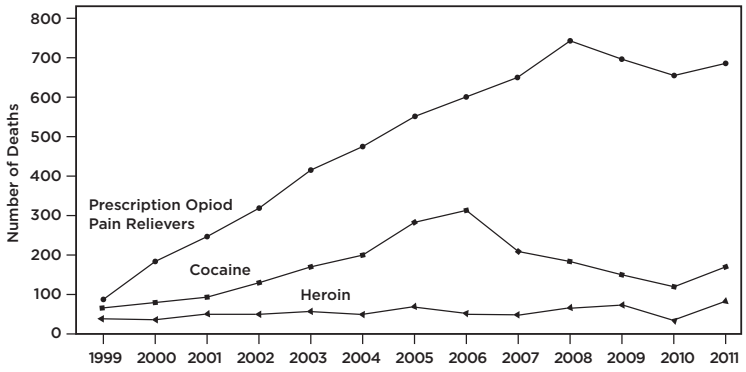
Evidence In Motion

Pain Neuroscience Education 101

Pain Epidemic

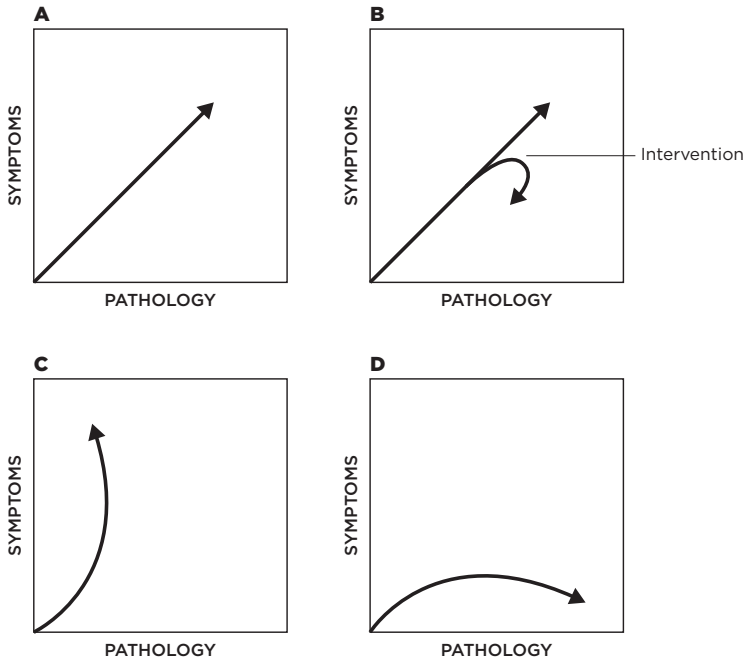
It is currently reported that 25.3 million adults in the United Stated (US) are suffering from daily chronic pain.[1,2] Furthermore, it is estimated that 126.1 million adults in the US experience some pain over a 3 month reporting period.[1,2] Even children and adolescents struggle with persistent pain with various studies reporting approximately one in six experiencing persistent pain.[3-5] Within these staggering prevalence numbers is the associated cost of persistent pain in the US which adds an economic burden of $560-635 billion dollars annually.[1,2] Beyond the financial costs lies the psychological and social consequences for the individual and those closely connected to that person. In 2012 US healthcare providers wrote 259 million prescriptions for opioid pain medications.[6] Americans, constituting only 5% of the world's population, have been consuming 80% of the global opioid supply, and 99% of the global hydrocodone supply[7] and the Centers for Disease Control (CDC) reports prescription opioids causing 3 times more annual fatalities than heroin and cocaine combined.[8] It is clear that something significant regarding pain must change in the US.



Why this problem with pain?

Although the solution to the pain epidemic is most likely multi-factorial, one potential part of the solution may be changing how people view pain.[9,10] Pain is a normal human experience and essential for survival.[10] It can be argued that pain cannot and should not be prevented, but what a person does when they experience pain, may be far more important than the pain experienced itself.[9,11] Numerous studies have shown that coping skills and coping behaviors powerfully predict persistent pain and disability.[12,13] It is intriguing to consider that seemingly similar people may experience a similar injury, yet recover very differently in terms of duration, pain intensity, progression and healthcare utilization.[14,15] When it comes to pain, however, a fundamental part of coping with it relates to how much a person knows about pain.[16] Traditional pain education models have connected the health of tissues to pain, yet it is well documented that the health of tissues and pain do not necessarily correlate.[17-19] As long as patients, healthcare providers and the general population connect the health of tissues to how much pain someone will experience, it can increase fear-avoidance and pain catastrophization, which have been shown to be powerful predictors of persistent pain, culminating in a viscous cycle.[20,21]

