

## Can Pain Neuroscience Education Change Older Adult's Beliefs About Pain Medication?

Greg Alwick, PT, DPT, OCS<sup>1</sup>, Adriaan Louw, PT, PhD<sup>2\*</sup>, Jessie Podalak, PT, DPT<sup>3</sup>, Hailey Louw<sup>4</sup>, Terry Cox PT, DPT, OCS, FAAOMPT<sup>5</sup>

<sup>1</sup>Evidence in Motion Pain Fellowship, North Country Healthcare, Gorham Patient Care Center, 167 Main st. Gorham, NH 03581

<sup>2</sup>Evidence in Motion Pain Fellowship, 618 Broad Street, Suite B, Story City, IA 50248

<sup>3</sup>Evidence in Motion Pain Fellowship, Phileo Health, 1500 Deerfield Road, Eau Claire, WI, 54701

<sup>4</sup>University of Wisconsin – Madison, Department of Statistics, 1300 University Avenue, Madison, WI 53706

<sup>5</sup>Southwest Baptist University, Davis Physical Therapy Building, 1600 University Ave, Bolivar, MO 65613

\***Corresponding Author:** Adriaan Louw, PT, PhD, Evidence in Motion Pain Fellowship, 618 Broad Street, Suite B, Story City, IA 50248.

**Received date:** 11 April 2023; **Accepted date:** 09 May 2023; **Published date:** 13 May 2023

**Citation:** Alwick G, Louw A, Podalak J, Louw H, Cox T (2023) Can Pain Neuroscience Education Change Older Adult's Beliefs About Pain Medication?. J Med Case Rep Case Series 4(08): <https://doi.org/10.38207/JMCRCS/2023/MAY04080246>

**Copyright:** © 2023 Adriaan Louw, PT, PhD. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

### Abstract

**Background:** Pain neuroscience education (PNE) has been shown to increase knowledge of pain and improve cognitions and beliefs regarding pain. Most positive shifts in beliefs have focused on the connection between tissue health and pain. No study has ever explored whether increased pain knowledge may shift non-medical providers' thoughts about pain medication.

**Objective:** To determine if a community-delivered PNE educational session for older adults can positively shift beliefs regarding pain medication.

**Design:** Case series with pre- and immediate post-intervention measurements.

**Methods:** A convenience sample of older adults who voluntarily signed up for a series of community events/lectures attended a 45-minute, 40-slide PNE PowerPoint™ presentation by a physical therapist. Before and immediately after PNE, pain knowledge, pain beliefs regarding pain and aging (Likert scale), and ideas about pain medication were assessed.

**Results:** Twenty-six participants (9 females), with a mean age of 74.3 years, attended the session. Immediately following education, pain knowledge improved by 16.4% ( $p < 0.001$ ), while all beliefs regarding pain and aging improved with two reaching significant differences ("*The older I become, the more pain I have due to degeneration*" ( $p = 0.001$ ); "*I hurt because of the bodily damage I sustained when I was younger*" [ $p = 0.010$ ]). Regarding pain medication, all beliefs regarding pain medication shifted positively, with two reaching significances after education: "*Most pain medicines are addictive*" ( $p = 0.010$ ) and "*If doctors had more time with patients, they would prescribe fewer pain medicines*" ( $p = 0.007$ ).

**Conclusion:** A community-based educational session for older adults improves pain knowledge, which drives healthier beliefs regarding pain medication. Larger-scaled studies using control groups and long-term follow-up are needed to validate these early, immediate post-education results.

### Keywords

- Pain neuroscience education
- Older adults
- Pain literacy
- Medication beliefs

### Introduction

Pain is a universal human experience and affects all people of all ages [1]. Pain is typically studied in adult populations aged 18-65 [2] but is also very prevalent in people under 18 and over 65 [3]. It has been shown that approximately one in five children and adolescents experience pain regularly, while on the other end of the age spectrum, pain, including chronic pain, is joint in older adults aged 65 and above [3,4]. With baby boomers now exhibiting longer life expectancy than before, it is projected that older adults will become a more significant

portion of the population, bringing issues surrounding their healthcare. This age group contains the largest share of health issues about cancer, cardiovascular disease, arthritis, Parkinson's disease, etc. Afron, in 1995 already showed that adults aged 65 and above account for 13% of the population yet consume nearly one-third of all medications [5].

