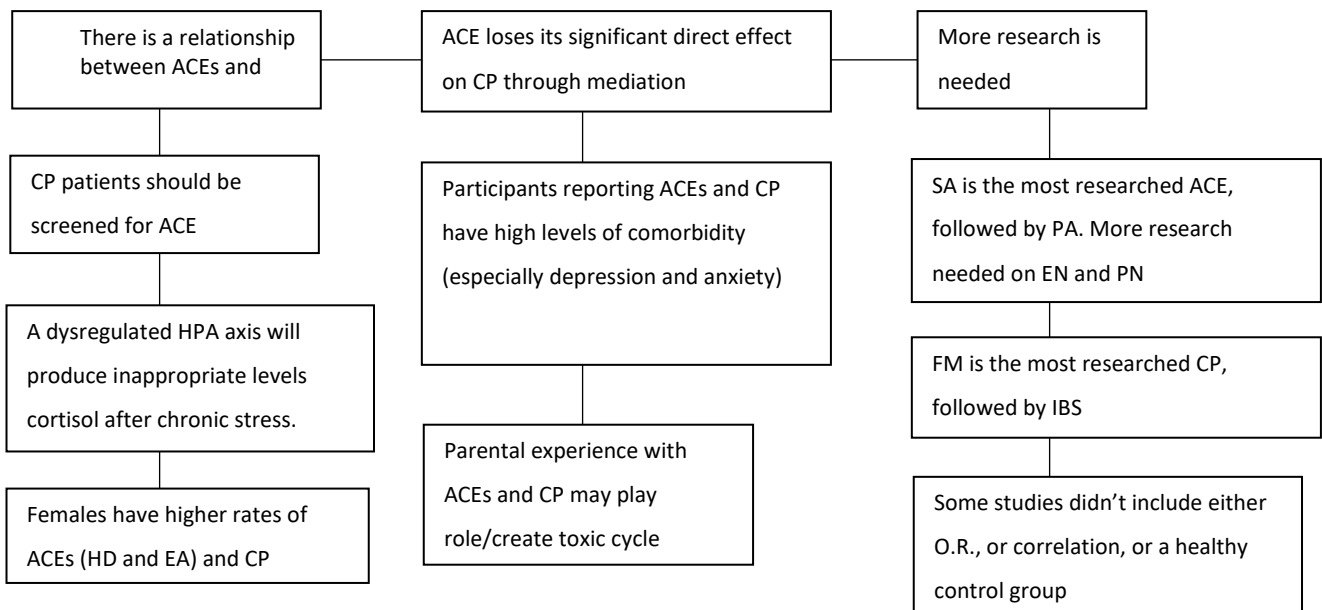
Note: abbreviations as follows: FM = fibromyalgia; CMP = chronic musculoskeletal pain; CWP = chronic widespread pain; GCP = general chronic pain; SA = sexual abuse

3.3 Themes Generated from the Thematic Analysis

After the articles had been full text screened and coded, three themes were identified (Figure 2). The themes were reviewed twice before arriving at the final themes (Figure 3 and 4). The first theme, “there is a potential relationship between ACEs and chronic pain in adulthood”, directly answers the research question and the aim of this scoping reviewing. Two subthemes were also identified (Figure 4). The first subtheme, “the ACE and chronic pain relationship is complex” acknowledges there is not a linear pathway. The second subtheme, “there is more that needs to be done”, gives a direction for future research. This final theme was identified from the suggestions that the authors gave. Due to the complexity of the research topic, it would require professionals from varied backgrounds to work together and develop this body of knowledge. From this development of knowledge, more people who experience chronic pain may find relief from their condition, and a greater goal of reducing a reliance on healthcare could be achieved. Hence the term “more” is used, purposely kept broad in the hope to not limit further suggestions.

Figure 2:

Initial themes identified from the descriptive codes in the thematic analysis.



Note: abbreviations as follows: ACEs = adverse childhood experiences; CP = chronic pain; HPA = hypothalamus-pituitary-adrenal; HD = household dysfunctions; EA = emotional abuse; SA = sexual abuse; PA = physical abuse; EN = emotional neglect; PN = physical neglect; IBS = irritable bowel syndrome; FM = fibromyalgia; OR = odds ratio.

