Biopsychosocial Determinants of Chronic Pain Amongst Canadian Armed Forces Veterans

By

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Abstract

Chronic pain is a significant health concern in Canada and abroad. While greater prevalence rates are found among military veterans as compared to the general population, little research has explored psychosocial factors associated with chronic pain amongst Canadian Armed Forces (CAF) veterans. Recently, a revised biopsychosocial (BPS) model of chronic pain for military veterans has been proposed to provide a conceptual framework for understanding the dynamic interactions between BPS factors and persistent pain within US veteran samples. This thesis employed a mixed methods approach to explore determinants of chronic pain amongst CAF veterans. The first study utilized both the Canadian Community Health Survey Canadian Forces Supplement (CCHS- CFS; 2002), and the associated follow-up survey, Canadian Armed Forces Members and Veterans Mental Health Follow-up Survey 2018 (CAFVMHS; 2018). Cross-sectional logistic regression analyses found depression, anxiety, PTSD, and social support to be associated with increased odds of chronic pain conditions (OR) in a sample of CAF veterans (N = 1,905). Contrary to the proposed BPS model, work stress and AUD were not associated with persistent pain in this sample. Longitudinal analyses showed that only depression was associated with new onset chronic pain. Study 2 applied qualitative methods, informed by constructivist grounded theory, to examine CAF veteran perceptions on the development and maintenance of their chronic pain in relation to BPS and cultural factors. Fifteen male veterans described the initial causes and contributing factors of chronic pain as being influenced by physiological causes (i.e., injury, wear and tear, and inadequate medical care) and barriers to treatment seeking (i.e., perceived impacts on career, stigma, and internalized warrior ethos). Themes describing current contributing factors included chronic conditions, psychosocial influences (i.e., PTSD, depression, and stress), and difficulties obtaining coverage for healthcare services. A mixed-

methods convergent design was employed to examine the convergence and divergence between studies. Analyses revealed concurrent findings on most biological conditions, as well as depression and PTSD. However, notable divergence was observed between studies on anxiety, social support, and stress. Findings from both studies highlight the burden of chronic pain on this vulnerable population and emphasized the role of psychosocial and cultural factors in the development and exacerbation of persistent pain. Implications of these findings and direction for future research are discussed.

Keywords: chronic pain, veteran, military, Canadian Armed Forces, biopsychosocial variables

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Dedication

This research is dedicated to Canadian Armed Force veterans and their families.

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Chapter 1: Introduction

Chronic pain is a widespread concern in Canada and abroad (Boulanger, et al., 2007; Gardner & Sachdeva, 2019). Persistent pain negatively impacts the biopsychosocial (BPS) functioning of individuals, with significant associations being found between chronic pain and increased health-care utilization (e.g., Gore et al., 2012), disability (e.g., Vlaeyen, & Linton, 2012), economic burden (e.g., National Center for Health Statistics, 2012), and family dysfunction (e.g., Kemler & Furnée, 2002). In Canada, pain-related healthcare and lost productivity costs are estimated to range from 56-60 billion dollars annually (Canadian Pain Society, 2014). Not surprisingly, those with chronic pain use more disability and sick leaves, report lower levels of social satisfaction and support, and present with greater psychopathology than those without chronic pain (Häuser et al., 2014; Volders et al., 2015). Historically, pain has been conceptualized as a symptom of injury and illness, with pain intensity connoting the seriousness of the injury. Within this framework, chronic pain has been viewed as a symptom of unresolved residual scarring directly linked to the initial injury (Siddall & Cousins, 2004). In the last two decades there has been a call to re-evaluate how researchers and clinicians define, diagnose, and treat chronic pain. When pain no longer serves the function as the body's warning system of actual or potential tissue damage, many now view chronic pain as an independent disease state (Cohen et al., 2013; Fine, 2011; Niv & Devor, 2004; Taylor et al., 2015).

The prevalence of chronic pain has been found to be variable between studies and methodological approaches, with Canadian population estimates of chronic pain ranging from 18-29% (Schopflocher et al., 2011). Interestingly, these rates are estimated to be doubled amongst Canadian Armed Forces (CAF) veterans (Thompson et al., 2011), with similar findings

amongst Canadian police forces (Carleton et al., 2018). Chronic pain is also a widespread concern in other countries' military organizations. For example, persistent pain has been the primary cause of medical evacuation from U.S. deployments in Iraq and Afghanistan (Center for Deployment Psychology, 2019). Even with the high prevalence and established impact chronic pain has on military populations, little is known about the causal mechanisms contributing to its increased prevalence amongst CAF veterans. Some studies have implicated elements of military culture and the challenges in the transition to civilian life as contributors to the development of poor physical health and chronic pain in military veterans, though these findings are preliminary (e.g., Denke & Barnes, 2013; Marshall & Matteo, 2004; Zamorski, & Colman, 2018). Recently, the well-established BPS model of chronic non-cancer pain (CNCP; Gatchel, 2004) was adapted specifically for military veterans (see Baria et al., 2019). This model provides an overview of the extant literature on BPS dimensions of chronic pain in U.S. veteran samples and the authors propose a conceptual model to explain the interaction between the proposed variables. While the empirical literature reviewed in the model chiefly involved studies with U.S. military personnel, it provides an important theoretical framework for understanding the etiological determinants of chronic pain in military veteran populations globally. To date, the proposed model has not been empirically examined in other military populations.

Chronic Pain: Etiology and Epidemiology

As with many disorders, conditions, and syndromes, numerous definitions and classification systems exist for pain. The International Association for the Study of Pain (IASP) describes the phenomenon of pain as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage" (IASP, 2017, Definition section). A systematic review and meta-analysis examining the definition of

chronic pain in epidemiological studies found a high degree of inconsistency in the phrasing and content of the definition across studies (Steingrímsdóttir et al., 2017). Traditional definitions of chronic pain commonly used phrasing describing pain that persisted beyond the normal or expected healing period (Bonica, 1984). More recently, this descriptor has been found to be problematic as normal healing periods can be difficult to determine, especially when factoring in the presenting condition or injury, age of the individual, and the presence of comorbidities (Steingrímsdóttir et al., 2017). An IASP expert group has suggested a definition of chronic pain for research purposes that is characterized by pain that lasts or reoccurs for more than three months (Merskey & Bogduk, 1994). Within the research literature numerous chronic pain types have been studied (e.g., migraine headache, pelvic pain, fibromyalgia, arthritis pain, inflammatory bowel syndrome, neuropathic pain), with some of the most prevalent physician-diagnosed pain conditions including lower back pain, osteoarthritis, rheumatoid arthritis, and migraine headaches (Johannes et al., 2010).

In the last decade researchers have begun to argue for the recognition of chronic pain as an independent disease state, which contrasts the traditionally held view that pain is solely related to, and the result of the amount of injury or illness one has experienced (Cohen et al., 2013; Taylor et al., 2015; Treede et al., 2019). Nicholas et al. (2019) noted that numerous chronic pain conditions “have an obscure etiology and pathophysiology, but they are characterized by a complex interplay of biological, psychological, and social factors” (p. 29). Several theoretical models have been developed to address and explain these complexities, such as operant behavioural models (Fordyce, 1976), cognitive-behavioural models (Lewandowski et al., 2007), biopsychosocial models (Turk & Monarch,1996), and biochemical models (Voscopoulos & Lema, 2010).

The assessment and diagnosis of chronic pain can take many forms. In the medical field, pain may be assessed using musculoskeletal or neurological exams (e.g., reflex and balance tests), diagnostic imaging tests (e.g., MRI, X-ray), or electrodiagnostic procedures (e.g., electromyography; Hooten et al., 2017). However, as Katz et al. (2015) note, "pains that do not conform to present-day anatomical and neurophysiological knowledge are often attributed to psychopathology" (p. 162). Chronic pain has not been identified as a psychiatric disorder in the Diagnostic and Statistical Manual of Mental Disorders (DSM), though several pain-related disorders have been recognized (American Psychiatric Association [APA], 2013). The DSM-IV included Psychogenic Pain Disorder, Somatoform Pain Disorder, and Pain Disorder as psychiatric disorders, though these have since been removed due to criticisms regarding the validity and reliability of the diagnostic criteria (Katz et al., 2015). The latest edition of the DSM has identified only one pain-related disorder: Somatic Symptom Disorder (APA, 2013). Somatic Symptom Disorder is characterized by a pronounced focus on physical symptoms (e.g., pain), that is persistent and causes significant distress and disruption in daily life. When pain is the chief somatic concern, the specifier "with predominant pain" (i.e., formerly Pain Disorder) is used, and when the symptoms extend beyond 6-months they are noted as "persistent" (p. 311). The latest revision of the International Classification of Disease (ICD-11) includes a classification of chronic primary pain, which describes persistent pain influenced by biological, psychological, and social factors, that causes significant emotional distress or functional disability, and is not better explained by another diagnosis (World Health Organization [WHO], 2018).

Prevalence of Chronic Pain

National population estimates of chronic pain vary considerably between countries and pain types (e.g., United Kingdom: across chronic pain types, 35% to 51.3%; Fayaz et al., 2016; USA: chronic widespread pain, 0% to 24%; Mansfield et al., 2016; France: chronic pain and chronic neuropathic pain, 27.2% to 32.7% and 5.55% to 7.30% respectively; Chenaf et al., 2018; Canada: across pain types, 18.9%; Schopflocher et al., 2011). Higher rates of chronic pain are commonly found amongst females (e.g., Johannes et al., 2010), older adults (e.g., Herr & Garand, 2001), those with lower SES (e.g., Poleshuck & Green, 2008), and those who are unemployed (e.g., Elliott et al., 1999). The disparity in prevalence rates across studies is likely influenced by a host of variables including the absence of a universally accepted operational definition of chronic pain and methodological differences.

Prevalence of Chronic Pain in Military Populations

Lifetime physical health concerns are common in military populations (Levy & Sidel, 2009). For both veterans and the general public, physical health conditions are two to four times more prevalent than diagnoses of mental health disorders, and some physical health conditions have been found to be more prevalent in veteran samples than comparable civilian samples (Dominick et al., 2006; Thompson et al., 2011).

Prevalence rates of chronic pain in military samples have been found to vary, though on average rates tend to be higher than in the general population. One study examining chronic pain variables in active CAF Regular Force personnel found that 25.5% of respondents reported experiencing chronic pain (Vun et al., 2018). Of the specific pain conditions reported in this sample, fibromyalgia and musculoskeletal problems were the most prevalent (30.5%), followed by back problems (23.3%), arthritis (12.4%), and migraines (9.1%). As noted above, these rates are comparable to what has been reported for the Canadian general population (e.g., 19-29%;

Boulanger et al., 2007; Moulin et al., 2002; Schopflocher et al., 2011). Interestingly, rates of chronic pain appear to be significantly higher in military veteran samples than in both active military personnel and in the Canadian general public. In their systematic review of chronic pain prevalence in military veteran samples, VanDenKerkhof et al. (2014) analysed data from 12 studies (i.e., 11 from the USA, and one from Finland) which revealed a prevalence range of 25% - 72%. The authors suggested that the significant disparity between prevalence findings was largely attributable to methodological differences, sampling, and the manner in which pain was measured; though also stated that it was possible that true population differences exist. A much smaller spread was observed for all studies examining chronic pain prevalence rates amongst Operation Enduring Freedom/Operation Iraqi Freedom (OEF/OIF) veterans (i.e., prevalence of persistent pain ranged from 43%-48%). An analysis of the data from the Survey on Transition to Civilian Life examining CAF veterans who released from the military between 1998 and 2007, found that 41% of CAF veteran respondents reported persistent chronic pain, with another 23% reporting intermittent chronic pain (i.e., a total of 64% indicating they experienced persistent or intermittent chronic pain and/or discomfort; VanDenKerkhof et al., 2015). While this is the only data available regarding chronic pain in CAF veterans, there are some notable limitations. First, only three questions in the survey examined pain variables: 1) Do you have any pain or discomfort that is always present? *(yes/no)*; 2) Do you have any pain or discomfort that reoccurs from time to time? *(yes/no)*; and 3) During the past four weeks, how much did pain interfere with your normal work (including work both outside the home and housework)? *(not at all/a little bit/moderately/quite a bit/extremely*). Furthermore, the study only examined veterans who had served as Regular Force members (i.e., did not include Reserve Force personnel), and findings cannot reasonably be generalised to older veterans as the sample's oldest participant was 67

years old. Further high-quality epidemiological studies are required to confidently determine the prevalence of CNCP in CAF veterans.

Theoretical Perspectives

Based on the aforementioned research literature, theories have been developed to integrate causal factors describing the development and maintenance of chronic pain. This section will include a description of the BPS model of chronic pain, as well as providing a detailed overview of a novel BPS model of chronic pain for military veterans.

Biopsychosocial Model of Chronic Pain

Turk and colleagues (2016) aptly noted that an individual's pain experience does not occur in isolation, rather, it is uniquely influenced by the interaction of biological and psychological factors, as well as by the social contexts in which individuals find themselves. Traditionally, the scientific view of chronic pain was dualistic in nature, understanding the mind and body to exist and operate as independent entities (Gatchel et al., 2007). Further:

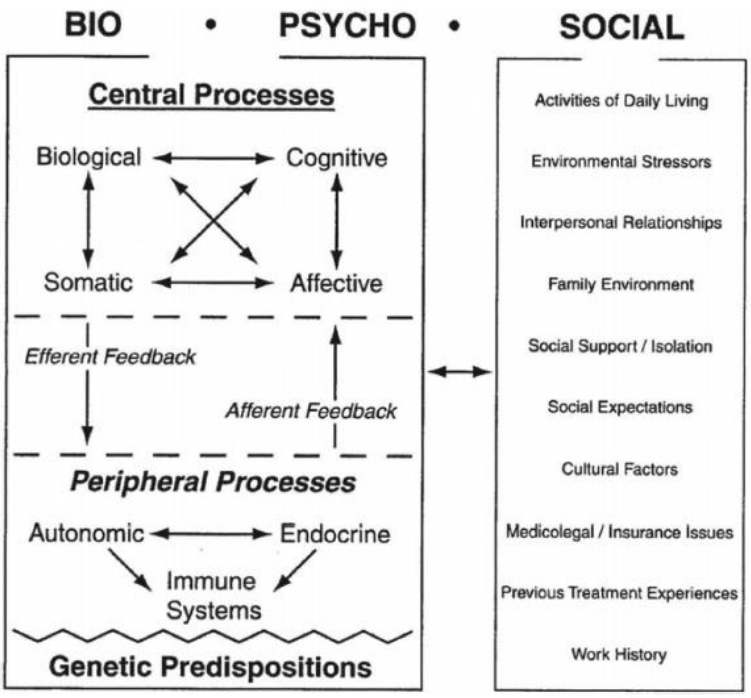
> the concept of pain largely depended on the assumed linearity between identifiable organic pathology and pain report. Thus, the amount of pain was expected to be associated with and proportional to the nature and amount of tissue damage. When the presence and extent of a pain report was not "validated" by objectively determined pathology, the subjectively reported pain was considered "functional" or "psychogenic" (Turk et al., 2016, p. 22).

Mounting evidence has found both the dualistic and linear approaches to be lacking, leading to the recognition and integration of psychosocial (PS) factors. The BPS model of chronic pain (see Figure 1) incorporates both disease and illness; disease being defined as the disruption of body

structures and/or organs caused by pathological changes in a manner that is objectively biological (Gatchel et al., 2007), and illness being defined as the interaction of BPS factors influencing one's subjective interpretation and experience related to their presenting disease (Gatchel, 2004). As seen in Figure 1, the BPS model conceptualizes the subjective experience of pain as a composition of the interplay of biological (e.g., central and peripheral processing of noxious information), psychological (e.g., level of depression, cognitive appraisal of pain stimuli), and social dimensions (e.g., reinforcement of pain behaviours, social appropriateness of expressing pain). The interaction between these dimensions is thought to maintain and, at times, exacerbate one's pain experience (Gatchel et al., 2007).

Figure 1

BPS Model of Chronic Pain



Note. A conceptual model of the biopsychosocial interactive processes involved in health and illness. From "Comorbidity of Chronic Mental and Physical Health Conditions: The Biopsychosocial Perspective," by R. J. Gatchel, (2004), *American Psychologist, 59,* 792–805.

As previously noted, persistent pain is now understood by many to involve much more than the presence of mutable physical symptoms (Turk & Gatchel, 2018). This understanding, however, does not undermine the important role numerous biological processes have been found to play in the development and maintenance of chronic pain. The BPS model identifies three interacting biological dimensions (i.e., central processes, peripheral processes, and genetic factors) that have been found to influence the presentation of chronic pain. Some of the most seminal models describing both central and peripheral processes of chronic pain include the Gate Control Theory of Pain (Melzack & Wall, 1965), the Neuromatrix Theory of Pain (Melzack, 2001), and the Diathesis-stress Model of Chronic Pain (Kerns & Jacob, 1995; for a list of pain models see Gatchel et al., 2007). The formulations included in these models overview the role that factors such as nociception, homeostatic systems, peripheral nerve activity, immune system, and cutaneous inflammation have in pain perception. Human genetic expression has also been implicated in the human pain experience (Mogil, 2012). Studies examining genetic factors and chronic pain have found gene expression to play a role in the presentation of fibromyalgia (Ablin & Buskila, 2015; Buskila, 2007), opioid responsiveness (Tremblay & Hamet, 2010; Stamer, Bayerer, & Stüber, 2005), tinnitus (Sand et al., 2007), spinal conditions (Kim & Schwartz, 2010), and tension headaches (Russell, 2007).

The BPS model of chronic pain describes a dynamic interaction between cognitive, affective, and behavioural factors in the development and maintenance of chronic pain. These psychological processes have been found to influence and be influenced by social and biological

factors (Gatchel, 2004). Interestingly, cognitive and affective variables have been found to have greater predictive qualities (i.e., accounting for significantly more variance) than objective signs of chronic pain and disability (e.g., MRI, physical impairment measures; Carragee et al., 2005; Severeijns et al., 2001). Studies have also shown certain psychological variables (i.e., coping style, self-efficacy; Benyon 2010; Busch, Göransson, & Melin, 2007) to be important predictors of how beneficial participating in pharmacological and nonpharmacological interventions will be for chronic pain patients, as well as predicting the duration of disability. The co-occurrence rate of many psychiatric disorders with chronic pain is high, though these phenomena are not well understood (Velly & Mohit, 2018). Some psychiatric disorders have been conceptualized to be mutually maintained with chronic pain, suggesting the presence of a bi-directional relationship (Asmundson et al., 2002; Beck & Clapp, 2011; Liedl & Knaevelsrud, 2008; Scioli-Salter et al., 2015; Sharp, & Harvey, 2001). Personality characteristics have also garnered empirical interest in the etiological formulation of chronic pain. Attempts have even been made to identify personality profiles (e.g., “rheumatoid arthritis personality”, “migraine personality”, “pain-prone personality”), that are more susceptible to developing persistent pain (Blumer & Heilbronn, 1982). Anxiety sensitivity (i.e., the fear of the arousal of anxiety symptoms, and the interpretation of such symptoms as harmful) has also been identified as a risk factor for developing chronic pain (Asmundson & Norton, 1995). One of the most notable models of chronic pain adopting a BPS approach is the fear avoidance model of chronic pain (Vlaeyen & Linton, 2000). Unlike a biomedical model, the fear-avoidance model of chronic pain emphasizes the influence of cognitive appraisals on the development and maintenance of pain symptoms and behaviours. The model asserts that following an injury the pain experience can be maintained by engaging in pain-related catastrophizing, kinesiophobia (i.e., fear of movement and reinjury),

avoidance behaviours, and hypervigilance. Since its inception, the model has received a significant amount of empirical interest and support (see Alodaibi et al., 2018; Crombez et al., 2012; Vlaeyen & Linton, 2012).

The social dimension within the BPS model identifies the experience of pain as being, at least partially, informed by one's social context. For example, during the Vel Hinduism Festival in Sri Lanka, a Tamil Hindu devotee is chosen to be suspended by hooks that are pierced through their skin. Those participating in this ceremony have reported little to no pain, which is understood to be mitigated by the honour of being chosen for the task (Letchumy-Tamboo, 2020). Conversely, when one sustains a minor injury (e.g., paper cut, stubbed toe) the experience is often interpreted as unpleasant and painful. The dichotomy between the amount of pain experienced with the minor injury and that experienced with the Tamil practice highlights the modulating effect social influence can have on one's perception of both noxious and non-noxious stimuli. Social variables identified in the BPS model include cultural factors, family environments, employment dynamics, social expectations, interpersonal relationships, and social support and/or isolation (Gatchel, 2004). Social systems have been shown to play an important role in the presentation of chronic pain conditions. In their literature review on chronic pain and the family, Payne and Norfleet (1986) stated that "a psychosomatic illness has 'symbolic and communicative functions' within a family system and these functions often cannot be distinguished from originating causes" (p. 2). Studies examining specific pain conditions have shown an increased likelihood of family members presenting with similar pain symptoms compared to nonfamily members; highlighting both environmental and genetic factors (Cardol et al., 2006; Laurell, Larsson, & Eeg-Olofsson, 2005). Interestingly, parental catastrophizing has been associated with increased pain-related disability and school absenteeism in a pediatric

chronic pain sample (Goubert et al., 2006). Further, children's illness behaviours have been found to be exacerbated by parental catastrophizing and hypervigilance, with increased attention on the child's pain behaviours acting as a conditioned reinforcer (Walker & Zeman, 1992).

The incorporation of biological, psychological, and social variables within the conceptualization of chronic pain allows for a richer, more comprehensive picture of pain and more closely follows the reality of human existence. As Turk and Gatchel (2018) aptly summarise:

> Pain is a subjective perception that results from the transduction, transmission, and modulation of sensory input, filtered through a person's genetic composition and prior learning history, and modulated further by the person's current physiological status, idiosyncratic appraisals, expectations, current mood state, and sociocultural environment (p. 7).

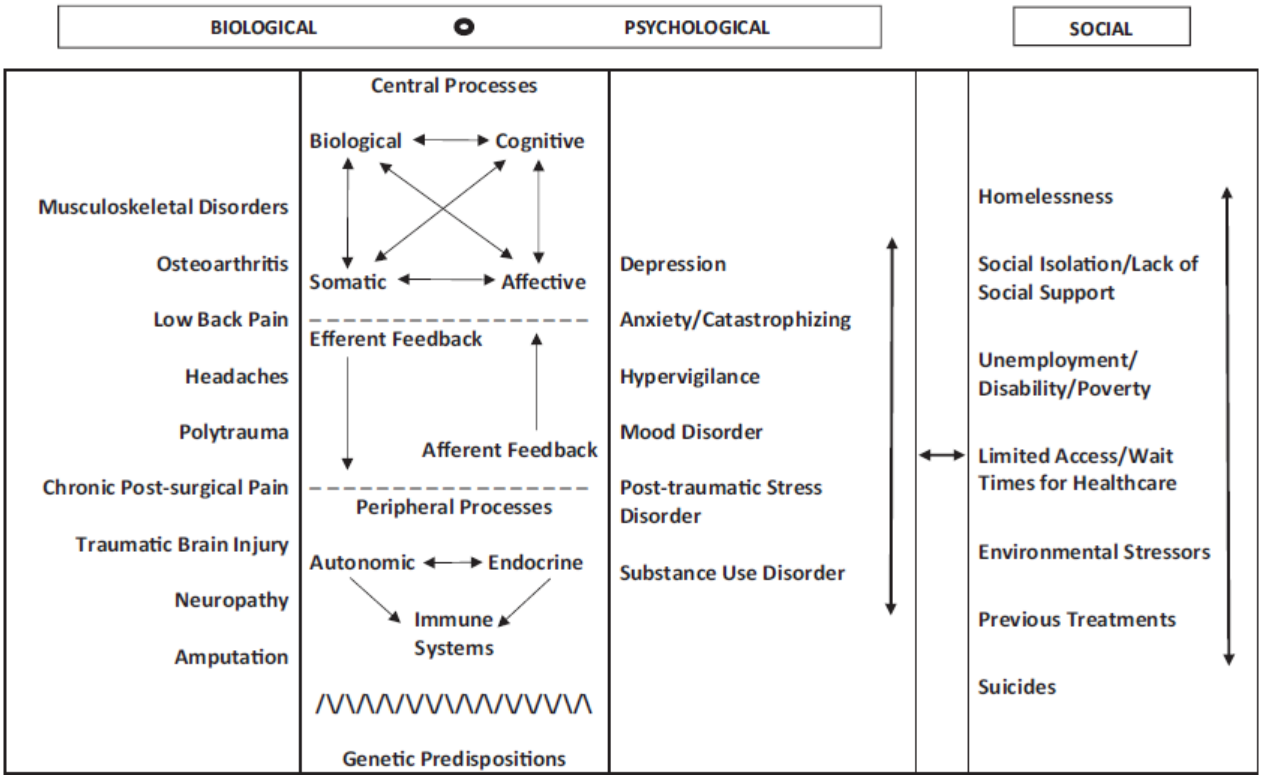
Biopsychosocial Model of Chronic Pain for Veterans

Since the inception of the BPS model for chronic pain, several research groups have empirically validated the model within specific pain populations (e.g., multiple sclerosis; Day et al., 2016; pediatric burn injuries; Nelson et al., 2019; cancer pain; Novy, & Aigner, 2014; sickle cell disease; Taylor et al., 2013; veterans with hepatitis C virus; Morasco et al., 2014). A recent article published in the journal *Pain Medicine* by Baria and colleagues (2019) introduced a revised BPS model for chronic non-cancer pain specifically adapted for military veterans (see Figure 2). The model proposes several BPS variables theorized to significantly contribute to the development and maintenance of chronic pain in veteran populations. Of note, the model is designed to explain factors believed to contribute to chronic pain rates amongst U.S. military

veterans, as it utilized only research pertinent to U.S. army personnel. While providing an important framework for understanding this phenomenon, any comparison with other military organizations should be done with caution. The following is a summary of the BPS variables identified by Baria et al. in their model of CNCP for veterans.

Figure 2

Adaption of the Biopsychosocial Model of Chronic Noncancer Pain in Veterans



Note. A conceptual model of the biopsychosocial model of chronic noncancer pain in veterans. From "Adaption of the Biopsychosocial Model of Chronic Noncancer Pain in Veterans" by A. M. Baria, et al., (2019), *Pain Medicine, 20,* 14–27.

Biological Factors. The authors of the revised BPS model reviewed pertinent biological factors that have been found to contribute to CNCP in veterans (Baria et al., 2019). Baria et al.

highlighted several physical health conditions found to be prevalent in the U.S. veteran population (i.e., musculoskeletal disorders, osteoarthritis, low back pain, headaches, polytrauma, chronic post-surgical pain, traumatic brain injury, neuropathy, and amputation). Within the U.S., nearly half of the military's active service personnel have experienced at least one injury, with most injuries occurring during training, exercise, or sport activities (Bedno et al., 2014). A study by Kaufman et al. (2000) found that the most frequent injuries sustained by U.S. military personnel were musculoskeletal in nature (e.g., overuse or stress syndrome, ankle sprain, muscle strains, overused knee injuries), with other conditions (e.g., tendonitis, low back pain, patellofemoral syndrome) also being associated with persistent pain. Baria et al., (2019) outlined several studies that examined rates of chronic comorbid physical health conditions, noting high co-occurrence rates of chronic pain with hypertension, obstructive sleep apnea, diabetes, obesity, and functional disability (Cheatle, 2016; Nahin, 2016; Rivera et al., 2017). Surgical complications and poorer surgical outcomes have also been noted as a contributor to chronic pain symptomology when comparing veterans with and without CNCP (see Bhatnagar et al., 2015; Owens et al., 2015). Baria et al. (2019) ended their examination of biological influences with an emphasis on the complex effects that injury and trauma have on long-term consequences of persistent pain.

Psychological Factors. In the revised veteran-focused BPS model of CNCP, Baria and colleagues (2019) reported on psychological variables found to significantly influence the development and maintenance of chronic pain while also impacting the degree of physical disability and suffering amongst veterans (i.e., depression, anxiety/catastrophizing, hypervigilance, mood disorders, posttraumatic stress disorder, and substance use disorder). Mental health disorders, as Baria et al. point out, are common amongst veterans with CNCP, and

greatly impact the effectiveness of pain management regimes (e.g., Gallagher, 2005; Kerns et al., 2003; Smeeding et al., 2010). The authors specifically examined the complex nature of the comorbidity between CNCP and depression. Approximately 14% of all U.S. military veterans experience depression, with these rates significantly greater among veterans with comorbid CNCP (e.g., 15%-57%; Goulet et al., 2016; Naliboff et al., 2011; Outcalt et al., 2015; Rozet et al., 2014; Smeeding et al., 2010). Rates of depression have been found to vary considerably among subgroups of U.S. veterans with CNCP. For example, depression rates were found to be 60-62% in Operation Iraqi Freedom/Operation Enduring Freedom (OIF/OEF) veterans with CNCP (Helmer et al., 2009; Outcalt et al., 2014; Outcalt et al., 2015), 40% in a sample of veterans with CNCP from spinal cord disorders (Boakye et al., 2013), and 49% in a sample of veterans with comorbid CNCP and hepatitis C (Morasco et al., 2014). Anxiety was also noted by the authors of the revised model as a significant contributor to the exacerbation of CNCP in veterans. Strong predictive qualities of anxiety and catastrophizing have been observed regarding maladaptive pain-related behaviours and pain severity (see Outcalt et al., 2014). Maladaptive and avoidant strategies, both common responses to anxiety, have been associated with increases in perceived helplessness, hopelessness, and vulnerability (Phillips et al., 2016); the presence of which can subsequently lead to increased disability and pain intensity (Gatchel et al., 2007). Like rates of depression, comorbidity rates of CNCP and anxiety vary greatly amongst veteran samples (e.g., 6.9%-53%; Goulet et al., 2016; Naliboff et al., 2011; Outcalt et al., 2014; Philips et al., 2016; Smeeding et al., 2010). Similarly, co-occurrence rates of CNCP and posttraumatic stress disorder (PTSD) are highly variable with rates ranging from 27% to 80% (Gibson, 2012; Goulet et al., 2016; Outcalt et al., 2015; Phillips et al., 2016; Rozet et al., 2014; Runnals et al., 2013). As compared to veterans without CNCP, veterans with comorbid PTSD and CNCP are

more likely to utilize health care resources, endorse higher self-reported pain intensity, and present with additional comorbid psychiatric health conditions (Gibson, 2012; Philips et al., 2016; Runnals et al., 2013; Outcalt et al., 2014). In one study, veterans who had been deployed to either Iraq or Afghanistan and who were presenting with comorbid PTSD and CNCP were found to have poorer treatment outcomes and higher adverse effects to opioids as compared to veterans with CNCP alone (Seal et al., 2012).