When pain is experienced, a person aims to find ways to decrease and eliminate it. Treatment choices can vary from benign, self-help

strategies on the one end of the spectrum to invasive, drastic approaches, including surgery, opioids, injections, and more [6]. Within this spectrum of choices, another scope exists regarding pharmaceutical interventions. Patients may use over-the-counter, non-prescribed medications or supplements to ease pain [7], whereas powerful addictive narcotics often represent the other side of the pharmaceutical spectrum [8]. In the United States, the opioid epidemic is well-described and has reached epidemic proportions [9]. With increased awareness, legislation, and education, the opioid epidemic showed some levels of slowing down but was accelerated during the coronavirus of 2019 pandemic [10]. Tied into the issues with pain, pharmacology, and older adults is polypharmacy, the simultaneous use of multiple drugs to treat a single ailment or condition. The prevalence of polypharmacy ranges from 4 % among community-dwelling, more senior people to over 96.5 % in hospitalized patients, and numerous adverse clinical outcomes are associated with polypharmacy [11]. In a large-scale review of over 2 billion patient visits, Young et al. reported an overall prevalence of polypharmacy at 65.1 % [12]. Specific to the pain epidemic, it has been shown that pain medications are the most frequently prescribed medications in older adults associated with polypharmacy [12,13].

## Methodology

### Study

Before the study, institutional review board approval was obtained from Southwest Baptist University. Participants were asked to provide written consent for participation in the study, and the study followed the Helsinki Declaration of Ethics for medical research. The study was a case series with pre- and immediate post-intervention measures with no personally identifiable information collected.

### Participants

Based on the study's goals, various community and hospital educational centers in New Hampshire were contacted to participate in the survey since they provide regularly scheduled community talks for older adults. These hospitals and community centers host regular speakers at various events, and the pain neuroscience education (PNE) lecture was added to the schedule of events and advertised to their clients. Attendance of the events was entirely voluntary, free of charge, and open to anyone signing up for the presentation. These hospitals and community centers were chosen after one of the authors (GA) approached them to do these presentations as part of his pain fellowship community outreach project. The specific author regularly speaks at community events on physical health and physical therapy topics. The author recently completed a 6-month PNE post-graduate certification and enrolled in a post-professional pain fellowship focusing on PNE. His educational exposure to PNE, a score of > 90 % on the neurophysiology of pain questionnaire, and clinical experience using PNE align with the previous study's minimum requirement to have professional experience and knowledge in PNE

Beliefs and attitudes about illness influence adherence to treatment, including taking medication [14]. Older adults believe and are taught by society and medical providers that with aging comes pain [5, 15]. This belief is not based on current pain science. If aging and pain are synonymous, then only older adults should experience pain, whereas it's been shown that children, adolescents, and adults experience high pain rates [4]. Various normative studies have shown that the aging of joints found on imaging does not correlate to pain, be it back, neck, knee, or shoulder joints [16-18].

In contrast, it has been shown that decreased movement and activity in older adults are associated with pain but not aging [15]. This is important because if older adults expect pain due to their beliefs about pain, it will drive more use of pain medication. In recent years, older adult studies have shown that when older adults are taught more about pain, it yields positive shifts in movement, pain experience, knowledge of pain as well as beliefs about pain, including decreasing the idea that aging and pain are synonymous [5,15,19]. No study we're aware of has tested whether increased pain knowledge and beliefs alter older adults' beliefs about pain medication. This study aimed to teach older adults more about pain to determine if it can also positively influence their beliefs about pain medication.

to participate in the study [20]. Participation in the study was entirely voluntary, and no payment was made for participation in the study.

