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## Review

# Self-management of pain and depression in adults with spinal cord injury: A scoping review

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**Context:** Pain and depression are two prevalent secondary complications associated with spinal cord injury (SCI) that negatively impact health and well-being. Self-management strategies are growing in popularity for helping people with SCI to cope with their pain and depression. However, there is still a lack of research on which approaches are best suited for this population.

**Objective:** The aim of this scoping review was to determine what is known about the self-management of pain and depression through the use of pharmacological and non-pharmacological therapies in adults with SCI.

**Methods:** Seven electronic databases were searched for articles published between January 1, 1990 and June 13, 2017. Grey literature was searched and additional articles were identified by manually searching the reference lists of included articles.

**Results:** Overall, forty-two articles met the inclusion criteria; with the majority reporting on the self-management of pain, rather than on depression or on both complications. Non-pharmacological interventions were more likely to include self-management strategies than pharmacological interventions. A limited number of studies included all of the core self-management tasks and skills.

**Conclusions:** There are significant knowledge gaps on effective self-management interventions for pain and depression post-SCI. There is a need to develop interventions that are multi-faceted, which include both pharmacological and non-pharmacological therapies to address multimorbidity.

**Keywords:** Spinal cord injuries, Self care, Self-management, Adaptation, Psychological, Pain, Depression

## Introduction

A spinal cord injury (SCI) is a devastating injury with damage to the spinal cord that occurs from either a traumatic or non-traumatic event.<sup>1</sup> Damage to the spinal cord can result in paraplegia or tetraplegia, but the severity of the injury depends on the cause and location of the damage.<sup>2,3</sup> There are debilitating secondary complications associated with SCI, often caused by the partial or complete loss of motor and sensory functions

and the inability to control bodily functions.<sup>4,5</sup> Common secondary complications include pain,<sup>6</sup> depression,<sup>7</sup> anxiety,<sup>8</sup> cardiovascular complications,<sup>9</sup> pressure ulcers,<sup>10</sup> respiratory complications,<sup>11</sup> spasticity,<sup>12</sup> urinary and bowel complications<sup>9</sup> and fractures.<sup>12</sup>

Importantly, secondary complications of a disabling condition, such as a SCI, can be reduced by incorporating self-management tasks and skills into daily life.<sup>13</sup> For this reason, programs involving self-management are becoming increasingly common.<sup>14</sup> Self-management has been commonly defined using Barlow's definition as,

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an individual's ability to manage the symptoms, treatment, physical and psychosocial consequences and lifestyle changes inherent in living with a chronic condition. Efficacious self-management encompasses ability to monitor one's condition and to affect the cognitive, behavioural and emotional responses necessary to maintain a satisfactory quality of life (p. 178).<sup>15</sup>

Lorig and Holman identify three main categories of self-management tasks: medical management, role management and emotional management and six core skills: problem solving, decision making, using resources, communicating with healthcare providers, taking action and self-tailoring.<sup>16</sup> Self-management strategies have shown positive outcomes in individuals with chronic conditions.<sup>15,17,18</sup> However, in individuals with multiple chronic conditions (e.g. multimorbidity), including persons with SCI, self-management is more complex than in individuals with one chronic condition because the dominant condition is often prioritized for management.<sup>19</sup>

Pain and depression are among the most common chronic complications of SCI, co-occur frequently, and have overlapping implications for well-being. The majority of persons with SCI report experiencing some type of pain,<sup>20</sup> with about half endorsing neuropathic pain.<sup>21</sup> SCI-related pain correlates with multiple adverse effects on physical,<sup>9</sup> emotional,<sup>22,23</sup> and social health.<sup>24,25</sup> These include: depression,<sup>6,26</sup> unemployment,<sup>27</sup> reduced function,<sup>28</sup> social isolation<sup>28</sup> and decreased quality of life.<sup>29</sup> Similarly, approximately a quarter of persons with SCI experience depression,<sup>30</sup> a rate that is substantially higher than the general population worldwide prevalence of 3.2%.<sup>31</sup> As with pain, depression in persons with SCI represents a major concern because it is connected to multiple negative health outcomes including: urinary tract infections, poor social and community integration, decreased self-appraised health, pressure ulcers, fewer leisure activities, the lack of meaningful social pursuits and mortality.<sup>32</sup> Depression may also interfere with the physical rehabilitation process.<sup>33</sup>

Several self-management interventions and programs have highlighted positive outcomes in individuals with pain and/or depression.<sup>34,35</sup> A recent longitudinal study ( $n = 250$ ) published in 2016 identified that primary care patients with comorbid musculoskeletal pain and depression (receiving antidepressant therapy and a pain self-management program) had greater self-efficacy for managing their pain and depression when compared to the group receiving usual care

(advised to seek care from their primary care provider).<sup>35</sup> Similarly, a randomized controlled trial ( $N = 60$ ) of an online pain self-management program conducted among patients with chronic non-cancer pain demonstrated similar positive results.<sup>34</sup> Participants in the intervention group had lower pain severity, pain interference, opioid misuse and depressive symptoms, as well as increased pain self-efficacy. Despite the positive results of self-management programs for addressing pain and depression in the general population,<sup>34,35</sup> little is known about the use of self-management strategies for pain and depression among adults with SCI.

Given the benefits of self-management strategies for the management of SCI,<sup>36,37</sup> as well as the prevalence and complexity of pain and depression, there is a need to improve our knowledge on existing self-management strategies and interventions to help people with SCI better cope with these significant complications. An individual's ability to self-manage their pain may be hindered by comorbid depression.<sup>35</sup> Thus, when developing and implementing self-management strategies, pain and depression might be better considered in conjunction, rather than separately. Currently there is a lack of research on self-management strategies for pain and depression among persons with SCI.

While self-management approaches have been used extensively in other conditions with pain and depression, the potential value for people with SCI remains in its infancy with key questions still unanswered. Key issues include, but are not limited to: what types of interventions work best for SCI?; when and where should these interventions be delivered?; who should deliver these interventions?; and what formats and supports are considered useful by those undergoing the intervention and those implementing them? The purpose of this scoping review was to examine the literature to determine what is known about the self-management of pain and depression through the use of pharmacological and non-pharmacological therapies in adults with SCI. In addition to identifying what is known, suggestions for future research were developed in order to fill gaps in the literature.

## Materials and methods

Scoping reviews are conducted to analyze the extent, range and nature of available research, determine if a systematic review is feasible, summarize and disseminate research findings and identify gaps in the literature.<sup>38</sup> This review was conducted using the six stage methodological framework of scoping reviews presented by Levac and colleagues.<sup>39</sup>

### Stage 1 – Identifying the research question

The research question leading this scoping review was: *What is known about the self-management of pain and depression through the use of pharmacological and non-pharmacological therapies in adults with SCI?* Through this scoping review we identified: (1) types of research studies on this topic and described various methods of pain and depression management being used; (2) characteristics of adults with SCI included in studies (e.g. etiology and level of injury, functional status, etc.); and (3) characteristics of interventions and outcomes (e.g. knowledge, attitudes and behaviors regarding self-management).

### Stage 2 – Identifying relevant studies

The search strategy, developed in consultation with a Medical Librarian in Rehabilitation Sciences at the University of Toronto, included literature between January 1, 1990 and June 13, 2017 using the following electronic databases: MEDLINE (Ovid Interface), EMBASE (Ovid Interface), PsycINFO (Ovid Interface), AMED (Ovid Interface), Cumulative Index to Nursing and Allied Health Literature (CINAHL) (EBSCO Interface), SPORTDiscus (EBSCO Interface) and Cochrane Library. Grey literature was searched on TSpace, Spinal Cord Injury Research Evidence, the Rick Hansen Institute, Spinal Cord Injury Ontario and the World Health Organization websites. A manual search of the included article reference lists was also performed to ensure all relevant articles were included.