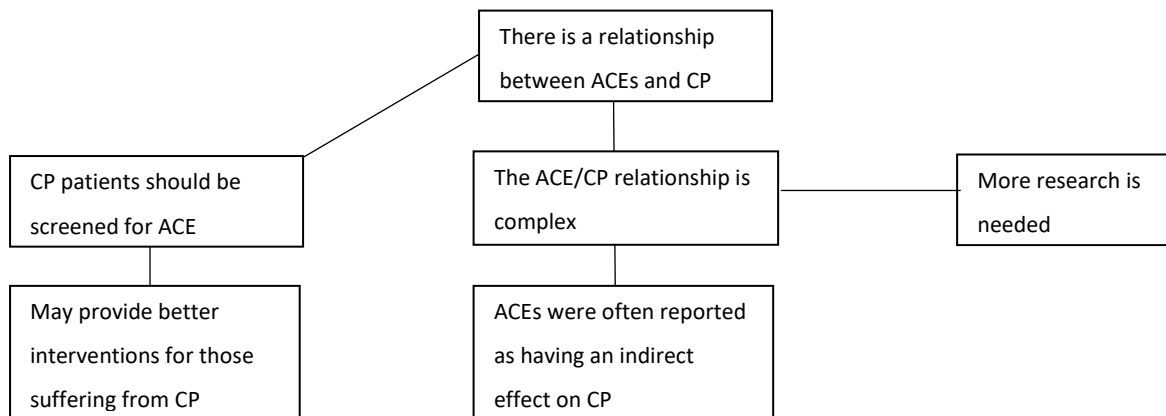
Reviewed articles critiquing ACE and chronic pain relationship. Overall, there were four studies (Table 3), that did not find a statistically significant relationship between ACEs and chronic pain in adulthood. Hauser et al., (2019) found a large effect size for chronic noncancer pain (CNCP) and disabling CNCP participants that were more than 65 years of age. However, when the authors looked at the independent ACEs and the potential relationship with CNCP, there was no statistically significant association. The small effect found in univariate analysis of combined ACEs being associated with CNCP could not be detected after multivariate analysis (Hauser et al., 2019).

A second study looked to affirm rates of sexual abuse in chronic pain and acute pain patients, and community patients with and without pain. Though there were higher numbers of childhood sexual abuse in female patients (both community and clinical), there was no significant difference between patients with pain and those without. Therefore, the authors could not claim a significant association (Fishbain et al., 2014).

The final study, did find a weak correlation between physical abuse and chronic pain but after multivariate analysis the correlation was no longer significant, and the authors concluded their data did not support a relationship between both physical and sexual abuse and FM. Of note however, emotional abuse did significantly correlate with depression in FM patients (Waller et al., 2016).

Figure 3:

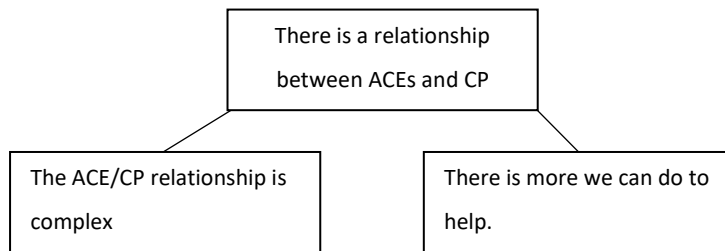
First review and edit of themes.



Note: abbreviations as follows: ACEs = adverse childhood experiences; CP = chronic pain.

Figure 4:

Second and final review of themes.



Note: abbreviations as follows: ACEs = adverse childhood experiences; CP = chronic pain

3.3.1 There is a Potential Relationship Between ACEs and Chronic Pain in Adulthood.

Quantitative studies. Most articles (n = 46) reviewed provided statistically significant evidence for a potential relationship between ACEs and chronic pain in adulthood (Table 1). A range of different chronic pain conditions were studied, including fibromyalgia (FM) or chronic widespread pain (CWP), irritable bowel syndrome (IBS), chronic pelvic pain (CPP), chronic musculoskeletal pain (CMP), multisomatoform disorder (MSD), chronic back pain (CBP), chronic headaches and migraines (CHM), and general chronic pain (GCP). FM (20 articles) was the most studied chronic pain condition within the reviewed articles, followed by GCP (14 articles). Of the 66 articles reviewed, 62 provided an initial significant relationship between ACEs and chronic pain in adulthood. However, of the articles that carried out multivariate analysis, six studies could not support the significant direct association between ACEs and chronic pain (Table 2 and 3). Further, five studies did not find or did not report statistically significant associations, yet still claimed a potential relationship between ACEs and chronic pain (Table 3).