### Intervention

The content of PNE is well documented and in line with other studies [21-24]. The lecture was an abbreviated 45-minute, 40-slide PNE PowerPoint™ presentation modelled after a previous PNE study, allowing ample time for survey completion before and following the PNE lecture [5]. The presentation's main themes included a discussion of peripheral sensitization, central sensitization, bio-psycho-social factors associated with pain, threat appraisal of the brain, nociception, stress, and endocrine responses in pain various therapeutic endogenous strategies to ease pain [21-24]. Multiple images, metaphors, and examples conveyed the PNE to the participants [25]. Following the formal presentation and completion of the post-PNE surveys, participants were encouraged to ask questions. The production did not specifically address or target any questions in the outcome measures. Recent studies on older adults have shown that older adults can understand this content, resulting in positive shifts in pain knowledge and beliefs regarding pain [5,19].

### Outcomes

Before formal outcome measures, participants signed a consent form and completed a demographic section capturing their gender, age, social status, pain experience, pain rating (Numeric Pain Rating Scale), and pain medication usage.

Four formal outcome measures were used for the participants to assess changes associated with PNE:

**Pain Knowledge:** Pain knowledge was measured using the revised neurophysiology of pain questionnaire (NPQ). The NPQ is based on a current pain science text [26] and was used in a previous study measuring the neurophysiology knowledge of patients and healthcare personnel [21]. The original NPQ is a 19-item questionnaire requesting 'true'; 'false'; or 'not sure' answers to statements, with higher scores indicating more correct answers. Since the development of the NPQ, a statistical analysis of the NPQ has led to the development of an abbreviated NPQ with 12 questions, which removed ambiguous questions [27]. The revised 12-question NPQ was used in this study. The questionnaire was adapted similarly to previous studies to make it easier for non-medically trained people to understand, e.g., "nociception" was replaced with "danger messages" [21]. Data on patients or healthy controls are still being determined as to what constitutes a meaningful shift. Adult studies (ages 18-65) have shown NPQ mean improvements after a PNE session to typically range between 25-30 % [28-30]. In the previous older adult PNE studies, the mean increase in NPQ was 11.07 % [5].

**Beliefs regarding pain and aging:** A series of questions about pain and aging is added to ascertain patient beliefs. The five questions in the survey have been used in previous studies and scored using a Likert Scale (0 strongly disagree; 10 strongly agree) [5,15].

1. As you age, you will hurt more.
2. Movement helps ease the pain.
3. Younger people are hurt less than older people.
4. The older I become, the more pain I have due to degeneration.
5. I hurt because of the bodily damage I sustained when I was younger.

**- Pain rating (NPRS):** The study's intention was not to precisely determine the efficacy of PNE for older adults in pain. NPRS was included before and after the PNE intervention due to higher rates of pain prevalent in older adults. The NPRS is often used in studies for persistent pain [31-34]. The minimal clinically significant difference (MCID) for the NPRS for acute/sub-acute pain is reported to be 2.0 [35], and for persistent musculoskeletal pain, 1.0 [36].

**- Beliefs about (pain) Medication:** To study patient beliefs about pain medicine, the ideas about medicines questionnaire (BMQ) was used [37]. The questionnaire has 8 statements, ranked on a 5-point

Likert scale between 0 (strongly agree) and 5 (strongly disagree). To be specific to pain medicine, each reference to treatment was prefaced by "pain" medicine – versus the original design focusing on medicine in general. This strategy has been used in a previous study examining PNE for middle school children changing beliefs about pain medicine (Louw et al., 2023 – submitted for publication).

**Statements from the BMQ are:**

- *Doctors use too many pain medicines. People who take pain medicines should stop their treatment for a while now and again.*
- *Most pain medicines are addictive.*
- *Natural remedies are safer than pain medicines.*
- *Pain medicines do more harm than good.*
- *All pain medicines are poisons.*
- *Doctors place too much trust in pain medicines.*
- *Doctors who had more time with patients would prescribe fewer pain medicines.*

All the surveys were administered before and after the PNE lecture. Community center staff, not the presenter of the PNE, was on hand to help older adults who needed help with the forms. To avoid influencing answers to the outcome measures, the attending community center staff addressed any questions arising during the completion of these forms rather than the presenter of the PNE. Upon completing the surveys, the surveys were placed into envelopes, sealed, and sent to an independent research assistant who entered the data into an Excel™ document for analysis.

