

Yoga for Veterans with chronic pain.

A scoping review

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Executive summary

This scoping review examines the state of research conducted on yoga for Veterans with chronic pain. Chronic pain is a complex whole person condition, with implications across the biopsychosocial spectrum. One of five Canadians is affected with moderate to severe constant chronic pain. Twice as many Veterans have high-impact chronic pain. For Veterans, pain often coexists with diagnoses such as PTSD, generalized anxiety and major depression. Yoga, with its inherent biopsychosocial approach, shows positive effects in research on civilians with chronic pain. As such, research to assess its effects for Veterans as a stand-alone therapy or as a component of interdisciplinary pain care is warranted. This review describes recent quantitative and qualitative studies about yoga and pain care as they relate to the unique experiences of Veterans with chronic pain. Gaps in research are identified and the need for future research affirmed. Finally, recommendations are given to guide researchers in ongoing study in this field.

Statement of problem

This scoping review is motivated by the current use of yoga by Veterans with chronic

pain, the growing body of evidence establishing yoga's potential in addressing chronic pain in civilians, and the increasing access to yoga created by veteran's organizations in the USA. Like their civilian counterparts, Veterans are increasingly seeking out yoga as a way to manage pain conditions. Veteran's organizations in both Canada and the USA are actively taking steps to promote a whole person approach to care, which may include yoga. However, a review of the current literature on this topic does not exist to guide further research of yoga for Veterans with chronic pain.

Description of review conducted

A literature review was conducted of data bases from 2007 to 2022. Only those studies in which the intervention was identified as yoga or "yoga-based" were included. In all the studies identified the yoga was practised in a small group setting, with four main categories of techniques: physical postures and movement, breathing techniques, relaxation, and mindfulness. Sixteen studies were identified, three qualitative and thirteen quantitative.

Key Findings

- The yoga studied was not consistently veteran-informed, trauma-informed or pain-informed.
- No studies assessed the effects of adding yoga to best-practice pain care.
- The inclusion of yoga as part of integrated interdisciplinary care was not observed in any study.
- More qualitative research was identified than quantitative.
- Benefits of yoga were shown across the biopsychosocial spectrum, similar to the benefits of yoga for civilians with chronic pain. A small number of adverse musculoskeletal effects were noted.
- Research papers to date offer important information about factors that support and prevent Veterans from initiating and sustaining yoga practice. These will guide how yoga interventions are studied in the future.
- Most studies discuss yoga as homogenous and as an 'exercise' practised in group classes.
- Classes are most often 'yoga for well-being' classes, rather than being identified as pain care informed or addressing the specific concerns of Veterans with chronic pain.
- Yoga interventions are poorly described.
- Two more recent papers provide guidance in how to address and improve reporting transparency.
- Yoga teachers' beliefs (about pain and about Veterans) which could impact effectiveness of treatment are not described.
- There are few randomised controlled trials.

Recommendations for future research

Recommendations are made in the following areas:

- Designing yoga interventions for Veterans.
- Methodological transparency sufficient for replication of studies.
- Filling the gaps in current research.

This paper affirms the need for further research in this field and suggests research into the effectiveness and cost-effectiveness of integrating veteran-informed, trauma-informed and pain-informed yoga into best practice pain care.

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Introduction

Chronic (non-malignant) pain is defined as pain that lasts longer than three months or pain that lasts longer than the predicted recovery time.¹ While the origins of chronic pain often can be traced to specific events such as trauma or disease, chronic pain may stem from an extraordinarily complex combination of biological, psycho-emotional, social, cultural and spiritual factors. Chronic pain is not only a medical diagnosis. It is a complex condition with the potential to impact every aspect of existence – physical, cognitive, autonomic, psycho-emotional, social, cultural and spiritual. The most effective treatments for chronic pain are likely to be as nuanced as the pain itself, and include approaches that intend to support the whole human who is experiencing pain. With its inherent biopsychosocial (BPS) nature, yoga offers potential as one such approach.

Scope and Burden of Chronic Pain

The human condition of chronic pain is also a social problem which places a tremendous burden on the health care system.^{2,3} One in five North Americans^{4,5} and two in five Veterans report living with chronic pain.⁶ Chronic pain is associated with increased hospital and emergency visits estimated to equate to \$7.2 billion per year in Canada (in 2016).³ According to Health Canada's analyses, the direct and indirect costs of chronic pain in 2019 was approximately \$40 billion.⁵ Moreover, chronic pain is known to be associated with diminished productivity, lower quality of life, addiction, and mental health conditions including increased suicide and suicide ideation.⁷ The actual social burdens of chronic pain seem inestimable.

For Veterans, pain often coexists with moral injury⁸ and diagnoses such as post-traumatic stress disorder (PTSD), generalized anxiety, and major depression.⁹ These psychosocial factors are strong predictors of the chronicity of pain.¹⁰ For many Veterans, the relationship between body and mind has been one of over-riding the unpleasant experiences related to the body and mind in order to put the mission first, and military life can train individuals to be in hypervigilant state.¹¹ The pain, comorbidities and stress related to no longer having a military identity¹² can all persist and be associated with irritability, anxiety, depression, insomnia and difficulty in engaging with pain care techniques.