It was suggested by 11 reviewed articles that specific domains would be directly associated with specific chronic pain conditions. However, across all the reviewed articles there was no specific domain that was directly associated with a specific chronic pain condition, more than another domain. Rather each condition had a good spread of each of the domains. For example, FM was directly associated with both emotional abuse and household dysfunction in five articles each, both physical and sexual abuse in four articles each, and both emotional and physical neglect in three articles each. In each of the chronic pain conditions, sexual abuse was one of the highest reported direct associations. However, it was the most researched ACE, with 19 of the reviewed articles reporting on it. Substance abuse in the household was significantly correlated with sexual abuse. A second study adds to this with the results showing that neglect and abuse shared 64% variance, therefore although abuse did not have a significant association with FM, it still may play a role (Yeung et al., 2016). This was also backed up by Sprang et al. (2020), who reported a combination of sexual and physical abuse with adult abuse generated larger odd ratios. These results suggest the

risk for chronic pain increases through the cumulative impact of ACEs, rather than independent direct effect (Nacak et al., 2016).

Qualitative Articles. Three articles were qualitative studies (Table 4). One explored 20 patients' life experiences with ACEs in Sao Paulo, Brazil (Borini et al., 2021). A second study was done with seven women in Iceland, who had all experienced sexual abuse before the age of 12, and by multiple people (Sigurdardottir & Halldorsdottir, 2013). The third was a semi-structured interview with one woman who discussed her experience with sexual abuse from a very young age, again from multiple people (Sigurdardottir & Halldorsdottir, 2018). Each of these 28 participants, all experienced some form of chronic pain in their lifetime and were receiving treatment for it. For example, of the seven women in the Iceland study, six of them had received a diagnosis for FM (Sigurdardottir & Halldorsdottir, 2013). A similarity between the three qualitative articles is a discussion of the role that healthcare professionals have played in the patients' chronic pain experience.

Article Reviews. Five reviews were also included in this scoping review. One article focused on IBS and found there was evidence for a significant relationship between IBS and sexual abuse, however evidence was unclear for emotional and physical abuse (Sansone & Sansone, 2015). A second review found evidence that FM, IBS, CPP, CBP and CHM all have a significant relationship with sexual abuse (Spiegel et al., 2015). A third review found support for those who had experienced ACEs had greater pain intensity, pain interference, and a likelihood of experiencing chronic pain (Tidmarsh et al., 2022). Borsini et al. (2014) found majority of their reviewed articles, except for two, had a significant relationship between ACEs and FM. Conversely, a systematic review carried out by Marin et al. (2021) found mixed results for significant relationships, the data they reviewed was considered to have weak correlations and to be of low-quality. Therefore, the authors concluded there was no sufficient indication for a relationship between ACEs and chronic pain, but rather post-traumatic stress disorder (PTSD) may have more of an influence than the adverse experience itself. Inclusion of the five different reviews meant that there was more literature included in the scoping review. This includes one article that reviewed nine longitudinal studies based on prospective reports of ACEs.

3.3.2 The ACE and Chronic Pain Relationship is Complex.

As mentioned above, there were studies that could not claim a significant direct effect of ACEs on chronic pain after secondary analysis. A range of mediators were the cause, but the main factors included PTSD (Coppens et al., 2017), unemployment (Poli-Neto et al., 2018; Schrepf et al., 2018), cortisol levels (Yeung et al., 2016; Achenbach et al., 2022), anxiety (Park et al., 2016), and depression (Gonzalez et al., 2012; Borsini et al., 2014; Piontek et al., 2021). Two studies however found when

depression symptoms were low, ACEs had a greater influence on chronic pain (Filippon et al., 2013; Sachs-Ericsson et al., 2017). A third article adds to the depression mediation conversation, by discussing the impact of depression in the household. Not only is it included in the ACE domains but is known to be heritable (Piontek et al., 2021). Therefore, it is likely participants who report household dysfunction, specifically mental illness in the household, may also experience both chronic pain and depression in adulthood. This was reiterated by Sachs-Ericsson and colleagues (2017) and Salonsalmi and colleagues (2022). Two articles reported on the adult attachment styles effect on reporting chronic pain. Nacak et al. (2017) found that somatoform pain disorder patients were more likely to have insecure attachment style (OR = 11.20). The second study found that adult attachment mediated the ACE and chronic migraine relationship, in full (Kascakova et al., 2020). Comparatively, confiding in others about ACEs was identified as a protective factor for chronic pain (Ju et al., 2020)