The search strategy (Supplemental Material A) was developed based on appropriate indexing and command line syntax for each database. Relevant articles were identified by searching the following keywords using Boolean operators, truncation, wild cards and proximity operators: spinal cord injuries, self care, self-management, medication adherence, pain, depression. A previously published and recommended ‘gold standard’ search strategy for identifying spinal cord damage (not due to trauma) was adapted for each database and incorporated into our search.<sup>40</sup>

### Stage 3 – Study selection

Study selection was guided by Bramer’s three stage method<sup>41</sup> and managed using a reference manager software system (EndNote X8 software). Bramer’s three stage method is used for the de-duplication process; and the stages consist of (1) changing settings for displayed fields and installing custom export filters and formats; (2) importing articles from the seven databases into a temporary library, exporting them in an adapted

format and importing them into a new library; and (3) modifying the settings for fields to detect and remove duplicates.<sup>41</sup> The initial searches identified 2,081 articles, but after importing the articles to EndNote and removing duplicates using Bramer’s three stage method, 1,267 articles remained for further assessment (see Figure 1).

Included studies met the following criteria: (1) adults older than 18 years of age with SCI; (2) focused on self-management, which included concepts defined by Barlow and the categories of self-management described by Lorig and Holman;<sup>15,16</sup> (3) related to pain or depression; (4) peer-reviewed or grey literature; and (5) published from January 1, 1990 to June 13, 2017. To meet criteria two (focus on self-management), the article was required to mention or discuss one of the concept’s defined in Barlow’s definition of self-management (e.g. managing symptoms and treatment, psychosocial support, physical consequences, and lifestyle changes due to pain or depression) or at least one component of Lorig and Homan’s self-management framework. Lorig and Holman’s self-management framework describes the three self-management tasks and six self-management skills when implementing self-management education into healthcare systems (see Supplemental Material B).<sup>16</sup> The criteria for self-management were intentionally kept broad, as one of the purposes of this review was to characterize the types of self-management approaches in the literature for pain and depression.

Studies were excluded if they met any of the following criteria: (1) books, book chapters, opinion pieces, editorials, case studies/reports, case laws, trial papers, narratives; (2) published before January 1, 1990; (3) studies on animals; (4) population younger than 18 years of age; or (5) conference and poster abstracts without a published full-text article. Articles were excluded prior to 1990 given that the majority of research on self-management occurred after this date.<sup>15</sup>

The title and abstract screening was completed using a study-specific form to determine study eligibility and identify discrepancies between reviewers. Prior to beginning, 20 articles were independently screened by all three reviewers (LC, CD, SJTG); disagreements were discussed until consensus was reached. Two reviewers then independently screened the next 110 articles (LC and CD). The overall kappa agreement was 0.91; which is greater than the commonly accepted threshold of 0.80 for high agreement.<sup>42</sup> The remaining articles were screened by a single reviewer (LC). After the title and abstract screening, 169 articles were imported into Covidence (a software system for article review and

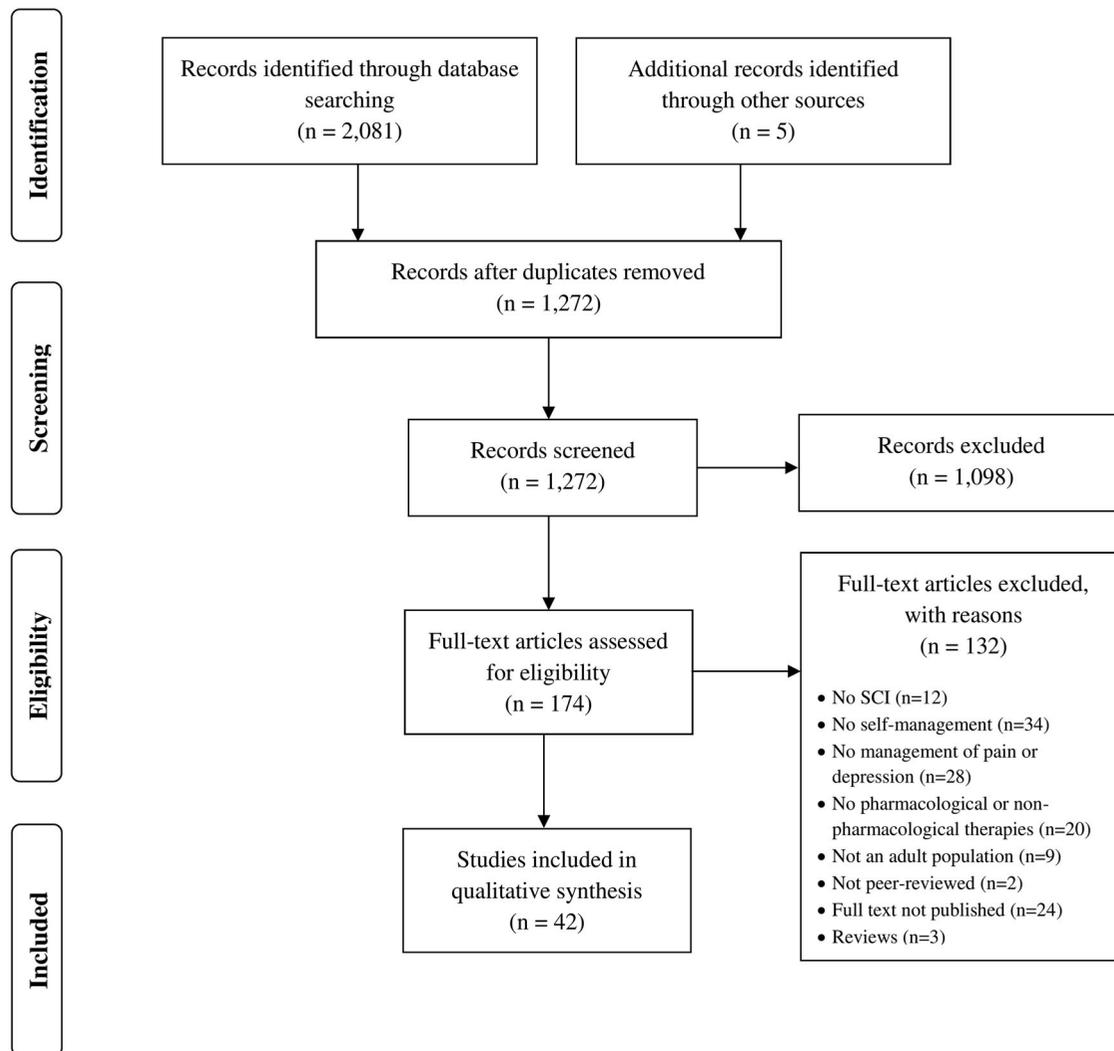


Figure 1 PRISMA flow diagram.

data extraction) for full-text review. Two reviewers (LC and CD) independently screened ten full-text articles, with a kappa agreement of 1.0 the remaining articles were screened by a single reviewer (LC). Following full-text analysis, 42 articles were included in the scoping review.