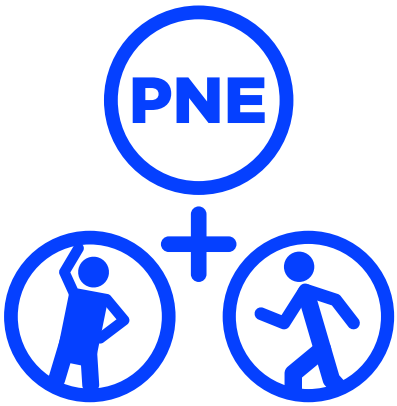
In line with the commonly held belief that tissue health and pain are correlated, traditional educational models teaching people about pain have similarly focused on anatomical, pathoanatomical and biomechanical explanations.[22] In acute, sub-acute or perioperative conditions, these biomedical explanations may be helpful to explain the pathology and biomechanics of the injury portion of a pain experience to patients, but they fall short of explaining persistent pain.[10,22] Additionally, there is growing evidence that biomedical models used in explaining a pain experience may actually induce more fear and anxiety, which in turn have been linked to the development and maintenance of persistent pain.[23,24] It is within these traditional models that a clinical and potentially, societal, dichotomy exists that adds to the current pain epidemic.[9,25] This dichotomy refers to the poor correlation between the health of a person's tissues and the pain they may be experiencing.[10,17] Most traditional pain models have perpetuated a model whereby the level of tissue injury and pain and disability were seen as synonymous, which is contrary to emerging pain science research.[18,19]



Some specific issues pertaining to Pain Neuroscience Education:

Delivered primarily by physical therapists as verbal one-on-one education with the use of metaphors, examples, pictures and books.[28,33]

Typically delivered in fifteen to thirty minute sessions once or twice a week for four to six weeks.[34-37]



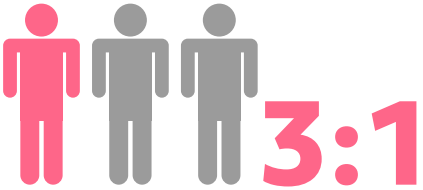
PNE combined with movement and exercise is superior to education alone in decreasing pain and disability.[28,33]

Guide to Abbreviations:

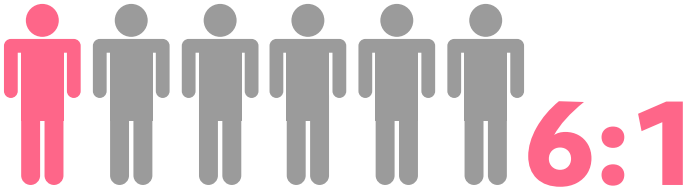
NNT: The numbers needed to treat (NNT) refers to the effectiveness of a treatment. The lower the number, the more effective the treatment. For chronic pain the NNT refers to when patients experience a 50% reduction in pain or dysfunction. For example, the NNT for PNE shows that for every 3 people who receives PNE, one in three end up with a 50% reduction in pain. In comparison, when patients with chronic pain receive gabapentin, one in 6 end up with a pain reduction of 50% in a similar time frame.

SSRI: Selective Serotonin Reuptake Inhibitor. Examples include Celexa,™ Lexapro,™ Prozac,™ Paxil,™ and Zoloft.™

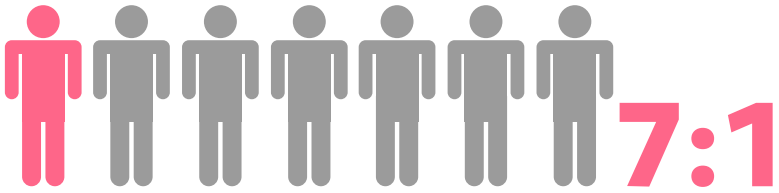
2:1
PNE NNT for function



3:1
PNE NNT for pain



6:1
Gabapentin NNT for pain



7:1
Antidepressant (SSRI) NNT for pain

OLD APPROACH

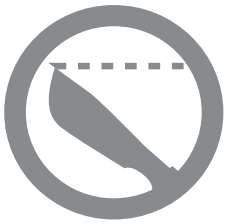
Patient has low back and leg pain.

NEW APPROACH

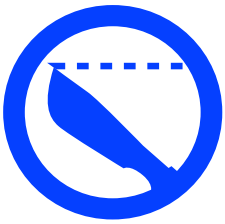
Patient consults with spine surgeon and decides to undergo low-back surgery. Surgeon gives patient 10-15 minutes of preoperative education regarding the surgery, procedures and recovery.

Patient also visits a physical therapist for preoperative education regarding pain science and a booklet to take home.

- **1 visit**
- **30 minutes**
- **$3 booklet**



Patient undergoes low-back surgery.



Patient is tracked for one year after surgery.

Patient doesn't understand how pain works and worries about post-operative pain. Patient undergoes additional imaging, tests and treatments.