To look for a connection between ACEs and chronic pain, many of the articles referenced the effect of a dysregulated HPA axis or inflammation, which could lead to over sensitisation or a dysregulated central nervous system (Bradford et al., 2012; Mehta et al., 2017; Gunduz et al., 2018;). One of the reviewed articles (Yeung et al., 2016) observed what a dysregulated HPA axis would look like in community FM subjects. Yeung et al. (2016) found when both physical and emotional neglect were modelled as predictors of chronic pain, daytime cortisol levels became plateaued throughout the day, rather than gradually declining, thus showing a dysregulated HPA axis. This further indicated the physical and emotional neglect effect on chronic pain is indirect and partially mediated by daily cortisol levels. As mentioned, it was only a partial mediation, as the relationship was still significant after analysis. However, Yeung et al. (2016) did not find a significant mediated effect when the abuse domains were used as predictors. Achenbach et al. (2022) also supported this hypothesis, with their research finding that there were significantly lower cortisol levels in the group reporting mild amounts of ACEs compared to those that reported no ACEs ($p = 0.032$).

Hellou et al. (2017) also discussed the potential confounding variable of the 2014 Israel-Gaza conflict, which is when participants were being recruited for the study. The authors previously reported the effects this kind of stress can have on the population, such as increased rates of somatic symptoms, similar to FM symptoms and anxiety symptoms. Generaal et al. (2016) also reported in their study that recent life stress had the same significant effect on chronic pain as ACEs.

3.3.3 There is More That Needs to Be Done.

The final theme which was identified in 42 of the reviewed articles was the recommendation that more research was needed to develop the body of knowledge around chronic pain, and further the

understanding of the relationship between ACEs and chronic pain. Several authors suggested further development of their own research projects.

Specific focus areas for further research included the biological and environmental interaction on chronic pain, to understand the pathogenesis of CMP better (Lobo et al., 2022) and the ACE and chronic pain relationship, as this would help to develop prevention and interventions for chronic pain (Halland et al., 2014). Berens et al. (2021) made suggestions for the need of further research on why some people with ACEs have remained healthy and whether that can be correlated with specific coping mechanisms. Another suggestion from Berens and colleagues (2021) was the need for more chronic pain research in males, this was also previously suggested by Bradford and colleagues (2012).

As part of the recommendations for exploring why people respond differently to ACEs, resilience as a protective factor was discussed. One reviewed article found that within the general German adult population, resilience was not a protective factor for experiencing chronic pain (Hauser et al., 2019). In contrast, Kizilkurt et al. (2021) found in their study that resilience did act as a protective factor for those who had reported experiencing ACEs and were now experiencing chronic pain. Two other reviewed articles (Poli-Neto et al., 2018; Tidmarsh et al., 2022) made conclusive statements, based on previous research, that resilience is a protective factor. However, Poli-Neto et al. (2018) highlights that there is a complex interaction between resilience and one's vulnerability to stress. Two other reviewed articles add to this by discussing the negative impact stress has on resilience (Ju et al., 2021; Achenbach et al., 2022).

Finally, five reviewed articles discussed that resilience, in relation to ACEs and chronic pain, would be an area where future research is warranted. Specifically, Krantz et al. (2019) discussed that by identifying the factors that encourage resilience in at-risk populations, treatments can be informed by the new information, which may lead to an improvement in childhood experiences. Sachs-Ericsson et al. (2017) discussed using future studies on resilience to improve and develop psychotherapeutic treatments. The other three studies (Mehta et al., 2017; Fuller-Thomson et al., 2020; Kascakova et al., 2020) only highlighted that it would be an interesting area for future research.

Some methodological recommendations were also identified in the reviewed articles, which included a general call for more research to occur with prospective reports of ACEs (Liu et al., 2014; Marin et al., 2021) and for research to be longitudinal (Alciati et al., 2017; Hauser et al., 2019; Johnson et al., 2020; Alciati et al., 2021). The reports of ACEs were retrospective, thus many of the authors highlighted the limitation of recall bias (Generaal et al., 2016; Fowler et al., 2020). A second methodological recommendation identified in 23 reviewed articles, was to screen chronic pain

patients for ACEs as this would expand treatment options for chronic pain symptoms. One article did raise concerns that screening may cause alienation between the healthcare professional and the patients (Daily et al., 2022) and Gunduz et al. (2018) also raised the issue of screening in outpatient clinics, where the patients may not feel comfortable disclosing ACEs in an unpersonal environment.