**Statistical Analysis**

Upon completion of the study, participant intake forms from pre- and post-treatment were collected for analysis. There was no attrition during the study, and all participants were accounted for in the post-treatment analysis. Summary statistics were generated in tables to understand the study sample's demographics better. A series of student's paired, one-sample t-tests with df = 25 was used to test for significant differences in Pain Knowledge, Fear-Avoidance, and Pain Beliefs. A pre-defined significance level for any results was set at a = 0.05. Post-hoc power analysis showed that with n = 26, a = 0.05, and an effect size of 0.8, the results yielded power at 0.975, indicating that the results of this study can reasonably be generalized to a larger population.

**Results**

Twenty-six participants participated in the community PNE events (Table 1).

**Table 1:** Participant demographics

Characteristic	Participants (n = 26)
Female (%)	9 (34.6)
Mean age (years) (range)	74.3 (62-90)
Social	
• Married (%)	17 (65.4)
• Widow/widower (%)	6 (23.1)
• Single (%)	3 (11.5)

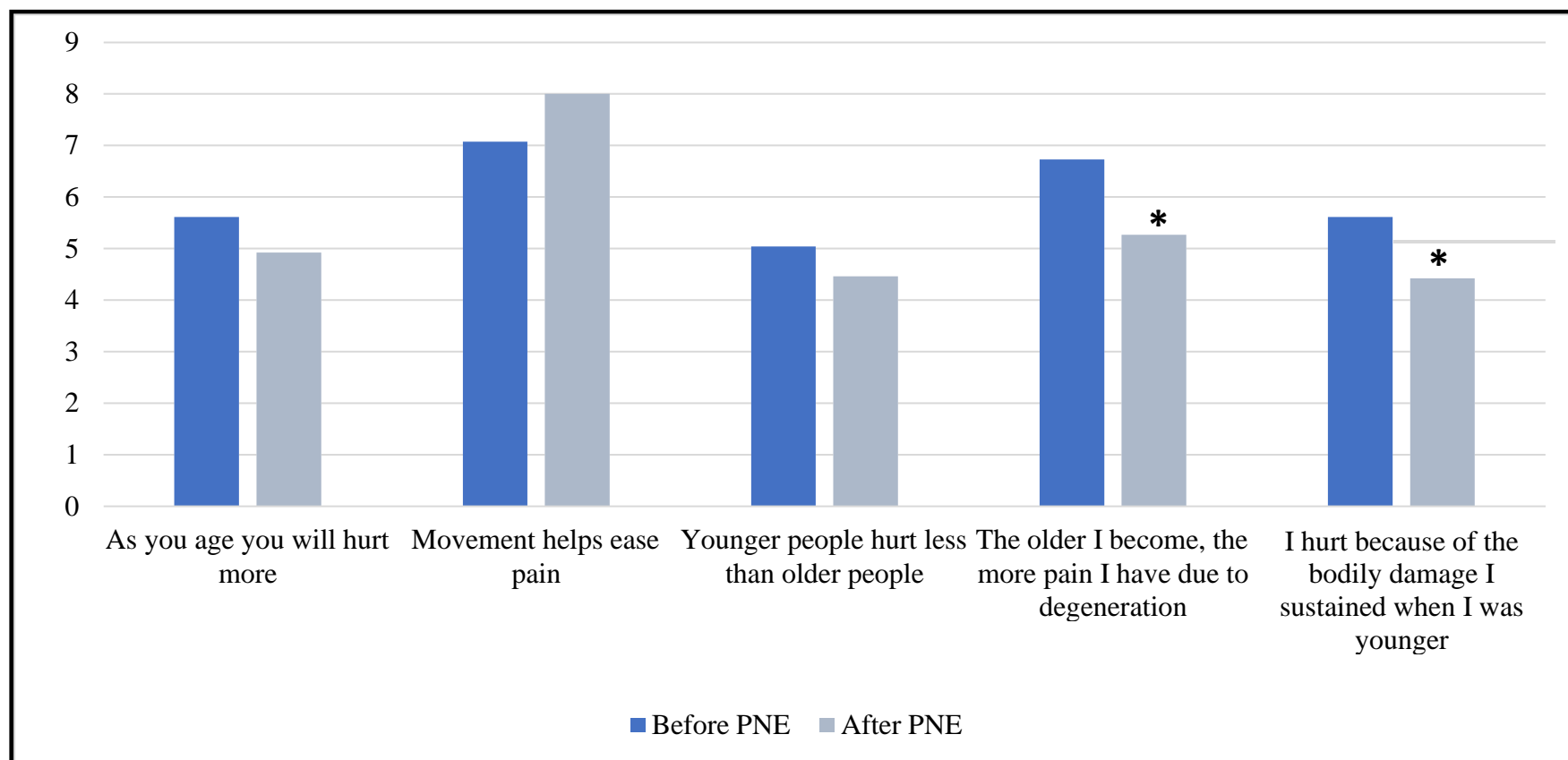
Currently experiencing pain	16 (61.5)
— Mean pain rating for those experiencing pain (NPRS)	4.4
Experienced pain:	
• For a week (%)	5 (19.2)
• For a month (%)	3 (11.5)
• More than 3 months (%)	15 (57.7)
Currently taking pain medication (%)	11 (42.3%)