Chronic Pain Care: best practices, evidence, how does yoga fit?

The gold standard of pain management in the medical system is interdisciplinary care (“IDC”). Although the specific content of IDC can be widely divergent,^{13,14} it may include BPS interventions such as pain education, expert-supported self-care, medical and pharmacological care, active rehabilitation, and cognitive-behavioural therapy.¹⁴ When pain does not fully resolve with IDC, many people in pain will move to approaches outside conventional western approaches.¹⁵ One of these approaches is yoga. Like pain, yoga itself is highly complex and multifaceted. Although yoga can be viewed as the practice of physical postures, combined with mindfulness, breath-work, relaxation and meditation, yoga is also a philosophy, a lifestyle, and a moral and ethical path towards freedom from suffering.

Relevance and goal

This scoping review is motivated by the growing body of evidence establishing yoga’s potential in addressing chronic pain in civilians, combined with the current use of yoga by Veterans and the increasing access to yoga created by veteran’s affairs administrations in the U.S. and Canada.

Over the past 20 years there has been a surge in research demonstrating the effects of yoga on general health and well-being, as well as the effects of yoga for chronic pain conditions in particular.^{16,17} Overall, the effects of yoga on pain and functional recovery for people with chronic pain are considered similar to effects sizes for opioids,¹⁸ yet the same yoga practice that can help with musculo-skeletal pain also will have positive effects on mental health and social well-being.^{19,20} Unlike medications and surgery, negative side effects of yoga are uncommon.²¹ In light of these findings, and coupled

with the inclusion of yoga in evidence-based guidelines,^{22,23} more people may turn to yoga for the specific management of chronic pain.

Like their civilian counterparts, Veterans are increasingly seeking out yoga as a way to manage pain conditions, and veteran's affairs organizations in both Canada and the USA are taking steps to actively promote access to yoga for Veterans. Veterans in the USA often have access to veteran-specific, trauma-informed classes through VA clinics and hospitals¹¹. The most common formats are yoga for well-being classes. As recently as November 2022, Veterans Affairs Canada (VAC) began covering the cost of Veterans receiving individualized yoga as part of interdisciplinary pain care.

In addition to identifying research, this review has the following objectives:

1. To identify the types of available evidence related to yoga for Veterans with chronic pain
2. To clarify key concepts in the literature related to yoga and pain care for Veterans
3. To examine how research is conducted on yoga for Veterans with chronic pain
4. To identify and analyze gaps in the research
5. To provide guidance for future research methodologies and research funding

Methodology and methods

A literature review was conducted of CINAHL, Pubmed and Medline data bases from 2007 to 2022. Only those studies in which the intervention was identified as yoga or "yoga-based" were included. Each of the studies identified included yoga that was practised in a small group setting, with four main categories of techniques: physical postures and movement, breathing techniques, relaxation, and mindfulness.

Sixteen studies were identified, three qualitative and thirteen quantitative.

Findings

Objective 1: Identifying available evidence related to yoga for Veterans with chronic pain

This review considered 13 quantitative^{21,24-35} and three^{25,36-37} qualitative studies related to yoga for Veterans with chronic pain. The quantitative studies included the four main categories of yogic techniques, and all measured outcomes that acknowledged the BPS nature of pain.

Measured effects

The quantitative studies (Table 1) identified specific improvements in Veterans' energy levels, quality of life, self-efficacy, PTSD symptoms, and ability to participate in social activities after their participation in yoga interventions. They also reported decreases in pain interference, depression and anxiety, fatigue, and fear of movement amongst the Veterans in the studies. Particularly noteworthy is the finding in Groessl³⁰ that yoga may produce similar results to physical therapy at a much lower cost; as well as the result in Schulz-Heik³⁵ that Veterans reported virtual yoga classes to be equally effective to classes conducted in-person. Also interesting was the finding in Groessl²⁷ that women Veterans experienced greater benefits from yoga than their male counterparts.

The qualitative studies (Table 2) identified additional effects across the BPS spectrum. In these studies, Veterans reported substantial decrease in pain and pain-related interference with activities;³⁶ gaining some influence over, and reduced medication use for depression, sadness and anxiety;³⁶ improved emotional well-being, enhanced cognitive functioning and a calmer mental state;^{35,36} better sleep;³⁶ ability to transfer what they learned in yoga to other aspects of life and work;³⁶ a sense of empowerment to challenge limits, learn how to calm mental states, and to impact pain,³⁵ as well as increased feelings of positivity and better relationships with family and friends after the yoga intervention.³⁶

Adverse Effects

Adverse physical effects of yoga for Veterans with chronic pain were uncommon and not consistently reported in the studies. No studies specifically questioned whether yoga might be associated with adverse effects on emotional, social or spiritual health.

Objective 2: Clarifying key concepts/definitions

In this review “yoga” is synonymous with yoga classes, typically 60-90 minutes in length, taught in-person by instructors with some experience in teaching Veterans or individuals with chronic pain. Participants in the group classes were guided to complete additional individual home practice.

The content of the yoga classes in these studies was consistently guided by the advice of health and yoga professionals experienced in teaching yoga to Veterans, and by principles of controlled movements combined with calm breathing, mindfulness and relaxation. Yoga interventions were modified to address the musculo-skeletal aspects of the pain condition. In one RCT,²⁸ the yoga was designed by physicians and yoga

experts with the reported intent of making the practices safe for those with chronic low back pain.