3.5 Synthesis of Results

This review has provided an overview of 66 articles published between 2012 and 2022. Overall, they cover a wide range of chronic pain conditions and the majority give evidence to suggest a potential relationship exists between ACEs and chronic pain in adulthood. However, it's a complex pathway, often mediated by other variables such as depression, or minimised due to resilience or confiding with another person. Further, there is still the need for more research, though there is confidence that future research, screening chronic pain patients for ACEs, and psychoeducation will aid in the prevention and treatment of chronic pain.

Chapter Four: Discussion

This chapter will discuss the findings from the thematic analysis. This includes the relevance of the themes identified; the potential gaps that were found in the reviewed literature; and future research recommendations. The limitations of the current scoping review will also be discussed.

4.1 Overview of the results

The aim of this project was to provide a scoping review of literature on the potential relationship between ACEs and chronic pain in adulthood and identify any potential gaps in the literature. The following sections discuss the findings in accordance with these aims.

4.1.1 There Is a Potential Relationship Between ACEs and Chronic Pain in Adulthood.

The findings of this scoping review suggest there is a potential relationship between ACEs and adulthood chronic pain. It is important the term “potential” is used, as all the reviewed studies used retrospective reports of ACEs, rather than prospective reports within longitudinal studies, thus causality could not be confirmed. Additionally, the reviewed articles often reported a lack of a linear association between the ACEs and chronic pain. The non-linear nature of this relationship was attributed to several factors. These factors included allostatic load, which dysregulates the central nervous system or the hypothalamus pituitary adrenal (HPA) axis which puts people at a higher risk of chronic pain due to increased sensitivity to pain (Kendall-Tackett, Marshall, & Ness, 2003). Further, a dysregulated HPA axis was often attributed to mediating factors, including psychological disorders, such as depression (Danese & McEwen, 2012; Gonzalez et al., 2012; Borsini et al., 2014). Another factor which contributes to the non-linear nature of the relationship between ACEs and chronic pain is related to the timing of physical and sexual abuse, which indicates that ACEs in the first five-years of life would put the child at increased risk of a dysregulated HPA axis (Lobo et al., 2022) and in turn increases the risk of experiencing chronic pain in adulthood. This could be due to the more vulnerable state that an infant is in, compared to a child that feels safe enough to go to school on their own (six years and older; Arnett et al., 2020)

Coppens et al. (2017) have suggested that the impact of the ACEs rather than the mere presence of an ACE was a key factor in the relationship between ACE and chronic pain, which highlights the need to understand the impact of cumulation versus severity. To clarify, is one singular event of physical abuse enough to cause dysregulation in the HPA axis or a change in cortisol levels? Or does the ACE need to occur frequently? Allostatic load is based on the chronic activation of nervous, endocrine, and immune systems (Danese & McEwen, 2012). Therefore, it would be assumed that

there needs to be a significant impact from the ACE, whether that means it occurred frequently to not allow the systems to return to normal functioning; or the ACE was severe enough for the systems to stay activated (e.g., sexual abuse). Within this hypothesis, it would also be assumed that the child's level of resilience would determine how much the ACE impacted them.

4.1.2 The Relationship Between ACEs and Chronic Pain in Adulthood is Complex.

Many of the reviewed studies identified mediating variables between ACEs and chronic pain, which highlight the complexity of the relationship. For example, depression was a common mediator (Gonzalez et al., 2012; Kamiya et al., 2016; Krantz et al., 2019; Fuller-Thomson et al., 2020; Ju et al., 2020). This is supported by other articles that found ACEs predicted depression (Amone-P'olak & Letswai, 2020; LeMasters et al., 2021; Satinski et al., 2021), and comparatively chronic pain had a direct association with depression (Munce et al., 2006; Van Hecke et al., 2017; Yin et al., 2021). A hypothesis that relates to how a child would express their emotions, and thus may give further explanation for depression as a mediator. If a child felt grief that their parents were separating, yet they were the eldest child so felt they had to stay strong for the younger siblings, their emotions may be felt somatically (Filippon et al., 2013; Penninx et al., 2013). This may develop into chronic pain in the future. Alternatively, the emotions may be felt psychologically and may result in depressive symptoms (Filippon et al., 2013). To add to this complexity, if one parent experienced depression, there is an increased genetic risk for the child to also experience depression (Wurtman, 2005). Therefore, not only is the child increasing their risk to chronic pain due to genetic predisposition but also due to having an ACE of a mental illness in the household. Additionally, Prangnell et al. (2019) mention that experiencing depression may increase poor coping mechanisms, such as catastrophisation, and thus develop acute pain into chronic pain.