Substance use disorders (SUD) have also been a subject of empirical interest regarding veterans with CNCP. The prevalence of comorbid SUD and CNCP has been found to be less variable than with anxiety and PTSD, with rates ranging from 52%-77% in veteran samples (Bennett et al., 2013; Gaither et al., 2016; Gros et al., 2015; Lovejoy et al., 2016; Morasco et al., 2011; Morasco & Dobscha, 2008; Philips et al., 2016; Trafton et al., 2004; Whitehead et al., 2008). Substances such as alcohol, illicit drugs, marijuana, and prescription drugs have been misused by military personnel as a means to cope with significant physical and mental stressors common to military deployment and service (Bennett et al., 2013; Gibson, 2012; Olenick et al., 2015; Philips et al., 2016). In their study investigating correlates in opioid therapy with veterans diagnosed with both SUD and CNCP, Lovejoy and colleagues (2016) found that veterans prescribed long-term opioids were at increased odds of having higher pain intensity ratings, lower self-efficacy, and more catastrophizing symptoms than their veteran counterparts who were on a short-term opioid regimen, or who were not prescribed opioids. In their summary of psychological factors, Baria et al. (2019) noted that comorbid mental health disorders, as well as other psychological variables, had been found to significantly exacerbate CNCP, as well as negatively impact functionality and treatment outcomes.

Social Factors. In their model, Baria and colleagues (2019) highlight social factors associated with CNCP amongst military veterans (i.e., homelessness, social isolation/lack of social support, unemployment, disability, poverty, limited access/wait times for healthcare, environmental stressors, previous treatment, and suicides). The authors argue that these social variables do not operate independent of the biological and psychological variables mentioned above and are highly associated with chronic pain amongst military veterans. Homelessness is the first social factor addressed within the revised BPS model as U.S. military veterans account for approximately 11% of the U.S. homeless population (Henry et al., 2016). Baria and colleagues connect the interacting effects of homelessness, lack of social support, and presence of social isolation as being detrimental to veterans' overall mental and physical well-being. Studies have shown that beyond the high proportion of homeless veterans dealing with psychiatric conditions, many also face challenges with fragmented health care service, limited access to transportation, issues with medical appointment attendance, a lack of trust in healthcare professionals, and competing physical healthcare needs (Bennett et al., 2013; Gabrielian et al., 2014; National Coalition for Homeless Veterans, 2017; Olenick et al., 2015; O'Toole et al., 2016). Of note, a large-scale study of 62,459 veterans in the greater Los Angeles area found that healthcare utilization rates, as well as identified healthcare needs, were significantly greater amongst homeless veterans than veterans with stable living arrangements (Gabrielian et al., 2014). As previously noted, limited social support and high rates of social isolation are prevalent within the U.S. military veteran population (Bennett et al., 2013; O'Toole et al., 2016). These phenomena are theorized to be exacerbated by disruption in relational continuity due to frequent deployments and moves, which greatly impact a veteran's ability to maintain quality connection with family members, friends, and coworkers (Bennet et al., 2013). One study of 356 OIF/OEF

veterans noted that 20% of veteran respondents indicated they had inadequate or nonexistent social support, and 37% of the sample reporting feelings of social isolation and difficulties managing interpersonal relationships with family, friends, and coworkers (Strong et al., 2014). Timely and appropriate specialty care can be difficult to access for many military veterans (Gallagher, 2016). Notably, VA services are often under-resourced, overburdened, and operate within aging infrastructures, thus limiting the quality of care available for veterans (Elnitsky et al., 2013; Franco et al., 2016, Rosen et al., 2017; Simmonds et al., 2015; Tsai et al., 2017). In their qualitative study examining barriers to multimodal pain treatment, Simmonds et al., (2015) observed five primary themes from their interviews with veterans, with three being social in nature (i.e., mistrust and limited access to nonpharmacological pain interventions, poor past experience with VA health care, and lack of social support). Poverty, unemployment, and disability have been found to have an impact on the health and wellbeing of veterans (Smith, 2015; Strong et al., 2014). The high unemployment rate in the U.S. veteran population has been theorized to be driven by high rates of mental and physical health issues, lower SES at time of enlistment, stigmatization and discrimination by employers, and difficulties transferring skills from military to civilian careers (Loughran, 2014; Smith, 2015). Regarding disability, it is estimated that approximately 22% of U.S. military veterans have a service-related disability (U.S. Department of Veterans Affairs; 2017). Common service-related disabilities recorded amongst veterans include hearing loss, tinnitus, ankle limitations, degenerative arthritis of the spine, scars, diabetes, and sciatic nerve paralysis (Holder, 2016). Baria and colleagues (2019) summarise their findings regarding social factors and veterans with chronic pain by highlighting the housing, familial, and financial struggles within this population.

Military Culture and Chronic Pain

In their influential BPS model of chronic pain, Gatchel et al., (2004) identified cultural factors as important and influential variables in the development and maintenance of chronic pain. Given the lack of empirical literature examining the role of military culture on the development and maintenance of chronic pain in military populations, it is not surprising that Baria et al. (2019) did not include this social construct in their adapted model for veterans. While understudied, it is the belief of the principal investigator (PI) of this study that cultural factors play an important role in how military personnel interpret pain stimuli, and subsequently cope with persistent pain.

Since Thomas Burk's (1999) seminal work on the four elements of military culture (i.e., discipline, professional ethos, ceremonies, and etiquette), many researchers have endeavoured to study the complexities of military culture. Organizational culture broadly has been defined as a pattern of effective communal assumptions that have been learned over time and adopted by new members, all of which are influenced by external adaptation and internal integration as novel problems are presented to the group (Tharp, 2009). In his analysis of military culture in Canada, English (2015) adds to this framework by noting the importance of including all cultures within the conceptualization (e.g., national, regional, unit-based), as well as noting the fluidity of culture as individuals and organizations respond to conflicting pressures. Military culture is seen as the bedrock for understanding the collective set of values, norms, and beliefs that are pervasive throughout the organization (English, 2004). Further, it follows that one's behaviours are strongly influenced by the values, norms, and beliefs they adopt. With this cultural framework in mind, one can reasonably assume that military members' beliefs and behaviours regarding pain are thus shaped by the overarching cultural complexities of the military organization. In their ethnographic study examining chronic pain experiences in recently

retired/discharged female U.S. military veterans, Denke and Barnes (2013) identified several prominent cultural influences in the experience and development of chronic pain. Firstly, the authors identified the "Mission First" expectation, which can be described as a culturally primed requirement within each military branch requiring soldiers to perform optimally, regardless of their physical or mental status. When confronted with pain stimuli, soldiers are "taught to ignore it or block it out because there is nothing more important than the mission" (p. e191). Secondly, the authors identified a military strategy known as Calling Out the Weak, as an instrumental factor in participants' pain experiences. This strategy is designed to source out limitations within each unit, noting the mental, physical, and emotional weaknesses of individual soldiers. Participants in this study described withholding physical complaints to their respective chain-of-command due to fears of being stigmatized as the "weak link" (e.g., "[Pain means] you are made to feel like you are not a team player, because you can not deploy, you can not participate in flight walks. If you can not walk long periods of time, you are made to feel like nothing"; p. e192). Seeking care was also identified as a major theme within participant narratives. Soldiers refrained from seeking medical attention until their pain levels increased to where they were no longer able to perform their duties effectively. To summarize study findings, due to stigma and cultural drives to perform optimally, female military personnel described continual efforts to ignore and suppress their pain symptoms until critical thresholds were reached, rendering them incapable for performing their duties effectively.

Stigma

As previously noted, stigma has been identified as a barrier to accessing physical as well as mental health treatment amongst actively serving military members (see Richards et al., 2016). While policies have been enacted to address and reduce stigma within many of these

organizations, persistent culturally based challenges remain for practitioners and policymakers. Relevant research literature on stigma has addressed both mental and physical health concerns amongst military personnel (as discussed below), though physical health concerns related to stigma have received surprising little attention.

Mental Health Stigma in the Military. In their review of stigma and mental health service utilization in military personnel, Michalopoulou et al. (2017) identified important findings from the extant literature. Studies examining active-duty personnel found that some unit leaders within the military consider personnel weak and/or malingering if they sought out mental health services (e.g., Zinzow et al., 2013). However, when unit leaders were perceived as supportive, personnel reported an increased likelihood of seeking mental health services (e.g., Adler et al., 2015). Military culture was further implicated in perpetuating self stigma (i.e., "negative self appraisal associated with mental health problems or with seeking help"; Michalopoulou et al., 2017, p. 15). Respondents in three studies reported feeling embarrassed, "crazy", and weak if they were to seek mental health treatment and/or receive a mental health diagnosis (Britt et al., 2015; Skopp et al., 2012; Zinzow et al., 2013). Interestingly, in one study examining stigma and barriers to metal health care in deployed CAF members, Sudom et al., (2012) found that care-seeking was not associated with perceived stigma, and that perceived structural barriers were in fact positively correlated to care-seeking. From their analyses, only respondents' negative attitudes regarding quality of care and outcomes trended in the anticipated direction with care-seeking (i.e., negatively correlated). Help-seeking stigma amongst 271 men in the U.S. military was found to be significantly predicted by restrictive emotionality when experiencing low-to-moderate levels of distress, whereas, amongst those experiencing high levels of distress, restrictive emotionality was not associated with help-seeking stigma (Heath et

al., 2017). This study's findings suggest that the relationship between restrictive emotionality and help-seeking stigma is mediated by the member's level of distress. In a joint effort to examine stigma and barriers to mental health care across military organizations, researchers from the UK, U.S., Australia, New Zealand, and Canada found similarities in patterns of reported stigma and barriers in seeking psychological care between these Western military forces (Gould et al., 2010).

Physical Health Stigma in the Military. As discussed previously, the stigma related to physical health concerns has received less attention than the stigmatization of mental health disorders within military samples. Among the few authors examining physical health stigma in the military, Frank and colleagues (2018) examined the extant literature and outlined several hypotheses regarding the presence of physical health stigma in the military. The authors described the relation between physical fitness and health standards, and the threat of being deemed unfit for service, promotion, or deployment as being a perceived barrier to seeking mental or physical health services (see Boulos & Zamorski, 2015; Hoge et al., 2006). The persistent concern of being deem unfit for service is especially prominent in military organizations where the employer provides both mental and physical health services (e.g., CAF), as a military member's personal health status is at an increased risk of discovery by one's superiors (Frank et al., 2018). Similarly, confidentiality has been identified as a concern for CAF personnel regarding potential leaks of personal health information to superiors (Born et al., 2017). In their study examining physical and mental health stigma between CAF personnel (N = 1900) and Canadian civilians (N = 2960), Frank et al. (2018) found that military personnel were nearly six times more likely to report enacted stigma (i.e., perceived discrimination regarding a stigmatizing condition). Interestingly, the authors found that physical health, and not mental

health, was a significant predictor of felt stigma (i.e., the affective response associated with one's condition, such as embarrassment or shame) in both samples, though predominantly more so amongst military participants. It appears that the cultural differences between samples significantly influenced the prevalence of both enacted and felt stigma, with physical health predicting greater perceived stigma than mental health for military members. As described earlier, care-seeking stigma can significantly influence one's tendency to access important health interventions. These findings have important implications for understanding the etiology of chronic pain conditions, as military personnel are at risk of experiencing chronic pain if acute injuries are left unattended.

Military Masculinity

A well-studied phenomenon within military organizations is that of military masculinity. Broadly defined, military masculinity is the construction of masculine ideals characterized by self-reliance, propensity toward aggression and violence, pronounced heterosexuality, physical toughness, respect for established rank hierarchies, and a willingness to prioritize service-over-self (Ogilvy, 2016; Swain, 2016). The construct of military masculinity can be adopted by both males and females and is fluid and adaptable within varying contexts (e.g., peacekeeping vs. combat missions; Duncanson, 2009). Military masculinity has been theorized to be differentially adopted amongst military branches (e.g., U.S. Marine Corps emphasizes a culture of combat competence, whereas the Navy idealizes service before the self; Brown, 2012). Some of the aforementioned elements of military masculinity can be viewed as adaptive in the context of battle. For example, when faced with life-threatening circumstances, prioritizing the 'mission' and ignoring bodily pains can be an effective means to preserving one's life and the life of others around them. However, these principles can become problematic outside of a life-or-death

context. For instance, opting to go "on course" instead of resting following an acute injury, while aligned with military masculine norms, can potentially prolong recovery and/or exacerbate the injury. The experience of persistent pain conflicts with the masculine warrior model. The demonstrations of toughness, self-reliance, and service-over-self are made difficult by disabling pain conditions, and personnel are at times struggling in their decisions to seek out potentially stigmatizing care (Denke & Barnes 2013).

To summarise, the interactions between stigma, internalized military masculine dogmas, and threats to job security and promotion can drive military personnel to refrain from seeking important and timely medical attention for their physical health concerns. When injuries are left unattended, the risk of further damage and re-injury compounds over time. Through this lens, once acute and treatable injuries can turn into chronic debilitating conditions from which the management of symptoms is often the only realistic intervention available. Future studies are needed to examine this phenomenon in the CAF as the cost on the quality of life, burden to Veteran Affairs health systems, and economic toll are substantial.

Transition to Civilian Life

Similar to the influence of military culture on chronic pain, the transition to civilian life for military veterans has received limited attention. Anecdotal evidence from the PI's clinical experiences with CAF veterans dealing with chronic pain has highlighted the diverse difficulties experienced by military personnel as they transition to civilian life. Notably, financial and social stressors during transition, as well as delayed access to specialty pain care, have been identified as negatively affecting one's ability to cope with physical ailments. The subsequent change in role identity has also been extrapolated by some as a significant challenge during and after transition. Despite limited empirical evidence supporting these claims, it is the belief of the PI of

this study that the inclusion of transitional factors needs to be discussed to obtain a complete conceptual picture of CAF veteran's pain experiences.

"Soldiers, sailors, and aviators will eventually remove their uniforms and transition into civilian life. This is inevitable" (Cathcart, 2017, p. 60). While this transition is an inevitability for military personnel, this multifaceted process is largely understudied in the extant literature (Veterans Affairs Canada, 2017). The transition experience has been uniquely defined by some veterans and researchers alike as "reverse culture shock", as unanticipated difficulties and the reinterpretation of roles within interpersonal relationships must be addressed by veterans and close others (Westwood et al., 2002). In the CAF, personnel can leave active duty through compulsory, voluntary, or medical release, with the manner of release having differing impacts on perceived transition success (Cathcart, 2017). Transition to civilian life is largely a unique endeavour for military personnel as few other professions embody cultural and organizational dynamics so distinctly different from that of general populous (e.g., deployment, military training, organizational hierarchy). While many veterans consider themselves to have successfully transitioned from the military, others struggle to cope with the multitude of adjustments needed for civilian life (Bowes et al., 2018). Data from the Canadian Armed Forces Transition and Well-being Survey (2016) found that amongst Regular Force members who released in 2016, many found understanding benefits and services (32%), losing military identity (34%), and finding a healthcare provider after transition (42%) to be *very* or *extremely* challenging (VanTil et al., 2017). In a non-governmental study conducted by Black and Papile (2010), the authors found that 37% of respondents reported feeling as if they did not successfully transition to civilian life. When asked what, if anything, kept respondents from seeking help (e.g., for health, relational, or employment concerns), 22% indicated that their pride was a

barrier, with 29% stating they believed that they could do it on their own. Interestingly, from 190 responses, only 6% endorsed physical health as an important factor in their transition, whereas finding satisfying work (27%) and mental health (20%) were perceived as the most important elements in transition.

A Canadian-based research group conducted a literature review to examine determinants of successful military to civilian transitions (Rose et al., 2018). Findings revealed a range of factors that are believed to be interconnected in both a direct and indirect fashion. Personal factors included age at time of release, post-release income and employment, substance abuse, and marital status, whereas health factors included the presence of PTSD, anxiety, depression, and pain. One study by Marshall and Matteo (2004) found that current level of pain or discomfort in relation to medical release status was a significant indicator of decreased income post-release. Further, this study found that those reporting severe daily pain and/or increased disability indicated feeling less economically protected post-release than those with lower levels of pain symptoms. Based on the cumulative findings, Rose et al. (2018) created an overview of the barriers and facilitators of successful transitions for military members, as well as suggesting possible interventions that can be established prior to release, during transition, and following release. Notably, many factors identified as barriers to successful transition to civilian life were also identified by Baria et al. (2019) as biopsychosocial variables associated with veterans' chronic pain experiences (e.g., lack of social support, musculoskeletal disorders, mental illness, healthcare and treatment issues, low income). Rose et al. (2018) highlight the importance of early identification of, and intervention for, at-risk military personnel, which could result in subsequent indirect benefits in both the development and management of pain symptoms for veterans.

Identity and Transition

Like many social constructs, no one definition of *identity* has been accepted within and across disciplines (Beart et al., 2005). For the purposes of this paper, identity will be defined as "a set of 'meanings' applied to the self in a social role or situation defining what it means to be who one is" (Burke, 1991, p. 837). The aim of Identity Theory is to understand and explain the dynamic relationships between individuals and society in terms of the mutual and/or reciprocal interactions between the two (Wilson-Smith & Corr, 2019). Role identity is also understood within this framework, such that behavioural choices individuals make are ultimately guided by predetermined self-oriented standards that are situation- and context-dependent. The construct of commitment within the Identity Theory literature, defined as the degree to which important others are perceived to want the individual to maintain a particular position, has been found to be an important modulator of social roles (Stryker & Statham, 1985). Individuals showcase higher levels of commitment in a social role when most of their prominent social relationships are affirmed within that context (Hogg et al., 1995). For military personnel, high levels of commitment to operational roles are ubiquitous and promoted through training and cultural norms (Wilson-Smith & Corr, 2019). The identity change dynamics of releasing from military careers can be understood by considering the construct of role exit. Military members often establish close connections with their peers, enmesh themselves in the culture of the organization, and find fulfillment in their military responsibilities. Ending one's career in the military can result in a "fragmentation of their social identity which can lead to a sense of grief over the loss of a central aspect of the self" (Wilson-Smith & Corr, 2019, p. 36). Role exit describes the process whereby individuals leave a role that was formed within a socio-cultural environment and are subsequently required to establish new alternative roles outside of this

context. As noted earlier, 34% of veterans exiting the CAF in 2016 indicated that losing their military identity was either *very* or *extremely* challenging (VanTil et al., 2017). The same survey found 38% of respondents reported moderate to high levels of difficulty transitioning to civilian life. While not explicitly captured in this survey, establishing a new role identity in the civilian world appears to be a difficult task for many CAF members. Confidence in one's role identity has been positively associated with perceived physical well-being (e.g., Frone et al., 1995; Wickrama et al., 1995), a phenomenon which has potential implications for CAF veterans chronic pain experiences.

The commemoration and recognition of service is of paramount importance in the Canadian military (e.g., medal ceremonies, Remembrance Day). Black and Papile (2010) found that 48% of the 187 CAF veteran respondents reported feeling *somewhat under-appreciated* to *not appreciated at all* by their civilian counterparts following their release; noting that the transition experience would have been "easier if Canadians understood more about the military way of life" (p. 396). The civilian reception (i.e., on a spectrum from veneration to ridicule) of releasing CAF members appears to impact the perceived ease and success of transitioning. In an interesting study by Kut et al (2007), the authors found that in experimental groups role-playing characters recognized as *heroes/heroines*, affective pain tolerance increased from pre-to-post role-play, whereas affective pain tolerance significantly decreased among those role-playing a *faint-heart* character. The findings suggest self-perceived role identity (i.e., recognition of heroic acts/character) has a function in modulating pain sensations through attentional and affective means. The phenomenon of role identity, specifically that of perceived and recognized heroism, may play a role in modulating pain perception amongst CAF veterans. Importantly, if findings from the Black and Papile (2010) study are generalizable, nearly half of all CAF veterans would

endorse feeling underappreciated for their service. Feelings of underappreciation, coupled with other transitional difficulties, may serve to modulate pain perception in CAF veterans as they attempt to establish a new identity in the civilian world. Other studies have found significant associations between identity making and chronic pain (e.g., Eccleston et al., 1997; Gotlib, 2012; Harris et al., 2003; Sharpe et al., 2013), highlighting the role of social identity and role establishment in pain perception.

Limitations of the Extant Research

As mentioned previously, etiological variables of chronic pain in veteran samples have received a moderate amount of empirical interest, with most studies examining U.S. military veterans. Comparatively, the chronic pain experiences of Canadian veterans have received significantly less attention. In the extant empirical literature involving CAF veterans, researchers have examined the associations of chronic pain and suicide (e.g., Thompson et al., 2014), mental health conditions (e.g., Thompson et al., 2016; Vun et al., 2018), anxiety disorders (e.g., El-Gabalawy et al., 2015), disability (Hopman et al., 2015; Thompson et al., 2015), and PTSD (e.g., Asmundson et al., 2003; Asmundson et al., 2004; Irwin et al., 2014; Poundja et al., 2006). While these studies are few in number, there appears to be, to the knowledge of the PI, an absence of empirical studies exploring the interrelationship between chronic pain and SUDs, mood disorders, homelessness, employment status, poverty, social support/isolation, access and wait-times for healthcare, environmental stressors, and previous treatment experiences amongst CAF veterans. Among the available studies mentioned above, the authors unanimously concluded that further research was needed to understand the complex nature of chronic pain in the CAF veteran population. Another notable limitation of the extant literature is that of the absence of qualitative studies. To gain a robust understanding of any phenomenon, the use of varied research design

modalities is of vital importance. Thus, exploring the perceptions of CAF veterans, how they interpret and explain their pain experiences, is essential to broaden the theoretical picture of chronic pain in this population.

Summary of Objectives and Hypotheses

Study 1

As reviewed earlier, the well studied biopsychosocial model of chronic pain (Gatchel, 2004) was adapted by Baria and colleagues (2019) to reflect variables thought to significantly contribute to the chronic pain experience in military veterans. Currently, the elements of the model have yet to be empirically examined in Canadian military veteran samples as they have in US samples. Study 1 examined the relationship between and predictive qualities of the proposed variables to better understand the complexity of the chronic pain experience for CAF veterans. This study used data obtained from the Canadian Community Health Survey Canadian Forces Supplement (CCHS- CFS; 2002), and the Canadian Armed Forces Members and Veterans Mental Health Follow-up Survey 2018 (CAFVMHS; 2018). Cross-sectional analyses examined PS correlates (i.e., at the 2018 time period) of chronic pain conditions amongst veterans. Further, analyses were conducted using survey data of participants who were actively serving in the CAF at the 2002 survey administration, and who were subsequently released from the CAF at the 2018 survey administration time period. Available data of the proposed PS variables (i.e., depression, post-traumatic stress disorder, anxiety, alcohol use disorder (AUD), work stress, poverty, and social support) were used as predictors of chronic pain conditions at the 2018 time period. Utilizing longitudinal data allowed for greater confidence in the quality of predictor variables used in this study. Study findings provided preliminary evidence toward the utility of the revised BPS model of chronic pain for CAF veterans.

Hypothesis. Given the wealth of literature that has validated the close association between chronic pain and the proposed PS variables, it was anticipated that the variables measured would be associated with increased odds of chronic pain conditions among veterans. Secondary to this, while no research examining the longitudinal relationship between PS variables and chronic pain amongst CAF samples was found, I anticipated that baseline (2002) PS variables would be associated with increased odds of new onset chronic pain conditions at follow-up (2018) after controlling for demographic and military characteristics.

Study 2

While a wealth of research has examined etiological factors influencing the development and maintenance of chronic pain in veteran samples, very few studies have examined these variables through qualitative means. There is a sparsity of empirical qualitative literature examining etiological factors of chronic pain in veteran samples, and none to the best of my knowledge that explore these variables within the CAF veteran population. The overarching aim of Study 2 was to better understand how CAF veterans describe and understand influential factors in the development and maintenance/exacerbation of their chronic pain in relation to proposed BPS and cultural factors. CAF veterans with chronic pain were recruited to participate in audio/video-recorded semi-structured interviews with the purpose of detailing veterans' perceptions of how their chronic pain developed, and how it is currently maintained/exacerbated. The open-ended questions utilized in this study were extracted from the proposed BPS model of chronic pain for veterans (Baria et al., 2019), with additional questions added to address cultural factors unique to military service. Interview data was analysed using constructivist grounded theory methodology. To my knowledge, this was the first qualitative study examining CAF veteran experiences with chronic pain through a BPS lens.

Mixed-Methods Convergent Design

A comparison and integration of the findings from both studies is provided utilizing a convergent design methodology (Creswell & Plano Clark, 2018). As both Study 1 and Study 2 were designed to explore the same phenomenon through different methodological lenses, a comparison of findings allowed for a more in-depth examination of the research aim. Joint display tables were created to present the findings of both studies alongside the BPS variables proposed by Baria and colleagues (2019). Interpretation of comparisons and suggestions for a revised BPS model of chronic pain for CAF veterans are reviewed.

Chapter 2: Study 1

Overview

The aim of Study 1 was to assess the elements of the adapted BPS model for chronic pain in a Canadian veteran sample by examining the predictive quality and relationship between the proposed PS variables and chronic pain conditions. First, cross-sectional data were analysed to explore the relationship between the proposed PS variables and chronic pain conditions in a sample of CAF veterans. A secondary analysis examined the predictive qualities of proposed PS variables on new onset chronic pain conditions using longitudinal data. These analyses used data on PS variables while participants were still actively serving in the CAF, and data on chronic pain conditions after the participants were released from the CAF. The first analyses directly examined the claims in the adapted BPS model for chronic pain, whereas the secondary analyses extended the examination to longitudinal influences on chronic pain development.

Methods

Sample

The analyses for this study were conducted using the 2002 CCHS-CFS, and the associated follow-up survey, 2018 CAFVMHS. Data were accessed at the Manitoba Research Data Centre (RDC). An application was made to access the date based on the study parameters, which was subsequently approved by Statistics Canada. The CCHS-CF was the first survey of its kind to examine the health and well-being (i.e., primarily mental health concerns) as well as healthcare utilization amongst a representative sample of the CAF (both Regular Force and Reserve Force). Components of the World Mental Health Survey, along with other sources, were selected by an expert group of mental health professionals to develop the survey. A total of 5,155 computer-assisted interviews were conducted with Regular Force members, aged 15 to 64 years old, utilizing a structured diagnostic interview protocol. Further information regarding description and methodology of the survey can be found elsewhere (e.g., Statistics Canada, 2007). Of the regular force personnel who completed the CCHS-CF, 2,941 completed the 2018 follow-up survey (CAFVMHS), yielding a response rate of 68% (66% veterans; 34% active duty; Afifi et al., 2020). Participants of the CAFVMHS were similar to non-respondents, though serving in land operations and being of younger age were predictors of attrition (Bolton et al., 2021). The CAFVMHS had four key objectives, 1) to estimate the incidence, prevalence and course of mental health issues, as well as health service utilization, physical health concerns, and suicidal behaviours, 2) to examine pre-deployment, deployment, and post-deployment factors in relation to physical and mental health problems, 3) to aid in the development of risk prediction tools, and 4) to explore baseline predictors of mental wellness, resilience, and factors impacting the transition to civilian life (Afifi et al., 2020). For the longitudinal analyses in the current study, those who participated in both the 2002 and 2018 surveys and who were of veteran status were included (N = 1,905). For cross-sectional analyses, only those who were of veteran status in 2018

were included. Ethical approval for this study was submitted to and received from the Human Research Ethics Board (HREB) at the University of Manitoba prior to the commencement of this research.

Measures

Based on PS variables proposed in the novel BPS model of chronic pain for veterans (Baria et al., 2019), the following PS and chronic pain variables were selected from the CCHS-CF and CAFVMHS surveys, as they best reflected the PS variables theorized to affect chronic pain experiences amongst veterans. Of note, not all the variables proposed by Baria et al. were assessed in CCHS-CF and CAFVMHS surveys. Thus, I have limited my interpretation of the findings associated with the model accordingly.

Psychosocial Variables

PS variables used in this study included depression, anxiety, PTSD, AUD, social support, work stress, and poverty. The World Health Organization Composite International Diagnostic Interview (WHO-CIDI) is a structured diagnostic interview that was administered by lay interviewers trained by statistics Canada to administer the surveys. The WHO-CIDI assesses mental health disorders as outlined by the criteria in the Diagnostic and Statistical Manual of Mental Disorders, Forth Edition (DSM-IV). The reliability and validity of this instrument has been well established (Kessler et al., 2004; Kessler & Üstün, 2004). Past-year PS variables were utilized for cross-sectional analyses, whereas lifetime variables were used in the longitudinal analyses. Major depressive episode, PTSD, and anxiety disorders (i.e., panic, generalized, social), were the primary mental health conditions used in both analyses of this study. Alcohol use and dependence were also utilized in the cross-sectional analyses in this study. Of note, Baria

et al. (2019) include substance use disorders more broadly (i.e., not just AUD), though do emphasize alcohol use as problematic for veterans in the text descriptions.

Social support, assessed in both 2002 and 2018, was measured using the Medical Outcomes Study Social Support Survey (Sherbourne & Stewart, 1991). The 19-item measure is rated on a 0-4 Likert scale (i.e., "none" to "all of the time") and assesses four functional support scales (i.e., active social interaction, affection, tangible, and emotional/information). For each participant, item responses were summed at each administration. The derived continuous variables were used to assess overall perceived level of social support, where high scores indicated greater perceived support. Work stress was measured using 12 items derived from the Job Content Questionnaire (Karasek et al., 1998). Items were assessed on a 5-point Likert scale (i.e., "strongly agree" to "strongly disagree") and were summed to create a new continuous variable. The items assessed work stress in six areas: decision authority/control, job insecurity, psychological demand, physical exertion, social support from colleagues/supervisors, and skill discretion/demand). Work stress was assessed at both the 2002 and 2018 time points, and those in 2018 who were working (i.e., although retired from the CAF) completed the questions. Similar to the issue with AUD, Baria et al. (2019) included the broader variable of environmental stress, whereas only work stress was available in this dataset. Thus, interpretations are specific to this type of stress. In the 2018 follow-up survey, poverty was assessed based on participants responses to the following: "With your current household income, do you have any difficulty meeting basic expenses such as food, shelter and clothing?" (yes/no).