Objective 3: Examining how research is conducted on yoga classes for civilian adults and for Veterans with chronic pain

Research on yoga for Veterans is conducted similarly to that for yoga for civilian adults with chronic pain. This review found a mixture of qualitative and quantitative studies on this topic.

Data from one RCT²⁸ that included Veterans with chronic low back pain has been used to write multiple reports exploring primary outcomes, secondary outcomes, cost-effectiveness and causal mediation.

Study design included a quasi-experimental study comparing effects of yoga for male and female Veterans,²⁶ a feasibility study for an RCT,³⁴ a quasi-experimental study comparing effects of yoga for male and female Veterans,²⁶ and a pre-post study design comparing effects of yoga on Veterans with chronic pain to Veterans with chronic pain and PTSD.³¹

The yoga classes in the reviewed studies were taught in-person. One study compared effects of in-person to virtual yoga classes.³⁵

No specific style or lineage of yoga was identified in most studies. Five of the studies discussed teacher's qualifications, reporting that teachers had varying degrees of training in different lineages of yoga. The yoga instructors in three studies were also health care professionals.^{24,26,34}

None of the yoga classes was taught by Veterans, and no reports indicated that Veterans provided guidance in yoga class design or content. Moreover, information

about the specific ways in which classes may have been tailored to address unique issues facing Veterans were not included in the studies.

Four of the reviewed papers discussed attendance in yoga classes. Attendance was reported to be moderate, with the highest attrition rates of 44% in Chopin's study.²⁴ Compliance with home practice between classes was not well-described.

The specific effects of one-to-one yoga (as compared to yoga classes) were not included within the studies.

The more recent studies^{24,28} provided enough detail to allow replication of the yoga intervention. One study used the Essential Properties of Yoga Questionnaire (“EPYQ”),²⁵ and none used the 2021 guidance of the Checklist Standardizing the Reporting of Interventions For Yoga (“CLARIFY”) to report interventions.

Outcome measures varied across studies. Questionnaires addressing pain intensity, pain related disability and quality of life were most commonly used; with sleep, fatigue, fear of movement and self-efficacy among other outcome measures. Only two studies, both qualitative, measured overall satisfaction with the yoga intervention. The quantitative studies did not include responder analysis.

Notably, there was not sufficient reporting transparency to identify the extent to which the yoga was presented as a technique explicitly addressing the BPS nature of pain or intending to create neuroplastic or whole person changes rather than a technique purely intended to impact the physical body.

Objective 4: Identify and analyze gaps in the research

Critical gaps remain in the available knowledge. These include questions about:

- the effectiveness of individualized yoga as distinct from group yoga classes;

- the effectiveness and cost-effectiveness of adding yoga to interdisciplinary care;
- the intersection of the unique circumstances of Canadian Veterans and yoga;
- the effects of yoga on Veterans with chronic pain and common comorbidities;
- the effects of yoga on medication use;
- the effects of yoga on health care utilization;
- the effects of yoga for Veterans across pain conditions or pain mechanisms;
- the effects of different doses of yoga;
- the predictability as to which specific segments of the veteran population will have best effects from including yoga in their IDC; and
- the effects of yoga on veteran across sex and gender differences.

Objective 5: provide guidance for future research proposals intending to study the effects and effectiveness of yoga for Veterans with chronic pain

The studies provide important information about factors that support and prevent Veterans from initiating and sustaining yoga practice.

Veterans reported barriers to committing to yoga. These deterrents included skepticism about yoga as an effective pain care strategy,³⁷ personal concerns about not being able to discuss the benefits of yoga with health providers, as well as potential complications in care coordination with veteran's affairs. The inconvenience of yoga classes,²⁵ and time³⁶ required for practice presented further practical barriers for some Veterans, while others reported shame associated with the emotional aspects

of their pain³⁶ and self-consciousness about participating in group yoga practice.³⁷

Veterans in the Hurst³⁷ study were negatively affected by various stigmas associated with yoga, including the idea that yoga is neither manly, macho, nor a practice that can support those in the military culture.

In the Donaldson study,²⁵ Veterans expressed specific preferences for short, gentle yoga practices. The qualitative studies reported that physical postures, breathing techniques, concentration, meditation, and the spiritual aspects of yoga were all important components of the practice. Some Veterans had lesser endorsement of the spiritual practices.²⁵

Donaldson's report also included that Veterans found it helpful to have an instructor knowledgeable about pain and physical limitations. Some Veterans found that pain education presented in conjunction with their care was helpful in managing expectations and avoiding aggravating existing pain.²⁵ There were no reports that highlighted the importance of a trauma-informed approach to Veterans taking the classes. Neither were there reports in which Veterans discussed the importance of removing Sanskrit language, chanting and 'yoga music' from the classes.