#### Stage 4 – Charting the data

A single reviewer (LC) charted the data using a data extraction form in Microsoft Excel. Questions that arose during data extraction were discussed with the core team (LC, SJTG, CD) who met on a weekly basis. The data extraction form was adapted from two frameworks: 1) Lorig and Holman's components of self-management framework as previously described<sup>16</sup> and 2) Ogallo and Kanter's framework.<sup>43</sup> Ogallo and Kanter's framework for medication therapy management was developed based on the parent models of medication therapy management service and chronic

care.<sup>43</sup> The collated data included general information, study characteristics, study population, population characteristics, intervention characteristics, self-management characteristics, and study outcomes and findings.

#### Stage 5 – Collating, summarizing, and reporting results

The data was extracted and entered into Microsoft Excel which allowed for analysis and comparison of different variables across multiple studies. Qualitative studies were reviewed to identify major themes.

#### Results

Of the 174 full-text articles reviewed, 132 were excluded and 42 articles met the inclusion criteria (see Figure 1). Of the included studies, 38 were identified from the literature search and four were found from other sources. Three literature reviews were identified (one literature

**Table 1 Study characteristics identified in scoping review of articles January 1, 1990 to June 13, 2017.**

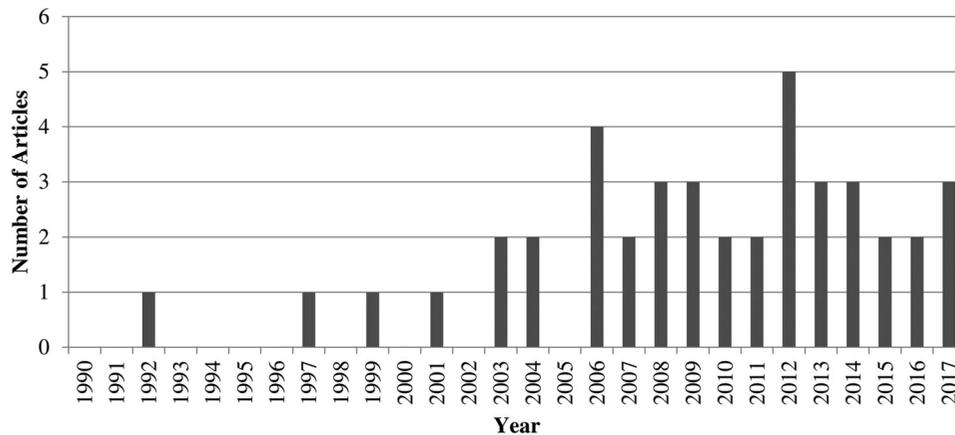
Author, (year), Country study was conducted	Objective	Method	Study Design	# of Participants
Norrbrink Budh <i>et al.</i> , (2006), Sweden <sup>44</sup>	To assess whether a comprehensive multidisciplinary pain management program contributes to improved sleep quality, mood, life satisfaction, health-related quality of life, sense of coherence and pain for patients with SCI and neuropathic pain.	Mixed Methods	Before after intervention, program evaluation, interview	38
Molton <i>et al.</i> , (2008), United States <sup>45</sup>	To test the Motivational Model of Pain Self-Management in adults with SCI-related pain.	Quantitative	Cross-sectional survey	130
Buscemi <i>et al.</i> , (2017), United Kingdom <sup>46</sup>	To explore how Italians with SCI-related CNP lived with their pain, what they knew about CNP, their experience of healthcare, and how their pain was best managed.	Qualitative	Interview, Focus groups	9
Norrbrink and Lundeborg, (2011), Sweden <sup>47</sup>	To explore the possibility of using acupuncture and massage therapy for relieving neuropathic pain following SCI.	Quantitative	Before after intervention	30
Rodgers <i>et al.</i> , (2007), United States <sup>48</sup>	To adapt a family psychoeducation model, multiple-family group treatment, for persons with brain and SCI and their families.	Mixed Methods	Before after intervention, focus groups, interviews	55
Curtis <i>et al.</i> , (2015), Canada <sup>49</sup>	To conduct a modified yoga program for individuals with SCI, in terms of both participant experiences and program satisfaction.	Mixed Methods	Pilot study, interview, program evaluation	11
Nawoczinski <i>et al.</i> , (2010), Australia <sup>50</sup>	To determine the effects of an exercise intervention on pain and functional disability in people with SCI and shoulder impingement symptoms.	Quantitative	Randomized controlled trial	41
Perry <i>et al.</i> , (2010), Australia <sup>51</sup>	To evaluate the effectiveness of a multidisciplinary cognitive-behavioral pain management program in people with SCI-related chronic pain.	Quantitative	Cross-sectional survey, program evaluation	36
Stuntzner, (2008), United States <sup>52</sup>	To determine if a self-study intervention helps people with SCI improve their emotional functioning.	Quantitative	Randomized controlled trial	16
Henwood <i>et al.</i> , (2012), Canada <sup>53</sup>	To provide insight into the experience and context of SCI individuals who live with CNP and have some degree of acceptance of their pain.	Qualitative	Interview	7
Kratz <i>et al.</i> , (2013), United States <sup>54</sup>	To examine if activity engagement and pain willingness predict adjustment to pain.	Quantitative	Longitudinal	164
Smith <i>et al.</i> , (2015), United Kingdom <sup>55</sup>	To investigate users' perceptions of physiotherapeutic interventions in the syringomyelia population.	Mixed Methods	Cross-sectional survey, interviews	49
Lofgren and Norrbrink, (2012), Sweden <sup>56</sup>	To identify strategies and treatments used by individuals with SCI for long-term neuropathic pain, and their experience, needs and expectations of pain management.	Qualitative	Interview	18
Henwood and Ellis, (2004), Canada <sup>57</sup>	To explore the experience of CNP in SCI patients relating to physical, emotional, psychosocial, environmental, informational, practical and spiritual domains, and to identify pain coping strategies.	Qualitative	Focus groups	24
Heutink <i>et al.</i> , (2011), Netherlands <sup>58</sup>	To describe pharmacological and non-pharmacological pain treatments used for CSCIP and examine their effectiveness.	Quantitative	Cross-sectional survey	215
Dorstyn <i>et al.</i> , (2012), Australia <sup>59</sup>	To determine whether an individualized counseling intervention delivered by telephone improves the emotional adjustment of adults with a newly acquired SCI.	Quantitative	Randomized controlled trial	40
Jensen <i>et al.</i> , (2009), United States <sup>60</sup>	To examine the effects of hypnosis intervention on pain intensity and depressive symptoms.	Quantitative	Randomized controlled trial	37
Curtis, K <i>et al.</i> , (2017), Canada <sup>61</sup>	To evaluate the effects of a specialized yoga program for individuals with a SCI on pain, psychological, and mindfulness variables.	Quantitative	Randomized controlled trial	22
Guest <i>et al.</i> , (1997), United States <sup>62</sup>	To determine if an electrical stimulation walking program results in a change of physical self-concept and depression.	Mixed Methods	Before after intervention, interview	15
Burns <i>et al.</i> , (2013), Canada <sup>63</sup>	To assess the effectiveness of an interdisciplinary pain program for persons with SCI and chronic pain.	Quantitative	Before after intervention	17
Zsoldos <i>et al.</i> , (2014), Hungary <sup>64</sup>	To promote the psychological adaptation and social reintegration of patients with SCI by reducing depression and feelings of isolation caused by the long hospitalization.	Qualitative	Interview	15

*Continued*

Table 1 Continued.