The findings from the scoping review also indicated that part of the complex nature of the relationship was that some ACE domains were more likely to result in the experience of chronic pain than others. Johnson et al. (2020) found that different experiences of abuse and neglect were associated with different pain elements. For example, sexual and physical abuse, and neglect were all associated with pain severity, whereas only physical abuse and neglect were associated with widespread pain, and only neglect was associated with continuous pain. Another example is Piontek et al. (2021). who found that emotional abuse was highly prevalent within their chronic pelvic pain syndrome (CPPS) sample. Therefore, it may be suggested that different ACEs may be felt in different parts of the body. For example, emotional abuse and neglect may be more commonly reported by those who experience IBS due to the microbiota-gut-brain axis, which is commonly dysregulated through the presence of stress (Cryan et al., 2019). From the reviewed articles that mentioned ACE

prevalence, the most common ACE was either household dysfunction, specifically parental loss (death or separation) and substance abuse in the home. This relates back to Felitti et al. (1998) who also found substance abuse within the home to be the most common ACE reported. However, given most of the articles did not use the ACE-Q scale, thus did not include household dysfunction as an ACE, it could be implied that reports of neglect covered the aforementioned household dysfunction subscales. Piontek et al. (2021) also considered the influence of psychological conditions on the development and perpetuation of CPPS, which further led the authors to suggest that ACEs should be screened for in patients who present with CPPS.

Another complexity to the researched relationship is the influence of culture. Oshima et al. (2015) discussed whether some cultures were more susceptible to ACEs than others. This could be expanded to hypothesize that some cultures may experience some ACEs more than others (Kalmakis & Chandler, 2013), through cultural norms of discipline (physical and emotional abuse); systematic bias which may perpetuate household dysfunctions (mental illness and substance abuse in the home, and someone in the home going to jail); or lower socioeconomic communities working long hours, for a small income (emotional and physical neglect). Conversely, some cultures may not express pain as much as others (Lovering, 2006), whether this is due to responsibilities a person has that does not allow them to think of their own ailments, or whether the culture has beneficial coping mechanisms to reduce pain expression. The measurement of this hypothesis could only be done in population studies. Further, only conducting clinical studies may cause bias, as some cultures are not able to access healthcare, particularly healthcare that conducts research, due to high costs, limited places available, or not living within appropriate zones or neighbourhoods. The Ministry of Health (2021) determined that there are higher numbers of those who suffer from chronic pain living in the more deprived neighbourhoods. Yet, Nelson et al. (2019) posited that those with higher levels of ACEs are less likely to engage with healthcare programmes, such as an outpatient rehabilitation treatment. Therefore, if future research was to investigate cultural influences, researchers would need to accommodate for participants who may not have access to quality healthcare, to ensure no bias occurs and does not reduce the chance for specific cultures to participate.

4.1.3 There is More That Needs to be Done.

Through the complex nature of this ACE and chronic pain relationship, it is clear that more research is needed. As mentioned in the findings, the biological and environmental interaction is one specific area of focus that was recommended. Lobo et al. (2022) found that a combination of genetic risk alleles, small hippocampal volume, and ACEs increases the risk for experiencing chronic pain. This would indicate that if a child was to experience an ACE, they could be screened to see whether

they have the genetic risk allele or a small hippocampal volume, and thus chronic pain could be prevented as much as possible. However, it would be important to know whether age has an influence on the risk allele or the hippocampal volume being present at appropriate levels to measure.

Berens et al. (2021) also mentioned focusing future research on why some people have remained healthy after experiencing ACEs. This in turn may highlight positive coping mechanisms that are being used. This information would allow practitioners to use treatments and interventions from a strengths-based framework, which may benefit chronic patients who also experience depressive symptoms or illness anxiety.