Recommendations and Future Directions for research of Yoga for Veterans with Chronic Pain

Based on this scoping review, there are three areas through which future research can be directed:

1. Designing yoga interventions for Veterans with chronic pain

2. Reporting yoga interventions for Veterans with chronic pain
3. Filling gaps in research on yoga for Veterans with chronic pain

1. Research Design

- avoid a reductionist view of yoga, pain and pain care
- make yoga interventions replicable
- account for Veteran preferences to decrease attrition and foster greater engagement
- make efforts to reduce stigma and skepticism about yoga amongst participating Veterans
- educate yoga teachers/therapists about pain science, military context and the unique manner in which Veterans relate to the body and pain
- acknowledge and reflect the breadth of yoga as a philosophy and a guide towards using every aspect of our existence to decrease all aspects of pain

2. Research Reporting

- include sufficient detail to replicate (using CLARIFY or Essential Properties of Yoga Q)
- report both benefits and adverse effects across whole person or BPS outcomes
- align outcome measures with up-to-date beliefs about pain and recovery

3. Filling research gaps

- compare the benefits of yoga vs other IDC interventions
- explore whether and how the addition of yoga as a therapeutic modality will enhance IDC outcomes
- compare the benefits of yoga between civilians and Veterans with chronic pain

- differentiate the effects of yoga classes compared to the effects of one-on-one yoga for the veteran
- clarify the effects of yoga provided by teachers who have in-depth understanding of pain and pain care
- study outcomes from Veteran-designed and taught yoga interventions
- explore the benefits of yoga classes as distinct from yoga therapy
- compare the effects of yoga on Veterans who are educated about pain versus those who are not
- assess the effects of providing infographics, information sheets, or video testimonials to Veterans to teach them about yoga's potential benefits
- consider which Veterans will benefit the most from yoga, or from different aspects of yoga

Discussion and Summary

This review of research papers published between 2007 and 2022 reveals only a small number of studies on the topic of yoga for Veterans with chronic pain. More systematic research and reporting is required to compare effects of yoga for Veterans with chronic pain with the mild-moderate treatment effects in pain, function, and mental health reported in systematic reviews of yoga for civilians with chronic pain. Although moderate reductions in pain alone might not seem impressive, these same effects sizes are seen when studying the effects of opioids on pain and function.¹⁸ Unlike opioids, the benefits of yoga come with few reported adverse effects.

Within the reviewed papers, the yoga studied was provided in-person, in small group classes lasting 60-90 minutes, once or twice a week, and for eight to twelve weeks.

Yoga teachers had varying education and backgrounds. There was not sufficient methodological transparency to replicate the yoga provided within most studies. The Essential Properties of Yoga Questionnaire,³⁸ created in 2018, and CLARIFY³⁹ (the

checklist standardizing the reporting of interventions for yoga) created in 2021 are now available to assist researchers in fulsome and transparent reporting.

Veterans in the qualitative studies reported barriers to engaging in and sustaining yoga practice, and expressed the importance of considering their unique history and co-morbidities in the delivery of yoga. However, none of the studies acknowledged Veteran engagement during the development of the yoga program or during the preparation or education of yoga instructors. Neither did all acknowledge whether the yoga teachers were trauma-informed, even though the Yoga Service Council and Veteran's Yoga Project in the USA¹¹ endorse the importance of a trauma-informed approach and training for yoga teachers working with Veterans. Trauma-informed yoga intends to support coping and resilience in participants by offering a safe environment in which to practice, as well as choice and an acknowledgment of the impacts of violence and trauma on participant experience during yoga. A Veteran-informed approach also supports coping and resilience, but through understanding of military and veteran culture. Examples of a veteran-informed approach might include accepting that a Veteran might not follow all of a civilian teacher's instructions until they have gained sufficient trust; knowing to modify instructions for those from a warrior culture; and offering Veteran participants choice about where they place themselves in a yoga room in relation to entrances and other students. Yoga instruction offered to Veterans with a language and approach that seems more appropriate for civilians may impact Veteran participation and adherence, as well as the effectiveness of the yoga intervention for Veterans. The effects of yoga that is veteran-informed and trauma-informed have not been studied.

Future research might also consider the effects of pain-informed yoga, in which an understanding of pain biology and of the lived experience of chronic pain are integrated into yoga practice and classes. Studies are needed to assess potential differences in outcomes from classes created and offered by those whose language and approach reflect knowledge of the complexities of pain and its whole person effects on the Veteran living with chronic pain. For example, evidence suggests that educating about pain may improve outcomes by limiting the detrimental effects of nocebic language⁴⁰⁻⁴² by teachers who conceptualize pain as equal to tissue damage. Pain education for the Veterans attending pain-informed yoga classes may also impact effects and effectiveness of the yoga. Research of pain education for civilians with chronic pain has shown that knowledge of pain science can decrease pain, the threat value of pain, and perceived disability.⁴³⁻⁴⁵ As such, future research may consider the effects of combining pain education with yoga.

This review focusses on studies in which the yoga intervention included four main categories of techniques (physical postures and movement, breathing techniques, relaxation and mindfulness). The rationale for this focus was in consideration that contemporary Western yoga at its best is more than just a physical practice. It combines physical movements with breathing and/or meditation techniques intended to impact the whole person, across biopsychosocial and spiritual realms. Studies reviewed included outcome measures suggesting researchers had some expectations that yoga could impact pain, physical abilities/function, sleep, medication use, emotions such as anxiety, fear and depression, cognitions including self-efficacy and catastrophic thinking, and even relationships. Yet, if yoga has potential to positively

impact the whole person, then adverse effects across the BPS realms might also arise. Future studies could include reporting on adverse psycho-emotional, cognitive, social and medication outcomes, in addition to pain and function outcomes.