Patient understands what pain is and how it works and has realistic expectations for post-operative pain. Patient undergoes standard follow-up.

After one year, both patients have the same outcome regarding back pain, leg pain, fear of work, fear of physical activity, pain catastrophization and function. Substantial differences are observed in average cost and level of satisfaction.

Patient is significantly less satisfied with surgery.

Average cost for imaging, tests and treatments: **$4,833**

Average cost for imaging, tests and treatments: 45% savings **$2,678**

Patient is significantly more satisfied with surgery.

600,000 discectomies were performed in the US in 2012

If the cost savings per patient were applied, it would account for an annual savings of **$1.2 billion**

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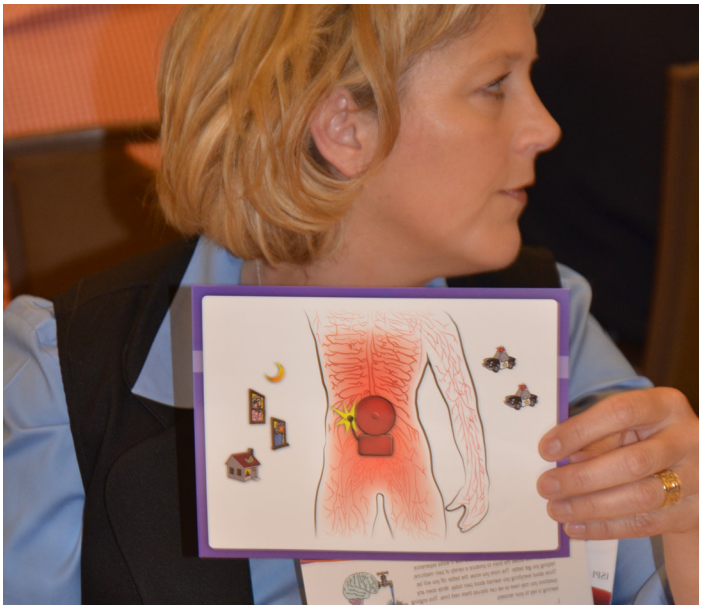
EIM

Pain Neuroscience Education

In recent years, born out of this dichotomy, clinicians and scientists explored the notion of teaching people more about pain.[26,27] This type of education is referred to as pain neuroscience education (PNE).[11,28-30] PNE is an educational strategy used by physical therapists that focuses on teaching people in pain more about the biological and physiological processes involved in their pain experience.[27,31,32] Current best-evidence provides strong support for PNE to positively influence pain ratings, dysfunctions, fear-avoidance, and pain catastrophization, limitations in movement, pain knowledge and healthcare utilization.[28,33]



Some specific issues pertaining to PNE:

- Delivered primarily by physical therapists.[28,33]
- PNE is typically delivered in 15-30 minute sessions once or twice a week for 4-6 weeks.[34-37]
- The primary delivery method is verbal one-on-one education with the use of metaphors, examples, pictures and books.[28,33]
- PNE as an educational intervention is combined with various physical and movement-based therapies including exercise, and current best-evidence indicate that PNE plus movement/exercise is superior to educational-alone approaches in decreasing pain and disability.[28,33]
- Numbers needed to treat for PNE and chronic low back pain:
  - To improve function 2:1
  - To improve pain 3:1
    - In comparison Gabapentin's NNT is 6:1 for pain[38]