A final research area of recommendation is for an increase in male and gender diverse representation. A common conclusion from the reviewed articles was that females were more likely to suffer from both ACEs and chronic pain. However, females were more often overrepresented in studies or the only gender within studies. Therefore, there is a gap in the conclusions that can be made on how the potential relationship relates to males and to those who identify as gender diverse. One study found that those within the LGBTQ+ community, particularly transgender and non-conforming gender, have significantly higher rates of ACEs, with 43% of the respondents reporting four or more ACEs (Craig et al., 2020). This is significantly higher than Felitti et al.'s (1998) study (6.2%) and the reviewed articles that reported this statistic. Two of the qualitative articles only interviewed women and the third qualitative article had a prevalence of 85% for female participants (Borini et al., 2021). Again, this highlights the overrepresentation of women in these studies. One theory for the lack of representation of males in these ACE and chronic pain studies is due to societal and cultural standards for males to suppress emotions and any notions of being in pain which might result in males also not reporting to healthcare services for treatment. It is interesting to mention the statistic from the Ministry of Health 2020/21 Survey, that Pasifika males in Aotearoa/New Zealand experience chronic pain more than Pasifika females (Ministry of Health, 2021). This would imply that Pasifika males are reporting to healthcare services. No literature was identified to support whether cultural roles influenced this disparity, and thus would be another research recommendation.

The methodological recommendation of screening patients for ACEs would allow practitioners to investigate the use of broader interventions to alleviate chronic pain symptoms. For example, the Pain Rehabilitation Programme (Mary Free Bed Rehabilitation Hospital, United States of America) screened for ACEs in an initial consultation with a psychologist. The programme was over a 10-week period and included pain psychological treatment using an acceptance and commitment therapy (ACT) framework, as well as occupational therapy, physical therapy, and opioid tapering (Craner &

Lake, 2021). This highlights the range of professionals that would need to be involved. Craner and Lake (2021) concluded that using interdisciplinary rehabilitation may be suitable for those with prior ACEs, as there is a focus on functional restoration for both physical and mental health. Further, the authors found that the pain rehabilitation programme had positive outcomes for participants at discharge.

Screening and interventions for resilience has been suggested based on the findings that imply those with higher levels of resilience had less reports of somatisation and psychological disorders (Goldenson et al., 2021). Building resilience may be one way to improve chronic pain symptoms, especially within the context of ACEs. For example, if a child experienced divorce within their family, yet they had strong social support from grandparents or peers, it could be predicted that the child would still develop resilience, or a secure attachment style (Sippel et al., 2015). However, it is noted that there is variation within definitions for resilience (Smith et al., 2008). Therefore, it would be important to clarify a definition within future research, such as the definition used by Smith and colleagues (2008) in their Brief Resilience Scale.

4.1.4 Summary

In summary, this scoping review provides support, based on 66 reviewed articles, for a potential relationship between ACEs and chronic pain in adulthood. However, the reviewed articles describe this relationship as a potential one, and as a complex relationship. Considerations include the biological pathology which can be traced back to both the endocrine (HPA axis) and nervous (inflammation) systems; or the psychological pathology which is mediated by disorders such as depression. There is further complexity surrounding the theory that some ACE domains are associated with certain chronic pain disorders. Within these complexities, future research was recommended by 42 of the reviewed articles. This was often with the idea that further knowledge would lead to developments in prevention and treatments of chronic pain. On the other hand, some authors were confident that the relationship between ACEs and chronic pain in adulthood existed. Therefore, these authors recommended that ACEs should be screened for in chronic pain patients, so that treatment options could be expanded.

4.1.5 Clinical Implications

This scoping review implies that the pathology of chronic pain is multifaceted, however there is a potential for ACEs to play a significant role in the development of chronic pain. Therefore, this scoping review could be useful for specialists and primary healthcare practitioners. The incorporation of ACE screening in chronic pain patients, as recommended by the reviewed articles,

may be one way of identifying other therapies, such as ACT, to alleviate chronic pain symptoms. This may be especially important for patients who have previously been resistant to treatments. Additionally, the inclusion of resilience screening, such as the Brief Resilience Scale (Smith et al., 2008), could encourage development of resilience in those that have experienced ACEs, and may be one pathway to reduce a later health outcome of chronic pain. Alsubaie et al., (2022) discussed the need to go beyond screening and begin a preventative measure of raising awareness with adults and parents around the negative impacts of ACEs and educating children of the benefits of seeking help. This is backed up by Ju et al. (2020) claiming a protective factor for chronic pain is confiding in others.