IDC is a gold standard for people with chronic pain.¹⁴ Multimodal components vary, yet reports indicate IDC involves treatments addressing the whole person, including pain education, expert-supported self-care, activity and exercise, cognitive-behavioral therapy, interventions to address the psychological, social and spiritual impacts of chronic pain, and meditation management/medical interventions as appropriate.¹⁴ The addition of yoga to gold standard care could support outcomes of IDC in a number of ways. Yoga's movement and contemplative practices offer repeated opportunities for the veteran to re-conceptualize pain and to experience that pain is not immutable but something over which some influence can be gained. Yoga is also a process through which Veterans can gain greater skill in self-care, and potentially increase the dose of self-care to a level associated with neuroplastic changes. Furthermore, the mindfulness practices of yoga also provide an opportunity to gain skill in calming thoughts, emotions and the autonomic nervous system, while observing that pain is changeable and something over which we have some influence. Given the potential for yoga to support patient-centered goals and outcomes, future research may compare cost-effectiveness and whole-person outcomes when yoga is an integrated component of IDC, as opposed to simply comparing applications of yoga to other treatments in isolation.

Effective pain management also requires individualized care. To date, research has not considered the effects of providing individualized yoga. Future research can compare

effectiveness and cost-effectiveness of adding group yoga practices versus individualized yoga to gold standard care.

In summary, this paper strongly urges future researchers to embrace yoga as a complex and multi-faceted practice and philosophy with the potential to affect the whole BPS range of impacts of chronic pain in Veterans, and then rise to the challenge of carrying out replicable study of yoga in its fulsome expression. Future study is warranted to demonstrate the effects of integrating yoga with gold standard care; the effects of yoga that is trauma-informed; as well as assessing the implications of educating both yoga teachers and Veterans in fundamental principles of pain science. Critically, future study must be sensitive to the unique nature of Veterans in study design, delivery and analysis. Without these changes, our understanding of yoga's true potential to alleviate the complex suffering of Veterans in pain will not be known.

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Table 1: Quantitative study details

Study	Chopin (2020) Yoga for Warriors: An Intervention for Veterans With Comorbid Chronic Pain and PTSD
Study type	Pre-post with no control group
Participants	Veterans with comorbid chronic pain and PTSD at a large, urban Veterans Affairs Medical Center. N= 49 completed the program
Method	Yoga for Warriors, developed by the first author, consists of eight weeks of standardized 60 min classes. Each class centered around a theme and series of poses that built toward a pinnacle pose. The eight classes grew in intensity so participants built their practice over time. The yoga instructor was both a registered yoga teacher and a licensed clinical psychologist with experience offering evidence-based treatments for PTSD.
Outcome measures	PCL5 (PTSD symptoms), Patient Reported Outcomes Measurement Information System (“PROMIS”), satisfaction, Tampa Scale of Kinesiophobia
Key Results	Significant improvement in ability to participate in social activities. Significant reductions in kinesiophobia.

	<p>Veterans reported high levels of satisfaction with the program.</p> <p>44% attrition rate</p>
Key Features	<p>Sufficient detail to replicate.</p> <p>No adverse events reported.</p>
Study	<p>Coeytaux (2014)</p> <p>Evidence Map of Yoga for High-Impact Conditions Affecting Veterans</p>
Study type	Systematic review and evidence map of yoga for high-impact issues affecting Veterans.
Participants	Veterans and adults with chronic pain.
Method	Reviewed RCTs and systematic reviews from 2008 to 2014. Studies self-identified as providing yoga with classes guided by teachers with varied qualifications.
Outcome measures	Varied across studies.
Key Results	The evidence from good-quality systematic reviews suggests that yoga can improve functional outcome in adults with non-specific chronic low back pain. Findings consistent with previous reviews, but still lack evidence specific to Veterans in 2014.
Key Features	Very few adverse events reported, yet unclear if this was not recorded in some studies.
Study	<p>Donaldson (2020)</p> <p>Yoga practice among Veterans with and without chronic pain: a mixed methods study</p>
Study type	Multiple-contact mixed-mode survey methodology to collect data on yoga practice.

Participants	<p>Veterans who completed a 2015–2016 survey focused on pain and non- pharmacological health practices.</p> <p>Those who reported yoga in the past year [n=174 (9.4%) of 1850] were eligible for the present study.</p>
Method	<p>Yoga offered in classes.</p> <p>Practice patterns were compared for participants with and without chronic pain. To explore potential reasons for reported yoga practice patterns, researchers conducted focused semistructured interviews with a subset of participants.</p>
Outcome measures	<p>Semi-structured interviews and pain intensity and interference, RAND 12 Health Survey, and Essential Properties of Yoga Questionnaire</p>
Key Results	<p>Practitioners with chronic pain reported gentler and less active yoga practice than those without, attended yoga studios less frequently, and reported shorter yoga practices than those without.</p> <p>Most yoga practice was self-directed and at home.</p> <p>These findings indicate that breath practices are more universally practiced in this sample than spirituality practices, with no differences across levels of chronic pain.</p>
Key Features	<p>Practice patterns were compared for Veterans with and without chronic pain to explore potential reasons for reported yoga practice patterns. Focused semistructured interviews were conducted with a subset of participants.</p> <p>No adverse events reported.</p>
Study	<p>Groessler (2008)</p> <p>Yoga for Veterans with chronic low-back pain.</p>
Study type	<p>Single group design pre-post</p>
Participants	<p>33 Veterans</p>