Author, (year), Country study was conducted	Objective	Method	Study Design	# of Participants
Hearn <i>et al.</i> , (2015), United Kingdom <sup>65</sup>	To achieve an understanding of the experience of chronic NP post-SCI and to explore what those living with it consider important in their experience.	Qualitative	Interview	8
Widerstrom-Noga <i>et al.</i> , (2017), United States <sup>66</sup>	To identify the importance of positive and negative contributors to living with chronic pain after SCI.	Mixed Methods	Cross-sectional survey	526
Heutink <i>et al.</i> , (2014), Netherlands <sup>67</sup>	To investigate the long-term outcomes of CONECISI, a multidisciplinary cognitive behavioral treatment program in persons with SCI.	Quantitative	Before after intervention	29
Widerstrom-Noga <i>et al.</i> , (2016), United States <sup>68</sup>	To define neuropathic pain phenotypes in persons with SCI, relationships between thermal pain sensitivity, overall neuropathic pain symptom severity, and pain coping strategies.	Quantitative	Longitudinal	119
Norrbrink and Löfgren, (2016), Sweden <sup>69</sup>	To explore patients' and physicians' needs and requests for improving the management of neuropathic pain following SCI.	Qualitative	Interview	16
Taylor <i>et al.</i> , (2012), United Kingdom <sup>70</sup>	To determine the temporal relationship between pain-related coping strategies and psychosocial factors during the subacute phase of SCI.	Quantitative	Longitudinal	26
Norrbrink Budh and Lundeberg, (2004), Sweden <sup>71</sup>	To assess which non-pharmacological treatments patients with SCI have tried or are using to relieve pain and evaluate their effectiveness from the patient's perspective.	Quantitative	Cross-sectional survey	90
Wilson, (2008), United States <sup>72</sup>	To identify the association between pain intensity and depressive outcome among persons with SCI.	Quantitative	Cross-sectional survey	60
Dorstyn <i>et al.</i> , (2010), Australia <sup>73</sup>	To examine the effectiveness of cognitive behavior therapy on the psychological adjustment of patients in rehabilitation for newly acquired SCI.	Quantitative	Non-randomized controlled trial	24
Molton <i>et al.</i> , (2009), United States <sup>74</sup>	To replicate and expand on previous work demonstrating associations between specific pain-related beliefs, coping, mental health, and pain outcomes in persons with SCI.	Quantitative	Cross-sectional survey	130
Radwanski, (1992), United States <sup>75</sup>	To identify reasons for the use of drugs and alcohol by people with chronic pain following SCI and to describe interventions that can be used when treating a patient with SCI who uses drugs and/ or alcohol.	Quantitative	Cross-sectional survey	16
McCasland <i>et al.</i> , (2006), United States <sup>76</sup>	To examine the prevalence of shoulder pain and functional impairment in patients with TSCI and to identify factors associated with shoulder pain and dysfunction.	Quantitative	Cross-sectional survey	63
Wollaars <i>et al.</i> , (2007), Netherlands <sup>77</sup>	To examine chronic pain prevalence in individuals with SCI and to determine the influence of psychological factors have on SCI pain and the impact on quality of life.	Quantitative	Cross-sectional survey	279
Phillips <i>et al.</i> , (2001), United States <sup>78</sup>	To present preliminary results on health-related outcomes of a randomized trial of telehealth interventions in people with SCI.	Mixed Methods	Randomized controlled trial, interview	111
Heutink <i>et al.</i> , (2012), Netherlands <sup>79</sup>	To evaluate the effectiveness of a cognitive behavioral therapy program.	Quantitative	Randomized controlled trial	61
Norrbrink, (2009), Sweden <sup>80</sup>	To assess the short-term effects of high- and low-frequency transcutaneous electrical nerve stimulation for neuropathic pain following SCI.	Quantitative	Cross-over study	24
Cardenas and Jensen, (2006), United States <sup>81</sup>	To determine the degree and duration of pain relief provided by specific chronic pain treatments used by individuals with SCI.	Quantitative	Cross-sectional survey	117
Widerstrom-Noga and Turk, (2003), United States <sup>82</sup>	To identify the types of pain treatments used after SCI and determine the role that pain characteristics and psychosocial and behavioral factors play in the use of prescription or non-prescription treatments.	Quantitative	Cross-sectional survey	120
Dalyan <i>et al.</i> , (1999), United States <sup>83</sup>	To determine the frequency and severity of upper extremity pain and to identify types of treatments that SCI patients received for UE pain and the benefits of these treatments.	Quantitative	Cross-sectional survey	130
Martin Ginis <i>et al.</i> , (2003), Canada <sup>84</sup>	To assess exercise as a strategy for reducing pain and improving subjective well-being in people with SCI.	Quantitative	Randomized controlled trial	30
Heutink <i>et al.</i> , (2013), Netherlands <sup>85</sup>	To determine associations of pain coping strategies and cognitions with pain intensity and pain-related disability.	Quantitative	Randomized controlled trial	47

## Articles Published Per Year



**Figure 2** Articles published each year during the period January 1, 1990 to June 13, 2017.

review and two systematic reviews). These reviews were not included in the final data extraction, but their reference lists were searched for relevant articles.

Key study characteristics of included articles are summarized in Table 1. The included articles consisted of seven qualitative studies, 28 quantitative studies and seven mixed method studies. These studies were conducted in seven countries: United States ( $n = 17$ ), Canada ( $n = 6$ ), Sweden ( $n = 6$ ), Netherlands ( $n = 5$ ), United Kingdom ( $n = 4$ ), Australia ( $n = 3$ ) and Hungary ( $n = 1$ ). As seen in Figure 2, from 1990 to 2002, a small number of studies ( $n = 4$ ) were published on the self-management of pain and/or depression in adults with SCI. There has been an upward trend since 2003, with 38 articles published on this topic in the last 15 years.

The overall sample sizes of the included studies were relatively small, with an average of 118 participants and median of 38 participants across all 42 studies. The variation in sample size was large, ranging from 7 participants to 526 participants. On average, the breakdown of the population based on sex was 69.6% male and 30.4% female. There were only three studies that had a greater percent of female participants than male.<sup>44,49,71</sup> Approximately three quarters of the studies reported the type of SCI ( $n = 31$ ) and the level of injury ( $n = 32$ ), with slightly more than half ( $n = 25$ ) reporting the participant's functional status. Of the 31 studies that reported the type of SCI, 20 studies had participants with both traumatic and non-traumatic injuries,<sup>44,47,49,51,53,56–59,61,63–65,67,69,73,77,79,80,85</sup> 10 studies had participants with only traumatic injuries<sup>45,62,66,70,72,74–76,81,84</sup> and 1 included participants with only non-traumatic injuries.<sup>55</sup> None of the studies reported if the participants were diagnosed with other comorbidities.

Approximately half ( $n = 20$ ) of the studies discussed or evaluated interventions ( $n = 11$  pain;  $n = 7$  depression;  $n = 2$  both), as seen in Table 2. Of the studies involving interventions, the method of delivery mostly included in-person ( $n = 16$ ), technology (e.g. online books with reflective responses and telephone counseling;  $n = 3$ ) and 1 using both in-person and technological components (e.g. self-hypnosis began with in-person sessions then used a compact disc (CD) recording and telephone interviews to assess pain intensity). Based on the description and content of the interventions, about half ( $n = 11$ ) were single-component (e.g. yoga), while the other half ( $n = 9$ ) were multi-component (e.g. included several components such as cognitive behavioral therapy (CBT) that consists of educational, cognitive, and behavioral elements). Approximately one quarter ( $n = 6$ ) used a multidisciplinary team to facilitate the intervention.