**Pain Knowledge**

Prior to PNE, the mean NPQ score was 5.65 (47.1 %). Immediately following the PNE lecture, NPQ scores increased by 16.4 % to 7.62 (p < 0.001).

**Pain beliefs and aging**

Immediately following PNE, all measures regarding pain beliefs and aging improved (**Figure 1**). Two statements improved significantly after PNE – “The older I become, the more pain I have due to degeneration” (p = 0.001) and “I hurt because of the bodily damage I sustained when I was younger” (p = 0.010).



**Figure 1:** Participant beliefs regarding pain and aging before and after the PNE lecture (\* indicates significant difference [p < 0.05]).

**Beliefs about pain medicine**

All beliefs regarding pain medicine shifted positively after PNE (**Table 2**). Two statements improved significantly after PNE – “Most pain medicines are addictive” (p = 0.010) and “If doctors had more

time with patients, they would prescribe fewer pain medicines” (p = 0.007).

**Table 2:** Participant beliefs regarding pain medication

0 (strongly agree) and 5 (strongly disagree)	Before PNE	After PNE	Significance
Doctors use too many pain medicines	2.34615385	2.230769	0.502
People who take pain medicines should stop their treatment for a while every now and again	2.88461538	2.769231	0.599
Most pain medicines are addictive	3	2.461538	0.010*
Natural remedies are safer than pain medicines	2.69230769	2.653846	0.856
Pain medicines do more harm than good	3.42307692	3.038462	0.134
All pain medicines are poisons	3.57692308	3.269231	0.174
Doctors place too much trust in pain medicines	2.73076923	2.269231	0.007*
If doctors had more time with patients, they would prescribe fewer pain medicines	2.76923077	2.365385	0.098

\* Significant change (p = 0.05)

## Discussion

The results of this study show that older adults who improve their pain knowledge show healthier beliefs regarding pain medication. This is the first study to explore if teaching older adults more about pain yields positive shifts in their opinions about pain medication.

Immediately following PNE, pain knowledge for the cohort improved by 16.4 % ( $p < 0.001$ ), which is higher than a recent similar older-adult community study which yielded an 11% increase in NPQ [5]. This result concurs with a growing body of research indicating that older adults, even in the face of potential cognitive decline, can improve their knowledge of pain by attending and being exposed to a lecture on pain science [5,19]. More interestingly, and in line with the primary objective of the study, the PNE lecture was able to positively improve older adults' beliefs about pain medication, with two of them reaching significance ("*Most pain medicines are addictive*" – [ $p = 0.010$ ] and "*Doctors place too much trust in pain medicines*" –  $p = 0.007$ ). The first belief regarding addiction may indicate a concern about becoming addicted to pain medication. It can be argued that with the increased awareness of the US opioid epidemic, including illicit drug use, consumers are becoming more aware and concerned about the potential dangers of the addictive nature of opioids, which are commonly seen as pain medication [38]. This ties to research showing physicians themselves are developing negative beliefs and attitudes about opioid medication abuse [39]. The results of this study, precisely the concerns about opioids, highlight the need for more patient-centered studies on the problems consumers have over opioid use. Most medical databases feature a few dozen studies on physician concerns over opioid addiction but very few on patients' concerns, including older adults. [38, 39]