Method	<p>10 week program with one 60 min class/wk and recommended home practice.</p> <p>Instructed by an MD trained in yoga therapy in India, with 4+ years of teaching experience.</p>
Outcome measures	Pain, depression, fatigue, quality of life and mental health.
Key Results	<p>Decreased pain, depression, fatigue. Improved quality of life and mental health.</p> <p>Average attendance of 5-6 weeks of the 10 week session.</p>
Key Features	<p>Not sufficient detail to replicate.</p> <p>No adverse events reported.</p>
Study	<p>Groessl (2012)</p> <p>The benefits of yoga for women Veterans with chronic low back pain.</p>
Study type	<p>Single group, pre-post quasi-experimental study design.</p> <p>Benefits of yoga for women Veterans.</p>
Participants	53 male and female Veterans
Method	10 weeks of once/week yoga classes.
Outcome measures	<p>(Pain Severity Scale), depression (CESD-10), energy/fatigue, and health-related quality of life (SF-12)</p> <p>Questionnaires included measures of pain (Pain Severity Scale), depression (CESD-10), energy/fatigue, and health-related quality of life (SF-12).</p>
Key Results	<p>Results suggest that women Veterans may benefit more than men Veterans from yoga interventions for chronic back pain, including reductions in depression and fatigue, and enhanced quality of life. Conclusions are tentative because of the small sample size and quasi-experimental</p>

	<p>study design. A more rigorous study is being designed to answer these research questions more definitively.</p> <p>Teacher qualifications not reported.</p> <p>Attendance measured but not reported.</p>
Key Features	<p>Not sufficient detail to replicate.</p> <p>No adverse events reported.</p>
Study	<p>Groessler (2017)</p> <p>Yoga for Military Veterans with Chronic Low Back Pain: A Randomized Clinical Trial</p>
Study type	RCT, with delayed treatment comparisons
Participants	150 military Veterans with chronic low back pain (“CLBP”) who had primary care providers at the VA
Method	<p>12-week yoga intervention study with two 60 minute Hatha yoga classes/week plus a home practice manual recommending 15-20 min /day. Outcomes were measured at baseline, 6 weeks, 12 weeks, and 6 months.</p> <p>This program was designed by physicians and yoga experts to be safe for persons with CLBP.</p> <p>Yoga sessions were delivered by experienced instructors, each with more than 7 years of teaching experience. An instructor manual was created to guide sessions and improve standardization.</p>
Outcome measures	Roland Morris Disability Q, pain intensity, opioid use
Key Results	Yoga improved RMDQ and pain intensity scores despite evidence they had fewer resources, worse health, and more challenges attending yoga sessions than community samples studied previously.

	20 of 76 discontinued yoga.
Key Features	Sufficient detail to replicate; supplementary information provided. No adverse events attributed to the yoga practice.
Study	Groessler (2020) Secondary outcomes from a randomized controlled trial of yoga for Veterans with chronic low-back pain
Study type	RCT, with delayed treatment comparisons
Participants	150 military Veterans with CLBP who had primary care providers at the VA
Method	12-week yoga intervention study with two 60 minute Hatha yoga classes/week plus a home practice manual recommending 15-20 min /day. Outcomes were measured at baseline, 6 weeks, 12 weeks, and 6 months. This program was designed by physicians and yoga experts to be safe for persons with CLBP. Yoga sessions were delivered by experienced instructors, each with more than 7 years of teaching experience. An instructor manual was created to guide sessions and improve standardization.
Outcome measures	Mediation analysis of secondary outcomes included pain intensity, pain interference, depression, fatigue, quality of life, self- efficacy, and medication usage. Outcomes include Brief pain inventory, Fatigue severity scale, Center for Epidemiologic Studies Short Depression Scale, Health Related Quality Of Life, Brief Anxiety Inventory, Lorig's self efficacy scale, and Pittsburg Sleep Scale.

Key Results	<p>Yoga participants had significantly greater change in pain interference, quality of life, fatigue and self efficacy.</p> <p>No significant differences over time were found between the intervention groups on depression, anxiety, or sleep quality.</p> <p>20 of 76 discontinued yoga.</p>
Key Features	<p>Sufficient detail to replicate; supplementary information provided.</p> <p>No adverse events attributed to the yoga practice.</p>
Study	<p>Groessler (2020)</p> <p>Cost-effectiveness of yoga for chronic low back pain in Veterans</p>
Study type	RCT, with delayed treatment comparisons
Participants	Veterans with CLBP who had primary care providers at the VA
Method	<p>12-week yoga intervention study measured outcomes at baseline, 6 weeks, 12 weeks, and 6 months.</p> <p>This program was designed by physicians and yoga experts to be safe for persons with CLBP.</p> <p>Yoga sessions were based on a manualized protocol developed by physicians and senior yoga instructors specifically for CLBP.</p> <p>Yoga sessions were delivered by experienced instructors, each with more than 7 years of teaching experience.</p>
Outcome measures	Quality adjusted life years; cost effectiveness analysis; intervention costs; and health care costs.
Key Results	A scenario comparing the costs of yoga and physical therapy suggests that yoga may produce similar results at a much lower cost.
Key Features	Sufficient detail to replicate.