The majority of articles ( $n = 31$ ) focused on the self-management of pain. The most commonly used scales for measuring pain were the Numeric Rating Scale, Visual Analogue Scale, Brief Pain Inventory, Multidimensional Pain Inventory and the Chronic Pain Grade Scale. There were 11 studies that evaluated interventions for pain (Table 2), with the majority involving an in-person intervention ( $n = 10$ ). The majority ( $n = 9$ ) of these interventions focusing on pain had favorable outcomes, while two of the interventions showed no improvements in pain intensity. The two interventions (yoga and a pain management program<sup>44,61</sup>) that showed no improvements in pain intensity, did show favorable outcomes in mood, quality of sleep, self-compassion and symptoms of depression. There were seven qualitative studies identified, all of which focused on the self-management of

**Table 2 Intervention characteristics identified in scoping review of articles January 1, 1990 to June 13, 2017.**

Author, (year), Country study was conducted	Intervention	Description/ Content	Setting -Delivery Format	Frequency/ Duration	Facilitators	Results
<b>Pain Interventions</b>						
Norrbrink Budh <i>et al.</i> , (2006), Sweden <sup>44</sup>	Pain Management Program	A program consisting of educational sessions, behavior therapy, light exercise, relaxation techniques, stretching and body awareness training.	Not reported -In person, group	2/week for 10 weeks	Healthcare professional	Improved mood and quality of sleep, decreased demand for care, no reduction in pain intensities.
Norrbrink and Lundeberg, (2011), Sweden <sup>47</sup>	Medical acupuncture and massage therapy	Acupuncture (a) points were chosen individually and needles were inserted in areas with preserved sensation. Classical massage therapy (b) was carried out in areas with pain and preserved sensation.	Not reported -In person, individual	2/week for 6 weeks	Not reported	a) Improved energy, bladder/bowel, sleep, function, decreased allodynia, spasticity, medication; b) Less stiffness, spasticity, allodynia, painful attacks, medication, improved function, sleep, relaxation, circulation
Curtis <i>et al.</i> , (2015), Canada <sup>49</sup>	Yoga	A yoga program focusing on breath awareness, nonjudgmental attention to present experience, mindful movement, and a supportive environment.	Rehabilitation Center -In person, group	1/week for 8 weeks	Yoga Instructor	Positive experiences along emotional, mental, and physical dimensions.
Nawoczenski <i>et al.</i> , (2006), United States <sup>50</sup>	Exercise Program	A home exercise program consisting of stretching and strengthening exercises with elastic band resistance.	Home -In person, individual	1/day for 8 weeks	Self	Reduced pain and improved function and satisfaction.
Perry <i>et al.</i> , (2010), Australia <sup>51</sup>	Pain Management Program	PMP consisted of education about pain mechanisms and training in self-management skills.	Pain Management Center -In person	10 sessions for total of 45 hours	Clinical psychologist, PT, nurses, doctors	Improved SF-12 MCS and Multidimensional Pain Inventory (MPI) Life Interference scores.
Jensen <i>et al.</i> , (2009), United States <sup>60</sup>	Self-Hypnosis	The intervention consisted of hypnotic analgesia and self-hypnosis training.	Home -In person and technology (asynchronous)	Daily to weekly for 10 sessions	Clinician	Decreased average daily pain
Curtis <i>et al.</i> , (2017), Canada <sup>61</sup>	Yoga	Yoga classes included breathing practices, physical postures, yoga philosophy, mindfulness, and meditation/relaxation techniques.	Rehabilitation Hospital -In person, group	2/week for 6 weeks	Certified Iyengar yoga teachers	Increased self-compassion, decreased symptoms of depression, no improvements in pain intensity, interference, or catastrophizing.
Burns <i>et al.</i> , (2013), Canada <sup>63</sup>	Interdisciplinary Pain Program	The sessions included CBT, patient education, self-management strategies, group discussions and activities, and either group exercise or guided relaxation.	Rehabilitation Hospital -In person, group	Biweekly for 10 weeks	PT, OT, social worker	Increased incorporation and maintenance of coping strategies, less pain interference and a greater sense of control.
Heutink <i>et al.</i> , (2014), Netherlands <sup>67</sup>	Multidisciplinary Program	The program comprises educational, cognitive, and behavioral elements targeted at coping with CNSCIP.	Rehabilitation Center -In person, group	1/week for 10 weeks	PT, nurse, psychologist	Favorable long-term outcomes on pain intensity, pain-related disability, anxiety and activity participation.
Heutink <i>et al.</i> , (2012), Netherlands <sup>79</sup>	Cognitive Behavioral Therapy	The intervention consisted of educational, cognitive, and behavioral elements designed for people with CNSCIP.	Rehabilitation Center -In person, group	1/week for 10 weeks	psychologist, PT, nurse practitioner, peer	Decreased pain intensity and anxiety, increased participation in activities.
Heutink <i>et al.</i> , (2013), Netherlands <sup>85</sup>	Cognitive Behavioral Therapy	The CBT program comprises educational, cognitive, and behavioral elements to cope with SCI.	Rehabilitation Center -In person, group	1/week for 10 weeks	Psychiatrist, trainer	Improved pain coping strategies and pain cognitions.

Depression Interventions						
Rodgers <i>et al.</i> , (2007), United States <sup>48</sup>	Multiple Family Group Treatment	A psychoeducational management intervention designed to assist families and patients with their coping and illness management skills.	Rehabilitation center -In person, group	2/month for 12–18 months	Clinicians, social worker, OT, PT, speech pathologists, RN Researcher	Improved happiness with life, satisfaction, psychosocial well-being, decreased depressive symptoms and anger. Decreased depression
Stuntzner, S. M., (2008), United States <sup>52</sup>	Coping Effectively with SCI	A program consisting of reading specific chapters and answering questions to reflect on experiences and feelings.	Home -Technology (asynchronous)	~ 1/week for 8 weeks		
Dorstyn <i>et al.</i> , (2012), Australia <sup>59</sup>	Telecounseling Program	Group-based or individual counseling delivered via telephone, telecounseling.	Home -Technology (synchronous)	Biweekly for 12 weeks	Psychologist	Improved mood and the use of SCI-specific coping skills.
Guest <i>et al.</i> , (1997), United States <sup>62</sup>	Electrical Stimulation Walking Program	The system consists of a microprocessor-controlled stimulator and a modified walking frame with user controlled, finger-operated switches that activate stepping.	Research Laboratory -In person	32 sessions	Not reported	Statistically significant changes in scores on the Physical Self subscale of the TSCS and the Beck Depression Inventory.
Zsoldos <i>et al.</i> , (2014), Hungary <sup>64</sup>	Animal Assisted Intervention	An intervention that intentionally involves animals in the therapeutic process.	Hospital -In person, group	2/week for 5 weeks	First author, psychologist, therapeutic dog guides, conservator Psychologist	Positive changes affecting emotional state, improved socialization and group cohesion.
Dorstyn <i>et al.</i> , (2010), Australia <sup>73</sup>	Cognitive Behavioral Therapy	CBT incorporated confidence building, education surrounding the emotional impact of SCI, stress and symptom relief and coping skills.	Rehabilitation Center -In person	Biweekly for average of 11 sessions		Improved depression scores which then significantly declined post-intervention.
Phillips <i>et al.</i> , (2001), United States <sup>78</sup>	Telehealth – Telephone Counseling	Educational initiatives to promote rehabilitation following discharge after initial spinal cord injury.	Home -Technology, synchronous	1/week for 5 weeks, 1/2 weeks for 4 weeks	Nurse	Depressive symptoms declined for all three groups.
Pain and Depression Interventions						
Norrbrink, (2009), Sweden <sup>80</sup>	Transcutaneous Electrical Nerve Stimulation (TENS)	Patients self delivered the treatment involving a stimulator and four self-adhesive electrodes.	Home -In person, individual	3/day for 3 weeks	Self	Low frequency and high frequency TENS had no statistically significant effect on any parameters.
Martin Ginis <i>et al.</i> , (2003), Canada <sup>84</sup>	Exercise Program	Exercise training sessions included stretching, aerobic arm ergometry and resistance exercise.	Rehabilitation Center -In person, group	24 sessions (ideal: 2/week for 12 weeks)	PT and kinesiology students	Reduced stress, pain, and depression, better physical self-concept and quality of life.