Chronic Pain Conditions

Physical health conditions were only assessed in the 2018 follow-up survey. Of those physical health conditions, three conditions (i.e., arthritis, back pain [excluding arthritis], and

migraines) were identified as prevalent chronic pain conditions in the revised BPS model of chronic pain for veterans (Baria et al., 2019). Of note, for this study I conceptualized and labelled back problems (excluding arthritis) as back pain. The CAFVMHS chronic pain conditions used in this study have been examined in other studies (e.g., Perera et al., 2021), and other studies have also used and labelled these conditions as chronic pain conditions (e.g., Csupak et al., 2018; Grocott et al., 2021). In addition to questions about specific physical health conditions, the survey queried the presence of chronic pain conditions with a single variable (yes/no). An additional *any chronic pain* composite variable (i.e., having any of the three pain conditions compared to none) was created for the purpose of this study. For cross-sectional analyses exploring the relationship between chronic pain and PS variables, all chronic pain conditions were included in the analyses. For longitudinal analyses, only new onset chronic pain conditions were included (i.e., onset of pain condition following the 2002 survey administration). Participants were asked whether they had a diagnosis of each pain condition and the date of onset (e.g., "What age were you when you were first diagnosed with arthritis?). The latter variable was used to calculate new onset following the 2002 survey administration. Individual new onset chronic pain condition variables were used (i.e., arthritis, back pain, and migraines), as well as a composite of any new onset chronic pain condition. Those with pre-existing chronic pain were excluded to isolate a comparison between new onset vs. no chronic pain ever experienced.

Sociodemographic and Military Variables

The following sociodemographic and military variables were used in the analyses as covariates: age (continuous), sex (male/female), race/ethnicity (White/non-White), education (secondary school or less, some postsecondary or higher), marital status (married/common-law, separated/widowed/divorced, single/never married), household income (<CAD $49,999, CAD

$50,000+), rank (junior non-commissioned member, senior non-commissioned member, officer), service environment (air, land, sea), deployment history (new deployment since 2002/no, any deployments/none), length of service (continuous). These variables have been used as covariates in previous research examining health outcomes amongst CAF veterans (e.g., Gill et al., 2022; Perera et al., 2021; Sommer et al. 2022).

Due to issues with residuals between the two surveys (i.e., concerns that residuals between baseline and follow-up variables could allow for individual participants to be identified), and sample sizes being too small for some analyses, some outputs were not releasable from the Manitoba RDC (findings deemed non-releasable are noted in the tables below). Based on the advice from the RDC analyst, only the follow-up (2018) variables of income, marital status, and sex were used as covariates for the cross-sectional analysis and the longitudinal analysis. This was done to avoid outputs being deemed non-releasable due to residuals between baseline and follow-up periods. While I acknowledge issues with utilizing variables that are likely to change over the course of 16 years (e.g., marital status, income) as baseline covariates for the longitudinal analyses, it was decided that since the cross-sectional analyses amongst veterans was the primary focus of the study, the 2018 variables were the most important to retain if a selection between the two timepoints was required.

Statistical Analyses

Across both sets of analyses (longitudinal and 2018 cross-sectional), STATA/MP (Stata statistical software, release 16, StataCorp LLC, College Station, TX) was utilized. 2002 sampling weights created by Statistics Canada were applied to inferential analyses used in this study. To account for the complex design of the survey, bootstrapping weights were used for estimates of variability (i.e., weights were calculated by Statistics Canada). The 2002 CCHS-CF and 2018

CAFVMHS datasets were previously merged, and those who did not complete both surveys were excluded from the merged dataset. Listwise deletion was utilized when missing data were present. This is considered standard practice when less than 5% of values are missing (see Sareen et al., 2021).

Weighted cross-tabulations established the prevalence of PS variables across pain types (i.e., new onset chronic pain types and lifetime chronic pain). Multivariable logistic regressions were used to examine the association between each PS variable and each chronic pain condition. Each regression analysis included an unadjusted model, an adjusted model including sociodemographic and military characteristics, an adjusted model including sociodemographic variables, military characteristics, and the other PS variables, and a final adjusted model including sociodemographic variables, military characteristics, PS variables, and the remaining chronic pain conditions (i.e., to isolate the effect and control for the influence of comorbid pain conditions).

The first objective of this study (i.e., the cross-sectional analyses) was to examine the cross-sectional association between PS variables (i.e., depression, anxiety, PTSD, AUD, social support, work stress, and poverty) and chronic pain conditions amongst CAF veterans. The CAFVMHS (2018) data was used and only those who were of veteran status in 2018 were included in the analyses. Bivariate logistic regressions were used to examine relationships between each PS correlate and both 1) individual chronic pain conditions, and 2) the composite any chronic pain condition. As described above, multivariate logistic regression analyses were performed to examine the association between PS variables and chronic pain while controlling for covariates. Four models were assessed, 1) unadjusted model: PS variables and chronic pain conditions, 2) adjusted model 1: added sociodemographic and military characteristics (as

covariates), 3) adjusted model 2: added the other PS variables, and 3) adjusted model 3: added the other chronic pain conditions.

For Analysis 2, the CCHS-CF (2002) and CAFVMHS (2018) data were used, and only those who were actively serving in the CAF in 2002, and subsequently of veteran status in 2018, were included in the analyses. Bivariate logistic regressions were used to examine the relationship between each 2002 PS correlate and 2018 new onset chronic pain conditions. Multivariate logistic regression analyses were performed to examine the associations between each PS variable and new onset chronic pain condition while adjusting for the selected sociodemographic. Four models again were assessed, 1) unadjusted model: PS variables and new onset chronic pain conditions, 2) adjusted model 1: added sociodemographic and military characteristics (as covariates, 3) adjusted model 2: added the other PS variables, and 3) adjusted model 3: added the other new onset chronic pain conditions.

Results

Sample Characteristics

Among the CAFVMHS sample, 65% (N = 1905) were veterans. Table 1 displays the prevalence of sociodemographic, military demographics, PS variables, and chronic pain conditions at baseline and follow-up periods (note that some variables only available at either baseline or follow-up periods – see Table 1). Of the sample characteristics, the mean ages were 38.12 (at baseline) and 53.65 (at follow-up), and participants were primarily male (88.08%, at follow-up), White (95.00%, at baseline), with a reported income above $50,000 (85.37% at baseline, and 92.97% at follow-up) and had obtained some post-secondary education (57.06% at baseline). Most were junior non-commissioned members (54.18%) and served in the Army (46.76%) at the baseline period. In 2002, most respondents had deployed at least once (64.90%),

whereas 76.24% had done so by 2018, with the average length of service in 2018 being 25.29 years. As of 2018, 65.59% had a chronic pain condition at some point in their lifetime, with the most common being back pain (50.15%), then arthritis (39.82%), and lastly migraine headaches (12.64%). Any new onset chronic pain condition (i.e., chronic pain conditions developing after the 2002 survey administration), was endorsed by 53.20% of the sample, with 29.81% reporting new onset arthritis, 29.37% reporting new onset back pain, and 4.75% reporting new onset migraine headaches.

Table 1
Sample characteristics at baseline (2002) and follow-up (2018) among veterans (N = 1,905)

	2002	2018
Sociodemographics and military characteristics		
Age (*M*, *SE*)	38.12 (0.16)	53.65 (0.16)
Sex		
Male	---	88.08
Female	---	11.92
Race		
White	95.00	-
Non-White	5.00	-
Marital status		
Married/common-law	75.98	81.66
Widowed/separated/divorced	9.17	11.75
Single/never married	14.84	6.59
Income		
$0-$49,999	14.63	7.03
$50,000+	85.37	92.97
Education		
Secondary	42.94	---
Some post-secondary	57.06	---
Rank		
Junior non-commissioned member	54.18	--
Senior non-commissioned member	27.29	--
Commissioned officer	18.53	--
Element		
Land	46.76	--
Sea	34.50	--
Air	18.75	--
Deployment		
Deployed at least once	64.90	76.24
Never deployed	35.10	23.76

Length of service (*M*, *SE*)	-	25.29 (19.7)
Chronic pain conditions		
Any chronic pain condition	-	65.59
Arthritis	-	39.82
Back pain	-	50.15
Migraine	-	12.64
Any new onset chronic pain condition	-	53.20
New onset arthritis	-	29.81
New onset back pain	-	29.37
New onset migraine	-	4.75
Psychosocial factors		
Depression	18.67	21.09
Anxiety	15.62	23.06
PTSD	8.02	18.84
AUD	-	3.74
Social support (*M*, *SE*)	63.05 (38.01)	35.53 (24.22)
Work stress (*M*, *SE*)	18.39 (12.43)	17.24 (18.46)
Poverty	-	6.08

Note. When not otherwise indicated, values are expressed as weighted percentages of the population. *N* rounded to base 5. Psychosocial variables from 2002: Depression = lifetime depression in 2002; Anxiety = any lifetime anxiety disorder (GAD, panic, social phobia) in 2002; PTSD = lifetime PTSD 2002. Psychosocial variables from 2018: Depression = past-year major depressive episode; Anxiety = any past-year anxiety disorder (GAD, panic, social phobia); PTSD = PTSD diagnosis since last interview; AUD = past-year alcohol abuse or dependence; Poverty = difficulty meeting basic expenses.
M = mean, *SE* = standard error
(-) = data not available in dataset
(--) = data not assessed in analysis
(---) = data unable to be released due to residuals

Prevalence of Chronic Pain Conditions According to Sociodemographic Characteristics (2018).

Table 2 shows the cross-sectional relationship between psychosocial, sociodemographic, military variables and chronic pain conditions at follow-up. With respect to sociodemographic and military characteristics, the prevalence of chronic pain (i.e., any chronic pain condition) was elevated among both those who had deployed at least once and those who were non-White, and was comparable across marital status categories. Notable elevations of arthritis were observed amongst those who were widowed, divorced, or separated, those with only secondary education,

and those who reported incomes below $50,000. The prevalence of back pain was elevated for those who were non-White and who deployed at least once. Regarding migraine headaches, being female, and being single/never married was found to be associated with elevations in this sample of veterans. The prevalence of PS variables (i.e., depression, anxiety, PTSD, AUD, and poverty) across any chronic pain condition ranged from 68.6% (AUD) to 84.0% (anxiety). For arthritis specifically, the prevalence of PS variables ranged from 53.3-56.3%, whereas the prevalence ranged from 64.6-70.3% and 20.4-24.8% for back pain and migraine headaches respectively. The observed means across all continuous PS variables of those with and without chronic pain conditions were relatively similar (i.e., age: 52.5-54.2, social support: 33.5-36.2, work stress: 17.1-18.2, and length of service: 23.7-25.8).

Table 2

Prevalence of chronic pain conditions according to sample characteristics at follow-up (2018) among veterans

	Any chronic pain (*N* = 1,225)		Arthritis (*N* = 745)		Back pain (*N* = 915)		Migraine (*N* = 250)	
	No	Yes	No	Yes	No	Yes	No	Yes
Sex								
Male	35.00	65.00	60.60	39.40	49.80	50.20	88.80	11.20
Female	30.30	69.70	57.40	42.60	49.80	50.20	76.50	23.50
Race								
White	34.80	65.20	60.10	39.90	50.70	49.30	87.70	12.30
Non-White	25.50	74.50	60.60	39.40	31.40	68.60	82.40	17.60
Marital status								
Married/common law	34.00	66.00	60.20	39.80	49.30	50.70	88.30	11.70
Widowed/separated/divorced	35.20	64.80	55.20	44.80	50.70	49.30	85.20	14.80
Single/never married	39.40	60.60	71.70	28.30	57.40	42.60	81.10	18.90
Income								
$0-$49,999	28.50	71.50	52.10	47.90	48.00	52.00	86.10	13.90
$50,000+	35.10	64.90	60.90	39.10	50.20	49.80	87.90	12.10
Education								
Secondary	30.90	69.10	57.10	42.90	46.10	53.90	88.40	11.60
Some post-secondary	37.10	62.90	62.50	37.50	52.70	47.30	86.70	13.30
Deployment								
Deployed at least once	30.30	69.70	67.80	32.20	59.70	40.30	86.20	13.80
Never deployed	47.60	52.40	57.90	42.10	46.70	53.30	87.70	12.30
Depression								
No	39.20	60.80	63.80	36.20	55.20	44.80	89.60	10.40
Yes	16.60	83.40	46.70	53.30	29.70	70.30	79.00	21.00
Anxiety								
No	40.30	59.70	64.70	35.30	56.00	44.00	90.70	9.30
Yes	16.00	84.00	46.20	53.80	29.70	70.30	76.50	23.50
PTSD								
No	38.90	61.10	64.00	36.00	54.80	45.20	89.50	10.50
Yes	17.60	82.40	46.20	53.80	31.90	68.10	79.60	20.40

AUD								
No	34.80	65.20	--	--	--	--	--	--
Yes	31.40	68.60	--	--	--	--	--	--
Poverty								
No	35.30	64.70	61.20	38.80	50.80	49.20	88.30	11.70
Yes	22.40	77.60	43.70	56.30	35.40	64.60	75.20	24.80
Age (*M*, *SE*)	53.80 (0.34)	53.60 (0.21)	53.30 (0.24)	54.20 (0.27)	53.90 (0.26)	53.50 (0.26)	53.80 (0.18)	52.50 (0.46)
Social support (*M*, *SE*)	36.20 (0.42)	35.20 (0.31)	36.10 (0.30)	34.80 (0.42)	36.20 (0.35)	34.90 (0.38)	35.80 (0.26)	33.50 (0.75)
Work stress (*M*, *SE*)	17.10 (0.29)	17.30 (0.24)	17.10 (0.22)	17.70 (0.33)	17.30 (0.26)	17.20 (0.28)	17.10 (0.20)	18.10 (0.68)
Length of service (*M*, *SE*)	25.50 (0.40)	25.20 (0.24)	25.00 (0.28)	25.80 (0.31)	25.50 (0.31)	25.10 (0.28)	25.50 (0.22)	23.70 (0.59)

Note. Values are expressed as weighted percentages of the population. *N* rounded to base 5. Psychosocial variables from 2018: Depression = past-year major depressive episode; Anxiety = any past-year anxiety disorder (GAD, panic, social phobia); PTSD = PTSD diagnosis since last interview; AUD = past-year alcohol abuse or dependence; Poverty = difficulty meeting basic expenses. As noted, Race and Education are baseline (2002) and not follow-up (2018) variables, as the 2018 variables were not released by the RDC.
(--) = data unable to be released due to residuals

Cross-sectional Associations Between Chronic Pain Conditions and Psychosocial Variables in 2018.

Cross-sectional associations between PS characteristics and chronic pain conditions at follow-up are displayed in Table 3. In the unadjusted model, depression, anxiety, PTSD, and poverty were associated with increased odds of any chronic pain condition and with each individual chronic pain condition: depression (OR range: 2.00-3.24), anxiety (OR range: 2.14-3.55), PTSD (OR range: 2.08-2.98), and poverty (OR range: 1.88-2.48). Results were consistent after adjusting for sociodemographic and military characteristics, with the exception of poverty, which was only associated with increased odds of migraine headaches and arthritis. Greater levels of social support were associated with decreased odds of individual chronic pain conditions and for any chronic pain condition after controlling for sociodemographic and military characteristics (AOR1 = 0.98 for each condition and any chronic pain). Work stress and AUD were not associated with any chronic pain condition across all models, with the exception of AUD and migraines in AOR1. After including all PS variables in addition to the sociodemographic and military characteristics in the same model, depression was associated with increased odds of any chronic pain condition and back pain (AOR2 = 1.91; 95% CI = 1.09-3.33; 1.92; 95% CI = 1.11-3.32 respectively), whereas anxiety was associated with increased odds of any chronic pain condition and arthritis (AOR2 = 1.83; 95% CI = 1.07-3.12 and 1.77; 95% CI = 1.05-3.01 respectively). Due to insufficient sample size, the third model could not be computed for migraine headaches. In the final model, which additionally adjusted for the other chronic pain conditions, only depression was found to be associated with increased odds of back pain (AOR3; 1.93; 95% CI = 1.07-3.48).

Table 3

Associations between psychosocial factors and chronic pain conditions at follow-up (2018) among veterans

	OR (95% CI)	AOR1 (95% CI)	AOR2 (95% CI)	AOR3 (95% CI)
		Any chronic pain		
Depression	3.24 (2.37-4.43)***	3.11 (2.23-4.35)***	1.91 (1.09-3.33)*	-
Anxiety	3.55 (2.65-4.75)***	3.35 (2.43-4.61)***	1.83 (1.07-3.12)*	-
PTSD	2.98 (2.14-4.15)***	2.62 (1.85-3.70)***	1.25 (0.71-2.20)	-
AUD	1.17 (0.60-2.25)	1.09 (0.56-2.09)	0.72 (0.23-2.29)	-
Social support	0.99 (0.98-1.00)	0.98 (0.97-0.99)*	1.00 (0.98-1.02)	-
Work stress	1.01 (0.98-1.03)	1.01 (0.98-1.04)	1.00 (0.97-1.03)	-
Poverty	1.88 (1.07-3.33)*	1.59 (0.86-2.94)	1.48 (0.51-4.27)	-
		Arthritis		
Depression	2.00 (1.56-2.58)***	2.18 (1.65-2.89)***	0.99 (0.57-1.71)	0.84 (0.47-1.48)
Anxiety	2.14 (1.67-2.75)***	2.19 (1.67-2.87)***	1.77 (1.05-3.01)*	1.48 (0.85-2.58)
PTSD	2.08 (1.58-2.74)**	2.17 (1.61-2.92)***	1.43 (0.79-2.59)	1.58 (0.83-2.99)
AUD	0.94 (0.54-1.65)	0.92 (0.52-1.63)	0.49 (0.15-1.62)	0.54 (0.17-1.76)
Social support	0.99 (0.98-0.99)*	0.98 (0.97-0.99)**	1.01 (0.99-1.03)	1.01 (0.99-1.03)
Work stress	1.02 (0.99-1.05)	1.02 (0.99-1.05)	1.02 (0.99-1.05)	1.02 (0.99-1.05)
Poverty	2.03 (1.27-3.24)**	2.06 (1.22-3.46)**	2.14 (0.82-5.62)	1.95 (0.81-4.69)
		Back pain		
Depression	2.91 (2.24-3.79)***	2.89 (2.17-3.85)***	1.92 (1.11-3.32)*	1.93 (1.07-3.48)*
Anxiety	3.01 (2.31-3.93)***	2.85 (2.16-3.77)***	1.28 (0.78-2.1)	1.03 (0.61-1.73)
PTSD	2.59 (1.96-3.42)***	2.36 (1.76-3.17)***	0.88 (0.52-1.5)	0.85 (0.49-1.48)
AUD	1.60 (0.89-2.85)	1.47 (0.82-2.66)	1.22 (0.38-3.86)	1.54 (0.48-4.93)
Social support	0.99 (0.97-0.99)*	0.98 (0.97-0.99)**	0.99 (0.96-1.00)	0.98 (0.96-1.00)
Work stress	1.01 (0.97-1.02)	1.0 (0.97-1.03)	0.99 (0.96-1.02)	0.98 (0.95-1.02)
Poverty	1.88 (1.15-3.08)*	1.58 (0.95-2.62)	1.26 (0.5-3.15)	0.98 (0.41-2.36)
		Migraine		
Depression	2.29 (1.64-3.21)***	2.05 (1.37-3.04)***	---	---
Anxiety	3.01 (2.16-4.19)***	3.06 (2.13-4.40)***	---	---
PTSD	2.17 (1.55-3.04)***	1.91 (1.28-2.86)**	---	---
AUD	--	0.18 (0.04-0.77)*	---	---
Social support	0.98 (0.96-0.99)**	0.98 (0.96-0.99)**	---	---

Work stress	1.04 (0.99-1.09)	1.04 (0.99-1.09)	---	---
Poverty	2.48 (1.40-4.38)**	2.32 (1.27-4.25)**	---	---

Note. OR = unadjusted odds ratio, AOR1 = adjusted odds ratio (controlling for age, sex, race, marital status, income, and education), AOR2 = adjusted odds ratio (controlling for age, sex, race, marital status, income, and education, and all IVs in same model), AOR3 = adjusted odds ratio (controlling for age, sex, race, marital status, income, and education, all IV's in same model, and all the other chronic pain conditions). CI = confidence interval.
(-) = analysis already includes all chronic pain conditions
(--) = outputs unable to be released due to residuals
(---) = analyses could not be computed due to insufficient sample size
*$p \leq .05$
** $p \leq .01$
*** $p \leq .001$

Prevalence of New Onset Chronic Pain Conditions (2018) According to Baseline Sample Characteristics (2002).

Table 4 describes the prevalence of new onset chronic pain conditions (i.e., onset after the 2002 survey administration) according to baseline (2002) sample characteristics. In terms of sociodemographic and military characteristics, the prevalence of any new onset chronic pain condition was elevated among those who were non-White, widowed/separated/divorced, and who had served in a land-based environment. Elevations of arthritis were observed amongst those who were junior and senior non-commissioned members, as well as those serving in a land environment. The prevalence of back pain was elevated for those who were non-White, junior non-commissioned members, and served in a land environment. Regarding migraine headaches, being a junior non-commissioned member and serving in either a land or sea environment was found to be associated with slight elevations in this sample of veterans. The prevalence of psychiatric conditions (i.e., depression, anxiety, PTSD) across any new onset chronic pain condition ranged form 60.9-70.6%. For arthritis, these conditions ranged from 34.1-38.7%, for back pain 29.0-37.0%, and for migraine headaches 6.1-8.9%. Continuous variables (i.e., age, social support, and work stress) were consistent across those with and without new onset chronic pain conditions (i.e., range for age: 35.7-38.3; social support: 62.4-63.5; and work stress: 17.8-19.9). Of note, mean values for social support across individual new onset chronic pain conditions were not releasable due to residuals with any new onset chronic pain conditions.

Table 4

Prevalence of new onset chronic pain conditions (2018) according to baseline sample characteristics (2002) among veterans

	Any new onset chronic pain (*N* = 715)		New onset arthritis (*N* = 475)		New onset back pain (*N* = 360)		New onset migraine (*N* = 75)	
	No	Yes	No	Yes	No	Yes	No	Yes
Sex								
Male	47.40	52.60	--	--	--	--	--	--
Female	42.70	57.30	--	--	--	--	--	--
Race								
White	47.50	52.50	70.20	29.80	71.90	28.10	--	--
Non-White	32.80	67.20	69.40	30.60	45.50	54.50	--	--
Marital status								
Married/common law	48.20	51.80	--	--	--	--	--	--
Widowed/separated/divorced	38.40	61.60	--	--	--	--	--	--
Single/never married	46.10	53.90	--	--	--	--	--	--
Education								
Secondary	42.50	57.50	67.40	32.60	66.60	33.40	95.60	4.40
Some post-secondary	50.10	49.90	72.40	27.60	73.50	26.50	95.00	5.00
Rank								
Jr. non-commissioned	41.50	58.50	68.00	32.00	64.70	35.30	93.70	6.30
Sr. non-commissioned	46.20	53.80	67.80	32.20	74.00	26.00	96.40	3.60
Commissioned officer	62.30	37.70	79.50	20.50	82.00	17.70	98.00	2.00
Element								
Land	39.60	60.40	65.70	34.30	63.50	36.50	94.90	5.10
Air	55.20	44.80	74.70	25.30	78.10	21.90	96.40	3.60
Sea	49.00	51.00	73.20	26.80	73.10	26.90	94.00	6.00
Deployment								
Deployed at least once	43.30	56.70	68.90	31.10	69.60	30.40	95.20	4.80
Never deployed	52.80	47.20	72.40	27.60	72.40	27.60	95.30	4.70
Depression								
No	50.10	30.60	71.50	63.60	72.00	63.00	96.10	91.10
Yes	49.90	69.40	28.50	36.40	28.00	37.00	3.90	8.90

Anxiety								
No	47.70	39.10	70.40	65.90	70.50	71.00	95.40	93.90
Yes	52.30	60.90	29.60	34.10	29.50	29.00	4.60	6.10
PTSD								
No	48.20	29.40	70.90	61.30	70.80	66.80	95.50	92.50
Yes	51.80	70.60	29.10	38.70	29.20	33.20	4.50	7.50
Age (*M, SE*)	38.20 (0.34)	37.40 (0.29)	37.80 (0.24)	37.90 (0.36)	38.30 (0.26)	35.80 (0.42)	38.30 (0.18)	35.70 (0.78)
Social support (*M, SE*)	63.50 (0.55)	62.40 (0.68)	--	--	--	--	--	--
Work stress (*M, SE*)	17.80 (0.21)	18.70 (0.19)	18.10 (0.17)	18.60 (0.22)	17.90 (0.17)	18.90 (0.28)	18.20 (0.13)	19.90 (0.52)

Note. When not otherwise indicated, values are expressed as weighted percentages of the population. *N* rounded to base 5. Psychosocial variables: Depression = lifetime depression in 2002; Anxiety = any lifetime anxiety disorder (GAD, panic, social phobia) in 2002; PTSD = lifetime PTSD 2002. Income variable was not releasable.
M = mean, *SE* = standard error
(--) = data unable to be released due to residuals

Associations Between Baseline Psychosocial Variables (2002) and New Onset Chronic Pain Conditions (2018).

Table 5 summarizes the longitudinal relationships between PS variables at baseline and new onset chronic pain conditions at follow-up. In the unadjusted model, depression was associated with increased odds of any new onset chronic pain condition and each individual chronic pain condition (OR range: 1.44-2.44). Baseline measures of work stress were associated with increased odds of any new onset chronic pain condition, new onset back pain, and new onset migraines (OR range: 1.04-1.07). A lifetime diagnosis of PTSD was associated with increased odds of any new onset chronic pain condition (OR = 2.24; 95% CI = 1.27-3.24), though not for individual pain conditions. Baseline social support was associated with decreased odds of new onset migraine headaches (OR = 0.98; 95% CI = 0.96-0.99) though not for any other individual or any new onset chronic pain condition. When adjusting for sociodemographic and military characteristics, only depression was associated with increased odds of any new onset chronic pain conditions and each individual new onset condition (AOR1 range: 1.50-2.30), whereas PTSD was associated with increased odds of any new onset chronic pain condition alone (AOR1 = 1.81, 95% CI = 1.01-3.25). When additionally accounting for all PS variables in the same model, only depression remained associated with increased odds of any new onset chronic pain condition, arthritis, and back pain (AOR2 range: 1.47-2.14). In the final model, adjusting for sociodemographic and military characteristics, PS variables, and the other new onset chronic pain conditions, no PS variables were found to be predictive of increased odds of any new onset chronic pain condition.

Table 5

Associations between baseline psychosocial factors (2002) and new onset chronic pain conditions (2018) among veterans

	OR (95% CI)	AOR1 (95% CI)	AOR2 (95% CI)	AOR3 (95% CI)
		Any new onset chronic pain		
Depression	2.28 (1.64-3.16)***	2.30 (1.64-3.24)***	2.14 (1.50-3.06)***	-
Anxiety	1.42 (1.01-2.01)	1.42 (0.99-2.04)	1.04 (0.71-1.53)	-
PTSD	2.24 (1.27-3.24)**	1.81 (1.01-3.25)*	1.31 (0.69-2.47)	-
Social support	0.99 (0.99-1.00)	0.99 (0.98-1.00)	1.01 (0.98-1.01)	-
Work stress	1.04 (1.02-1.07)**	1.02 (0.99-1.05)	1.01 (0.98-1.02)	-
		New onset arthritis		
Depression	1.44 (1.05-1.98)*	1.50 (1.07-2.09)*	1.47 (1.02-2.12)*	1.05 (0.60-1.85)
Anxiety	1.23 (0.89-1.71)	1.25 (0.90-1.75)	1.01 (0.68-1.46)	1.09 (0.61-1.92)
PTSD	1.53 (0.98-2.41)	1.44 (0.90-2.33)	1.14 (0.69-1.90)	1.23 (0.54-2.82)
Social support	--	0.99 (0.98-1.00)	0.99 (0.98-1.00)	1.01 (0.98-1.01)
Work stress	1.02 (1.01-1.04)	1.01 (0.99-1.04)	1.01 (0.98-1.04)	1.01 (0.97-1.05)
		New onset back pain		
Depression	1.51 (1.06-2.14)*	1.54 (1.07-2.21)*	1.60 (1.07-2.39)*	1.30 (0.77-2.20)
Anxiety	0.98 (0.66-1.44)	1.07 (0.71-1.62)	0.97 (0.61-1.52)	1.09 (0.62-1.90)
PTSD	1.21 (0.68-2.14)	1.02 (0.53-1.97)	0.70 (0.33-1.49)	0.75 (0.26-2.15)
Social support	--	1.01 (0.99-1.01)	1.01 (0.98-1.01)	1.01 (0.98-1.01)
Work stress	1.04 (1.01-1.07)**	1.01 (0.98-1.04)	1.01 (0.96-1.03)	0.99 (0.96-1.03)
		New onset migraine		
Depression	2.44 (1.36-4.39)**	2.19 (1.13-4.26)*	1.91 (0.84-4.35)	1.62 (0.33-8.10)
Anxiety	1.34 (0.69-2.60)	1.24 (0.60-2.56)	0.89 (0.36-2.16)	0.24 (0.02-2.63)
PTSD	1.74 (0.68-4.41)	1.45 (0.48-4.41)	1.15 (0.37-3.62)	0.50 (0.05-5.38)
Social support	0.98 (0.96-0.99)*	0.98 (0.97-1.00)	0.99 (0.97-1.01)	0.99 (0.96-1.03)
Work stress	1.07 (1.02-1.11)**	1.04 (0.99-1.10)	1.03 (0.97-1.08)	1.05 (0.96-1.14)

Note. OR = unadjusted odds ratio, AOR1 = adjusted odds ratio (controlling for age, sex, race, marital status, income, and education), AOR2 = adjusted odds ratio (controlling for age, sex, race, marital status, income, and education, and all IVs in same model), AOR3 = adjusted odds ratio (controlling for age, sex, race, marital status, income, and education, all IV's in same model, and all the other chronic pain conditions). CI = confidence interval.
(-) = analysis already includes all chronic pain conditions
(--) = outputs unable to be released due to residuals
*$p \leq .05$
** $p \leq .01$
*** $p \leq .001$

Discussion

Findings from this study indicated that two-thirds of the veterans in this sample endorsed at least one of the three chronic pain conditions examined in their lifetime, and just over half reported new onset chronic pain following the baseline survey administration. This important finding highlights the enormous burden of chronic pain in this population, especially given that only three common pain types were available to be included in the analyses. This likely suggests an underestimate of actual chronic pain prevalence in this population. While some analyses were unable to be conducted due to residuals or small samples, the breadth of findings greatly adds to the extant body of literature examining the prevalence and correlates of PS variables with chronic pain amongst CAF veterans. Specifically, findings from both cross-sectional and longitudinal analyses showcase the independent association between depression and chronic pain conditions. Furthermore, several findings contrast elements of the proposed model by Baria et al. (2019), including the weak associations between AUD, work stress, and current chronic pain conditions amongst CAF veterans.