Study	Groll (2016) Yoga and Canadian Armed Forces members' well-being: An analysis based on select physiological and psychological measures
Study type	Compared effects of Veterans with chronic pain to those with chronic pain and PTSD on their self-reported symptoms of depression, anxiety, and anger.
Participants	Active or retired members of the Canadian Armed Forces who self-identified as having experienced at least one traumatic operational event. 35 males and 10 females.
Method	12 week, tailored mindful yoga program based on developing mind and body awareness through breath work, meditation, mindful movement, guided resting practices, and gratitude. Yoga classes provided by “four qualified instructors” took place in three locations in Kingston and Trenton, Ontario. Participants attended one 60-minute yoga class per week, with mindful meditation and breathing exercises given as homework between classes. Yoga was specifically developed for people with PTSD. The yoga program used in this study was developed and piloted in the USAF by Dr. Daniel Libby and is described as “mindful yoga.”
Outcome measures	Combat Exposure Subscale of the Deployment Risk and Resilience Inventory, Traumatic Life Events Questionnaire, Beck Depression Inventory-II, Medical Outcomes Survey Short Form, Pittsburgh Sleep Index Questionnaire, Anxiety Sensitivity Index-3, State-Trait Anger Expression Inventory, McGill Pain Questionnaire.

Key Results	<p>PTSD-positive individuals had statistically significantly poorer baseline scores on measures of depression, state and trait anger, anxiety, sleep quality, and mental health–related quality of life than individuals without PTSD. However, after the 12 weeks of yoga, there were no longer any statistically significant differences between the individuals with and without PTSD on any of the study measures.</p> <p>Individuals who screened positive for PTSD showed statistically significant improvement in depression, trait anger, and overall mental health-related quality of life, and they approached significant improvement in pain scores after they completed the yoga program.</p> <p>Attendance not reported.</p>
Key Features	<p>Sufficient detail to replicate.</p> <p>No adverse events reported.</p>
Study	<p>McCarthy (2022)</p> <p>Mediational Analysis of Yoga’s Effect on Chronic Low-Back Pain in Veterans: What Factors Really Matter?</p> <p>Secondary analysis of Groessl 2017 research data</p>
Study type	Mediational Analysis of Yoga’s Effect on Chronic Low-Back Pain in Veterans
Participants	150 military Veterans with CLBP who had primary care providers at the VA
Method	<p>12 week yoga intervention study measured outcomes at baseline, 6 weeks, 12 weeks, and 6 months.</p> <p>Yoga sessions were based on a manualized protocol developed by physicians and senior yoga instructors specifically for CLBP.</p> <p>Classes were delivered by experienced instructors, each with more than 7 years of teaching experience.</p>

	An instructor manual was created to guide sessions and improve standardization.
Outcome measures	Disability, fatigue, pain, self-efficacy, spinal range of motion, grip strength, core strength, and balance
Key Results	<p>Self-efficacy, spinal range of motion, grip strength, core strength, and balance—did not meet published criteria for mediation. Pain and fatigue factored together, mediating decreased disability after 6 months.</p> <p>Researchers used mediation analysis to examine factors that may mediate or influence the effects of yoga on disability over time. The finding that fatigue mediates the relationship between a mind-body intervention like yoga and disability appears novel.</p> <p>20 of 76 participants discontinued yoga.</p>
Key Features	<p>Sufficient detail to replicate.</p> <p>No adverse events attributed to the yoga practice.</p>
Study	<p>Miller (2017)</p> <p>Literature review of research on chronic pain and yoga in military populations</p>
Study type	Reviewed the existing body of literature and provide recommendations for future research.
Participants	Veterans
Method	<p>Literature review</p> <p>Classes with instructor qualifications not reported across studies</p>

Outcome measures	Varied - One study was a randomized controlled trial (RCT). Four of the five studies remaining used pre/post design, while the last study used a post-only design.
Key Results	<p>Studies on the use of yoga to treat chronic pain in military populations are in their infancy.</p> <p>Methodological weaknesses include small sample sizes, and use of single group uncontrolled designs (pre/post; post only) for all but one study.</p> <p>Attendance not reported across studies.</p>
Key Features	Adverse events not reported across studies.
Study	<p>Rae (2020)</p> <p>Yoga vs Stretching in Veterans with Chronic Lower Back Pain and the Role of Mindfulness: A Pilot Randomized Controlled Trial</p>
Study type	Feasibility study for RCT to compare effects of yoga to stretching class
Participants	20 Veterans with chronic low back pain
Method	<p>Weekly one-hour yoga or stretching class and encouragement to practice 3 times each week at home.</p> <p>Two yoga instructors who were also chiropractors.</p>
Outcome measures	Quality of life (PROMIS), modified Brief Pain Inventory, questionnaire with questions considering self-efficacy, pain catastrophizing, behavioural disengagement and fear-avoidance.
Key Results	<p>The study sample sizes are too small to demonstrate any clinical significance between the 2 groups, there were clearly responders that eagerly took to attending regular classes and engaging in self-care.</p> <p>40% of participants attended more than 80% of the sessions.</p>