The second significant belief regarding pain medication pertains to physician practices ("*Doctors place too much trust in pain medicines.*") This belief is powerfully underscored by a recent study showing the mismatch between what patients deem essential in consultation with a physician versus the physician's perspective [40]. Smuck et al. showed that patients valued more information about their pain (learning more about the reason for their pain) and ability to

perform their daily tasks, while physicians, in line with the results of this study, focused more on surgery, diagnostic tests, and medication [40]. This result concurs with emerging research showing that people in pain are interested in ways to help ease their pain pharmacologically and non-pharmacologically, including self-help strategies [41,42]. Interestingly, on the provider side, a PNE session taught to physician-assistant students has shown a shift in their beliefs regarding the use of pain medication toward non-pharmacological treatment for pain [43]. Additionally, older adults seeking care for pain have different needs than younger generations, which must be addressed. For example, in a study by Zimney et al., it was shown that Baby Boomers (born 1946 – 1964) and those of the Silent generation (born 1928 – 1945) highly regarded range-of-motion exercises, strengthening and aerobic exercise as a treatment option when attending physical therapy, over medical interventions, i.e., surgery [44]. Interestingly enough, this mismatch between heavy reliance on education about medication by physicians versus patient needs also highlights the patient's desire to learn more about their pain, i.e., PNE, which fuels the intent of this study [40,42].

The study contained various limitations. First, the case series design is commonly used in exploratory analyses, but the results are limited, given that no control group exists for comparison purposes. Second, this is not a patient sample, but somewhat older adults meeting inclusion criteria willing to sign up for the study, making its application to patients presenting with pain hypothetical. Third, the outcomes were only measured immediately following intervention with no intermediate or long-term follow-up, which is needed to determine the true efficacy of the intervention.

## Conclusion

A community-based educational session for older adults improves pain knowledge, which drives healthier beliefs regarding pain medication. To validate these early, immediate post-education results, more extensive scaled studies using control groups and long-term follow-up are needed.

## References

1. Moseley GL (2003) A pain neuromatrix approach to patients with chronic pain. *Man Ther.* 8(3): 130-40.
2. Louw A, Zimney K, Puentedura EJ, Diener I (2016) The Efficacy of Therapeutic Neuroscience Education on Musculoskeletal Pain – A Systematic Review of the Literature. *Physiotherapy Theory and Practice.* 32(5): 332-355.
3. Molton I, Cook KF, Smith AE, Amtmann D, Chen WH, et al. (2014) Prevalence and impact of pain in adults aging with a physical disability: comparison to a US general population sample. *The Clinical Journal of Pain.* 30(4): 307-15.
4. Louw A, Podalak J, Zimney K, Schmidt S, Puentedura EJ (2018) Can pain beliefs change in middle school students? A study of the effectiveness of pain neuroscience education. *Physiother Theory Pract.* 34(7): 542-550.
5. Watson S, Adriaan L, Wingood M, Rico D, Podolak J, et al. (2021) Pain Neuroscience Education for Older Adults. *Physical & Occupational Therapy In Geriatrics.* 40(1): 50-63.
6. Kløjgaard ME, Hess S (2014) Understanding the formation and influence of attitudes in patients' treatment choices for lower back pain: testing the benefits of a hybrid choice model approach. *Soc Sci Med.* 114: 138-50.
7. Bázquez Arencibia Z, Choonara I (2012) Balancing the risks and benefits of the use of over-the-counter pain medications in children. *Drug Saf.* 35(12): 1119-25.