Sample Characteristics

The prevalence of chronic pain amongst CAF veterans observed in this study was higher than some previously reported findings (e.g., Van Den Kerkhof et al., 2015: 41%; Thompson et al., 2013: 34%), and comparable to others (e.g., Thompson et al., 2011: 64%; Perera et al., 2021: 67.1%). Methodological differences likely account for much of the disparities between findings across studies (e.g., asking respondents about the presence of persistent pain versus asking about the absence of persistent pain and discomfort). Even so, this study adds to the small body of literature examining the presence of chronic pain in the CAF veteran population and highlights the burden of suffering that undoubtedly accompanies high prevalence rates. To my knowledge,

this is the first study to examine new onset chronic pain in relation to baseline PS factors amongst CAF veterans. The prevalence of new onset chronic pain conditions in this study (i.e., 53.2%) further demonstrates the high proportion of military members and veterans experiencing these symptoms.

An alarming finding in this study was the marked disparity in rates of chronic back pain between those identifying as White and non-White (i.e., back pain: 49.3% and 68.6% respectively; new onset back pain: 28.1% and 54.5% respectively). Interestingly, comparatively minimal differences were observed for arthritis (i.e., White = 39.9%; non-White = 39.4%), and only moderate differences for migraines (i.e., White = 12.3%; non-White = 17.6%). Previous findings regarding disparities in chronic pain prevalence between White and non-White populations have been mixed, though most studies have found increased odds of pain in non-White samples (e.g., Hardt et al., 2008; Nicholl et al., 2015; Rahavard et al., 2017; Reyes-Gibby et al., 2007). Inconsistent and mixed findings, though predominantly higher prevalence rates for non-White individuals, were also observed in veteran samples (e.g., Higgins et al., 2014; Seal et al., 2017; Van Den Kerkhof et al., 2014). Empirical explanations for the discrepant findings between those who are White and non-White across back pain, migraines, and arthritis, were not reported in the literature I examined. One hypothesis could be the relationship between rank and ethnic status. According to data from Statistics Canada, only 3% of officers in the Regular Force are visible minorities, whereas 6% of the entire CAF and 17% of Canadians are visible minorities (Park, 2015). Non-commissioned members reported higher rates of any chronic pain condition in this study, and other research has found members with a lower rank to have greater physical demands and intensive training, and less administrative duties than commissioned members (e.g., Knapik et al., 2004; Reynolds et al., 2002). Back problems may have a greater

association to the physical demands required of serving members than migraines and arthritis, though further examination would be required to validate this claim.

Not surprising was the finding that those who deployed were more likely to report any chronic pain condition than those who had not. Nearly 70% of those who deployed at least once reported having a chronic pain condition, whereas 52% of those who had never deployed endorsed a chronic pain condition. Other studies have observed similar findings regarding the impact deployment has on increased chronic pain prevalence (e.g., Forman-Hoffman et al., 2007), and related impairments in functioning and disability (e.g., Thompson et al., 2015). The physical demands and chance of injury are increased while on deployment, thus the chances of developing a chronic pain condition are similarly heightened given the close association between physical demand, injury, and persistent pain. Serving in a land environment had the highest prevalence of new onset chronic pain for all pain conditions other than migraine headaches, as compared to serving in sea or air environments. Perera et al. (2021) found that the prevalence of arthritis, back problems, and gastrointestinal issues amongst serving and veteran members of the CAF was notably higher for those serving in land environments than both sea and air. In their study on low back pain in the U.S. military, Knox and colleagues (2011) found that actively serving Army personnel had the greatest likelihood of endorsing low back pain, as compared to those serving in the Marines, Navy, and Air Force. No hypothesis was provided on the differences in pain incidence rates, though I would speculate that unique occupational demands and Army culture played a role in the higher rates of pain.

Cross-sectional Associations Between Psychosocial Factors and Chronic Pain Among Veterans

Given the wealth of empirical literature highlighting the high co-occurrence and bidirectional influence of the chosen PS variables and chronic pain in U.S. samples, I predicted that each of the PS variables would be associated with increased odds of chronic pain conditions among veterans. The cross-sectional analyses most closely aligned with the Baria et al. (2019) revised BPS model for veterans, as it examined current PS factors associated with chronic pain. Results from the bivariate regression models (i.e., model 1 = unadjusted) revealed that depression, anxiety, PTSD, and poverty were associated with increased odds for any chronic pain condition. After adjusting for sociodemographic and military characteristics, depression, anxiety, PTSD, and social support were associated with increased odds of any chronic pain condition. Analyses examining the individual chronic pain conditions revealed similar trends, with depression, anxiety, PTSD, social support, and poverty being associated with increased odds of most chronic pain conditions (i.e., with the exception of model 2 examining poverty and back pain, which was not statistically significant). These findings only partially support the hypothesis predicting strong relationships between the PS variables and chronic pain. Possible explanations for this finding include the use of different assessment measures for PS and chronic pain variables, sample demographic differences, and/or true phenomenological differences (i.e., relationship between chronic pain and PS variables) between Canadian and U.S. veterans.

Across all of the models analyzed, depression remained the PS most consistently significantly associated with chronic pain after adjusting for sociodemographic and military characteristics (i.e., model 1), other PS variables (i.e., model 2; not for arthritis), and even after controlling for the other chronic pain conditions (i.e., model 3; depression associated with increased odds of back pain: OR = 1.93, 95% CI: 1.07-3.48). That is, independent of the influence of other PS and chronic pain variables, depression was significantly associated with

back pain, the most commonly endorsed chronic pain condition in this sample. As overviewed in Baria et al. (2019), there is a wealth of literature that describes the etiology and epidemiology of comorbid depression and chronic pain. Banks and Kerns (1996) postulated that the high comorbidity of depression and chronic pain is best explained by the interplay between inherent vulnerabilities and stressors. Their hypothesis, described as the diathesis-stress framework for these two conditions, combines the literature examining human predisposition toward disease (i.e., biological or genetic) and stress produced by environmental or life events that exceeds the individual capacity to cope. The authors argue that pain predisposes individuals to endorsing negative attributions of their current and future states, personalization errors, overgeneralizations, and critical views of themselves. Further, increased disability, social isolation, specific functional losses, and social disruption are jointly linked as etiological factors contributing to both chronic pain and depressive disorders. It is the belief of this author that veterans are especially vulnerable to developing depressive symptoms following medical discharge from the CAF due to functional limitations caused by pain and injury. As this hypothesis cannot be determined with these data, future research is warranted to explore this possibility. As discussed previously, the mode in which one releases from the military (e.g., compulsory, voluntary, medical) can influence the perceived success of the transition (Cathcart, 2017). Release from the military, particularly premature and unwanted release due to medical issues, can cause a "fragmentation of their social identity which can lead to a sense of grief over the loss of a central aspect of the self" (Wilson-Smith & Corr, 2019, p. 36). Veterans who are transitioning to civilian life are, I believe, particularly vulnerable to engaging in negative cognitive appraisals and feelings of hopelessness, leading to an increase or exacerbation of comorbid depression and chronic pain as observed in this study.

Anxiety disorders (i.e., GAD, panic disorder, and social phobia) were also associated with increased odds of any chronic pain condition after controlling for sociodemographic and military characteristics, and the other PS variables (i.e., OR = 1.83, 95% CI: 1.07-3.12). Anxiety is believed to have a distinct role in intensifying an individual's fear response, increasing awareness of pain sensations, and exacerbating emotional processing of pain experiences (Gatchel, 2004; Smeeding et al., 2010). In a study examining psychiatric correlates among US OEF/OIF veterans with chronic non-cancer pain, 44% of respondents reported at least one comorbid anxiety disorder (i.e., panic disorder, social phobia, obsessive-compulsive disorder, and generalized anxiety disorder; Phillips et al., 2016). Interestingly, the present study found a much higher co-occurrence rate (i.e., 84%) of any chronic pain conditions for veterans meeting criteria for an anxiety disorder (i.e., GAD, social phobia, and panic disorder). Some of the difference in comorbidity rates may be explained by differences in measurement (i.e., Phillips et al. 2016 used the MINI for obtaining psychiatric diagnoses, whereas the CAFVMHS psychiatric diagnoses were obtained using the WHO-CIDI). However, both protocols are well validated structured clinical interviews, and both utilized DSM-IV criteria. As such, methodological differences may not well explain the total discrepancy in our findings. Comparable to the results in this study, El-Gabalawy et al. (2015) found significant associations between anxiety and physical health conditions, most notably chronic pain (AOR = 1.79, 95% CI = 1.15–2.78; 72.9% comorbidity) even after adjusting for other physical conditions in a sample of Canadian veterans. The findings from this study and the study by El-Gabalawy and colleagues do not reveal an obvious explanation for the higher rates of comorbid anxiety and chronic pain in CAF veterans compared to their US counterparts, and should thus be a topic of future exploration. PTSD, often conceptualized as an anxiety disorder, was also found to be significantly associated with

increased odds of chronic pain after controlling for sociodemographic and military characteristics, though not after controlling for the other PS variables. Much research has explored the etiological and epidemiological overlap between PTSD and chronic pain, and important developments in explanatory models describing this comorbidity have been well represented in the empirical literature (see Asmundson et al., 2002; Liedl and Knaevelsrud 2008; Sharp & Harvey, 2001). Given the increased risk of exposure to stressful and traumatic experiences related to their occupation, it is unsurprising that PTSD would be associated with increased odds of chronic pain conditions within this study.

Great levels of social support were found to be associated with decreased odds of any chronic pain condition after controlling for sociodemographic and military characteristics, though not after controlling for other PS variables or chronic pain conditions. In his seminal research on social support and physical health outcomes, Uchino (2009) argued that social support was "one of the most well-documented psychological factors influencing physical health outcomes" (p. 236). While social support is often perceived as a buffer to suffering for those with chronic pain, a body of research on social support by intimate partners has observed mixed findings. That is, in relation to pain intensity, and quality of intimate partner support and relationship satisfaction, some studies have shown no association between pain severity and intimate partner satisfaction (Cano et al., 2004; Cano et al., 2000; Masheb et al., 2002), others have found a positive relationship (Flor et al., 1989; Kerns et al., 1990), while another revealed a negative relationship between the variables (Kerns & Turk, 1984). The phenomenon known as solicitous spousal responses, described as verbal and behavioural reactions to a partner's pain behaviours, has been found to inadvertently maintain pain symptoms and promote pain expression through the taking over of responsibilities and reinforcing pain behaviours (e.g.,

showing concern over a partner's grimace; Paulsen & Altmaier, 1995). In summary, greater levels of social support were associated with decreased odds of chronic pain conditions in this study. The odds ratios associated with social support and decreased chronic pain diagnoses were not as pronounced as the psychiatric disorders discussed previously, which may be, in part, explained by the above-noted mixed findings on the benefits of social support on pain maintenance and behaviours. In later models, accounting for the influence of mental health disorders and the other chronic pain conditions, greater social support was not found to be associated with decreased odds of chronic pain. This finding suggests that social support is likely influenced by mental illness, or possibly that social support is only protective when mental health issues are not present.

Poverty, as determined by responses to whether household income was sufficient to meets basic expenses, was found to be associated with increased odds of arthritis and migraine headaches after controlling for sociodemographic and military characteristics, though was not associated with back pain or any chronic pain condition. MacLean et al. (2019) found that veterans who had released involuntarily, had more dependents, and who served for shorter periods of time were at higher risk of experiencing persistent low income. More broadly, the association between financial wealth and health outcomes has been well established (Kivimäki et al., 2020; Marmot et al., 1991). Regarding chronic pain specifically, those of lower socioeconomic status have been found to be more likely to endorse maladaptive pain beliefs, experience greater distress, and engage in poor coping strategies than those of higher SES (Day & Thorn, 2010). In this study, the weighted percentage of veterans in poverty at follow-up was 6.1%. Based on data from the Canadian Income Survey in 2018, 11% of the general population was living in poverty (Employment and Social Development Canada; 2020). While the rates of

poverty appear much lower, it is possible that the surveys failed to include many in severe poverty and/or those who were homeless due to methodological approach (i.e., CAFVMHS interviews were conducted over the phone, whereas the Canadian Income Survey was conducted both over the phone and by personal visits from field interviewers). As such, it is possible that impoverished veterans were underrepresented in the sample, and that the true relationship between poverty and chronic pain was inadequately captured.

A surprising finding was that of the decreased odds of migraine headaches for those with an AUD diagnosis after adjusting for sociodemographic and military characteristics (i.e., OR = 0.18; 95% CI = 0.04-0.77). Using the same CAFVMHS dataset, though different PS and military variables, Perera et al. (2021) also observed decreased odds of migraines for those with AUD (note that this finding was not statistically significant across all models). This is an interesting finding as most of the literature examining this relationship has found alcohol use and/or dependence to be associated with increased odds of chronic pain (i.e., including migraines; Apkarian et al., 2005; Brennan et al., 2005; Egli et al., 2012; Vun et al., 2018; Zale et al., 2015), or no significant association (e.g., Jette et al., 2008; Merikangas & Merikangas, 1994). In reviewing the literature on precipitating factors for episodic migraines, Marmura (2018) found that alcohol use was one of the most commonly endorsed triggers for migraine attacks. The findings in this study likely reflect a skewed relationship between AUD and migraines resulting from a small sample size, as both subsequent logistic regression models could not be computed due to insufficient sample size. As such, these findings are interpreted with caution, though also contradict the findings presented Baria et al. (2019) in their BPS model for U.S. veterans.

Interestingly, in this study work stress was not found to be associated with increased odds of any chronic pain condition. In their article on the revised BPS model of chronic pain for

veterans, Baria and colleagues (2019) included environmental stressors as a social variable influencing chronic pain, though did not expand upon this phenomenon in the body of their manuscript. While a broad measure of stress was unavailable in the dataset for the present study, measures of work stress were obtained at both baseline and follow-up periods. There is a sparsity of empirical literature examining work stress in veteran populations, though the bidirectional influence of work-related stress and chronic pain has been explored in the general population (e.g., Fanavoll et al., 2016; Lundberg et al., 1999; Munce et al., 2006). Data from the Survey on the Transition to Civilian Life showed that, of those who released between 1998 and 2007, the majority of veterans were employed in civilian jobs post-release (i.e., 89%). Results also highlighted high rates of satisfaction in their employment and financial compensation (Thompson et al., 2011). If these trends were found to be comparable in 2018, it could be argued that stress related to veterans' civilian occupations would likely be minimal given the high rates of job satisfaction. It is possible that other forms of stress (e.g., interpersonal, health) are associated with increased odds of chronic pain conditions in the CAFVMHS sample, but these were not available for the current analyses.

To summarize the cross-sectional results, depression, anxiety, PTSD, and poverty were largely found to be associated with increased odds of chronic pain conditions, while social support was associated with decreased odds of chronic pain. However, contrary to my hypothesis, AUD and work stress were not found to be related with increased rates of chronic pain. These findings add to our knowledge of the known PS correlates of chronic pain amongst CAF veterans and highlight differences between US and Canadian veterans regarding variables theorized to exacerbate and influence chronic pain. While further research is needed, these

findings support a refined BPS model that does not include AUD or work stress as current exacerbating features of chronic pain amongst CAF veterans.

Longitudinal Associations Between Psychosocial Factors and Chronic Pain

The primary aim of analysis 2 was to examine the longitudinal associations of PS factors while participants were still serving on the later development of new onset chronic pain conditions. I hypothesized, similar to the cross-sectional analysis, that the chosen PS factors would be associated with increased odds of new onset chronic pain conditions. While Baria and colleagues' (2019) revised BPS model for veterans did not review the predictive qualities of PS on new onset chronic pain, I hypothesized that given the wealth of research highlighting the etiological comorbidity, these same variables would be predictive of new onset chronic pain for veterans. Results from the analyses did not, on the whole, support my predictions. After adjusting for sociodemographic and military factors, only depression and PTSD remained significantly associated with increased odds of any new onset chronic pain condition (i.e., OR = 2.30, 95% CI = 1.64-3.24; OR = 1.81, 95% CI = 1.01-3.25 respectively). Interestingly, at the bivariate level, work stress was found to be associated with increased odds of new onset back pain, new onset migraines, and any new onset chronic pain condition; however, this relationship disappeared after adjusting for sociodemographic and military characteristics.

As mentioned, depression at baseline was associated with increased odds of any new onset chronic pain condition after adjusting for sociodemographic and military factors, and further after adjusting for the other PS factors (i.e., OR = 2.14, 95% CI = 1.50-3.06). After further adjusting for the other chronic pain conditions (model 4), depression was no longer associated with each new onset chronic pain condition. This finding may accurately reflect the joint influence of other chronic pain conditions alongside depression, or alternatively, given the

smaller sample size of the new onset pain conditions, the analysis may be too underpowered to predict a relationship that in fact does exist. Nevertheless, the notable increased likelihood of developing a chronic pain condition after meeting diagnostic criteria for a major depressive episode in 2002 highlights the profound influence of depressed mood on pain development. While there has been controversy regarding the temporal relationship between pain/chronic pain and depression (Leo, 2005), the findings from a systematic review also suggests chronic pain predisposes individuals to development of depression (Fishbain et al., 1997). However, a smaller body of studies have found depressive symptoms to predict later development of pain and chronic pain in samples of industrial workers (Leino & Magni, 1993), women (Croft et al., 2003; Forseth et al., 1999), and adults attending primary care (Croft et al., 1995). In exploring why depressive symptomology may predispose an individual to the future development of persistent pain, Magni and colleagues (1994) found that depressive symptoms, most notably sleep disruption and amotivation, were key predictors in later pain development for some pain conditions. The authors did not provide a conceptualization of this phenomenon, though hypothesized that some pain may be the somatic manifestation of the psychological distress accompanying depression. This author believes that depressive symptoms and related behaviours, specifically decreased activity levels, amotivation regarding health-promoting behaviours (e.g., persistence in physiotherapy exercises), and poor sleep hygiene serve as risk factors for later pain development.

Limitations

While there are notable strengths of this study (e.g., nationally representative sample, the inclusion of a 16-year prospective follow-up period, diagnosis utilizing structured clinical interviews), several limitations were identified. First, chronic pain diagnoses were derived from

participant self-report as opposed to being obtained by a healthcare professional; though, reasonable concordance has been observed between self-report and physician diagnosed chronic physical conditions (see Baumeister et al., 2010). There were three important chronic pain conditions available in the 2018 follow-up dataset, while many others, notably some identified in the Baria et al., 2019 model, were not included (e.g., chronic post-surgical pain, neuropathy, musculoskeletal conditions beyond back problems) and thus were not available for examination. Further to this, the survey assessed the presence of chronic pain/a chronic pain diagnosis, though did not examine indicators of pain complexity (e.g., intensity, pain-related disability). Moreover, while not as common, these conditions can exist in the absence of persistent pain symptoms. The inclusion of measures of pain intensity and related disability would have allowed for a richer exploration of the phenomenon in question. Further, as chronic pain conditions were only assessed in the follow-up survey, the reporting of the onset of these conditions could have been influenced by recall bias. Due to residuals issues between the 2002 and 2018 variables, some of the outputs of the analyses were not able to be released by the Manitoba Research Data Centre. Similarly, due to small cell sizes, some of the outputs were not released/reportable. Specifically, the prevalence of migraines in this veteran sample was smaller than that of back pain and arthritis, leading to insufficient observations to compute bootstrap analyses. Baseline psychiatric conditions were examined using the DSM-IV criteria. For assessment continuity, the same DSM-IV criteria were used in the 2018 follow-up survey. Given the conceptual changes from the DSM-IV to DSM-V established in 2013, generalization of conclusions regarding psychiatric conditions should be made with these limitations in mind.

Implications

Despite the aforementioned limitations, important findings were observed in this study. First, the alarming disparity in rates of chronic pain between veterans identified as White and non-White adds to the growing body of literature spotlighting racial vulnerabilities and inequalities. Second, in this study, rates of chronic pain (i.e., 65.6%) amongst CAF veterans were much higher than some previously reported statistics, and comparable to others. The high rates of persistent pain in this veteran sample reinforce the need for initiatives like the new Chronic Pain Centre of Excellence for Canadian Veterans and support calls for tailored assessment and treatment efforts for our veterans.

The results from the cross-sectional analysis revealed depression, anxiety, PTSD, and poverty as being associated with increased odds of chronic pain conditions, and social support being associated with decreased odds of chronic pain conditions after adjusting for sociodemographic and military characteristics. However, AUD and work stress were not similarly associated with increased odds of having a chronic pain condition. The latter findings contrasted my hypothesis that all chosen PS variables would be associated with increased odds given the wealth of literature supporting the revised BPS model for US veterans (Baria et al., 2019). The exact implications of this finding may be difficult to determine. It may be that AUD and work stress have little influence on the likelihood of having chronic pain for CAF veterans, or possibly that methodological (e.g., survey questions) or statistical limitations confound true relationships between the variables. Further research into these specific associations is required to best clarify their role in chronic pain prevalence amongst veterans. To my knowledge, this is the first study to conduct longitudinal exploration of PS associations with new onset chronic pain in a CAF veteran sample.

The results from the longitudinal analyses highlighted the effect depression has on increased odds of developing new chronic pain conditions. As few studies have examined this phenomenon in the general public, and less so with veteran samples, this finding underscores the important temporal role of depression in the development of chronic pain. Given the associated risk for pain development, screening and monitoring of depressive symptoms and targeting treatment for serving members struggling with low mood may help to decrease the burden of pain in this population. Future research should endeavour to include more chronic pain conditions reflected in veteran research (e.g., chronic post-surgical pain, traumatic brain injury, neuropathy), as well as including continuous measures of pain severity and related disability. BPS variables from the Baria et al. (2019) model that were not included in the CCHS-CF and CAFVMHS datasets (e.g., other mood disorders, homelessness, previous treatment) should be evaluated to examine whether they play a significant role in predicting and/or exacerbating persistent pain symptoms in samples of CAF veterans. Beyond the findings observed in Study 2 (detailed below), future research should investigate the experiences of currently serving members through a qualitative lens, to examine their perception of causal determinants of persistent pain. Lastly, as depression was associated with the greatest risk for developing chronic pain later in life, future research should explore which facets of major depressive episodes (e.g., amotivation, hopelessness, fatigue) most highly correlate with the development of individual chronic pain conditions.

Chapter 3: Study 2

Qualitative Review and Study Overview

While some research has examined etiological factors influencing the development and maintenance of chronic pain in veteran samples, very few studies have examined these variables through qualitative means. The overarching aim of Study 2 was to better understand how CAF veterans describe and understand the development and maintenance of chronic pain in relation to BPS and cultural factors. CAF veterans with chronic pain were recruited to participate in audio-recorded, semi-structured qualitative interviews with the purpose of detailing veterans' perceptions as to how their chronic pain developed and is currently maintained/exacerbated. The open-ended questions utilized in this study were based on the proposed BPS model for veterans with chronic pain (Baria et al., 2019), as well as addressing military culture factors. Interview data was analysed using constructivist grounded theory methodology (Charmaz, 2014). To my knowledge, this is the first study examining CAF veteran experiences with chronic pain through a BPS lens.

While qualitative explorations into BPS factors and chronic pain amongst veterans has received little empirical attention, some studies have provided preliminary insight into this phenomenon. In their focus group study examining barriers and facilitators for U.S. veterans receiving multimodal pain management, Simmonds et al. (2015) noted that the overwhelming emergent theme derived from the focus group discussions was the debilitating effects of pain on function and quality of life in many domains (i.e., physical, psychological, social). The authors highlighted common themes regarding barriers to pain management, including frustrations with the healthcare system, challenges obtaining medications, drug dependency, and lack of social support. Similarly, in their study examining veterans' experiences seeking non-pharmacological treatment for pain management, Giannitrapani et al. (2018) found that limited access to non-pharmacological pain treatments was common across veteran experiences (e.g., local availability,

schedule flexibility, reimbursement, and distance from healthcare provider). Aside from the aforementioned themes derived from qualitative studies on veterans' chronic pain experience, other studies have noted that frustrations with constant changes in healthcare providers (Driscoll et al., 2018), oscillating emotional responses (Hitch et al., 2020), distraction and avoidance (Beaton et al., 2012), fear, anger, and hopelessness (Matthias et al., 2014), and balancing responsibilities (Penney & Haro, 2019) significantly impacted veterans chronic pain experiences. As mentioned previously, an ethnographic study conducted by Denke and Barnes (2013) found that amongst 15 female military members, military culture and training exercises were the prominent factors impacting participants' pain experiences. Taken together, these studies, though few in number, highlight several of the proposed BPS variables (Baria et al., 2019) and cultural influences that have been found to influence and moderate veterans' chronic pain experiences (e.g., healthcare access and specialization issues, lack of social support, 'Mission First' culture, psychiatric features). The present study adds to the extant literature by expanding the exploration of BPS variables and their perceived influence on chronic pain for veterans (e.g., PTSD, depression, substance use, military training, occupational variables, CAF military culture).

Methods

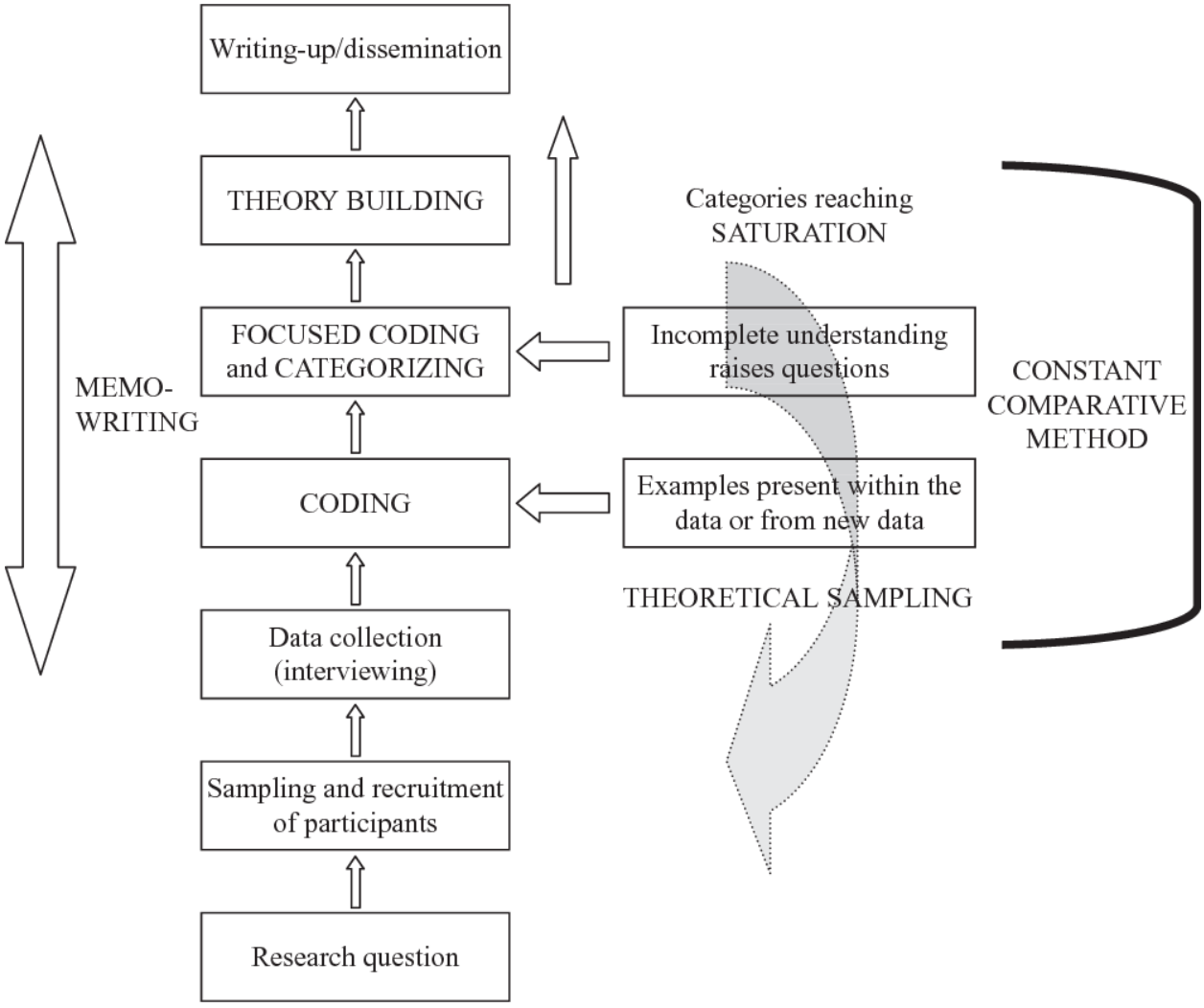
Research Strategy

Constructivism is an epistemological approach which describes the nature of knowledge and the process in which we as humans learn (Mogashoa, 2014). Through this framework, people are understood to construct individual and social meaning for themselves, by processing and integrating past beliefs, experiences, and ideas, and novel learning experiences (Hein, 2007). As opposed to empiricism, which views the human mind as a passive system that digests information from its environment, thereby creating a copy of reality, constructivism posits that

the mind is an active meaning-making organism that consciously interprets novel information. Constructivist grounded theory (Charmaz, 2006, 2014) was utilized to explore the chief aims of this study: understanding the experiences and perceptions of how chronic pain develops and is maintained in a CAF veteran sample. Several studies have utilized a constructivist grounded theory approach to study experiences of chronic pain (e.g., Fenwick et al., 2012; Howell, 1994; Miles et al., 2005; Snelling, 1994; Sofaer et al., 2005; Wentz et al., 2004), and veteran health issues (e.g., Burkhart & Hogan, 2015; Ganzini et al., 2013; Kramer et al., 2009; Reyes et al., 2018). I believe the constructivist approach is well suited to address this study's objectives as it utilizes an inductive method to generate theoretical frameworks which can be readily compared with other findings (e.g., quantitative). As Study 1 examined BPS determinants of chronic pain with CAF veterans through a quantitative lens, the rationale for including a qualitative approach was my belief that veterans have unique stories and perspectives to share regarding their persistent pain. It is these perspectives, derived from subjective interpretations of life experiences, that will enhance our knowledge of the personal experience of pain. Importantly, the constructivist nature of the approach assumes that any deductions based on study findings are not exact representations of social processes, but rather interpretations of these processes (Charmaz, 2014). As its name suggests, this methodological approach is grounded in the data derived from interviews with participants, allowing for robust interpretations of social phenomena. The constructivist grounded theory process follows the following steps: building research questions, sampling and recruitment of participants, data collection, initial coding, focused coding, theoretical coding, theory building, and final write up and dissemination (see Figure 3).