PT, physical therapist; OT, occupational therapist; RN, registered nurse; CBT, cognitive behavioral therapy; NP, neuropathic pain; CNSCIP, chronic neuropathic spinal cord injury pain.

pain. The qualitative studies highlighted the following themes: living with and the impact of pain, coping strategies, understanding pain, informal and formal support systems, and the importance of empowerment and autonomy with self-management.

Of all the included articles, only seven focused on the self-management of depression. The most frequently used measurements for depression were the Beck Depression Inventory, the Hospital Anxiety and Depression Scale and the Center for Epidemiological Studies – Depression Scale. As seen in [Table 2](#), just under half of the interventions ( $n = 3$ ) for depression used technological components (e.g. telephone counseling and CD recordings for self-hypnosis), while just over half ( $n = 4$ ) included in-person components. All of the depression interventions demonstrated improvements in depression or depressive symptoms, psychological well-being, emotional state or mood. One of the interventions targeting both pain and depression resulted in reduced pain and depression, while the other had no significant effect on either. There were no qualitative studies identified on the self-management of depression.

Only four studies included all of Lorig and Holman's core self-management tasks and skills ([Table 3](#)). Of the core tasks, all identified medical management ( $n = 42$ ), just over half identified emotional management ( $n = 23$ ) and only one quarter identified role management ( $n = 11$ ). The types of medical management consisted of non-pharmacological therapies ( $n = 27$ ) or a combination of non-pharmacological and pharmacological therapies ( $n = 15$ ). The most common types of non-pharmacological therapies discussed were exercise ( $n = 16$ ), massage ( $n = 13$ ), relaxation ( $n = 10$ ), acupuncture ( $n = 9$ ) and Transcutaneous Electrical Nerve Stimulation (TENS) ( $n = 9$ ). Antidepressants ( $n = 6$ ), anticonvulsants ( $n = 5$ ), opioids ( $n = 4$ ) and non-steroidal anti-inflammatory drugs (NSAIDs) ( $n = 4$ ) were the most commonly reported pharmacological therapies.

The studies that included all of the self-management tasks and skills were two CBT programs,<sup>73,85</sup> a pain management program<sup>44</sup> and a multidisciplinary program.<sup>67</sup> CBT programs are comprised of educational, cognitive and behavioral elements in order to improve coping skills for individuals with SCI. One CBT program<sup>85</sup> was conducted by a psychologist and a trainer at a rehabilitation center once per week for ten weeks. The program included a personal workbook that consisted of all of the program components such as: goal setting, information on relaxation techniques and communication. This program resulted in improved pain cognitions and pain coping strategies. The other CBT program that included all self-management tasks

and skills was conducted by a psychologist at a rehabilitation center biweekly for an average of 11 sessions, which resulted in improved depression scores.<sup>73</sup> A key component of the CBT program was the development of coping skills including problem solving, cognitive appraisal skills and behavioral activation which align with the components of self-management. The pain management program was comprised of educational sessions, behavioral therapy, light exercise, relaxation techniques, stretching, and body awareness training to assess its effect on a number of different outcomes (pain intensity, sleep quality, mood, life satisfaction, health-related quality of life and sense of coherence).<sup>44</sup> The specific self-management components of the program were goal setting and continuing home assignments. This program consisted of two sessions per week for ten weeks and resulted in improved mood and quality of sleep, but had no reduction in pain intensity. The multidisciplinary program was delivered by a physical therapist, nurse and psychologist and consisted of education, cognitive and behavioral elements that target patients coping with chronic neuropathic SCI pain.<sup>67</sup> A workbook was provided to each participant with information and exercises on goal-setting, communication, relaxation techniques and relationships. This program occurred once per week for ten weeks and displayed favorable long-term outcomes on pain intensity, pain-related disability, anxiety and participation in activities.

Another important finding in this review is the concentration of studies focused on non-pharmacological therapies, instead of evaluating self-management through the use of pharmacological treatments and perhaps more importantly, using both. In our review of the qualitative studies (see [Table 4](#)) challenges with pharmacotherapies were highlighted. Common challenges included multiple drug treatments, reliance on medication and ineffective drug treatments. Of the 20 interventions identified in this review, only one included both pharmacological and non-pharmacological components to managing pain.<sup>44</sup>

## Discussion

This scoping review analyzed the extent, range and nature of available research on what is known about the self-management of pain and depression through the use of pharmacological and non-pharmacological therapies in adults with SCI. Our findings showed that the majority of studies have focused on the self-management of pain, with a minimal number focusing on the self-management of depression or both pain and depression. All of the included articles focused on the

**Table 3 Components of self-management identified in scoping review of articles January 1, 1990 to June 13, 2017<sup>+</sup>**  
 ✓ – identified in article; X – not identified.

Study	Core Tasks			Core Skills					
	Medical Management	Emotional Management	Role Management	Problem Solving	Decision Making	Resource Utilization	Forming Partnerships	Taking Action	Self-Tailoring
Norrbrink Budh <i>et al.</i> , (2006), Sweden <sup>44</sup>	✓	✓	✓	✓	✓	✓	✓	✓	✓
Heutink <i>et al.</i> , (2014), Netherlands <sup>67</sup>	✓	✓	✓	✓	✓	✓	✓	✓	✓
Heutink <i>et al.</i> , (2013), Netherlands <sup>85</sup>	✓	✓	✓	✓	✓	✓	✓	✓	✓
Dorstyn <i>et al.</i> , (2010), Australia <sup>73</sup>	✓	✓	✓	✓	✓	✓	✓	✓	✓
Rodgers <i>et al.</i> , (2007), United States <sup>48</sup>	✓	✓	✓	✓	✓	X	✓	✓	X
Perry <i>et al.</i> , (2010), Australia <sup>51</sup>	✓	✓	X	✓	✓	✓	X	✓	✓
Burns <i>et al.</i> , (2013), Canada <sup>63</sup>	✓	✓	✓	X	✓	✓	X	✓	✓
Heutink <i>et al.</i> , (2012), Netherlands <sup>79</sup>	✓	✓	X	X	✓	✓	✓	✓	X
Henwood and Ellis, (2004), Canada <sup>57</sup>	✓	✓	✓	✓	✓	X	X	✓	X
Kratz <i>et al.</i> , (2013), United States <sup>54</sup>	✓	✓	✓	✓	X	X	X	✓	X
Stuntzner, S. M., (2008), United States <sup>52</sup>	✓	✓	X	X	X	✓	X	✓	✓
Lofgren and Norrbrink (2012), Sweden <sup>56</sup>	✓	X	X	✓	✓	X	X	✓	✓
Dorstyn <i>et al.</i> , (2012), Australia <sup>59</sup>	✓	✓	✓	X	✓	X	X	✓	X
Cardenas and Jensen, (2006), United States <sup>81</sup>	✓	X	X	✓	✓	X	X	✓	✓
Widerstrom-Noga and Turk, (2003), United States <sup>82</sup>	✓	X	X	✓	✓	X	X	✓	✓
Phillips <i>et al.</i> , (2001), United States <sup>78</sup>	✓	✓	✓	X	X	X	✓	✓	X
Martin Ginis <i>et al.</i> , (2003), Canada <sup>84</sup>	✓	✓	X	X	X	✓	✓	✓	X
Zsoldos <i>et al.</i> , (2014), Hungary <sup>64</sup>	✓	✓	X	X	✓	✓	X	✓	X
Molton <i>et al.</i> , (2008), United States <sup>45</sup>	✓	X	X	X	X	✓	X	✓	✓
Curtis <i>et al.</i> , (2015), Canada <sup>49</sup>	✓	✓	X	X	X	✓	X	✓	X
Guest <i>et al.</i> , (1997), United States <sup>62</sup>	✓	✓	X	X	X	X	X	✓	✓
Norrbrink and Löfgren, (2016), Sweden <sup>69</sup>	✓	X	X	✓	X	X	X	✓	✓
Wilson, (2008), United States <sup>72</sup>	✓	✓	X	X	X	X	X	✓	✓
Wollaars <i>et al.</i> , (2007), Netherlands <sup>77</sup>	✓	✓	X	X	X	X	X	✓	✓
Norrbrink, (2009), Sweden <sup>80</sup>	✓	✓	X	X	X	X	X	✓	✓