4.2 Limitations of the Scoping Review

To aid in future research, certain limitations of this study need to be acknowledged. Due to time constraints an article search could not be done within the reference lists of the reviewed articles. Therefore, it is acknowledged that other literature in the field may exist but has not been identified. Secondly, it would have been pertinent to carry out the article search a second time to show the reliability of the method. Finally, without a time constraint, the codes developed from the thematic analysis could have been discussed with a second person, additionally the second person could assess the accuracy of the codes against the reviewed articles. Again, this would strengthen the reliability of the thematic analysis based on inter-rater reliability.

Another limitation relates to the range of different tools used to measure ACEs and chronic pain, which reduced the construct validity. For example, the childhood trauma questionnaire (CTQ) was the most used tool, yet it only covers abuse (sexual, emotional, physical) and neglect (emotional and physical) history, whereas the ACE-Q includes household dysfunctions. Additionally, some measurement tools were single question items used within a larger and broader questionnaire or within an interview. Fishbain et al. (2014) highlighted in their article that contrasts in results could be due to the variations in definitions for ACEs between the measurement tools. These limitations suggest that there may be variation in the data, which further may result in some articles having stronger associations between ACEs and chronic pain, compared to others. However, the inclusion of the variety of tools can be considered a strength, as this scoping review provides an overview of what tools are being used within the literature.

A final limitation relates to the absences of studies carried out within an Aotearoa/New Zealand context, therefore making generalisability to the New Zealand/Aotearoa population difficult. A longitudinal study, carried out by Danese and colleagues (2009), found that children in New Zealand/Aotearoa exposed to adverse psychological experiences were at high risk for depression,

and high inflammation levels. As previously mentioned, both depression and inflammation are associated with chronic pain in adulthood. The Ministry of Health and the previously mentioned Growing up in New Zealand study (Walsh et al., 2019) have shown the high levels of chronic pain and ACEs (respectively) within the New Zealand/Aotearoa population. Therefore, assumptions can be made regarding the potential relationship between ACEs and chronic pain in adulthood within a New Zealand/Aotearoa context yet are limited by the lack of specific research and thus, no conclusions can be made regarding the potential relationship between ACEs and chronic pain in adulthood with a New Zealand/Aotearoa context.

4.3 Future Research Recommendations

With the gaps found in the literature, it is recommended that research on the relationship between ACEs and chronic pain in adulthood should be carried out within a New Zealand/Aotearoa context. This would also allow for further definitions to be created and made relevant to New Zealand/Aotearoa populations. Large population studies, such as the Growing Up in New Zealand study, would be a good place to start, as they already have early prospective reports on ACEs. This would allow the researchers to address chronic pain reports in any follow-up interviews with participants. Not only would this be the only longitudinal prospective study in New Zealand/Aotearoa, but also one of only a small few internationally.

It would be important to validate the ACE-Q in the New Zealand/Aotearoa population, particularly for indigenous populations. Māori are typically overrepresented in statistics representing violent behaviour (Mikahere-Hall, 2017) and poor health outcomes (Reid & Robson, 2000; Tauri et al., 2005). To validate the ACE-Q within the Māori population, it would be recommended to use a Kaupapa Māori methodology to ensure that the Te Tiriti o Waitangi principles are being upheld, and better rapport can be built between the researcher and participants.

4.4 Conclusion

This scoping review summarised the literature of 66 articles that measured and discussed a potential relationship between adverse childhood experiences (ACEs) and chronic pain in adulthood. Findings suggested a potential relationship to be present, yet this is likely to be complex, involving mediator variables such as depression, anxiety, and resilience. A dysregulated hypothalamus pituitary adrenal axis was often considered as the underlying biological factor that develops the relationship between ACEs and chronic pain. However, gaps were found in the research, such as a lack of longitudinal studies with prospective reports of ACEs, no articles examining the relationship in gender diverse communities, and no articles within a New Zealand/Aotearoa context. Thus, future

research is recommended to address these gaps. This current scoping review may contribute to the development of more appropriate treatment for those who suffer from chronic pain, and community programmes that educate people on the impacts of ACEs. Each of these developments could have the goal of developing resilience in those who have suffered ACEs, and then we may see a long-term result of reduced health issues and utilisation of healthcare services.

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