Figure 3

Visual representation of Grounded Theory



Note. Visual representation of Grounded Theory. From Tweed, A., & Charmaz, K. (2012). Grounded theory methods for mental health practitioners. *Qualitative research methods in mental health and psychotherapy*, 131-146.

The flexibility in this approach is based on the principle that analyses are completed as data are collected (i.e., grounded in the data). Levels of analysis (i.e., initial line-by-line, focused, and theoretical) are explained here in a linear manner, though in practice the analyst alternates between line-by-line, focused, and theoretical coding as they process and code participant

transcripts. This methodological approach was well suited to address the study aim of capturing experiences and perceptions of chronic pain etiology within a CAF veteran sample. It is a widely used rigorous method designed to examine social processes, allowing for the expansion of theoretical models, and lending itself well to comparison/integration with quantitative data. Specifically, the constructivist grounded theory approach aims to produce comprehensive theoretical model(s) that illustrate the patterns and relationships of phenomena amongst the studied variables. Thus, integration and comparison of findings was facilitated by evaluating the qualities of relationships observed in both the qualitative and quantitative studies. The structure and content of the questions used in this protocol closely followed the conceptual BPS model of chronic pain for veterans (Baria, et al., 2019), with the addition of theorized cultural factors (see Appendix B). By organizing protocol questions into these categories, it allowed for a meaningful comparison and integration of findings between Studies 1 and 2.

Participant Recruitment

Participants were CAF veterans with chronic pain recruited using purposive sampling methods from social media postings, and through the Winnipeg Operational Stress Injury Clinic (OSIC). Eligibility criteria included: CAF veteran, male, served primarily in the Army, had deployed internationally, and had chronic pain lasting longer than 3-months. The study recruitment poster was sent to the Royal Canadian Legion and was then redistributed to other veteran-oriented social media groups. As I was employed at the Operational Stress Injury Clinic (OSIC) at the time of recruitment, a participant recruited from that site was first contacted by my research assistant (RA), to avoid any undue pressure to participate. Those who expressed interest in the study, and met eligibility criteria, were emailed the study overview, consent form, and demographics form (see Appendix A) via Qualtrics, and participated in a screening phone call

where they were provided an overview of the study and participant requirements. Benefits and risks, as well as confidentiality were discussed with each potential participant. If the individual consented to participate, an interview date and time was scheduled. Participants were mailed a $25 Visa gift card as a thank you for their participation in the study following the screening phone call. All individuals who were screened for the study received a copy of a Canada-wide mental health resource list. The sample size needed was estimated to range from 10-30 participants, as recruitment efforts were determined by the principle of theoretical saturation (Charmaz, 2006). After interviews four, ten, and 13, I met and/or corresponded with Dr. Reynolds, an expert in qualitative methods, and my RA to discuss emerging themes and theoretical insights within the emergent models. Theoretical saturation guided my recruitment initiatives, such that, I ended participant recruitment when no new properties of the observed patterns emerged, yielding a conceptual density of the grounded theory as described by Glaser (2001; 13 interviews had been conducted at this point). Following a consultation with Dr. Reynolds, two additional interviews were conducted to ensure data were robust in explaining the core theoretical categories. When these two interviews did not spark novel theoretical insights, I drew from the recommendations by Dey (1999) in claiming theoretical saturation of categories with skepticism, while remaining flexible to returning to participant recruitment if my theoretical framework proved to be lacking or incomplete.

I received 22 emails from interested participants who heard of the study via social media postings. Eight of those who responded did not meet eligibility criteria (i.e., were female, were still serving in the CAF, or did not deploy overseas), and one did not respond to further communication. Purposive sample methods were employed on an ongoing basis to recruit a homogenous sample with the aim of reducing variation, simplify analyses, and providing an in-

depth examination of a particular subgroup (Palinkas et al., 2015). Fifteen male CAF veterans participated in interviews that were conducted through video conferencing software, as opposed to in-person, due to the COVID-19 pandemic. One of the 15 participants stated that he misunderstood the eligibility criteria part way through the interview, when asked veteran-specific questions (i.e., he was still serving in the CAF). This participant was not included in the study, and another participant was recruited in his stead. Thus, a total of 15 male veterans were included in the study.

Ethical Considerations

Ethical approval of this study was obtained through the University of Manitoba Fort Garry Campus Psychology/Sociology Research Ethics Board. All participants provided written consent before participating in the study and were reminded at the start of the interview that they could withdraw from the study at any point. The consent form can be found in Appendix D. To ensure confidentiality, all identifying information (i.e., names, certain locations, dates of service) have been changed in the write up of this study. Participants are identified in the findings section by their participant numbers.

Interviews

Piloting Study Questions

Open-ended questions were developed to capture the key BPS variables proposed in the Baria et al., (2019) model. In addition to the questions reflecting the BPS model, questions regarding the influence of military culture were included in the protocol. The protocol questions were reviewed and approved by my doctoral committee. Following this, and to ensure questions used appropriate language tailored to the military experience, one CAF veteran was recruited to

review each question and provide feedback regarding clarity and relevance. The veteran participant reviewed each question and shared his thoughts on potential revisions. The participant suggested some minor changes to increase the clarity of the questions, and I incorporated these suggestions before conducting interviews. The participant was given a $25 Visa gift card for his involvement in the study.

Interview Protocol

I conducted individual semi-structured interviews (45-75 minutes in length) using Zoom video-conferencing software. Interviews were audio-recorded and transcribed verbatim. Prior to the start of each interview, I reviewed the aims of the study and responded to any confidentiality concerns. If the participant agreed to proceed, I followed the interview protocol in asking study questions and prompting for further discussion. Audio recordings were uploaded to the Trint software program and transcribed into text. Each of the text transcriptions were assessed for accuracy by the RA. The text transcripts were stored on a password protected computer, and throughout the transcription process all identifying information was omitted. In line with a constructivist grounded theory approach, the RA and I were involved in coding each interview prior to proceeding to the next, as this allowed for revisions to the data-gathering process (e.g., rephrasing specific questions to allow for the expansion of emerging themes).

Following the first two interviews it became apparent that several revisions were required based on emerging concepts and response styles. Several of the questions were re-worded as they elicited dichotomous responding (i.e., yes/no), and did not facilitate open-ended dialogue. The RA was involved in providing feedback regarding changes to the interview questions, and all revisions were documented and dated. Furthermore, Drs. Kristin Reynolds and Pamela Holens provided feedback on content interpretation and grounded theory model development, which

aided in the targeting and refinement of interview questions. Several questions were removed from the protocol as they elicited similar responses to previously asked questions (i.e., “Can you tell me what makes your pain worse? What makes it feel better?”; “In your military training and service, do you remember any direct or indirect messages about showing/talking about your pain, or how to seek help if you’re in pain?”; “How might the pain you experienced have contributed to your retirement or discharge from the CAF?”). Other questions were removed as they were deemed irrelevant to the aims of the study and/or did not align with the BPS model (i.e., “What effect does ignoring your pain or avoiding activities that you think might worsen your pain, have on your pain symptoms?”; “Do you ever feel like your pain will never get better? How does that make you feel about your future hopes and plans?”). Additional open-ended questions were added to the interview protocol to reflect emerging themes and to gather more in-depth information on presenting issues (i.e., “How would you describe the Canadian military’s view of pain and injury? Has this changed over the years of your service?”; “Does your military-like mindset still influence how you manage and react to your pain? How so?”; “Did you receive adequate care, assessment, and treatment of your injuries while serving?”; “Was there proper documentation of your injuries at the time?”; “Were you immediately aware of the impact your injuries and training had on your body and pain? How so?”; “How would your pain experience change if you received more or less help from family and friends?”; “How did your peers and COC respond to pain and injury?”. The interview protocol for interviews 1-2 are displayed in Appendix B, and the revised interview protocol is displayed in Appendix C.

Data Analysis

Coding

The coding procedures for this study closely followed the structure outlined by Charmaz (i.e., initial coding, focused coding, and theoretical coding; 2006, 2014; Charmaz & Belgrave, 2012). Initial coding involved processing transcripts line-by-line in order to create short "labels that describe, dissect, and distil the data while preserving their essential properties" (Charmaz & Belgrave, 2012, p. 356). I attempted to remain as close as possible to the data when making code interpretations, while being cognizant of my preconceived conceptualizations of the phenomena being examined. Following initial coding of transcripts, a focused coding procedure was conducted. Focused coding is the process in which initial codes are sorted and synthesized into selective codes that describe frequently reappearing initial codes (Charmaz & Belgrave, 2012). These codes are inherently more abstract and summative in nature. The focused coding process involved the culmination of initial codes from multiple participant interviews and continued in a dynamic process as novel initial codes were added to the analytical narrative. Lastly, theoretical coding was conducted. Theoretical coding is the process in which relationships between observed categories are identified and amalgamated into an integrative theory (Charmaz, 2006). Charmaz described this process as an integrative weaving of concepts into an "analytic story", leading to a broader descriptive theory (p. 63). In this process, the models introduced in this study and the revised BPS model for veterans (Baria et al., 2019) were compared, and findings were integrated to provide a broader theoretical understanding of the BPS determinants of chronic pain for CAF veterans.

Memo-Writing

Memo-writing is an integral component in the grounded theory analytical process. As outlined by Charmaz (2006, 2014), memo-writing is the documentation of thoughts and insights regarding codes and data, and the dynamic relations between the two. For this study, I wrote

memos throughout the recruitment, coding, and theory building stages. Memos were documented in a stand-alone document, as well as through comments on the interview protocol. Memos largely focused on my thoughts regarding interview question validity and their overall contribution to the emerging themes and theory. Memos expedited the analytical process by condensing codes and integrating them into the larger theoretical model. Detailed memos allowed the me to track changes observed throughout the study and to make the comparison between "data and data, data and codes, codes of data and other codes, codes and category, and category and concept" (Charmaz, 2006, p. 72). Diagramming was also an important technique utilized to organize emerging themes. As outlined by Charmaz (2006), I employed diagrams to assist in conceptualizing the relationships between the emerging themes. This process was instrumental in assisting the development of both models presented below. A necessity in conducting constructivist grounded theory research is that of self-reflexivity (Tracy, 2010). The practice of reflexivity, as described by Tracy, is the process in which the researcher does not try to reduce their biases, but focuses instead on being transparent and explicit about their reactions and beliefs, and how these notions may influence the interpretation of emerging themes. Through the use of memos and discussions with consulting researchers and my RA, I committed myself to being candid about how my world view and past experiences shaped the meaning I made from veteran narratives. I further addressed my biases in the challenges section of this study to enlighten the reader further on how my world view likely influenced the manner in which I constructed the resulting theoretical models in this study.

Fieldnotes

Personalized documentation known as fieldnotes were recorded following each participant interview. Fieldnotes captured behavioural observations (e.g., participant body-

language, emotional reactions to questions, question/content avoidance) of participants during interviews. Fieldnotes were utilized as a means of describing contextual factors of interviews, as well as a form of personalized reflection and observation from my perspective of participant interactions. Specifically, I was mindful of participant affect, as well as notable avoidance of subjects when discussing personal experiences and interpretations of chronic pain development (e.g., traumatic experiences while operational).

Rigour

Rigour refers to the quality of thoroughness and accuracy a researcher employs while conducting their study, directly informing the trustworthiness of their findings (Krefting, 1991). To ensure rigour in this study, the following questions posed by Tracy (2010) in her article describing the criteria for high quality research were thoughtfully addressed: “Are there enough data to support significant claims?”, “Did the researcher spend enough time to gather interesting and significant data?”, “Is the context or sample appropriate given the goals of the study?”, “Did the researcher use appropriate procedures in terms of field note style, interviewing practices, and analysis procedures?” (p. 841). Further, the four main tenants of rigour proposed by Guba and Lincoln (1989) were applied in this study (i.e., credibility, transferability, dependability, and confirmability). First, to ensure the study measures reliably captured the social reality of the participants, I created my interview protocol questions based on the revised BPS model for chronic pain (Baria et al., 2019), had my doctoral committee approve the questions, piloted the questions with a CAF veteran with chronic pain, and critically assessed the validity of the interview questions throughout the data collection phase (e.g., revising questions when it was apparent they were not reflective of the factors proposed in the BPS model). Second, transferability was addressed by explicitly outlining participant inclusion criteria (i.e., male,

served in the Army, deployed internationally, experienced chronic pain lasting longer than 3 months), and chronological periods in which variables were being assessed (i.e., current pain as well as initial causes). By providing specific context and description, readers can assess whether findings are transferable to their situation. Dependability was addressed by providing details on the interview protocol, revisions to the protocol, as well as documenting detailed memos and field notes that influenced the development of the theoretical models. Lastly, confirmability was followed by outlining my research, clinical, and personal experiences that might have biased the findings of this study (e.g., my personal experience with persistent pain, many years conducting research with veterans).

Procedural and analytic strategies were also employed to increase rigour in this study. The RA and I were both involved in the coding process, as well as continually engaged in meaningful discussions regarding discrepant codes and interpretations. I acknowledged my own personal experience of chronic pain, as well as my history studying theories of chronic pain, and how these experiences may have coloured and/or biased my interpretations of interview data. By involving a content expert (i.e., Dr. Holens,) with expertise in the areas of chronic pain and veteran health in the coding process, I ascribed to the process known as negotiated coding which aids in controlling for "simple errors brought on by inexperience, coder-saturation or misinterpretation" (Garrison et al., 2006, p. 3). Dr. Reynolds, an expert in qualitative methodologies, was asked to provide oversight to ensure coding procedures were followed as prescribed by Charmaz (2006; 2014), and to provide feedback on emerging themes and models. Moreover, data collection procedures, protocols, and materials were clearly defined prior to the start of the study interviews (i.e., as recommended by Oliver, 2011). Issues concerning the length of interviews, breadth and appropriateness of recruited sample, level of coding detail, and

transcription accuracy were addressed on an ongoing basis to ensure the richest and most reliable data were obtained.

Findings

Sample Characteristics

Fifteen male CAF veterans participated in the study. They were, on average, 60.3 years old (SD = 11.7) with 73.3% being married or in a common law relationship, and 26.7% separated or divorced. Forty percent of the sample reported an education level of vocational/trade/technical school degree/certificate, 26.7% reported having a post-secondary degree, 33.3% a high school diploma or less. Participants reported serving an average of 25 years (SD = 10.9) in the CAF, with all serving in the Army and two additionally serving in the Air Force and one in the Navy. Regarding rank at time of release, 33.3% were Junior Non-Commissioned Members, 40% were Warrant Officers, Petty Officers and Senior Non-Commissioned Officers, 26.7% were Junior Officers or General/Flag Officers. Participants averaged a total of 3.0 international deployments (SD = 1.4). On average, participants reported experiencing chronic pain for 24.7 years (SD = 12.3) and listed a wide range of pain locations and types (e.g., neck, lower back, migraines, shoulder, knee, complex reginal pain syndrome, arthritis, sciatica).

The Theoretical Model of Veterans' Perceptions on the Development and Contributing Factors of Chronic Pain: An Overview

In discussing causal and contributing factors to their chronic pain, veterans described two distinct periods in which BPS factors influenced their pain experiences: 1) initial causes and contributing factors to the development of their chronic pain, and 2) current contributing factors to their chronic pain symptoms. Initial causes and contributing factors of chronic pain were

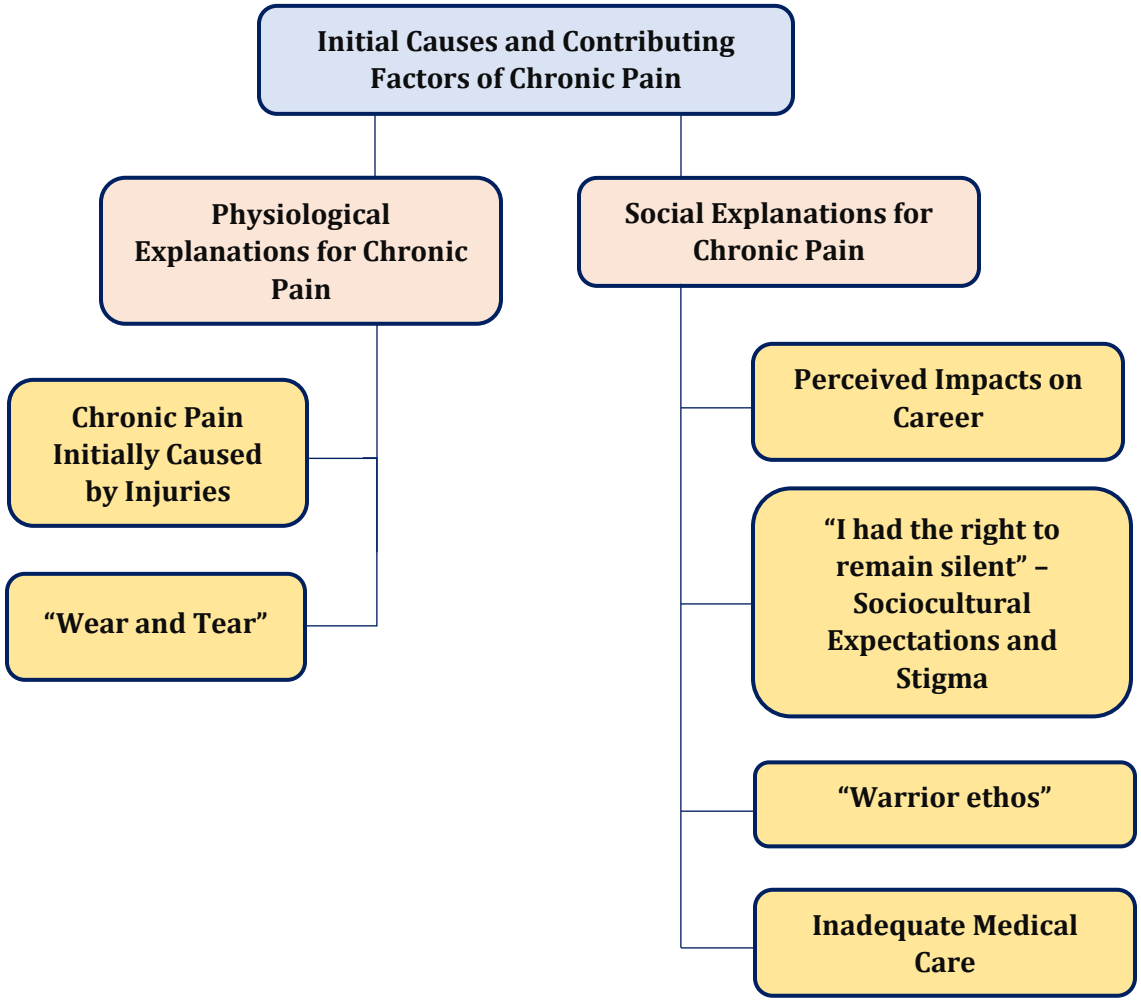
described in terms of physiological explanations and barriers to treatment while serving in the CAF. Current contributing factors to chronic pain were described as both physiological and psychosocial in nature and were influenced by medical experiences. The two models are linked as a chronological continuum, where injuries and barriers to treatment are viewed as catalysts in the development of persistent pain, and years later, physiological, psychological, and medical variables serve as exacerbators of current pain experiences.

Veterans Beliefs on Initial Causes and Contributing Factors of Chronic Pain

In reflecting on initial causes and contributing factors of their chronic pain, veteran participants described two main themes that summarized their beliefs on this topic. The first was physiological explanations for chronic pain, which encompassed two sub-themes highlighting the belief that their pain condition(s) were caused by an acute injury, and/or by the "wear and tear" of military duties. The second main theme reflecting veterans' perceptions of the causal factors of chronic pain included social factors emphasizing medical and cultural issues. The medical issue focused on inadequate medical care, while the cultural issues focused on three sub-themes including: perceived impacts on their careers, sociocultural expectations and stigma, and "warrior ethos". Beyond these themes, participants also described notable and positive changes regarding treatment barriers over the courses of their careers.

Figure 4

Beliefs on Causal Factors of Chronic Pain Amongst CAF Veterans



Physiological Explanations for Chronic Pain. Veterans described initial causes to their chronic pain to be physiological in nature. Veterans reported that chronic pain was initially caused by injury(ies) while serving, and/or it was exacerbated by the wear and tear of their military career. Injuries and increased physical demands varied between veterans throughout

their military careers (i.e., some experienced injuries early on, while others nearing the end of their careers).

Chronic Pain Initially Caused by Injuries. When asked what initially led to the onset of their pain symptoms, nearly all the veteran participants described multiple injuries sustained while serving in the CAF, injuries that would later develop into chronic pain conditions. Injury types and settings varied considerably between veterans, with many occurring in training exercises, physical fitness exercises, sport and athletic activities, and on deployment. Injury types included torn ligaments, fractured back, neck injury, meniscus tear, concussions, torn rotator cuff, and sprains. Injuries sustained while on deployment were reported by some veterans as the initial cause of their chronic pain symptoms. One veteran shared:

> P8: I was fighting with a guy, and we fell off one deck to the deck below and I landed, unfortunately the surgeon said, the worst possible way I could land with my arms up, right. I guess that just tore everything.

Veterans described injuries as being quite common while on deployment, and noted that only the most significant "life and limb" types of injuries were given any extensive medical attention:

> P6: I was [on deployment] and I had an accident, I had wood fall on top of my head. About a couple hundred pounds. And at the time nothing was done about it, just resumed and it slowly worsened… I think that the following day they gave me some Motrin and that was it, and there was nothing done. Back then we didn't sign no accident reports, just carried on.

As mentioned, most participants reported sustaining multiple injuries while serving in the CAF. Some injures were described as minor and resolved to some degree over time, while others were

more significant and consequently persisted beyond the participant's years serving. One described:

> P4: I injured my back, too. And but then it was more of a cumulative effect, over one hundred and fifty parachute jumps, that it ended up being about one in every ten jumps you'd land pretty hard. And quite often, like I mentioned, it was only through pride and determination that I made it off the drop zone.

Other veterans noted that training exercises and physical training activities were frequently the cause of injuries sustained by CAF members:

> P9: So, I was carrying a machine gun during that exercise, which is quite a bit of weight, and as I started going, the brakeman ended up pulling on the line, and it stopped me dead three times on the way down. All that weight on my lumbar spine.

Similarly, some regular occupational duties were described as activities in which injuries were common:

> P11: most likely jumping off a tank where you know, there was no such thing as having ladders, you just climbed up and when you want to get off you just jumped. Other times you landed on ground that wasn't level or whatever or on pavement because you were in a hangar and you'd be working on pavement, which is not the nicest thing to land on.

"Wear and tear" of Military Demands. Another main theme that arose from veterans' stories was that of the impact of 'wear and tear' from their military duties. One participant noted that it was, P5: "definitely wear and tear… It's just the general day to day grinding and the carrying of the heavy weight and stuff like that" which influenced the development of his pain symptoms. As alluded to, many veterans shared that the physical demands of their jobs were high and constant throughout much of their careers. One veteran shared:

> P14: But the causes of it probably simply go back to the type of lifestyle that I that I led as a combat arms officer, lots of rucksack marching, heavy loads, riding around in armored vehicles, bouncing around. I was, I've been a paratrooper my entire life, so that's not healthy for your body. But, so all this is just normal wear and tear.

Participants commonly shared about the specific demands of their military jobs, and how these demands required frequent physical exertion. One veteran described his role as a mechanic as contributing to the wear and tear on his body: “P11: Back in my time when you got the Centurion tank, which everything on the Centurion tank was heavy, there was nothing on it that was light, made no difference what it was you handled it had weight to it”. Ruck marches, as mentioned by some above, were commonly described as one of the most physically demanding requirements for military members:

> P5: Yeah, well, the training at that time included ruck marches and there was a substantial amount more ruck marches at that time. Back then, we used to do something called a 2 by 10, and essentially you'd probably train for it for a couple of months. But the 2 by 10 consisted of two 10 mile, one's a webbing march and one's a ruck march over the course of a couple of days. And that's, it's pretty taxing on the body. And then that’s just the training in general as an infanteer, was pretty intense stuff like uh, yeah. Not even so much the running, but the actual the training, the advance, the contact, the type of tactical training we did.

The general bodily wear and tear described by participants was recounted as a nearly daily occurrence, and other demanding physical tasks and training activities were described as required regularly. One veteran explained that he would experience daily fatigue and soreness from the physical demands of his job: “P3: So, you end up, at the end of the day, even as a

recruit you would step back and your muscles are sore and you take that is just growing pains as you're developing as a soldier".

Social Explanations for Chronic Pain. In discussing their perceptions of causal factors influencing the development of their persistent pain conditions, veterans outlined cultural issues and inadequate medical care as the foremost determinants of chronic pain. Cultural issues included three sub-themes: perceived impacts on their careers, sociocultural expectations and stigma, and "warrior ethos", whereas inadequate medical care emphasized quality and access issues regarding medical services while serving.

Perceived Impacts on Career. In discussing barriers to treatment seeking while serving, veteran participants highlighted several perceived worries if they were to openly discuss their pain and injuries with their chain of command (COC) and/or peers. Three primary worries arose from the discussion on perceived impacts on careers: being medically released, being sent home from deployment, and not being able to train or be promoted.

Some described a persistent fear that reporting their pain symptoms in the medical inspection room (MIR) or to their immediate COC would lead to a career-ending diagnosis. One participant shared:

> P6: There was no ifs, ands, or buts, my career was over. And sure enough, the minute I got my diagnosis, I went from a temporary category right to a permanent category, a medical category. So, there is that hesitation on even wanting to report anything.

Expanding on the topic of fears of early release, participants described their passion to remain in the CAF, and their fears of loss of financially stability, purpose, and identity if they were forced to medically release earlier planned. One veteran whose son is currently serving shared his thoughts about his experiences, and contrasted them to his son's present situation:

> P2: I think [seeking medical attention sooner] might have done one of two things it could have, one, given an actual diagnosis and maybe a treatment plan that actually matched the diagnosis. Or, it would have led to an early release from the military… [referencing his son] I keep telling him to get a hold of Veterans Affairs, submit his documentation for service-related injury and stuff like that. And he's like, no, I won't do it. I will not. I'm afraid of jeopardizing my career over getting an actual diagnosis. So, I know I'm talking on his behalf, but this is exactly what he's told me. And like I said, he's [XX] years old. He's got his whole life ahead of him. And he's kind of like, I don't want to get medically released, so I'm going to hide my injuries and carry on and do the job. And I can relate because that's exactly the way I was when I was in my 20s and my 30s and probably into my early 40s. You're very protective of your career and you find ways of either masking your pain through using medication or just not telling people.

Some of the participants described persistent worries that disclosing pain symptoms while serving would impede their chances at deployment or cause them to be sent back to Canada when they were deployed. Veterans described deploying as a rite of passage for military members. Not being able to represent your country, due in part or in the whole to one's pain symptoms, was in direct opposition to this value. One veteran shared his view on experiencing pain and injury while on deployment as:

> P9: It's like the whole time I was in the army, it's like you're sitting on the bench waiting to get the direction from your coach to go in and play the game, right? And then you finally get into the game and then you get hurt. It's like, oh fuck, I don't want to leave. So, you hide it like that. That's what I did. I didn't go and get checked. I should have, but I didn't because I didn't want to get sent home.

A similar fear was shared amongst veteran participants that disclosing pain and injury might obstruct their chances at getting promoted or going on additional training courses (which are required for most promotions). Two avenues of obstructing promotions included, 1) members disclosing their pain/injury and subsequently being placed on a category that would not allow them to attend courses that would lead to a promotion, or 2) members disclosing pain/injury and associated limitations, leading to social repercussions from their COC. In describing the reaction from his COC to an injury he sustained which limited his ability to attend exercise, one participant stated:

> P3: When I fractured the face, the superiors weren't happy because we were going on an exercise and I couldn't go and do the job. So, they gave me an administrative type job. So, they weren't happy. And sometimes they held, that got held against you. JB: *How so?*
> P3: Stopped your promotions… And then you end up, nobody will ever say it, you get blacklisted.

As noted, one fear was that disclosure of pain/injury might cause one to be placed on a medical category that would preclude them from courses or promotions. To this end, one veteran recounted returning home from deployment and minimizing the severity of his pain symptoms:

> P10: But that's when I remember when I came back, I put on my return medical that I, I put a 'stiff back'. And it was worse than a stiff back. But again, I didn't really want to take my chance of not getting promoted.

"I had the right to remain silent" - Sociocultural Expectations and Stigma. Nearly all participants identified that negative social perceptions about discussing pain, showing pain, and treatment- seeking were barriers to approaching or disclosing one's pain symptoms to the COC

or medical unit. These external pressures were experienced in a variety of ways (e.g., shaming in front of peers by COC, insults/teasing by peers, passive aggressive comments by COC). The use of pejoratives (e.g., “sick, lame, and lazy”, “walking wounded”, “MIR commando”) were described as commonplace for those who would disclose pain/injury or present to the MIR.

One perception of disclosing pain while serving in the CAF was that the member was faking their injuries to get out of physical training (PT) or their designated responsibilities. One veteran shared: P4: “…suck it up. Yeah. I mean, they didn't have too much tolerance for people that were trying to, you know, use the system or abuse the system on sick leave”. The attitude shared by some in explaining this phenomenon was that discouraging the fabrication of injuries/pain symptoms took priority over the risk of discouraging the disclosure of genuine bodily harms. One veteran shared that he would only attend the MIR on weekends to avoid the social repercussions from his peers and COC:

> P6: Yeah, it's definitely a culture of you don't want to go, and I would go to the MIR or the medical on the weekends to avoid going during the week. JB: *And why was that?* P6: Because when you go to the MIR, you get called an MIR Commando, it's because it's also done during your physical training period. If you go to the MIR, you don't go to PT. And so, it's always been looked down upon. So, to avoid that, I ended up going on the weekends.