8. Manubay JM, Muchow C, Sullivan MA (2011) Prescription drug abuse: epidemiology, regulatory issues, chronic pain management with narcotic analgesics. *Primary care*. 38(1): 71-90, vi.
9. Häuser W, Petzke F, Radbruch L, Tölle TR (2016) The opioid epidemic and the long-term opioid therapy for chronic noncancer pain revisited: a transatlantic perspective. *Pain Manag*. 6(3): 249-63.
10. Association AM (2021) Issue brief: Drug overdose epidemic worsened during COVID pandemic.
11. Pazan F, Wehling M (2021) Polypharmacy in older adults: a narrative review of definitions, epidemiology and consequences. *Eur Geriatr Med*. 12(3): 443-452.
12. Young EH, Pan S, Yap AG, Reveles KR, Bhakta K (2021) Polypharmacy prevalence in older adults seen in United States physician offices from 2009 to 2016. *PLoS One*. 16(8): e0255642.
13. Viswanath O (2019) A Pain Medicine Physician's Perspective on Iatrogenic Polypharmacy. *Turk J Anaesthesiol Reanim*. 47(4): 357-358.
14. Neame R, Hammond A (2005) Hammond, Beliefs about medications: a questionnaire survey of people with rheumatoid arthritis. *Rheumatology (Oxford)*. 44(6): 762-7.
15. Louw A, Zimney K, Johnson EA, Kraemer C, Fesler J, et al. (2017) De-educate to re-educate: aging and low back pain. *Aging Clin Exp Res*. 29(6): 1261-1269.
16. Brinjikji W, Luetmer PH, Comstock B, Bresnahan BW, Chen LE, et al. (2015) Systematic literature review of imaging features of spinal degeneration in asymptomatic populations. *AJNR Am J Neuroradiol*. 36(4): 811-6.
17. Milgrom C, Schaffler M, Gilbert S, van Holsbeeck M (1995) Rotator-cuff changes in asymptomatic adults. The effect of age, hand dominance and gender. *The Journal of bone and joint surgery. British volume*. 77(2): 296-8.
18. Bedson J, Croft PR (2008) The discordance between clinical and radiographic knee osteoarthritis: a systematic search and summary of the literature. *BMC musculoskeletal disorders*. 9: 116.
19. Rufa A, Beissner K, Dolphin M (2018) The use of pain neuroscience education in older adults with chronic back and/or lower extremity pain. *Physiotherapy theory and practice*. 35(7): 603-613.
20. Louw A, Diener I, Landers MR, Puentedura EJ (2014) Preoperative pain neuroscience education for lumbar radiculopathy: a multicenter randomized controlled trial with 1-year follow-up. *Spine*. 39(18): 1449-57.
21. Moseley L (2003) Unravelling the barriers to reconceptualisation of the problem in chronic pain: the actual and perceived ability of patients and health professionals to understand the neurophysiology. *Journal of Pain*. 4(4): 184-189.
22. Louw A, Butler DS, Diener I, Puentedura EJ (2013) Development of a preoperative neuroscience educational program for patients with lumbar radiculopathy. *American Journal of Physical Medicine and Rehabilitation*. 92(5): 46-52.
23. Louw A (2014) Therapeutic neuroscience education via e-mail: a case report. *Physiotherapy theory and practice*. 30(8): 588-96.
24. Zimney K, Louw A, Puentedura EJ (2014) Use of Therapeutic Neuroscience Education to address psychosocial factors associated with acute low back pain: a case report. *Physiotherapy Theory and Practice*. 30(3): 202-9.
25. Louw, A., *Why Do I Hurt? A Neuroscience Approach to Pain*. 2013, Minneapolis: OPTP.
26. Wall, P.D. and R. Melzack, *Textbook of Pain*. 5th edn ed. 2005, London: Elsevier.
27. Catley MJ, O'Connell NE, Moseley GL (2013) How good is the neurophysiology of pain questionnaire? A Rasch analysis of psychometric properties. *The Journal of Pain*. 14(8): 818-27.
28. Moseley L (2003) Unravelling the barriers to reconceptualisation of the problem in chronic pain: the actual and perceived ability of patients and health professionals to understand the neurophysiology. *J Pain*. 4(4): 184-189.
29. Meeus M, Nijs J, Van Oosterwijck J, Van Alsenoy V, Truijen S (2010) Pain Physiology Education Improves Pain Beliefs in Patients With Chronic Fatigue Syndrome Compared With Pacing and Self-Management Education: A Double-Blind Randomized Controlled Trial. *Arch Phys Med Rehabil*. 91(8): 1153-1159.
30. Van Oosterwijck J, Meeus M, Paul L, De Schryver M, Pascal A, et al. (2013) Pain physiology education improves health status and endogenous pain inhibition in fibromyalgia: a double-blind randomized controlled trial. *The Clinical journal of pain*. 29(10): 873-82.
31. Moseley GL (2003) Joining forces - combining cognition-targeted motor control training with group or individual pain physiology education: a successful treatment for chronic low back pain. *J Man Manip Therap*. 11(2): 88-94.
32. Moseley L (2002) Combined physiotherapy and education is efficacious for chronic low back pain. *Aust J Physiother*. 48(4): 297-302.
33. Moseley GL (2005) Widespread brain activity during an abdominal task markedly reduced after pain physiology education: fMRI evaluation of a single patient with chronic low back pain. *Aust J Physiother*. 51(1): 49-52.
34. Cleland JA, Childs JD, Whitman JM (2008) Psychometric properties of the Neck Disability Index and Numeric Pain Rating Scale in patients with mechanical neck pain. *Arch Phys Med Rehabil*. 89(1): p. 69-74.
35. Childs JD, Piva SR, Fritz JM (2005) Responsiveness of the numeric pain rating scale in patients with low back pain. *Spine (Phila Pa 1976)*. 30(11): 1331-4.
36. Salaffi F, Stancati A, Silvestri CA, Ciapetti A, Grassi W (2004) Minimal clinically important changes in chronic musculoskeletal