Continued

Table 3 Continued.

Study	Core Tasks			Core Skills					
	Medical Management	Emotional Management	Role Management	Problem Solving	Decision Making	Resource Utilization	Forming Partnerships	Taking Action	Self-Tailoring
Dalyan <i>et al.</i> , (1999), United States <sup>83</sup>	✓	X	✓	X	X	X	X	✓	✓
McCasland <i>et al.</i> , (2006), United States <sup>76</sup>	✓	X	X	X	X	X	X	✓	✓
Buscemi <i>et al.</i> , (2017), United Kingdom <sup>46</sup>	✓	X	X	X	X	X	X	✓	✓
Norrbrink and Lundeberg, (2011), Sweden <sup>47</sup>	✓	✓	X	X	X	X	X	✓	X
Jensen <i>et al.</i> , (2009), United States <sup>60</sup>	✓	✓	X	X	X	X	X	✓	X
Curtis <i>et al.</i> , (2017), Canada <sup>61</sup>	✓	✓	X	X	X	X	X	✓	X
Molton <i>et al.</i> , (2009), United States <sup>74</sup>	✓	X	X	X	X	X	X	X	✓
Radwanski, (1992), United States <sup>75</sup>	✓	X	X	X	X	X	X	X	✓
Taylor <i>et al.</i> , (2012), United Kingdom <sup>70</sup>	✓	X	X	X	X	X	X	X	✓
Norrbrink Budh and Lundeberg, (2004), Sweden <sup>71</sup>	✓	X	X	X	X	X	X	X	✓
Hearn <i>et al.</i> , (2015), United Kingdom <sup>65</sup>	✓	X	X	X	X	X	X	X	✓
Widerstrom-Noga <i>et al.</i> , (2017), United States <sup>66</sup>	✓	X	X	X	X	X	X	X	✓
Henwood <i>et al.</i> , (2012), Canada <sup>53</sup>	✓	X	X	X	X	X	X	X	✓
Nawoczenski <i>et al.</i> , (2006), United States <sup>50</sup>	✓	X	X	X	X	X	X	✓	X
Widerstrom-Noga <i>et al.</i> , (2016), United States <sup>68</sup>	✓	X	X	X	X	X	X	✓	X
Heutink <i>et al.</i> , (2011), Netherlands <sup>58</sup>	✓	X	X	X	X	X	X	✓	X
Smith <i>et al.</i> , (2015), United Kingdom <sup>55</sup>	✓	X	X	X	X	X	X	✓	X

<sup>+</sup>See Supplemental material B for definitions and examples of the core self-management tasks and skills outlined by Lorig and Holman.<sup>16</sup>

\*Studies are organized by the integration of self-management tasks and skills from highest to lowest.

**Table 4 Themes from qualitative studies identified in scoping review of articles January 1, 1990 to June 13, 2017.**

Study	Themes Identified	Explanation of Theme
Buscemi <i>et al.</i> , (2017), United Kingdom <sup>46</sup>	The continuous influence of pain on life	Pain negatively impacts all aspects of one's life including: work, physical and mental well-being, relationships, etc.
	Constructing knowledge about living with CNP <sup>a</sup> Developing specialist practice	Determining what triggers pain, so individuals are able to better manage it in daily life Providing individual input and perspectives to improve healthcare and limit the burden of living with pain
Henwood <i>et al.</i> , (2012), Canada <sup>53</sup>	Comprehending the Perplexity of CNP	Understanding the unpredictable nature of pain and how it affects one's physical and psychosocial well-being
	Seeking Pain Resolution	Finding ways to alleviate suffering caused from pain, holding a belief that there is a cure for CNP
	Acknowledging Pain Permanence	Learning to accept and deal with pain
	Redefining Core Values	Considering life aspirations and learning to move forward despite living with pain
Lofgren and Norrbrink, (2012), Sweden <sup>56</sup>	Learning to Live with the Pain	A process in which one's cognitive, emotional and behavioral approach to coping with pain was adapted
	Integrating Pain	Using pain management strategies in order to live an active life and discover one's identify
	Pain is my problem	Pain negatively impacts multiple areas of one's daily life including sleep
Henwood and Ellis, (2004), Canada <sup>57</sup>	Drugs - the health care solution	Experiences of pharmacological treatment, increased doses or alternative drugs when medication failed
	The gap in my meeting with health care	Positive and negative experiences when interacting with health care staff surrounding pain management
	But ... this works for me	Effective complementary methods and strategies for coping with pain
	Nature of pain	Includes types, pain onset, distribution, descriptors, severity, patterns and augments
Zsoldos <i>et al.</i> , (2014), Hungary <sup>64</sup>	Coping	Strategies to manage pain resulting in some adjustment
	Medication failure	Pain relief is not adequate and occurrence of problematic side effects
Hearn <i>et al.</i> , (2015), United Kingdom <sup>65</sup>	Pain impact	Consequences of living with pain, how it affects daily life
	Building relationships/asking for help	The team-building, cohesive aspect of the program allowed for new friendships and confidence asking for/giving help
Norrbrink and Löfgren, (2016), Sweden <sup>69</sup>	The chasm between biomedical perspectives and patient beliefs and needs	Reliance on insufficient medication, unmet expectations resulting in lost faith in healthcare professionals, no input into own care
	The battle for ultimate agency in life	Inability to control pain, learning to accept/live with disturbance of pain
	The coexistence of social cohesion and social alienation	Sense of belonging and support from SCI community, but isolated from the able-bodied community
	Limitations in structure	Treatments are physician oriented and mainly pharmacological drugs, care decreases over time, lack of pain rehabilitation
Lack of support and competence	Lack of support and competence	Lack of knowledge and support, must find information on learning to live with pain by themselves
	Frustrations	Distrust and lack of interest from health care team, sense of hierarchy in meetings with physicians, powerlessness
	Needs and requests	Knowledge about pain and living with pain, complementary treatments, support, accessibility to acute help, use of multidisciplinary teams

<sup>a</sup>CNP, chronic neuropathic pain.

core task of medical management with fewer focused on core tasks of emotional and role management. Our review highlighted a need for future research to address the following: (1) incorporate all three core self-management tasks (medical management, emotional management and role management); (2) utilize a multidisciplinary approach focusing both on pain and depression; (3) evaluate both pharmacological and non-pharmacological therapies; and (4) describe more details about population demographics and clinical characteristics.