Another veteran described waiting to attend the MIR until his pain symptoms were unmanageable, as he wanted to avoid/delay any ostracization he expected from his peers and COC:

> P3: I did hold on to it for as long as possible before I couldn't do whatever or train in this or that. I didn't want to say that I've got to go to the medical this morning. At that point, you knew you were going to be picked on by the other recruits or the other staff. [*mimicking his peers*] "What's a matter? You can't take a little bit of baby pain or discomfort, twisted ankle?" You've got to push through it.

One veteran described feeling unable to attend the MIR to have his pain symptoms assessed and treated as he believed there would be negative consequences as he was unable to prove, objectively, that he was experiencing significant pain:

> P12: I had the right to remain silent, you know? Because, say you went to the MIR because you've got a problem and that, there should be no repercussions of it, but you knew there was, there was going to be, you know? It's just sort of something you can't prove.

A recurrent and common cultural response to pain and injury shared by participants was the "suck it up" attitude. The ideal solider was described as stoic and undeterred by physical afflictions. This phenomenon was reported to be engendered by the CAF COC, as well the serving members themselves, and communicated by all through verbal and non-verbal behaviours. In responding to questions about how he managed pain and injury, one participant said:

> P15: No, you hid it. If you sprained your finger or broke your finger, you kind of just set it back yourself or whatever. Or, if it's bad enough, sprained, you just tape two fingers together and you carry on… you don't want to be perceived as weak.

Veterans described a social climate where physical expectations were high and tolerance for those who could not manage the demands was low. For example, veterans described training exercises that were designed to push members beyond the perceived limits of their bodies. One of the veterans in his 60's shared:

> P8: It was still sort of the old boy's club at that time. You know, there weren't a lot of women in the military, and it was still the culture of, you know, no pain, no gain, and "if it ain't raining, it ain't training" was the good army one… And they were of the attitude that you suck it up, you know? So what if your ankle hurts, keep on going.

Equally reported by participants was the expectation of training as if you are deployed in combat, regardless of the pain you were currently experiencing. Describing his experience with high expectation, one veteran noted:

> P2: I was 18 years old on my basic training or my trades training and being an artilleryman, you never did anything slow, everything was done fast. You know, the truck would stop, and we'd have to put the Howitzer into action… and we would jump out of the back of that truck to get that gun in action as fast as possible and not get yelled at by our staff and our instructors and that's the type of stuff that we did.

The majority of veteran participants medically released earlier than they desired and originally planned. Following an injury and subsequent diagnosis(es) and placement on temporary category, veterans described strong feelings of social isolation. Some emphasised the intrapersonal aspects of being on the edge of releasing (e.g., uncertainty of the future, feelings of loneliness and frustration), while others the interpersonal dynamics (e.g., relational distancing,

being treated differently by COC). One veteran described this experience and its influence on treatment-seeking behaviours as follows:

> P5: It's my opinion, I guess, that once you become an injured member, you're almost like an immediate second class citizen… "sick, lame, and lazy" was one they used to say to describe anybody that wasn't going to participate in PT or wasn't going to participate in a ruck march… perhaps it does affect the psyche of the person who is experiencing the pain, but it sort of discourages you from going to the MIR.

In summary, social expectations and stigma were purported by participants to be a significant barrier to treatment-seeking following injury. In my perspective, this appeared to be the strongest and most highly endorsed barrier to treatment seeking while veterans were serving. The perception that the member was simply faking their pain symptoms in an attempt to avoid PT, or was too weak and lacking the mettle required to be a solider, were both reported as strong factors leading to the avoidance of disclosing injury/pain. Being diagnosed and/or placed on a temporary category often led to strong feelings of 'otherness' (e.g., "second class citizen").

"Warrior ethos". Contrasting the interpersonal barriers to treatment seeking (i.e., social expectations and stigma), many of the veterans noted several intrapersonal factors influencing their treatment seeking behaviours. Chief amongst those mentioned were their beliefs about the role and attitudes of a soldier. Many noted that soldiers pride themselves on being able to push through adversity of mental and physical strain to perform their duties (i.e., the "warrior ethos", which was not believed to be similarly adopted by civilians). Veterans described these adopted values as distinct from the social pressures and stigma imposed by peers and COC. A veteran in his 80's who served as a paratrooper shared his experiences of dealing with the many injuries he sustained while landing:

> P4: Being about one in every 10 jumps, you'd land pretty hard, so… it was only through pride and determination that I made it off the drop zone quite often. But, but I mean, everybody was in the same situation, most people anyway.

This same veteran described a compassionate understanding between serving paratroopers, given the frequency of hard landings and subsequent impact on their bodies. He noted that he did not feel social pressure to remove himself from the landing site, rather it was his pride in being a soldier that was the catalyst for getting himself off the landing zone. The "warrior ethos" was aptly described by a younger veteran:

> P9: Part of our warrior ethos within the infantry was mission before self and I, still to this day, it's one of those things that you just can't untrain. So, the minute I dedicate myself to something, it doesn't matter how much my body starts aching or failing me to do it, I'm going to go until I finish that task, usually to my own detriment.

The present-day impact of adopting a warrior ethos, as endorsed by the young veteran, was not widely shared by the other veterans, as many described now being able to pause and address their health needs without battling an internal ethos to push past uncomfortable/painful sensations. Another veteran described this soldiering value as distinct from other service elements in the CAF, in that the warrior ethos was especially internalized and enacted by those in the Army:

> P15: Suck it up and embrace the suck. Yeah, and someone might have a different opinion than I do, but my opinion was, as ground pounders and infantry guys, we chose that career where you got injured. Suck it up, carry on. You're air force, you get injured, they'll do anything to take care of you and blah, blah, blah and so on and so forth.

The stoic soldier identity appeared to be especially prominent while on deployment. Veterans described deployment as the apex of soldiering, a venue to showcase the unique qualities ascribed to a warrior. Akin to the "warrior ethos" is the mentality that no one else should have to preform someone else's assigned duties. Soldiers pride themselves on their ability to conduct their duties unassisted, supporting the unit and larger military body. As such, seeking treatment for injuries and pain that might compromise a member's ability to remain in action is perceived as antithetical to a principled soldier. In describing this phenomenon, one veteran noted:

> P14: And sometimes it's just, it's months before I got properly treated in Afghanistan. I had to wait until I went back to camp. Because we were way, way out in butt fuck nowhere and it's not a matter of, yeah, they could have helo'd me in [*medical transport via helicopter*], but then I would have had to stay in [*at base camp*], and I don't think there's anybody in the military that would want to bring someone else out to do their job. When you're there you know, you suck it up and you do it. [JB] *Right, it was that pride piece it sounds like too*. [P14] Oh yeah, absolutely.

Inadequate Medical Care. In discussing the quality of medical care while serving and its impact on their physical health, many veterans described inadequacies in medical assessment and treatment as a contributor to their pain. While many of the noted injuries occurred while on deployment, this was also the environment where medical care was the scarcest. One veteran responded to the question regarding his perception of treatment availability and quality while deployed with: "P14: Yeah, no, but then I knew there wasn't anything there that they could do. Right. And they didn't have any X-ray equipment, they didn't have any ultrasound equipment or anything like that". Reflected in this description is the belief that little more could have been offered in the "theatre of war" to address non-life threatening musculoskeletal and other related

injuries. The veterans shared that injury and pain were inescapable biproducts of combat and should be expected by all who deploy to such environments. Even so, participants drew a connection between the inadequate medical assessment and treatment options while deployed, and their persistent pain conditions. Most of the veterans also noted inadequate medical care while serving at a Canadian Forces Base (CFB). In comparing his medical experiences while serving to those as a civilian (i.e., retired from the CAF), one participant lamented the competence of CAF physicians:

> P15: No, military medical doctors, the doctors in the military weren't the best, they were kind of, and I'm not trying to slam them, but a lot most of them were the lowest in their class or whatever and just, you know, medical degree and all that. And they weren't as, they weren't as good as some of the general practitioners out in the civilian world.

Some of the veterans described situations where they had difficulty accessing timely medical care following an injury. The barriers discussed ranged from a lack of personnel to take over assigned duties which would allow the member to take time off, to a lack of medical practitioners providing prompt intervention following an injury. When asked about the adequacy and effectiveness of his medical treatment, one veteran reported: “P14: Minimal. I mean, I did receive physiotherapy, but again, by the time I got in to see them, it had already been six weeks. So, you know, the injury is still there, but the acuteness of it isn't, right?” Some veterans noted that not all care was inadequate, but that the quality of care was inconsistent. One member, in responding to his view on whether he received quality medical care while serving, noted that he felt his situation was unique:

> P5: Assessment, yes. Treatments I don't, I'd say no. I was sort of, I think, I was trying to explain before that I was sort of in the limbo where I was kind of too old for the surgery to make me, you know, an active member.

Another veteran described his experience with the inadequacies of the medical care offered on a CFB by detailing his experience following a knee injury:

> P15: It was like, OK, they cut the cast off. Doctor said, OK, do a couple of deep knee bends. OK, you're good to go, get the fuck out. And that's how I was then the following week. I've got an 80-pound ruck on my back running, you know, and that's just how it was. And yeah, friggin ibuprofen was my best buddy, you know, I just ate them like candy.

Gradual Changes of Cultural Perceptions and Procedures in CAF. In addition to the above findings, veterans noted that perceived cultural and procedural barriers to treatment seeking had changed over the course of their service; in that fewer barriers were present closer to the end of their careers. This was especially evident for attitudes and access to mental health treatments, though most noted a gradual change with respect to physical health as well. Regarding the general changes in the CAF and their impact on physical functioning, one participant shared:

> P15: I've talked to a couple of guys that are in the military now and they have improved significantly. But there are some guys, the guys even before me, like the old sergeant majors and stuff like that that were, you know, forty-five, fifty when I was a young twenty, twenty-five years old there, and they can barely walk now.

Procedural and cultural changes over time were the most acknowledged themes associated with diminishing barriers to accessing medical treatment while serving. Changes in issued equipment was also noted as an important change influencing pain and injury in the CAF.

Procedural changes within the CAF were described by many as notably decreasing barriers to accessing health services for pain concerns. One procedural change described by veterans was in the way physical duty restrictions were categorized and communicated; P5: “It has definitely changed. I know even the way they did the chit, the chit is what categorizes what limitations you have, has changed since when I started in the late 80’s”. One participant described the change in the organizational structuring of medics within the COC of each unit, and how this and other changes influenced barriers to treatment-seeking amongst serving members:

> P7: You know, other things that changed significantly, at least in the Army, was that back in the day the unit doctor and medical team belonged to the unit. So as a commanding officer, my doctor and my medics were my doctor and my medics. He and I wrote his or her assessment, everything. And then in 2000, I think that's when they took them out and they reported through the health services group. And a lot of people, commanding officers were like, I now have no control over my people. Who do I turn to now about their medical state? And this was that thing about, you don't need to know what's wrong with them. You need to know what the restrictions are, when you're going to see them back on duty. And some people couldn't accept that. So along with a whole bunch of other things that were societal, whether it was same sex marriages, you know, gender transitioning, all those other things, privacy issues, and recognizing that we have to be more like society than this insular, closed culture of the military that I think contributed

> to opening the spectrum to let our people, you know, be more free with the doctors to say, look, I've got, I've got a real issue that I've got to get fixed. That took time for the chain of command to recognize".

Seeking medical attention for pain issues (often referred to as "complaining") was perceived as stigmatized in the CAF. While stigma has been noted by nearly all participants as a significant barrier to treatment seeking while serving, most did describe that there had been notable cultural changes over time. One veteran explained, P3: "Nowadays, it's more acknowledged. Back then, it was suck it up, buttercup, because life just treats you the way it treats you". Another shared, P1: "But again, there has been a big change though from the 80s, at least in my experience anyways, definitely has been a big change from the 80s to how they look at things now". In contrasting his experience from earlier to later in his career, one veteran said:

> P13: I remember being a young soldier and my NCO and stuff, if you got injured, is like 'get off your ass and move quickly'. And what you're doing is tough, jumping out of helicopters, climbing cliffs, repelling, all that stuff is hard work. And it's like you get falls, you get breaks, you damage yourself. And it was always, you know, 'get off your ass, get going'.

Decreased stigma around treatment seeking, coupled with changes in procedural changes in the CAF, led many of the participants to believe that the barriers to treatment-seeking that once existed when they were serving (i.e., most notably earlier in their careers), no longer hold the same influence presently.

Of note, however, a minority of the participants believed there was little to no change in how pain and injury were perceived within the CAF over the course of their service. One veteran

shared his belief that any changes to how pain and injury were viewed by the COC were superficial and inconsequential:

> P6: I don't think it's changed. I think it's the strong eat the weak. I don't think it's changed. I think they do a lot of lip service. But even talking, and I think it again, it all comes down to the rank, who you know and who likes you. Whether or not you were a shit pump before you got injured, I don't think that that culture has changed. There's more acceptance to PTSD, but people still hide the fact because they know they're going to end their careers. I don't think it's changed.

The evolution of equipment design and quality was a recurrent topic shared by veteran participants. Veterans reflected on the lack of or poor quality equipment they had when they began serving. Reflecting on an observation he made while serving later in his career, one veteran shared:

> P13: Now they have knee pads. I notice in Afghanistan, the guys all have knee pads. We never had that when I was a kid. It's like my hearing is gone and I have hearing aids because we never used ear defenders shooting rifles. So, with time they improved. But, you know when I was in, it was the very basic stuff. So, you hit the ground, there's no protection on your knees. You crawled on the ground, you did obstacle courses, did man-carries, you know.

Many participants recalled the negative impact of hard soled shoes, and how being required to march for long periods carrying heavy ruck sacks resulted in immense strain on the body. On this topic one veteran reported that P6: “[stress on] your feet and your legs and your joints, they took

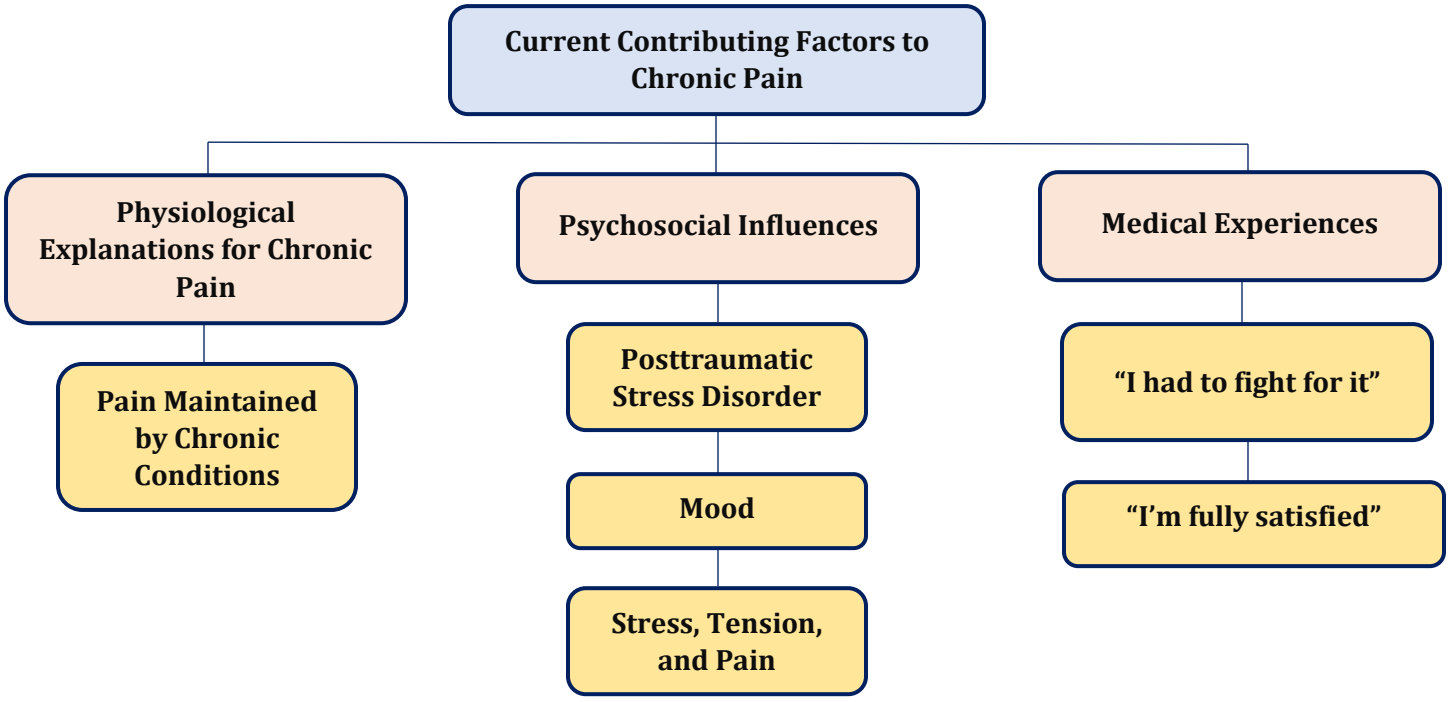
all that. Yeah, yeah, I think the boots are much better now. They got much better vibrant soles, so the rucksacks [marches] are different".

Veterans Beliefs on Current Causes and Contributors to Chronic Pain

In the second half of the model describing current contributing factors of persistent pain, participants emphasized three main themes: physiological explanations, psychological influences, and medical experiences. Within the physiological explanations for persistent pain, veterans identified conditions they believed to be maintaining their chronic pain symptoms (e.g., neck, lower back, migraines, shoulder, knee, complex reginal pain syndrome, arthritis, sciatica). In the next cluster of sub-themes, PTSD, low mood, and stress were identified as psychological influences for current pain symptoms. Finally, having to initially fight for benefits, while being relatively satisfied with pain treatments at present, encapsulated the medical experiences described by veterans. In connecting the main and sub-themes of this model, veterans reported chronic conditions being exacerbated by acute and prolonged psychological and social distress. This stress-pain interaction was made worse in early battles for benefits, though eased over time as veterans were awarded pensions and coverage they believed was due them.

Figure 5

Beliefs on Contributing Factors to Chronic Pain Amongst CAF Veterans



Physiological Explanations for Chronic Pain. When discussing causes and contributing factors for participants' current pain symptoms (e.g., "How do you understand the current causes of your chronic pain?"), veterans unanimously described chronic conditions as the primary source of current pain symptoms.

Pain Maintained by Chronic Conditions. Veteran participants each reported multiple chronic pain diagnoses. Some diagnoses were reported as obtained by medical professionals, while others were self-diagnosed. One veteran connected his initial injury with his current pain symptoms as, P1: "I know that the bulging disks are an issue just because, you know, that's more or less settled into place. So, the injury was what started that." Some of the conditions listed included osteoarthritis, bulging/protruding discs, herniated discs, sciatica, pinched nerves,

compressed discs, degenerative disc disease, frozen shoulder, patellofemoral syndrome, cervical disc disease, migraines, occipital headaches, and complex reginal pain syndrome. As mentioned, comorbidity was prevalent, with most veterans describing multiple pain conditions and multiple pain sites. P2: “I've got osteoarthritis in my joints, I've got degenerative disc in my lower back as well. Those are the only two real things that I've actually been diagnosed with throughout my military career.”

Most of the veterans described their pain in terms of its level of impact on functioning and quality of life. For example, one veteran shared:

> P8: So, then once that's all spasmed up, then my trap locks up and then I get these occipital headaches, which really affects my quality of life. I can deal with the ankle pain, the shoulder pain, the lower back pain. But it's the headaches.

Many veterans shared that the pain they were experiencing, as well as associated symptoms (e.g., diminishing mobility), worsened as they aged.

> P1: My thoracic spine wasn't immediately affected, but within about two years I had gone to the doctor because I noticed some decreased mobility in my back. He noted that my lumbar spine, in and around the area of my shoulder blades, was not bending as properly as it should. And over the years, that's developed into a condition known as D.I.S.H., its diffuse idiopathic skeletal hyperostosis, basically means my spine is fused.

Specifically, some veterans stated that their pain began earlier in their career, but worsened to the point they were unable to maintain the responsibilities and tasks in their jobs and thus contributed to their early release from the CAF. One veteran recounted an analogy that stuck with him regarding the unexpected impact of pain and injury resulting from military service:

> P3: The doctor I had there said, you know, the guys in the military are like bull riders. You go on and on for your career. And it's not until your career ends that you allow that chronic pain, those disruptions to enter your life, right? I thought it was a great analogy.

Psychosocial Influences. In describing factors that currently contributed to the intensity and frequency of pain symptoms, veterans identified three psychosocial variables: (PTSD), mood, and stress. Of note, six of the 15 veteran participants reported a diagnosis of PTSD, two reported mood disorder diagnoses, and one reported an anxiety disorder diagnosis. Questions regarding psychological factors queried disorder-specific influences, as well as associations with changes in one's mood in general. Questions on the impacts of stress on current pain symptoms included social, occupational, and other daily living stresses (e.g., finances).

Posttraumatic Stress Disorder. Most of the participants who endorsed having a PTSD diagnosis described a connection between the PTSD and their pain symptoms. The association identified between the two conditions varied between veterans and highlighted a bi-directional relationship between pain and PTSD. One veteran explained that it was usually his PTSD symptoms that triggered his pain:

> P15: Yeah, when I'm feeling like [I'm] getting closed in on and all that, and something sets me off with my PTSD, I'm - yeah, I know it's mental but it's almost like there's a little wire to my lower back and knees to my brain when I get aggravated. Lack of respect is one of my biggest triggers… so when I'm driving into the city and people cut people off or just go flying by me when the speed limit's 60, and they're doing like 85, 90, I have a stress ball, and I just work that. And then when I start to feel aggravated, I can feel just a little twinge in my back and my knees. It's just like a little pulse almost, it's weird. So yeah, the PTSD and my pain spots I believe are connected.

Another veteran described an example of the relationship between his PTSD-related nightmares and his pain as: “a good one would be if I'm sleeping and you have those intrusive memories and that, and you wake up stiff or you wake up achy, and then it's a little hard to move”. Another veteran shared that on days when his pain is worse and impacting his functioning/wellbeing, he is more vulnerable to posttraumatic stress symptoms:

> P3: I can be triggered by a war movie or something, but I'm not in a dark place on an ongoing daily basis. As I say, it's sort of the bad pain days that can sort of send me there. You know, it's usually I come out of it within a day or two, depending on how I can manage the pain.

Of those reporting a PTSD diagnosis, some viewed the association between the conditions to be unidirectional while others noted a mutual exacerbation. For example, one veteran shared that the concurrent experience of PTSD and pain, alongside other symptoms, caused him great distress and discomfort:

> P9: The constant pain that I get from that is the migraines, the headaches, the dizziness, the visual acuity issues. It's affected my ability to have caffeine, I can't have caffeine anymore. It affects sleep, it affects a whole lot of stuff. And then when you pair it with PTSD it kind of creates a perfect hell.

Mood. One’s mood, in particular a negative or low mood, was described as a contributing factor to pain intensity and frequency. Like PTSD, veterans described the connection between mood and pain as bi-directional. The belief that experiencing a low mood heightened the perception of pain was endorsed by several veterans: P7: “Usually if I'm having a bad day, I notice [pain] more.” Some veterans explained that when their mood was low, although their pain

symptoms may not have increased, they spent more time ruminating on the limitations caused by pain. This phenomenon was noted to be cyclical in nature, where the negative mood enhanced the perception of pain which, in turn, exacerbated one's mood. One veteran described:

> P6: I'm going through this cycle right now. My back, my neck goes out. I get very angry, upset, depressed, just frustrated. And then I think that that brings on even more pain or maybe just more of the perception of pain.

In addition to the increased perception of pain caused by low mood, pain was identified as an instigator of frustration associated with functional limitations and interference with life goals. One veteran described the impact his headaches had on his ability to work for prolonged periods of time:

> P1: So, you know, I take a lot of Tylenol, but it does really play on your mood. You know, I can handle pretty much anything, you know, the back pain or whatever, and it's an aggravation and it pisses me off. But it really gets to me when it manifests itself into a headache for quite a while.

Likewise, another participant shared his experience learning about the connection between pain and his mood in a pain management course:

> P2: So, I spent 30 days on this program through the fall of 20XX. And that's where I kind of learned about chronic pain and pain management and how it affected my mood. Because honestly, I would get very frustrated that I couldn't do the things that I really wanted to do anymore.

It is important to note that not all veterans identified a connection between their pain and mental health conditions or mood. One veteran participant shared that he did not see a connection between his anxiety and mood symptoms, and his pain:

> P7: No, I don't think so. I don't think there's a correlation there at all… I've never really thought of the two as connected because I think of the one as physical and mechanical, and then the other as a mental health thing.

Another shared that he could identify a connection between his mood and pain while he was still serving, though believed that the two no longer influenced each other in the same way: P5: "But, yeah, I don't know if it's affected my mood or, you know, I'm not sad because I can't do certain things anymore. I'm beyond that now. I think when I was still in I had those feelings".

Stress. Similar to the mechanisms described between PTSD and pain, veterans identified stress as bi-directionally connected to pain. In discussing this relationship, participants who endorsed a connection identified "tension" as the chief mediating factor between stress and pain. Stress generated from interpersonal, financial, occupational, and other causes would result in a tightening of muscles, chiefly in the neck and shoulder areas. Pain sensations would result from the tightening/tension they experienced.

> P8: Well, the first one is that the emotion is making the pain worse. If I get stressed and I tighten up, you know, I wear it in my neck usually. So yeah, it will just set things off more. But that's just the way it always has been my where I wear my stresses in the neck and shoulders.

Another veteran who experienced nerve pain identified stress and subsequent tension as an exacerbator of the pain he experienced:

> P14: Yeah, so it will affect my pain levels. They will spike and I think a lot of the reason is because you're so tense, in my case, that that's pressing on all these nerves and damaged whatever. And I'm 100 percent sure that's what's causing it.

When describing the association between stress and his chronic pain, one veteran explained that the two were associated via the same link from his "brain to [his] back" that connected his PTSD and his pain:

> P15: Yeah, I'm sure it's like that old connection from my brain to my back, it's just there. Yeah, and when I'm not stressed, it's tolerable right now, but there are some days it's like, holy shit, I just wish this would go away.

Several veterans did not endorse any association between their pain and stress, possibly due to the perception of having minimal stressors in their lives at present. These veterans reported minimal financial stress, due to stable financial assistance from Veterans Affairs Canada (VAC), and minimal relational stress as most did not engage relationally beyond a few close friends and family members.

Medical Experiences. In addition to the physiological and psychological influences on chronic pain described by veterans, navigating healthcare coverage was also noted as a contributing factor to their pain experience. Specifically, many veterans described difficulties obtaining coverage for treatments they felt they deserved to have compensated by VAC. One issue that spanned active service and retirement was that of lost or mismanaged medical files. Some veterans noted the mismanagement of healthcare records negatively impacted their VAC adjudication process as they did not have sufficient information to link their pain/injury to their operational duties. Others reported having to continually provide additional paperwork until they

were able to have their benefits and treatments covered. This impediment to coverage was described by some as exacerbating their pain by delaying timely access to effective treatments (i.e., covering costs of expensive treatments). Despite initial difficulties accessing coverage for treatment, most veterans described their current treatments as beneficial in managing their pain symptoms. Many reported participating regularly in massage therapy, chiropractic treatment, acupuncture, physiotherapy, and family doctor visits for various treatments (e.g., injections, pharmacological treatments). To this end, nearly all veteran participants described being satisfied with their current chronic pain treatments.

"I had to fight for it". As mentioned, many of the participants expressed frustration in dealing with VAC to obtain benefit coverage. Being awarded disability coverage/medical pension (i.e., being provided financial compensation based on the level of disability assessed) and treatment coverage were emphasized by veterans as areas of struggle. Some veterans described it as a "system of denial", in that, initial attempts applying for disability awards or treatment coverage were perceived to be dismissed outright:

> P13: But everything else has been a fight. And like I said, it's a system of denial, as I call it. They just deny, deny, deny, and if you fight long enough, they'll take it. I mean, even my knee brace, they're supposed to give me a new knee brace, I'm entitled to one every five years. I don't want one every five years because I don't use it that much. But it was 18 years from my last one to my new one, right. And it was just getting worn out, broken, when I use it quite a bit. And they turned around and denied it.

During the interview, some veterans became noticeably agitated discussing their frustrations with VAC, in some cases because their award applications were still being processed. Others spoke about the emotional toll fighting for benefits had on the veteran, and how some veterans would

quit pursuing resubmission of applications due to this toll. One veteran poignantly described the struggle he and his fellow veterans had obtaining health benefits from VAC:

> P9: And then you get released and then you feel disenfranchised. You feel like, what the fuck was it all for? Now I'm just Joe Schmo out on the corner. Now, I'm a veteran and I have to fight for every single one of my benefits, I have to fight for my treatment benefits. I've got buddies who lost both their legs in Afghanistan, and they still have to prove every single year to Veteran Affairs that their legs didn't miraculously grow back.

One veteran described advocating on behalf of his father, also a veteran, for health benefits, as well as fighting for his own:

> P13: Yeah, and I had to fight for it. And a lot of the veterans, they don't fight for it. My dad wouldn't fight for it, he was told “nope”, so he stopped. My dad was a veteran as well. He had some problems, and he was told “no”. And that's what the authorities said, “no”. And I go, bullshit. So, I fought for my dad, and I got him benefits and it has really helped him. And I fight for mine to get my benefits, which I think I am owed.

As mentioned, the mismanagement and/or loss of medical files while participants were still serving caused additional barriers to receiving benefits from VAC. The VAC disability and health benefit adjudication process was described as slow, and having to resubmit applications due to a lack of documentation resulted in veterans having to either pay out of pocket for regular pain-related treatments or go without. One veteran explained he had hired a lawyer to assist with his application:

> P11: I guess 19XX to 19XX, there's no record of me ever seeing a doctor, yet I know that I did. But, there's no way of, when they went back to my records, to find these things.

> There was nothing they could find when the lawyer was fighting for me for my medical pension.

Another participant described the importance of requesting your medical files upon releasing, as well as throughout one's military career, as without proper documentation applying for one's pension and benefits can become increasingly difficult:

> P10: But the first thing you're going to do when you leave the military is make sure you have your records of all your medical stuff. Because when I asked for my records, they said they didn't have it. So that's something you want to have a copy of.