	The yoga group averaged 2.52 days per week with an average of 20.37 minutes per home practice, whereas the stretching group averaged 2.32 days per week of home practice with an average practice time of 17.56 minutes.
Key Features	Not sufficient detail to replicate. No reported adverse events. One participant did not continue after first class for fear of causing injury.
Study	Schulz-Heik (2017) Results from a clinical yoga program for Veterans: Yoga via telehealth provides comparable satisfaction and health improvements to in-person yoga
Study type	Uncontrolled program evaluation
Participants	64 Veterans
Method	Classes offered in-person or by teleconference; half of participants attended via teleconference. Five different teachers with minimum 200 hours training as a yoga teacher in different lineages or approaches to asana-based classes. Anonymous program evaluation survey.
Outcome measures	Satisfaction and symptom improvement. No use of standardized questionnaires.
Key Results	Improvements in pain, energy level, depression and anxiety in over 80%. No difference between in-person and teleconference yoga. Attendance was reported. No control group.
Key Features	Not sufficient detail to replicate. A standard War Related Injury and Illness Study Center (“WRIISC”) protocol was used. WRIISC incorporates meditation, intention setting, controlled

	<p>breath practices, postures emphasizing alignment, synchronization of breath and movement, and relaxation/meditation.</p> <p>No adverse events reported.</p>

Qualitative study details

Study	<p>Donaldson (2020)</p> <p>Yoga practice among Veterans with and without chronic pain: A mixed methods study</p>
Participants	<p>Veterans with and without chronic pain; 110 who practiced yoga in past year and 31 who had not; of the 110, 37% reported chronic pain and of the 31, 58% reported chronic pain.</p>
Method	<p>Semi-structured, open-ended interviews.</p>
Key Themes	<ol style="list-style-type: none"> 1. Self-consciousness in group practice: supported independent practice for those with chronic pain. 2. Convenience: favoured independent practice for those with and without chronic pain. 3. Positive group dynamics: favoured practice in a group or yoga studio for participants without chronic pain. <p>Participants with chronic pain expressed that practicing yoga helped them cope.</p> <p>Participants reported they avoided aspects of yoga practice that aggravated their pain.</p> <p>The yoga practices of study participants with and without chronic pain were similar, including a large focus on breath-work, a moderate focus on mental and emotional awareness and mindfulness, and little focus on spirituality.</p>

Study	<p>Giannitrapani (2018)</p> <p>Veteran experiences seeking non-pharmacologic approaches for pain</p>
Participants	Veterans, 29 males and 7 females with chronic pain
Method	Semi-structured interviews (25–65 min) elucidating veteran experiences with assessment and management of pain in VA Healthcare
Key Themes	<p>Veteran experiences with and barriers to accessing complementary non-pharmacologic approaches for pain clustered into five main themes:</p> <ol style="list-style-type: none"> 1. Provider Communication About Alternative Pain Management Approaches <p style="margin-left: 40px;">“one of the best things the VA has ever given me was pain education and it was through my occupational therapist”</p> 2. Care Coordination for Alternative Pain Management Approaches <p style="margin-left: 40px;">“I have friends that go to small clinic in [area A] and I still see them down in [facility in area B] and they’re going through headaches upon headaches in trying to get their information to their primary care docs”</p> 3. Veteran Expectations About Experiencing Pain <p style="margin-left: 40px;">“I think as a society we have shifted the focus to if this doctor doesn’t relieve me of my pain I will find someone who does”</p> 4. Veteran Knowledge and Beliefs About Alternative Pain Management Therapies <p style="margin-left: 40px;">“how many people know that tai chi will help with pain?... Probably none. I saw them doing tai chi down here at the VA clinic and the only reason I knew about it was because I saw it being done”</p> 5. Access to Alternative Pain Management Therapies <p style="margin-left: 40px;">Specific access barriers included local availability, time, distance, scheduling flexibility, enrolment, and reimbursement.</p>

Study	<p>Hurst (2018)</p> <p>Yoga therapy for military personnel and Veterans: Qualitative perspectives of yoga students and instructors</p>
Participants	Participants included 24 individuals with yoga experience and current or past military service, and 12 instructors who had taught yoga for military personnel and/or Veterans.
Method	<p>A semi-structured set of questions guided interviews with each participant.</p> <p>The purpose was to explore the attitudes and perspectives of military Veterans and current military personnel toward yoga as a therapeutic modality in order to better plan for and support the provision of yoga to military populations.</p> <p>Data was not differentiated by current military service or veteran.</p>
Key Themes	<p>Five themes emerged from the interviews:</p> <ol style="list-style-type: none"> 1. mental health benefits experienced from yoga practice 2. physical health benefits experienced from yoga practice 3. important yoga elements and conditions that support effective practice 4. facilitators for engaging military in yoga practice 5. challenges and barriers to yoga practice for military.