Given the complexity of SCI, it is important for self-management interventions to address all three key domains of self-management.<sup>86</sup> In a recent systematic review of qualitative studies, Liddy *et al.* examined the perspectives of patients with multiple chronic conditions and the challenges with self-management.<sup>86</sup> The complexity of self-managing multiple chronic conditions was highlighted, as symptoms are often independent, such as pain and depression.<sup>86</sup> The coexistence of pain and depression often results in more negative clinical outcomes, health utilization and overall health and well-being.<sup>87–89</sup> The interdependency of symptoms highlights the need for self-management interventions to be multi-faceted and comprehensive. In particular, most of the challenges identified in Liddy *et al.*'s review were related to medical and emotional management of symptoms. Given that persons with SCI often have multiple chronic conditions,<sup>90,91</sup> findings from this review reinforce the need for self-management interventions to target not only medical management, but also emotional and role management.

Similarly, there is evidence to support multidisciplinary approaches for persons with multimorbidity.<sup>92,93</sup> Of the included articles, slightly less than half of the interventions reported using multidisciplinary teams to facilitate interventions. Psychologists, physical therapists and nurses were common members of the multidisciplinary teams identified in our scoping review. In our scoping review, the interventions with a multidisciplinary team facilitating the intervention were effective in the improvement of pain, depressive symptoms, coping strategies, sense of control and socialization. These positive outcomes suggest the need for more research to be done in this area. Previous research has highlighted the importance of a multidisciplinary team approach for managing SCI and secondary complications.<sup>94,95</sup> For example, Derakhshanrad and colleagues found that the use of a multidisciplinary team comprised of a neurosurgeon, urologist, occupational therapist, colorectalologist, psychologist, physiatrist and nurse specialist was effective in improving the functional outcome, as

measured by the Spinal Cord Independence Measure, in patients with SCI.<sup>95</sup> In addition to improving patient outcomes, Alizo *et al.*, recently demonstrated that a multidisciplinary team consisting of a physical therapist, occupational therapist, respiratory therapist, nutritionist, pharmacist, wound care specialist and neurosurgical and orthopedic services for persons with traumatic SCI improved hospital outcomes and reduced the length of hospital stays.<sup>96</sup>

In addition to using multidisciplinary approaches, there is evidence to support the use of technology for individuals with multimorbidity. Our scoping review identified a total of four interventions that included a technological component. The technologies used for the interventions identified in this review include: online books with reflective responses, two telephone counseling programs and self-hypnosis which incorporated a CD recording. In particular, the use of telephone-based counseling is attractive for this population since there is evidence showing that this modality can improve coping skills, increase levels of community integration and reduce depression in adults with physical disabilities. Similarly, a systematic review by Dorstyn, Mathias and Denson identified that telecounseling services following SCI can improve the management of pain and sleep difficulties.<sup>97</sup> As technology continues to increase in popularity for self-management, technological interventions for individuals with SCI should be investigated.

This scoping review highlights a lack of studies that focus on self-management through the use of pharmacological treatments, as the primary concentration is on non-pharmacological treatments. While pharmacological treatments are commonly recommended and prescribed,<sup>98</sup> there is limited published literature to date on *how adults with SCI self-manage their pain and/or depression through the use of medications* (e.g. knowledge, attitudes and beliefs about medication, how persons are communicating about medications with care providers, monitoring side effects and outcomes). While it is known that when used in conjunction, pharmacological and non-pharmacological therapies are beneficial for the management of pain,<sup>99,100</sup> our review highlighted a gap in interventions using both, as there was only one intervention that incorporated both for the management of pain.<sup>44</sup> This gap further emphasizes the importance for future research to incorporate self-management strategies that focus on both pharmacological and non-pharmacological components.

Finally, we found a lack of consistency in reporting on sociodemographic and clinical characteristics of the study populations. Characteristics that were often not

reported or not consistently reported include: income, ethnicity, use of mobility devices, employment status, type of SCI, level of injury, functional status and geographic location. There were 11 studies in this review that neglected to classify the type of injury as traumatic or non-traumatic. Of the 31 studies that did specify the type of injury, the majority did not examine how the self-management strategies or intervention outcomes differed by type of injury. Given the differences in age and sex profiles for persons with traumatic SCI and non-traumatic SCI, with an older and more even sex distribution among the latter group,<sup>101</sup> it is important to understand how population characteristics may impact self-management strategies which may inform the tailoring of programs to specific populations for optimal success.

Based on our scoping review, there have been no peer-reviewed studies to date on the SCI population regarding sex and gender differences in self-management. This review highlighted a gap in the literature examining self-management among women with SCI, with a bias for research among men with SCI, as we only identified two of the included articles to have more female participants. The two articles with more female participants were Curtis *et al.*'s yoga program and Norrbrink Budh and Lundeberg's cross-sectional study assessing what non-pharmacological treatments have been and are being used.<sup>49,71</sup> Moreover, men and women also have different responses to multimodal pain management programs that consist of individual treatments (doctor's appointments, physical therapy and psychotherapy) and group treatments (relaxation techniques, physical therapy, CBT, pain education, nutrition advice and social counseling).<sup>102</sup> Furthermore, future research should investigate self-management interventions with a focus on strategies for women with SCI in managing their pain and depression.

### Limitations

Despite an exhaustive search of seven electronic databases and grey literature, it is possible that relevant articles were missed and therefore, not included in the review. In order to minimize the possibility of missed articles, our search strategy was adapted to search text words and keywords that included all key concepts relating to SCI, self-management, pain and depression. It is possible we missed studies that focused on self-management for SCI in general and may have discussed pain and depression but were not flagged with our search strategy. In addition, we conducted a manual search of the reference lists of included articles. Results of self-

management tasks and skills were limited to studies that explicitly mentioned, incorporated as part of the intervention, or evaluated as an outcome. It is possible that studies were measuring more self-management tasks or skills, but they were not explicitly mentioned. Since this is a scoping review, there is no assessment of the quality of the interventions discussed.

### Conclusion

This scoping review analyzed the extent, nature and range of available research pertaining to the topic of the self-management of pain and depression in adults with SCI. Multiple gaps were revealed as the extent of information was limited in several areas; thus leading to the following recommendations for future research: self-management interventions should incorporate components of emotional, role and medical management; interventions should be multifaceted and evaluate both pharmacological and non-pharmacological therapies; and interventions should address multimorbidity and ways to support the self-management of co-existing pain and depression. Additionally, a lack of consistency in reporting sociodemographic and clinical characteristics was identified. Having an understanding of these characteristics of the SCI populations would allow for the gathering of clues about potential differences between groups (e.g. women vs. men, those of low vs. high level of education or income status, those living in an urban vs. rural area, those with traumatic SCI vs. non-traumatic SCI) and preferences for types of delivery (e.g. face to face or telephone/internet-based, mobile apps), and by whom (e.g. multidisciplinary team). By focusing future research in the recommended areas, improvements can be made in the understanding of how self-management strategies impact pain and depression for adults with SCI.

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