"I'm fully satisfied". Most participants described their current access, quality, and breadth of options for pain-related treatments as satisfactory: P15: "So, I feel now I'm getting the help and resources that help me with ongoing issues". However, as discussed above, most veterans felt they had to fight for their pension and health coverage: P10: "but Veterans Affairs there have been really good to me, but it just took a long time to fight for that initial claim". Massage therapy, chiropractic treatment, physiotherapy, acupuncture, and attending one's family doctor were the most common treatments currently accessed by veteran participants. Financial coverage of these treatments was dependent on the results of the disability/pension assessment by VAC. Several participants explained that the difficulty of the adjudication process, and subsequently obtaining treatments, was in part mediated by the perceived competence and relational qualities of their assigned VAC case manager: P9: "Again, I'm directing back to Veteran Affairs. It comes down to your case manager. I've had two unbelievably good case managers and one extremely bad case manager". Another participant shared:

> P15: And my case worker from Veterans Affairs, awesome, awesome guy. He's not putting any restrictions on me or anything, he just sends me a message once every two months or whatever and asks if there's anything I need or stuff like that. So that aspect, it's yeah. From when I was in the military from now, it's improved, very much so.

Having an understanding and competent family doctor was also described as positively impacting participants' pain experiences: P6: "I've been fortunate that I have a good family doctor". Physician relatability and understanding of the military culture, demands, and VAC system were also noted as a beneficial for one's pain management: P12: "Look, I'm fully satisfied. In fact, the guy that I see is ex-military. Okay, excellent! Yeah, so he knows". Several veterans noted specific VAC programming that has been instrumental in managing their pain symptoms:

> P13: They provided me with funds to hire somebody to cut the grass, right. So, there's not enough that they can do it every week, but it was enough that if I had a sore back, I could stop that, and we could call up somebody and have them come here. So, they gave me funding for that after I started complaining about it. And so, through Veteran Affairs, it's called the Veterans Independence Program, VIP program, that they provide funding for veterans to stay in their homes.

Overall, while the initial battle for benefits and coverage was described as overly and unnecessarily frustrating, participants on the whole stated that they were satisfied with the financial and instrumental support VAC was currently providing.

Discussion

The findings in this study showcase CAF veterans' beliefs about factors influencing the development, maintenance, and exacerbation of their pain conditions. To this end, participants spoke to a broad range of biological, psychological, and social factors, some of which were believed to bi-directionally interact with their persistent pain.

Figure 6

Integrated Model of Initial Causes and Current Contributing Factors of Chronic Pain

Timeframe/ Status	Physiological	Psychological	Social	
			Medical	Cultural
Past/ Serving	Acute Injury Wear & Tear	No Concerns	Inadequate Medical Care	Perceived Career Impact Stigma Warrior Ethos
Current/ Veteran	Conditions now Chronic	PTSD Depression Stress	Had to Fight for it ↓ Fully Satisfied	Gradually Changing

Note. Integrated model is the amalgamation of Figures 4 and 5.

Figure 6 displays an integrated model of both developmental and current factors believed to influence veterans' chronic pain (i.e., combination of Figures 4 and 5). The upper half of the

model details veterans' reports of variables influencing the development of their chronic pain while serving. The two chief components included 1) physiological explanations for persistent pain, and 2) social factors, including poor medical care and barriers to treatment-seeking. Veterans reported that their persistent pain resulted from an injury while serving, and/or wear and tear from the physical demands of training, service, and deployment. Many perceived the medical care provided by the CAF as inadequate and, at times, delayed. Additionally, numerous barriers to treatment-seeking following the emergence of pain symptoms were identified. Veterans shared their fear of repercussions (e.g., medical release, denial of promotion, deemed unfit to deploy) if they had their symptoms assessed by medical professionals. Further, veterans described a "suck it up" culture in which treatment-seeking for pain was viewed as unsoldierly and indicative of a weak individual. Veterans also endorsed intrapersonal influences (e.g., stoic soldier identity, "warrior ethos") which further discouraged the member from accessing pain treatment. Taken together, the high likelihood of experiencing an injury throughout service, coupled with the heavy physical demands of military service and the inadequacy of medical care, was believed to have led to the development and exacerbation of pain symptoms. While pain-related medical services may have been available at the time (specifically if members were located on a CFB), stigma and intrapersonal values prevented veterans from seeking such care. Consequently, injuries that were once potentially treatable became chronic conditions which the veterans were still dealing with at present: P4: "what can they do… there's really very little they can do".

Most participants described the onset of their pain symptoms as resulting from an injury while serving. Analyses from the 2013/14 Regular Force Health and Lifestyle Information Survey (Thériault et al., 2016) of Canadian Forces personnel revealed that 44.4% of Regular

Force personnel incurred a repetitive strain or acute injury in the 12-month period prior to the survey administration. Given the high rates of reported injury (and that many injuries may go unreported for the reasons mentioned above), it is unsurprising that pain experiences are prevalent. Further, the greater likelihood of injury was described as an obvious reason for the high prevalence of chronic pain amongst military veterans. That is, working in a career where injuries are high, it stands to reason that there is a higher likelihood that such injuries would develop into chronic conditions over time.

Another important subcategory of the model was the impact of 'wear and tear' on the development and exacerbation of pain conditions. As quoted previously: P14: "from the Army point of view, our training is constant. It's extremely dangerous, and it's hard on your body". The 2013 HLIS on Regular Force members noted that two-thirds of respondents reported engaging in rigourous and "unsafe physical training practices; e.g., exercising without a proper warm-up, engaging in a rucksack march while carrying more than 1/3 of one's own bodyweight; and running with a rucksack over distances longer than those meant to simulate running for cover" (Thériault et al., 2016, p. vii). While not all unsafe training activities lead to injuries, veterans described the physical expectations and responsibilities (i.e., both safe and unsafe) as negatively impacting their pain experience.

Inconsistent medical care while serving was the next subcategory described by veteran participants. Many veterans highlighted inconsistent medical care while on a CFB, and inadequate care while deployed. This phenomenon has been documented on both sides of the patient-clinician relationship. Army surgeons on deployment are frequently "expected to care for patients with potentially the most horrendous injuries, with minimal access to technology, equipment, and personnel to assist them" (Edwards et al., 2018, p. 1191). There was a high level

of acceptance of perceived inadequate care while deployed as many veterans described the provision of care as tailored to “life-and-limb” injuries/illness, and beyond that, prescriptions and non-prescription pain medications were expected to sustain the needs of the member until they returned to the CFB. While on the CFB, prolonged wait times were identified as a barrier to adequate treatment, and have been documented in the relevant literature as negatively influencing the health of veterans and serving members (e.g., Institute of Medicine et al., 2013).

The next main theme among the BPS determinants of chronic pain for CAF veterans was the prominence of barriers to treatment-seeking while serving. Three chief barriers emerged: perceived impacts on career, sociocultural expectations and stigma, and one’s “warrior ethos”.

The first subcategory describing impediments to treatment seeking was that of perceived impacts on one’s career. Participants described worries that, following the disclosure of their pain symptoms, they would be forced to release from the CAF. Several veterans cited “universality of service” as the chief proponent driving their worries around seeking treatment. As defined by the Department of National Defence,

> the principle of universality of service or "soldier first" principle holds that CAF members are liable to perform general military duties and common defence and security duties, not just the duties of their military occupation or occupational specification. This may include, but is not limited to, the requirement to be physically fit, employable and deployable for general operational duties (National Defence, 2018).

Veterans emphasized worries around not being able to deploy or be promoted, financial instability, and loss of purpose as barriers for presenting to the MIR for assessment. As such, members found ways to manage their pain independent of the military medical system (e.g., non-

prescription pain medication, avoidance of physical training). Some veterans, specifically those of higher rank and with greater administrative responsibilities, bemoaned the impact universality of service had on their pain experience, as they had confidence they could perform their duties even with their pain conditions. Notably, between April 1, 2014, and March 31, 2017, 36% of those releasing from the CAF did so for medical reasons, with 40% of these members citing musculoskeletal issues as the primary determinant (Serré, 2019). Some participants described knowing others who were "forced" out of the CAF after disclosing pain-related issues, and that this transition was a difficult one. In a recent Canadian study, transitioning to civilian life was perceived to be more challenging when the member was presenting with poorer health (McCuaig Edge et al., 2021). Taken together, the non-disclosure of pain issues was described to be driven by fears of limitations being placed on one's career (i.e., not deployable, or eligible for promotion) and worries that their employment with the CAF would be terminated prematurely.

Sociocultural expectations and stigma were identified as among the chief reasons serving members did not seek medical assessment and treatment for their pain concerns. As summarised in the introduction section, stigma has been identified as a barrier to treatment-seeking for military members in the literature exploring mental health services (e.g., Boulos & Zamorski, 2015; Britt et al, 2000; Greene-Shortridge et al., 2007; Hoge et al., 2004; Kim et al., 2011; Zinzow et al., 2013), though notably less research has explored this phenomenon with other medical and physical health issues (e.g., Frank et al., 2018; Hoge et al., 2006). The disparity in empirical attention was mirrored in veteran accounts of changes, over time, regarding the acceptance of mental health issues and related interventions. Some participants highlighted the emerging acceptability of mental health concerns, such as PTSD and depression, whereas the ubiquitous experience of pain was largely viewed as a symptom one could and should overcome,

at least while serving. Veteran participants described avoiding disclosure of their pain concerns as their peers would likely insult, belittle, and alienate the member. Several of the veterans described military culture as that of a “brotherhood”. The admission of pain was perceived as a threat to one’s standing within the “brotherhood”, as it was expected, and experienced by some, that their peers would purposely exclude them from the social network. Further, many described their COC responding in a similar fashion. The fear of being treated differently or looked down upon by one’s superiors was also linked to the worries of being “blacklisted” for promotions, honours, and chance of deployment.

Numerous theories and models have been published describing the concept of stigma. For the purposes of this research, I utilized the multifaceted framework introduced by Scambler and Hopkins (1986) to define the construct of stigma. The authors conceptualized stigma to include both enacted stigma (i.e., the perceived action of discrimination against the individual(s) with the stigmatizing illness/condition) and felt stigma (i.e., the fear of enacted stigma coupled with the emotional response, such as shame or embarrassment, associated with having an illness/condition). Veterans described many examples of enacted stigma (e.g., P3: “What's a matter? You can't take a little bit of baby pain or discomfort”, P5: “sick, lame, and lazy was one they used to say”, P12: “Say you went to the MIR because you've got a problem and that, there should be no repercussions of it, but you knew there was”). The comments made to veterans, paired with known consequences to one’s career (e.g., not being promoted), served as a significant deterrent to seeking timely care. Felt stigma was also broadly endorsed by participants (e.g., P5: “Perhaps it does affect the psyche of the person who is experiencing the pain, but it sort of discourages you from going to the MIR”, P15: “and you carry on… you don't want to be perceived as weak”, P15: “No, you hid it. If it was, if you sprained your finger or

broke your finger, you kind of just set it back yourself or whatever"). Frank and colleagues (2018) found a strong association between physical health and both felt and enacted stigma amongst Canadian Forces members. This phenomenon was found to be significantly stronger for military members than for their civilian counterparts. Stigma as a barrier to seeking timely medical care was a pronounced theme amongst veteran participants in this study. The convergence of findings around sociocultural expectations and stigma highlighted the unfortunate and significant barriers serving members faced while navigating care options.

The last subcategory identified as a barrier to treatment seeking was that of the "warrior ethos". As opposed to external threats of social isolation and rejection, one's warrior ethos was described as an internally motivated barrier to accessing timely care. Warrior ethos was broadly defined by veterans as the mental state and values which a solider adopts that are characterized by stoicism, persistence, physical and mental fortitude, and choosing one's service over self. Some research has suggested that the degree to which one adopts a warrior ethos directly influences their recognition and interpretation of health symptoms (e.g., Christian et al., 2009; Tanielian & Jaycox, 2008). That is to say, one's symptoms, pain for example, may be interpreted not as a threat to bodily injury/tissue damage, but as a sign of weakness that needs to be overcome. Veteran participants in this study described a sense of pride in their ability to ignore pain signals and focus instead on the task at hand. Similarly, the refrain "mission before self" was evident across participant narratives. The self in this context includes bodily ailments/conditions, which would subsequently be ignored (e.g., P9: "relegated it to a different part of your brain") in light of military duties. Of note, the perceived enmeshment between Army members and the warrior ethos was described to be embraced differently across military branches. Veterans, including those who served in multiple military branches over their careers,

described Army members as adopting an unadulterated warrior ethos, whereas the other branches (i.e., Air Force, Navy) embraced a lesser, diluted version of these principles (e.g., P15: “You’re air force, you get injured, they'll do anything to take care of you and blah, blah, blah and so on and so forth”). Cultural differences between military branches have been well-documented in sociological and organizational literature (e.g., Murray, 1999; Redmond et al., 2015; Soeters, 2018), thus it is unsurprising to find perceived differences in military stoicism showcased in this manner.

While not identified as a barrier to current care-seeking for the veterans in this study, the “soldiering on” phenomenon has been found to complicate the transition to civilian life and discourage new veterans from seeking medical/professional care (Markowitz et al., 2020; Verkamp, 2021). The dissimilar findings in the current study might be explained by the demographic and veteran status. That is, most veterans in the current study had been retired for many years and reported feeling stable and well-established in their civilian lives, contrasting the demographics of the samples explored in the above-mentioned research.

The final theme derived from veteran narratives relating to cultural barriers to treatment-seeking describes the gradual changes in stigma and procedures over the course of decades. The stigmatization of physical health issues, specifically pain, still exists in the CAF according to veteran accounts. However, notable changes in how physical injuries are viewed by peers and superiors was identified as a positive evolution of cultural beliefs in the CAF. Veterans, specifically those who served for more than two decades, reported noticing differences in how soldiers were treated following injuries and disclosures of pain (e.g., P3: “Nowadays, it's more acknowledged”). Importantly, veterans described greater changes in stigma and policy related to mental health, as compared to pain and physical health concerns. An epidemiological study

by Osorio et al. (2013), found significant changes in stigma related to care-seeking for mental health issues over time in the UK military organization. Changes in policy and procedure related to care-seeking were also noted as important and positive changes in the CAF. One veteran outlined an important structural change in the CAF wherein medical staff no longer reported to the officer in their unit but operated independent of specific Army units and reported to their own medical COC (quote on p. 108). The reported outcome of this change was that members felt they had increased privacy in disclosing medical concerns (e.g., P7: "I think contributed to opening the spectrum to let our people, you know, be more free with the doctors to say, look, I've got, I've got a real issue that I've got to get fixed").

Veterans identified the evolution of equipment (e.g., knee pads, better quality boots and ruck sacks) as valuable changes that would likely reduce injury and wear and tear on serving members. They contrasted their experiences with military equipment with that currently being used by active CAF members (e.g., P13: "Now they have knee pads. I notice in Afghanistan, the guys all have knee pads. We never had that when I was a kid"). While stigma and procedures remain a barrier to treatment seeking in the CAF, and not all veterans believe changes have been realized, many retired members emphasised the positive impacts of decreased barriers to care-seeking over the past three decades. Given the apparent association between barriers to care-seeking and the development of chronic pain conditions, this is an important and promising finding, suggesting that the CAF's continued efforts to reduce stigma and improve access to health care are likely contributing to this positive trend (see Arrabito & Leung, 2014, for historical efforts to address stigma in the CAF).

In summary, the upper half of the model illustrates participant beliefs about causal factors in the development and exacerbation of chronic pain conditions. Physiological explanations for

pain development (i.e., injuries and wear and tear) dominated veteran narratives, and was further compounded with accounts of inadequate medical care while serving. Following the onset of pain symptoms, veterans highlighted numerous barriers to treatment-seeking that included potential impacts on their career, stigma and sociocultural expectations, and an internalized warrior ethos. These findings add to the limited research exploring Canadian military members' perceptions of contributed factors to the development of their chronic pain conditions.

The lower portion of the integrated model (Figure 6) depicts participants' perceptions of the factors that currently influence and exacerbate their chronic pain conditions. In describing factors influencing their pain at present, veterans highlighted three primary themes: 1) physiological explanations, 2) psychosocial influences, and 3) medical experiences.

When asked why their pain symptoms persisted well after the initial injury(ies) and physical demands of military service, participants nearly unanimously identified physiological conditions as the primary source of their persistent pain. As previously described, conditions endorsed included osteoarthritis, bulging/protruding discs, herniated discs, sciatica, pinched nerves, compressed discs, degenerative disc disease, frozen shoulder, patellofemoral syndrome, cervical disc disease, migraines, occipital headaches, and complex reginal pain syndrome. Findings from Study 1 revealed the striking prevalence rates, 65.6%, of any chronic pain conditions (i.e., migraine headaches, back problems, and arthritis), amongst CAF veterans. Other research has similarly highlighted high rates of chronic conditions in military veteran samples (Boersma et al., 2021; Bosco et al., 2013; Van Den Kerkhof et al., 2014; Yu et al., 2003). Some veteran participants emphasized the impact multiple pain conditions had on their functioning. Maixner et al. (2016) found the co-occurrence of common chronic pain conditions, often referred to as chronic overlapping pain conditions (COPCs), to be high. These same authors theorized

shared ethological pathways in the co-occurrence of chronic pain conditions, which includes psychosocial, genetic, and physiological factors. The presence of multiple pain conditions appears to be common and likely complicates assessment and intervention efforts.

The next section in the model describing current contributing factors to persistent pain focuses on the impact of three psychological variables: PTSD, mood, and stress. The first subcategory highlighted by veterans is that of the bi-directional relationship between pain and PTSD. Most veteran participants who reported a PTSD diagnosis described PTSD symptomology as preceding pain symptoms, as opposed to pain sensations triggering a posttraumatic stress response. A minority of veterans reporting a PTSD diagnosis described PTSD and pain symptoms as co-occurring and mutually exacerbating each other. Research has found PTSD and chronic pain to frequently co-occur, with approximately 20-30% of the general population with a PTSD diagnosis, and 50-80% of paramilitary and military personnel with PTSD also reporting persistent pain (Asmundson et al., 2002, McWilliams et al., 2003; Shipherd et al., 2007). Researchers have identified several key events which commonly precede the development of both PTSD and chronic pain: motor-vehicle accidents, work-related injuries, and service in combat and emergency rooms (e.g., Asmundson et al., 1998; Beckham et al., 1997; Blanchard & Hickling, 2004; Taylor & Koch, 1995). Some veterans described PTSD as exacerbating their pain symptoms much like socially-based stress was believed to influence pain. When PTSD symptoms emerged, the resulting bodily tension was theorized by participants to mediate the relationship between PTSD and pain (i.e., tension would trigger pain symptoms). Several theoretical models have been proposed to explain the high comorbidity, capturing shared psychological and neurobiological mechanisms (e.g., Asmundson et al., 2002; Liedl and

Knaevelsrud 2008; Sharp & Harvey, 2001), though the precise mechanisms perpetuating this comorbid relationship are still unclear.

The next subcategory in the psychosocial influences is the effect of low mood on veterans' pain experiences. Similar to the primary connections between PTSD and pain symptoms, veterans described low mood to be bi-directionally influenced by pain sensations. Specifically, the onset of a low mood would accentuate one's pain, whereas pain sensations were also described as propelling the veteran into a depressogenic state. Examining etiological factors of chronic pain and depression, research suggests the experience of chronic pain is more likely to lead to symptoms of depression than the reverse (Fishbain et al., 1997), though both are theorized to mutually exacerbate and maintain the other (Bari et al., 2003; Campbell et al., 2003; Li, 2015). Among the prominent features identified in the relationship between chronic pain and low mood are functional limitations and goal impediments. Both depressed mood and pain were identified as negatively impacting one's ability to complete daily tasks and pursue life ambitions (e.g., recreational activities, continue with their career in the CAF). A recent study by Perera et al. (2021) found that amongst CAF veterans who met criteria for a major depressive episode, 81.2% also endorsed one or more chronic pain condition (i.e., back problems, migraine headaches, arthritis, and gastrointestinal conditions). The comorbidity of chronic pain and depression, as corroborated by both participants in this study and the relevant literature, plays a significant role in the quality of life and functional abilities of individuals living with these conditions.

The final subcategory in the psychological influences on chronic pain is the impact of stress. Stress, largely derived from interpersonal, financial, and occupational causes, was described as leading to tensing of muscles (primarily in the shoulder and neck area). The tensing

of muscles was described as the mediating factor between one's stress symptoms and pain exacerbation. Importantly, many of the veterans described experiencing very little stressors at present. Some cited financial stability (e.g., due to VAC disability awards) and limited interpersonal stressors (e.g., interacting with few outside their immediate family) as the chief reasons for limited stress. Others also noted that being the recipient of VAC Veteran Independence Program (VIP) services allowed them to offload many household and yard care responsibilities to professionals. As has long been identified in empirical literature, studies have found age and retirement to be negatively associated with stress (e.g., Aldwin, 2011; Midanik et al., 1995). As the average age of participants in this study was 60.3 yeas old and most were retired, stress may in fact contribute little to the burden of chronic pain in this population.

The final category outlining medical experiences is captured in two parts, 1) the initial fight for the veteran's pensions and benefits, and 2) ultimately being satisfied with the services and financial support they currently receive. Most of the veteran participants described their efforts to obtain disability coverage for their service-related injuries as stressful. Veterans expressed frustration in in a variety of ways (e.g., P13: "Veteran Affairs has a habit of denial, I always call it, they like to deny everything first, and then they accept it", P13: "Yeah, and I had to fight for it"). Denial concerns and inequalities identified in VAC, as well as other national veteran affairs departments, have been well publicised in media coverage (e.g., Berthiamue, 2021; Brennan, 2019; Campbell, 2018; Petracek, 2021), though have received less coverage in the relevant empirical literature (e.g., McClean, 2019; Nunley 2013). McClean (2019) discusses a common refrain used by veterans navigating claims with the U.S. Veteran Affairs Department: "Delay, deny, wait till they die" (p. 277). The author outlines the lengthy appeals process, which can often take five or more years to be processed through the various appeal stages (e.g., claim

submission/resubmission, notice of disagreement, Board of Veteran Appeals, Court of Appeals for Veterans Claims). Veteran participants also recounted difficulties with mismanaged and/or missing documents from when they were serving (e.g., P11: “I guess 19XX to 19XX, there's no record of me ever seeing a doctor, yet, I know that I did… There was nothing they could find when the lawyer was fighting for me, for my medical pension”), adding further delays and frustration to their claims process. Interestingly, nearly all the participants reported feeling currently satisfied with their pensions and health coverage (e.g., P12: “Look, I'm fully satisfied”). Alongside reports of satisfaction regarding pension and health coverage, there was also a common theme of resignation to the fact that pain will always be present (e.g., P4: “but what can they do, there's really very little they can do”). Overall, veterans described frustrations in having to “fight” VAC for their pension and health benefits, though once received, they were satisfied with the financial support and treatment coverage that they deemed to meet their expectations regarding pain management.

To summarize the second half of the model, veterans described pain as maintained at present by chronic conditions (e.g., arthritis, degenerative disc disease). Psychological factors including PTSD, low mood, and stress were implicated as exacerbating pain symptoms, while pain was also often noted to bidirectionally influence the psychological symptom(s). Lastly, veterans recounted fighting for their pensions and healthcare benefits, though were currently satisfied with the support received by VAC.

Comparison of Findings with Revised BPS Model of Chronic Pain for Veterans

The primary objective of this study was to explore veteran perceptions of how their persistent pain developed and what they saw as exacerbating factors, through the lens of the novel BPS model of chronic pain for veterans introduced by Baria et al (2019). As these authors

do not discuss etiological factors of pain development, only the currently maintaining and exacerbating variables are examined here.

Of the nine conditions listed in the biological section of the BPS model, six were explicitly endorsed by participants in this study (i.e., musculoskeletal disorders, arthritis, low back pain, headaches, polytrauma, traumatic brain injury). The broad overlap suggests that these same conditions likely play a key role in the unique impact of chronic pain in the Canadian veteran population. Of the psychological variables presented in the model, only depression and PTSD were described as playing an integral role in the maintenance and exacerbation of pain symptoms. Veterans in this study described depression as bi-directionally related to persistent pain, in that it both accentuates and is driven by unrelenting pain symptoms. PTSD, specifically intrusive symptoms, were believed to impact pain via tension and stiffness which occurred during and immediately following being triggered by internal or environment cues. While hypervigilance was included as a standalone variable in the revised model for veterans, no specific evidence was provided in the body of the Baria et al. article. As hypervigilance is a common feature of PTSD symptomology, its influence on pain is likely captured in the broader construct of PTSD.

Next, the overlap of social variables between this study and the revised BPS model for veterans was limited. The most prominent variable endorsed by veterans was stress, with functional disability and healthcare access playing a lesser role. Participants in this study noted that environmental stressors would cause tension, which in turn would trigger pain sensations. Functional disability was noted by most, as most medically released from the CAF and were pensioned accordingly, though few described their functional limitations as chiefly causing or maintaining pain symptoms. I conceptualized the period in which veterans described fighting for

their benefits as a waiting period. Healthcare wait-times, or accessing appropriate and timely care, was identified by Baria et al. (2019) as negatively impacting veterans' chronic pain experience. As veterans in this study almost unanimously described being satisfied with their healthcare services currently, I do not believe this barrier is an important factor influencing their current pain symptoms.

Of the BPS variables not endorsed, it is likely that sampling biases impacted the findings of this study. For instance, both substance use disorder and amputation were not represented in this sample. However, as these variables are less common than other physiological and psychological factors presented in the model, their absence was not altogether surprising. Also, as I recruited veterans with chronic pain using research posters advertised on the internet, those who were homeless or living in extreme poverty were much less likely to encounter the recruitment poster. In their model, Baria et al. provided significant evidence supporting some variables in their model (e.g., depression), while only briefly mentioning others (e.g., suicide). Of those variables where greater empirical support was noted, anxiety and social support were not corroborated as perceived correlates of persistent pain in this study. While rates of anxiety disorders are high amongst veterans (e.g., 23% endorsed any anxiety disorder in sample, and 84% comorbidly with any anxiety disorder and any chronic pain condition in Study 1), only one veteran reported having an anxiety disorder diagnosis, and he did not believe there was an important connection between his pain and anxiety. It is possible that anxiety, like I believe occurred with other variables in this study, was underrepresented in this sample. Alternatively, all veterans were asked whether anxiety influenced their pain symptoms (i.e., not specifically an anxiety disorder), thus, it is possible that veterans did not perceive anxiety to play a significant role in influencing persistent pain. An alternate hypothesis is that veterans may have interpreted

anxiety as stress, and thus the influence of anxiety was captured in the aforementioned influence of stress. Future research is required to differentiate the influence of anxiety from the impact of stress.

Concerning social support, many veterans described feeling generally supported by friends and family in terms of relational and practical needs linked to their pain (e.g., shoveling their driveway, empathic understanding by loved ones). As such, veterans did not highlight a link between social support and their chronic pain symptoms. Given that participants, by and large, did not endorse 100% satisfaction with their level of social support, I would anticipate some connection between support and pain being made if veterans believed there was an important link.

To summarize, there was a notable overlap in findings regarding the presence and impact of specific physical health conditions between this study and the revised BPS model for veterans. However, less than half of the psychological variables from the BPS model were described by participants in this study, and only two of eleven social variables emerged as prominent factors impacting chronic pain amongst the Canadian veteran participants. As discussed, sample demographics may have played a role in some of the variables being underrepresented in this study, and additional investigation is warranted to examine this finding further. Importantly, this study captures the essence of what veterans themselves perceive to be the greatest determinants of their persistent pain symptoms and emphasises discrepancies between veteran perceptions and quantitative/epidemiological findings on the subject.

Implications

This research provides a meaningful contribution to veteran pain and health literature. It broadens the sparse body of research exploring Canadian veterans' perspectives regarding chronic pain and how it is impacted by military culture. The theoretical models developed from this study provide an overview of BPS factors which influence 1) the development of pain conditions, and 2) the maintenance and exacerbation of pain conditions.

Veteran participants were quick to identify military cultural factors as chief contributors to the development of their pain conditions. Similar to the findings by Denke and Barnes (2013), stigma and sociocultural expectations were identified as primary reasons veterans did not seek treatment following injury and/or the development of pain symptoms. An important and promising finding highlighted by veterans was that meaningful reductions in stigma and changes in policy over the past three decades have decreased the perceived barriers to treatment-seeking, though this was found to be more prominent with mental health than physical health concerns. Taken together, the initiatives enacted by the CAF to reduce mental health stigma appear to be contributing to the felt experience of members, and these same efforts may work to address stigma around physical health issues. Another promising finding was that veterans largely described their current pain-related healthcare support as satisfactory. The paired finding that participants experienced notable frustrations "fighting" for their benefits should continue to be an area of exploration for VAC.

Education on the impacts of chronic pain, and the BPS determinants of its development, would provide important learning to still serving CAF members. A refrain from many of the veterans was that they had hoped their stories would aid in meaningful changes in the CAF so that serving members would not have to deal with the pain and suffering they were currently experiencing. Some of the veterans noted that they wished they would have known the suffering

involved with chronic pain conditions sooner, as this may have motivated them to seek support earlier in their careers for potentially treatable injuries. Lastly, study findings can support clinicians providing health services to both serving and retired CAF members. Identified BPS determinants, based on veteran perspectives, impact pain development and maintenance, which can be specific targets for interventions within CAF, VAC, and other health services offering treatment to veterans and military personnel.

Challenges

Several challenges and limitations of this study included: hindsight bias, issues with both the homogeneity and the heterogeneity of the sample, underrepresentation of certain psychosocial conditions/variables, and the influence of the interviewer.

As participants were asked to reflect on early career experiences (e.g., over 60 years ago for two participants), the possibility of recall/hindsight bias and other factors influencing memory is a potential limitation for this study. In interviews I observed that those who appeared to have a generally positive view of the CAF (i.e., largely those of higher rank at time of release) identified less negative cultural and policy related effects on pain condition development. For example, the participant with the highest rank at time of release was adamant that culturally driven barriers to treatment-seeking no longer existed or affected few in the CAF, whereas younger participants who recently released (e.g., in the past 5 years) described these barriers as affecting serving CAF members presently. Moreover, those who presented with a jaded attitude toward the CAF, such as feeling abandoned or dismissed, were more likely to view their entire CAF career negatively and to identify greater cultural and policy related barriers to treatment-seeking. It is possible that participants who felt jaded toward the CAF and/or VAC focused more

on their negative experiences and were thus less able to provide a balanced view of their time serving in the military.