- pain intensity measured on a numerical rating scale. *Eur J Pain.* 8(4): 283-91.
37. Horne R, Weinman J (1999) Patients' beliefs about prescribed medicines and their role in adherence to treatment in chronic physical illness. *J Psychosom Res.* 47(6): 555-67.
38. de Sola H, Salazar A, Dueñas M, Failde I (2018) Opioids in the Treatment of Pain. Beliefs, Knowledge, and Attitudes of the General Spanish Population. Identification of Subgroups Through Cluster Analysis. *J Pain Symptom Manage.* 55(4): 1095-1104.
39. Hooten WM, Bruce BK (2011) Beliefs and attitudes about prescribing opioids among healthcare providers seeking continuing medical education. *J Opioid Manag.* 7(6): 417-24.
40. Smuck M, Barrette K, Martinez-Ith A, Sultana G, Zheng P (2022) What does the patient with back pain want? A comparison of patient preferences and physician assumptions. *Spine J.* 22(2): 207-213.
41. Bialosky JE, Cleland JA, Mintken P, Beneciuk JM, Bishop MD (2022) The healthcare buffet: preferences in the clinical decision-making process for patients with musculoskeletal pain. *J Man Manip Ther.* 30(2): 68-77.
42. Subialka JA, Smith K, Signorino JA, Young JL, Rhon DI, et al. (2022) What do patients referred to physical therapy for a musculoskeletal condition expect? A qualitative assessment. *Musculoskelet Sci Pract.* 59: 102543.
43. Louw A, Schmieder A, Peppin E, Farrell K, Zimney K, et al. (2020) Can a pain neuroscience education lecture alter treatment choices for chronic pain in physician assistant students? *Psychological Disorders and Research.* 3(2): 1-5.
44. Zimney KJ, Louw A, Roosa C, Maiers N, Sumner K, et al. (2022) Cross-sectional analysis of generational differences in pain attitudes and beliefs of patients receiving physical therapy care in outpatient clinics. *Musculoskelet Sci Pract.* 62: 102682.