Purposive sampling allowed me to recruit a largely homogenous sample of male CAF veterans with long-standing chronic pain issues. Because the sample is homogenous, the results of this study cannot be confidently generalized beyond the targeted demographics, which is a limitation of this study. While I sought to recruit a homogenous sample based on the predetermined demographic and military characteristics (i.e., male, CAF veteran, chronic pain longer than 3-months, served primarily in the Army, deployed internationally) which were created with the assistance of a currently serving reservist and clinical psychologist, I noticed some differences that likely influenced the findings of this study. Chief amongst these observations were the age range between participants and their associated length of service. There was a significant range between the oldest and youngest participant (i.e., 32 to 82 years old). While most participants were between 50 and 60 years of age, the experiences of those at the ends of the age brackets were quite different in a number of respects. The military culture, policies, and procedures changed considerably over the decades of service represented in the study sample, and thus the experiences of pain and treatment-seeking were also different. It is possible that the range of experiences detracted from the depth and accuracy of the individual findings. Conversely, a prominent finding was that the experience of stigma and related social expectations, identified as a barrier of treatment-seeking following injury, has changed over the course of many decades. This phenomenon may not have been identified had the age of the sample been more homogenous.

With fifteen participants recruited in this study it is unsurprising that not all disorders, conditions, and social factors identified in the revised BPS model for veterans would be

represented. Notably, alcohol and drug abuse, anxiety disorders, homelessness, and poverty were not reflected in the experiences of this sample, and thus the connection and influence between these psychosocial variables and chronic pain could not be explored.

Finally, while I adopted a constructivist perspective, acknowledging my role in co-creating the derived theoretical models in conjunction with participants, my influence on study findings has invariably been shaped by my knowledge and past experiences working with CAF veterans with chronic pain. Having conducted chronic pain research with CAF veterans for the past seven years, and having provided psychological services to this same population, I recognize that I continually interpreted and filtered participant accounts through an established belief of pain theory and military culture and experiences. Similarly, with established biases I could well have dismissed some emergent themes that did not fit within my theoretical lens. These occurrences, however, were likely to be minimal given the oversight and collaboration with my RA, Dr. Holens, and Dr. Reynolds, who aided in the validation of the transcriptions, the development of codes, and the structuring of theoretical models.

Conclusions

Using a constructivist grounded theory model, I developed a theoretical model outlining Canadian veterans' beliefs about the factors that influenced the development of their chronic pain condition(s), and those that currently maintain their pain symptoms. Future research is needed to broaden the understanding of how these and other factors influence Canadian veterans with differing sociodemographic and military characteristics (e.g., Air Force, Navy, younger veterans, females). Similarly, further investigation of this phenomenon with veterans who experience other health and mental health difficulties, who were not captured in this sample, should be conducted (e.g., substance use, poverty, homelessness).

The theoretical model developed from participant narratives, which included physiological, psychological, and social influences on pain development and its current maintenance can aid the already promising effects of destigmatizing physical and mental health conditions in the CAF, revising injury/pain reporting procedures, current treatment targets for veterans, and direction for VAC pension and claims policy. Another equally important goal of this study was to broadly share the stories of these participants, who, as representatives of the greater veteran population, highlight the struggles many veterans still face years after serving our country. It is my hope that these findings validate that struggle and serve to advocate for the needs of this population.

Chapter 4: Mixed-Methods Convergent Design

Objectives and Method

The intent of utilizing a mixed-methods framework for this project was to integrate and compare findings from both the qualitative and quantitative studies. Specifically, I endeavoured to examine the convergence and divergence of findings regarding exacerbating and maintaining factors of chronic pain amongst CAF veterans. Through this process I compared individual and integrated findings against the revised BPS model introduced by Baria et al. (2019), thereby refining the proposed model based on the evidence on BPS factors for chronic pain amongst CAF veterans. I utilized a convergent design to achieve the stated objectives (Creswell & Plano Clark, 2018). The function and purpose of the convergent design is “to obtain different but complementary data on the same topic” (Morse, 1991, p. 122). As both Study 1 and 2 were tailored to explore the same phenomenon through different means, the convergent design was well suited to facilitate the integration of study findings. The convergent study design has been effectively employed by other research examining veteran health and wellbeing (e.g., McLean et

al., 2022; Rattray et al., 2022; Shaine et al., 2021; van Gelderen et al., 2020). I followed the convergent design procedures outlined by Creswell and Plano Clark by 1) first collecting data from both studies, 2) analysing the data from each study separately, 3) merging the data (i.e., in joint display tables), and 4) interpreting the "extent and in what ways the two sets of results converge or diverge from each other, relate to each other, and/or combine to create a better understanding in response to the study's overall purpose" (p. 127). To facilitate the integration and examination of data, joint display tables were created to present the findings of both studies alongside the BPS variables proposed by Baria and colleagues. Of note, both studies were designed to examine the theorized BPS variables' relationship with chronic pain, while also exploring separate aims (i.e., Study 1: longitudinal relationship between PS variables and chronic pain; Study 2: the influence of BPS and cultural factors on chronic pain while veterans were still serving). It is the shared aim that will be the focus of the mixed-methods analysis.

Results

Representative quantitative and qualitative data were juxtaposed in the first joint display table (Table 6), which shows the convergent, divergent, and inconclusive/insufficient findings between Study 1, Study 2, and the Baria et al. (2019) BPS model of chronic pain for veterans.

Table 6

Joint Display Table of Findings Between Revised BPS Model, Study 1, and Study 2

Revised BPS Model (Baria et al., 2019)	Study 1 (Quantitative)	Study 2 (Qualitative)	Convergence or Divergence of Findings
Biological factors			
Musculoskeletal disorders	Possibly included in back pain (e.g., degenerative disc disease)	Endorsed by participants	Inconclusive
Osteoarthritis	Arthritis endorsed by 39.82% of participants	Endorsed by participants	Convergence
Low back pain	Back pain endorsed by 50.15% of participants	Endorsed by participants	Convergence
Headaches	Migraine headaches endorsed by 12.64% of participants	Endorsed by participants	Convergence
Polytrauma	Not assessed	Endorsed by participants	N/A
Chronic post-surgical pain	Not assessed	Not present in sample	N/A
Traumatic brain injury	Not assessed	Endorsed by participants	N/A
Neuropathy	Not assessed	Not present in sample	N/A

Amputation	Not assessed	Not present in sample	N/A
Psychological factors			
Depression	Depression was significantly associated with all chronic pain conditions	Depression believed to bi-directionally impact chronic pain	Convergence
Anxiety/Catastrophizing	Anxiety was significantly associated with all chronic pain conditions	Anxiety not believed to effect chronic pain symptoms	Divergence
Hypervigilance	Not directly assessed	Not directly assessed	Inconclusive
Posttraumatic Stress Disorder	PTSD was significantly associated with all chronic pain conditions	PTSD believed to bi-directionally impact chronic pain	Convergence
Substance Use Disorder	AUD was not associated with any chronic pain condition	No connection endorsed	Convergence (i.e., between Study 1 and 2)
Mood Disorder	Not assessed beyond depression	No connection endorsed beyond depression	Inconclusive
Social factors			
Environmental Stressors	Work stress was not associated with any chronic pain condition	Stress (i.e., not work stress specifically) was linked to chronic pain symptoms	Divergence
Social Isolation/ Lack of Social Support	Social support was associated with all chronic pain conditions	Social support was not believed to impact chronic pain symptoms	Divergence

Homelessness	Not assessed	Not endorsed by participants	N/A
Unemployment/Disability/Poverty	Poverty was associated with arthritis and migraines	Not directly endorsed by participants	Inconclusive
Limited Access/Wait Times for Healthcare	Not assessed	Wait times for coverage endorsed by participants	N/A
Previous Treatments	Not assessed	Not directly endorsed by participants	N/A
Suicides	Not assessed	Not spontaneously reported by participants	N/A

Note. N/A = indicates the absence of, or insufficient data to determine convergence or divergence; Inconclusive = findings from either one or both of the studies not robust enough to claim convergence or divergence.

Nine distinct conditions were identified by Baria et al. (2019) in their review of biological determinants of chronic pain for veterans. Of those nine, only three conditions were available in the 2018 CAFVMHS dataset (Study 1). Back pain and arthritis were highly endorsed by veterans in the sample (50.15% and 39.82% respectively), and migraine headaches were reported by 12.64% of participants. It is possible that other conditions, such as degenerative disc disease, mechanical back syndrome, or herniated discs, were represented in the those reporting back pain. As these conditions commonly cause back pain, they may be jointly reflected in the musculoskeletal disorders and back pain categories (as identified by Baria et al). Findings from Study 2 showed considerable overlap with that of the Baria et al. biological conditions. A total of six disorders were explicitly identified by veteran participants in interviews (i.e., musculoskeletal disorders, osteoarthritis, low back pain, headaches, polytrauma, and traumatic brain injury), with most reporting multiple conditions. All three pain conditions in Study 1, that is arthritis, back pain, and migraines, were similarly endorsed by veteran participants in Study 2. The convergence of these findings highlights the influential role these conditions have in the Canadian veteran population and establishes them as prominent features in the BPS paradigm for CAF veterans. While musculoskeletal disorders may have been represented in both studies, the remaining five conditions were not assessed in Study 1. As such, no determination can be made on the convergence or divergence between quantitative and qualitative findings on the subject. Based on prior research, I anticipate that with further exploration in both methodologies (e.g., recruiting more qualitative participants and inquiries into more conditions in quantitative studies) that the remaining conditions would likewise emerge as uniquely impacting the chronic pain experience amongst veterans.

Regarding psychological factors, Study 1 found depression, anxiety, and PTSD to be associated with increased odds of any chronic pain condition. AUD was not found to be associated with any chronic pain condition, and hypervigilance and other mood disorders were not directly assessed in the CAFVMHS dataset. In Study 2, both depression and PTSD were described to mutually exacerbate pain symptoms. Conversely, anxiety, AUD, and mood disorders were not identified as factors augmenting pain severity. As mentioned, hypervigilance was not directly assessed, though may be conceptualized in the broader influence of PTSD symptomology. Convergence between the Baria et al. (2019) model, Study 1, and Study 2 was observed for depression and PTSD. Interestingly, contrary to the Baria et al. model, Study 1 and 2 found AUD to have little to no influence on chronic pain symptoms amongst Canadian veterans. Table 7 displays the three convergent findings of psychological variables between Studies 1 and 2. Regarding the influence of anxiety on chronic pain, Study 1 found anxiety to be associated with increased odds across all chronic pain types. In Study 2, veteran participants did not believe anxiety significantly impacted their pain experience, though this finding could be confounded by veterans misinterpreting “stress” and “anxiety”. Based on this mixed-model comparison, some of the findings corroborated the Baria et al. BPS model, in that depression and PTSD were described as exacerbating factors of pain, as well as being associated with increased odds of chronic pain conditions amongst Canadian veterans. As opposed to their US counterparts (i.e., as reviewed in the Baria et al. model), Canadian veterans did not believe that alcohol use played an influential role in their pain symptoms, nor was it associated with increased odds of any chronic pain condition. This important and positive finding might suggest cultural differences in the use of alcohol as a coping strategy for pain sensations between national veteran populations. A unique divergence on the finding of anxiety between studies may reflect an

accurate perception of this relationship or be confounded by confusion with “stress” or an underrepresentation of anxiety in the qualitative study. Study 1 found anxiety to be associated with increased odds of all chronic pain conditions available for analyses, whereas veterans in Study 2 did not endorse a connection between their anxiety and pain symptoms. As anxiety is a common human emotion, and though only one participant reported an anxiety disorder diagnosis, any of the participants could have made a connection between pain and anxiety if they believed it existed. Given this discrepancy and potential underrepresentation, further research is required to examine veteran’s perceptions on the relationship between anxiety and pain symptoms.

Table 7

Integration of Convergent Qualitative and Quantitative Psychosocial Findings

Variable	Study 1: Adjusted Odds Ratio (AOR1)	Study 2: Qualitative Theme	Quotations
Depression	OR = 3.11, 95% CI, 2.23-4.35*	Low mood and heightened pain perception	P6: "My neck goes out and I get very angry, upset, depressed, just frustrated. And then I think that brings on even more pain"
PTSD	OR = 2.62, 95% CI, 1.85-3.70*	Trauma and tension	P15: "With my PTSD, I'm - yeah, I know it's mental but it's almost like there's a little wire to my lower back and knees to my brain when I get aggravated"
Alcohol Use Disorder	OR = 1.09, 95% CI, 0.56-2.09	Alcohol and coping with pain	P5: "I never used any of that to cope with the pain" P7: "It's not that I don't use that, it's just I don't use it for that"

Note. Adjusted odds ratio (AOR1) = Logistic regression between psychosocial variables and any chronic pain condition while adjusting for sociodemographic and military characteristics.
* $p \leq .001$

Lastly, the joint display table (Table 6) presents the comparative findings on social factors between Studies 1, 2, and the Baria et al. (2019) BPS model. Results from Study 1 revealed that only a lack of social support was associated with increased odds of any chronic pain conditions, whereas poverty was associated with increased odds of arthritis and migraines. Work stress was not found to be associated with any chronic pain condition, and homelessness, healthcare access and wait times, previous treatments, and suicides were not evaluated in the survey. Findings from Study 2 showed that veterans perceived stress and healthcare wait times to be positively correlated with pain intensity, while social support and previous treatments were not believed to negatively impact veterans' current pain experience. Homelessness, poverty, and suicidal symptoms were not endorsed by participants. Interestingly, comparative analyses revealed no convergent findings between Studies 1 and 2 on any of the social factors. Results showed either divergence, inconclusive findings, or insufficient evidence to draw inferences between studies. While study 1 found social support to be associated with decreased odds of any chronic pain condition, veterans in Study 2 did not make any association between instrumental or emotional support and their chronic pain. The reverse was observed for comparative findings on stress, in that Study 1 found no association between stress and chronic pain, whereas veterans in Study 2 describe stress to negatively exacerbate pain symptoms as mediated through tension. Although poverty was a found to be associated with increased odds of arthritis and migraines in Study 1, participants in Study 2 did not endorse difficulties in meeting basic needs; thus, interpretations of this phenomenon cannot be reasonably established. Similarly, as homelessness, healthcare factors, previous treatment, and suicidal symptoms were not assessed in Study 1, no comparison can be made regarding these factors. Results from the mixed-methods analysis of social factors highlight the notable disparity between veteran beliefs and epidemiological

findings. Regarding the two notable divergent findings (i.e., social support and stress), several inferences can be made. Concerning social support, the measure used in the CAFVMHS assessed four functional support dimensions (i.e., active social interaction, affection, tangible, and emotional/information). However, the questions used in the qualitative interviews focused primarily on tangible and emotional support. While the measured conceptual overlap between studies was large, it is possible some veterans would have endorsed a greater connection if active social interaction and affection elements of support were captured in interviews; thus, a limitation of this study. Regarding stress, Study 1 examined *work* stress specifically, whereas qualitative questions examined the phenomenon more broadly (i.e., occupational, interpersonal, financial). Similar to social support, it is possible the broader conceptual picture captured in Study 2 included types of stress that veterans believed to more closely link with pain lability. Alternatively, qualitative findings may accurately reflect the beliefs of many veterans concerning the relationship between stress, social support, and chronic pain irrespective of statistical associations. Further qualitative and quantitative exploration is required to decode these disparate findings.

Discussion

The work presented in this research illustrates the application of a convergent mixed-methods design in the examination of BPS variables believed to play an important role in the exacerbation of chronic pain symptoms amongst veterans. The objective of this mixed-methods analysis was to explore the convergence and divergence of findings regarding exacerbating and maintaining factors of chronic pain amongst CAF veterans in light of the revised BPS model of chronic pain (Baria et al., 2019). Both studies served to revise the model by providing different perspectives on the complex issue of chronic pain amongst Canadian veterans. Of note, Baria et

al. only included quantitative studies in their examination of BPS factors affecting chronic pain in US veterans. This research expands the limited scope of their analyses by adding veteran voices to explain the mechanisms of the model (e.g., the stress and pain relationship is believed to be mediated by tension). In summary, there was much overlap between Study 1, Study 2, and the BPS model regarding biological conditions. This convergence was not similarly observed for both psychological and social factors, as coherence across all three studies was only confirmed with depression and PTSD, while findings regarding AUD were found to be consistent between Studies 1 and 2 but inconsistent with the Baria et al. model. Taken together, there is much divergence between these studies and the proposed BPS model of chronic pain for veterans. As mentioned above, some of the discrepant findings may be explained by sampling or methodological differences, and further research is required to explore these inconclusive findings.

While much divergence was observed between Studies 1 and 2, the prominent convergent findings provide empirical structure for a revised BPS model of chronic pain specific to CAF veterans. Notably, the inclusion of most of the Baria et al. biological conditions is warranted, with an emphasis on back pain, arthritis, and migraine headaches. Secondly, the retention of both depression and PTSD in the model was verified by both quantitative analyses and veteran narratives. As discussed, these conditions were believed to mutually exacerbate chronic pain symptoms and were associated with increased odds of any chronic pain condition. Lastly, the exclusion of AUD in the model is an important and unique finding amongst CAF veterans, juxtaposing the literature examining US veterans.

A major strength of this research was the use of a mixed-methods design, as well as the unique empirical qualities of Study 1 and 2 (e.g., incorporating longitudinal data, use of the well-

established constructivist grounded theory methodology). However, there are limitations to this project's mixed-methods approach. First, due to data availability in Study 1, there were several variables that could not be examined across studies (e.g., musculoskeletal disorders, homelessness). Secondly, given parameters inherent in the methods used in Study 2 (i.e., recruiting a homogenous sample), generalizability to Study 1 findings needs to be done with caution, even if the demographics well represent the current CAF population (e.g., predominantly males, majority have deployed internationally). While qualitative findings do provide descriptions of the veterans' beliefs about processes and mechanisms driving the relationship between psychosocial factors and chronic pain, causal attributions cannot be deduced or corroborated by results from the quantitative study due to methodological limitations. Lastly, as there is a sparsity of literature exploring BPS associated with chronic pain amongst CAF veterans, the validation of findings will have to wait, at present, until future research is conducted. Consequently, future studies should aim to address the aforementioned limitations through qualitative and quantitative means. Additionally, studies should seek to include more biological conditions and diverse qualitative samples to fill the gaps of our current knowledge.

Conclusion

This research investigated BPS determinants of chronic pain amongst CAF veterans. The mixed-method approach allowed for a more comprehensive examination of this complex phenomenon. Findings revealed some overlap with the revised BPS model of chronic pain for US veterans (Baria et al., 2019), with some important and distinct differences. The congruence in findings with the Baria et al. model for veterans suggests that many of the clinical applications of the model (e.g., directions for tailored assessments and interventions) would be similarly appropriate for CAF veterans. As reflected in the results and stories in this thesis, the burden of

chronic pain for Canadian veterans is significant and far reaching. There remains an obligation and responsibility by clinicians and researchers alike to continue refining our knowledge and expertise in such a way that translates into meaningful and positive changes in the quality of life for our veterans. It is my hope that this research contributes to that aim.

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Appendix A

Participant Demographic Information Form

Name: _____

Today's date: _____

Age: _____

Gender: _____

Marital status:

( ) Single ( ) Common law ( ) Married ( ) Widowed ( ) Separated ( ) Divorced

How many years did you serve in the military? _____

Which branch of the military did you serve in? (select all that apply)

Army ____ Air Force ____ Navy ____

Regular Force ____ Reserves ____

How long have you experienced chronic pain? _____

Types of chronic pain experienced (e.g., migraine, back pain): _____

_____

_____

Appendix B

Qualitative Interview Protocol (Interviews 1-2)

* Participants will be asked to confirm they have received and signed the informed consent form. Participants will complete (over the phone/video, or in-person) the demographic information form prior to the start of the interview.

Preamble:

- Introduce yourself
- Remind participant about the project aims
- Remind participant that they will be receiving an honorarium for their participation
- Remind participant that the interview will be audio-recorded and let them know when you are turning on the recorder (Ensure participant provides consent)
- Remind the participant that they can refuse to answer any of the questions asked during the interview

General probes to consider throughout:

- Tell me more about that.
- What happened next?
- Can you give me an example of that?
- What did/does that mean to you?
- How did/does that impact you?

Topic 1: Biological Influence on Chronic Pain

1. Can you tell me about how and when your pain started?

Probing questions:

i. How do you understand the physical cause(s) of your current pain symptoms?
ii. Can you describe how your military training and "wear and tear" from the job has impacted your pain experience now?
iii. What have medical professionals told you about why you still have pain?
iv. Can you tell me what makes your pain worse? What makes it feel better?

Topic 2: Psychological Influence on Chronic Pain

2. Can you tell me about how your pain influences your mood, and how your mood influences your pain?

Probing questions:

i. If you have any diagnosed operational stress injury (e.g., PTSD, depression), how are these symptoms influenced by, and influence your chronic pain?
ii. Do you ever like your pain will never get better? How does that make you feel about your future hopes and dreams?
iii. Can you describe your use of alcohol, cannabis, or other substances to help cope with your pain? What problems have you encountered in using substance to manage your pain?
iv. Can you tell me how ignoring your pain, or avoiding activities that you think might worsen your pain, help to reduce your pain levels?

Topic 3: Social Influence on Chronic Pain

3. Can you tell me how pain has influenced how you live and interact with others?

Probing questions:

i. How has your pain changed your ability to work (in the past or currently)?
ii. What has been your experience in talking to friends and family about your pain?
    a. Do you feel they understand what you are going through?
iii. When you are feeling stressed due to work, finances, relationships, etc., how does this influence your pain levels?
iv. Have you had any difficulties accesses healthcare or alternative treatments for your pain? How satisfied are you with your treatments thus far?

Topic 4: Cultural Influence on Chronic Pain

4. How would you describe the Canadian military's view of pain?

Probing questions:

i. In your military training, do you remember any direct or indirect messages about showing/talking about you pain, or how to seek help if you're in pain?
ii. How did you feel about talking about your pain with your chain-of-command?
iii. Can you tell me about a time when you were worried your chronic pain would impact your ability to deploy, or go on course, or affect a promotion in some way?
iv. What if anything, delayed your seeking medical attention for any injury while serving in the CAF?
v. How might the pain you experienced have contributed to your retirement or discharge from the CAF?

Closing remarks:

1. **Is there anything you would like to ask me? Or something regarding your pain experience that you think I should know?**

    - Thank participant for their time and participation
    - Give participant honorarium

Appendix C

Qualitative Interview Protocol (Interviews 3-15)

* Participants will be asked to confirm they have received and signed the informed consent form. Participants will complete (over the phone/video, or in-person) the demographic information form prior to the start of the interview.

Preamble:

- Introduce yourself
- Remind participant about the project aims (Veteran perceptions of what cause and maintains their chronic pain)
- Remind participant that the interview will be audio-recorded and let them know when you are turning on the recorder (Ensure participant provides consent)
- Remind the participant that they can refuse to answer any of the questions asked during the interview, and that they can withdraw their consent at any point during or following the interview – Some questions may apply to you, others may not***
- 1-1.5 hours
- *Assess for distress and any risk concerns* "How are you feeling about going forward?

General probes to consider throughout:

- Tell me more about that.
- What happened next?
- Can you give me an example of that?
- What did/does that mean to you?
- How did/does that impact you?

Topic 1: Biological Influence on Chronic Pain

1. Can you tell me about how and when your pain started?

Probing questions:

v. How do you understand the physical cause(s) of your current pain symptoms? (What conditions do you have?)
vi. What have medical professionals told you about why you still have pain?
vii. Did you receive adequate care, assessment and treatment, of your injuries while serving?
    a. Was there proper documentation of your injuries at the time?
viii. Can you describe how your military training and the "wear and tear" from the job has impacted your pain experience now?

ix. Were you immediately aware of the impact your injuries and training had on your body and pain? How so?

Topic 2: Psychological Influence on Chronic Pain

2. Can you tell me how your mood influences your pain? Do you notice pain more if having a bad day?)

Probing questions:

v. If you have any diagnosed with an operational stress injury or experience any mental health condition (e.g., PTSD, depression, anxiety), how do these symptoms influence your chronic pain?
vi. Can you describe your use of alcohol, cannabis, or other substances to help cope with your pain? What problems have you encountered in using substance to manage your pain?

Topic 3: Social Influence on Chronic Pain

3. Can you tell me what affects your pain in your day to day living?

Probing questions:

v. How has your pain changed your ability to work or volunteer (in the past or currently)?
vi. Do you feel your friends and family understand your pain experience? How so?
    a. How would your pain experience change if you received more or less help from family and friends?
vii. When you are feeling stressed due to work, finances, relationships, etc., how does this influence your pain levels?
viii. What has your experience been like accessing healthcare or alternative treatments for your pain? How satisfied are you with your pain-related treatments thus far?

Topic 4: Cultural Influence on Chronic Pain

4. How would you describe the Canadian military's view of pain and injury? (*Has this changed over the years of your service?*)

Probing questions:

vi. How did your peers and COC respond to pain and injury?
vii. How did you feel about talking about your pain and injuries with your chain-of-command?

viii. Can you tell me about a time when you were worried your chronic pain would impact your ability to deploy, go on course, or affect a promotion, or lead to an early release?
ix. What, if anything, delayed your seeking medical attention for any injury while serving in the CAF?
x. [if applicable] Did not seeking treatment following the injury influence the development of your pain?
xi. Does your military-like mindset still influence how you manage and react to your pain? How so?

Closing remarks:

2. **Is there anything you would like to ask me? Or something regarding your pain experience that you think I should know?**

- *Assess for distress and any risk concerns*
- Will be sending email with a copy of a resource list and the consent form for your filing
- Thank participant for their time and participation

Appendix D

Consent Form

Biopsychosocial Determinants of Chronic Pain in Canadian Military Veterans

Principal Investigator:

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Dr. Pamela Holens, Ph.D., C. Psych., Associate Professor,

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This consent form, a copy of which you may keep for your records, should give you the basic idea of what the research is about and what your participation will involve. Please take your time to review this consent form and discuss any questions you may have with the researcher. If there is something that you do not understand, please ask the researcher to explain any words or information that you do not clearly understand.

Purpose:

Jeremiah Buhler is conducting this study as part of his Doctoral Thesis, under the supervision of Dr. Pamela Holens and his research committee. The purpose of this research is to better understand how Canadian Armed Forces (CAF) veterans have come to understand how their chronic pain starts, and what factors influence their pain experience. This study will help to inform researchers, clinicians, and public policy initiatives aimed at enhancing assessments, treatments and policies related to the physical and mental well-being of CAF veterans.

Participation:

Your participation in this study is completely voluntary. Should you choose to withdraw from the study at any point or feel that you would rather leave some question(s) unanswered, you may do so. If you choose to withdraw from the study you may also choose to have your data destroyed, and not used in the data analysis.

Participation in this study involves one 60-90-minute interview. The interview will take place either over the phone, through video-conferencing applications (e.g., Zoom), or in-person at the Winnipeg Operational Stress Injury Clinic (i.e., depending on pandemic restrictions at time of interview).

Prior to the first meeting you will be asked to fill out the consent form and a questionnaire about your demographic information and some questions on your pain history. The consent form and questionnaire will be sent via mail. Once the consent form is completed, you will receive a $20 Visa gift card as a thank you for your participation. In the interview you will be asked a series of open-ended questions assessing your experience of chronic pain in relation to biological, psychological, social, and cultural factors. The gift card will be mailed to you following the interview (or given in-person if interview is face-to-face).

Results:

The summary results of this study (not your individual results) should be available by October 2022. If you would like to receive a summary of the results, please provide your contact information below.

Confidentiality:

Only the principal investigator, his supervisors, his research committee, and research assistants will have access to the data. The information that you provide will be de-identified and kept in a secure location on password-protected laptop.

Information gathered in this research study may be published or presented in public forums, however your name will not be used or revealed. Data will be presented in aggregate (i.e., a collection of all of the interviews), with the exception of direct quotes from the qualitative interview, which will be included to support the aggregate-level findings (main themes). No identifying information (e.g., name, age) will be used in the reporting of quotes. We will share findings at conferences, workshops, and in peer-reviewed publications.

Limits to confidentiality:

If you disclose information that you are an imminent threat to someone else or to yourself, we are required to break confidentiality to ensure the safety of the person at risk. If you disclose information that a child or other vulnerable person is being abused or neglected, we are required to break confidentiality and report the information to the appropriate authority.

Benefits:

There are many possible benefits to participants of this study. Participants may benefit from being provided with time and space to discuss and express their experiences with chronic pain with a doctoral candidate in clinical psychology. There are also possible benefits to the larger community of CAF veterans experiencing chronic pain. Information learned from this study will be shared with fellow researchers and care providers, and may inform the developments of assessments and treatments that are unique to CAF chronic pain experiences.

Risks:

You will be asked to provide information that you could find difficult or distressing to recall and to talk about. You might also become distressed after participating in this study. If you are distressed, you can stop at any time without consequence. We will also provide you with a contact for the psychologist at the OSI Clinic should you need to talk with someone.

University approval:

This research has been approved by the University of Manitoba Psychology/Sociology Research Ethics Board. If you have any concerns or complaints about this project you may contact any of the above-named researchers or the Human Ethics Secretariat at (204) 474-8872, humanethics@umanitoba.ca.

Security:

All questionnaire and interview data will be stored on a password-protected, data encrypted laptop. University administrators may check the data to see that the research has been ethically done. The University of Manitoba Psychology/Sociology Research Ethics Board may review research-related records for quality assurance purposes.

Contact:
If you have any additional questions about this study or your rights as a research participant, please feel free to contact the principal investigator, Jeremiah Buhler, graduate student in Clinical Psychology, University of Manitoba. You may also contact Mr. Buhler's supervisor, Dr. Pamela Holens. Contact information for these individuals can be found at the top of this form.

Statement of Consent:
I have read this consent form and I understand my role as a participant. I have had the opportunity to discuss this study with Jeremiah Buhler and I have had my questions answered. The risks and benefits have been explained to me. I have not been influenced by any study team member to participate in the study by any statements or implied statements. I understand that I will be given a copy of this consent

form after signing it. I understand that my participation in this study is voluntary and that I may choose to withdraw at any time. I freely agree to participate in this research study.

I understand that information regarding my personal identity will be kept confidential, but that confidentiality is not guaranteed. I consent to have de-identified direct quotes from my interview included in published materials. I permit the inspection of my records that relate to this study by The University of Manitoba Research Ethics Board for quality assurance purposes. By signing this consent form, I have not waived any of the legal rights that I have as a participant in a research study.

Participant signature: _____

Participant printed name: _____

Date _____

(day/month/year)

Would you like to receive a summary of the results of this study?

____No

____Yes, I would like to receive the summary results.

If yes, please provide your contact information below:

Email: _____

Phone number: _____

Mailing Address: _____

_____

Consulting psychologist:

Dr. Pamela Holens,