Preemptive Pain Neuroscience Education

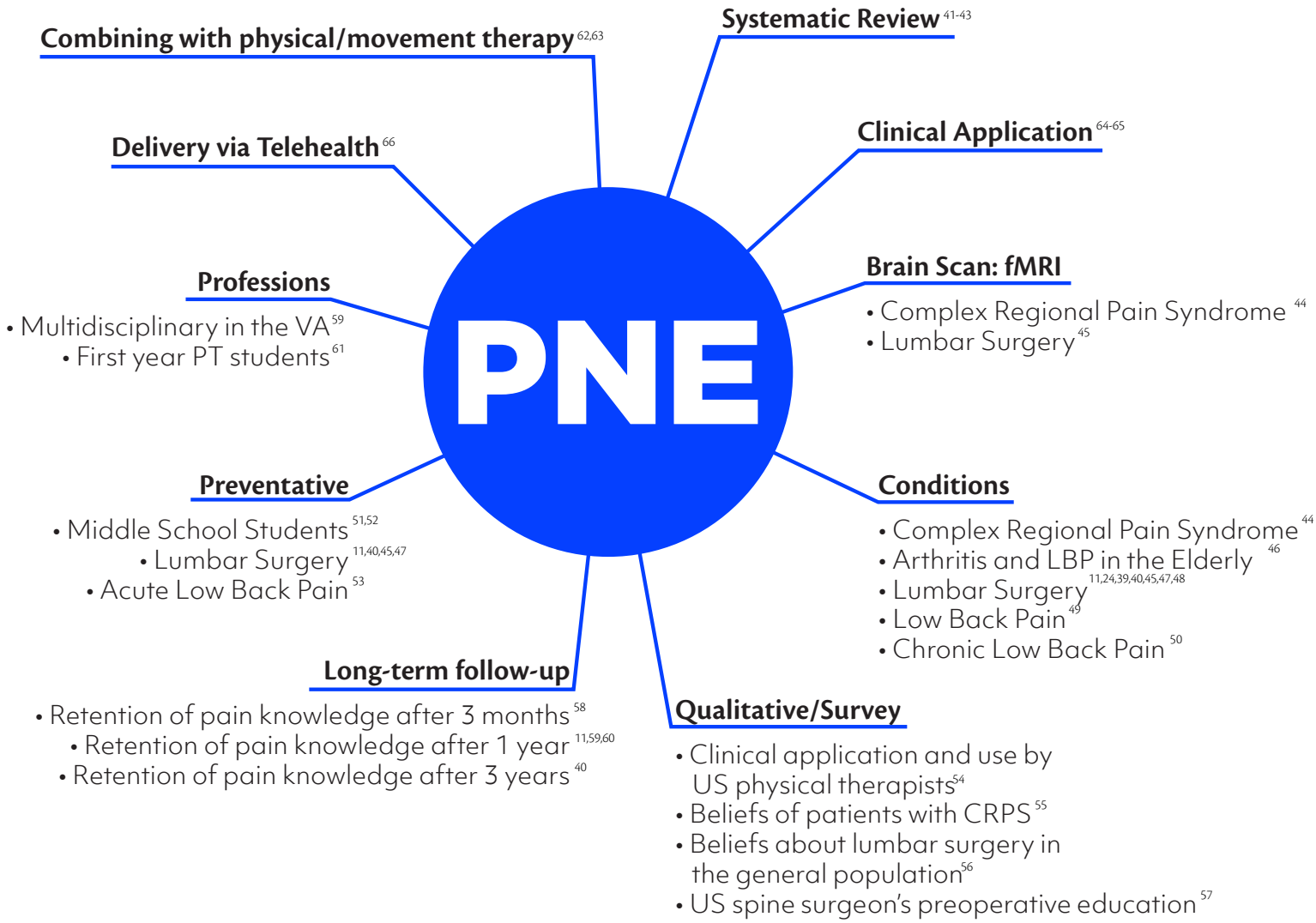
In regards to prevention, PNE is now being explored in acute and perioperative studies.[11,39] It is hypothesized that by educating patients more about the biology and physiology of a pain experience, they actually change seeking behaviors related to healthcare utilization.[11] For example, a recently developed preoperative PNE program was tested in a multi-center randomized clinical trial with 1 and 3 year outcomes.[11,39,40] One year after surgery; the group that received PNE had similar rates of pain and disability compared to the patients who did not receive PNE, but demonstrated a substantial reduction in postoperative medical utilization.[11] Despite having residual pain and disability, the PNE group spent 45% less on healthcare in the year following surgery compared to the non-PNE group.[24] A key element of the preoperative PNE was that pain after lumbar surgery was to be expected, normal, and over time would calm down.[39] On average, the PNE group spent over $2000 less seeking help for their persistent pain and disability. In 2012, there were over 600,000 discectomies in the US alone and if the cost-savings per patient were to be applied to each person undergoing a discectomy in the US it would account for an annual savings of $1.2 billion.[9] The results from the 1-year follow-up was sustained 2 years with publication of the 3-year outcome study. Upon completion of the preoperative PNE program for lumbar surgery, the same research team started trials on preoperative PNE for total knee arthroplasty and shoulder surgery.

Pain Neuroscience Education and Evidence in Motion

The following series of studies, pertaining to PNE has been conducted by the EIM research team:

- Adriaan Louw, PT, PhD
- Emilio "Louie" Puentedura, PT, DPT, PhD
- Ina Diener, PT, PhD
- Kory, Zimney, PT, DPT, PhD (c)
- Terry Cox, PT, DPT, PhD (c)
- Stephen G. Schmidt, PT, MSc (physio)

References include published, accepted and submitted for publication studies:



PNE and Behavior Change

Education by itself, however, is not a powerful facilitator of behavior change. In the words of the late Bill Fordyce:

"Information is to behavior change as spaghetti is to a brick."

The latest PNE systematic review demonstrated that when PNE is combined with a physical treatment (PNE+) is has superior results for pain reduction as compared to education alone.[67] The main idea of the + component of the PNE+ program is to utilize and add strategies aimed at overall well-being, facilitate movement, and increase function as well as enhancement of endogenous analgesia via non-pharmacological mechanisms.

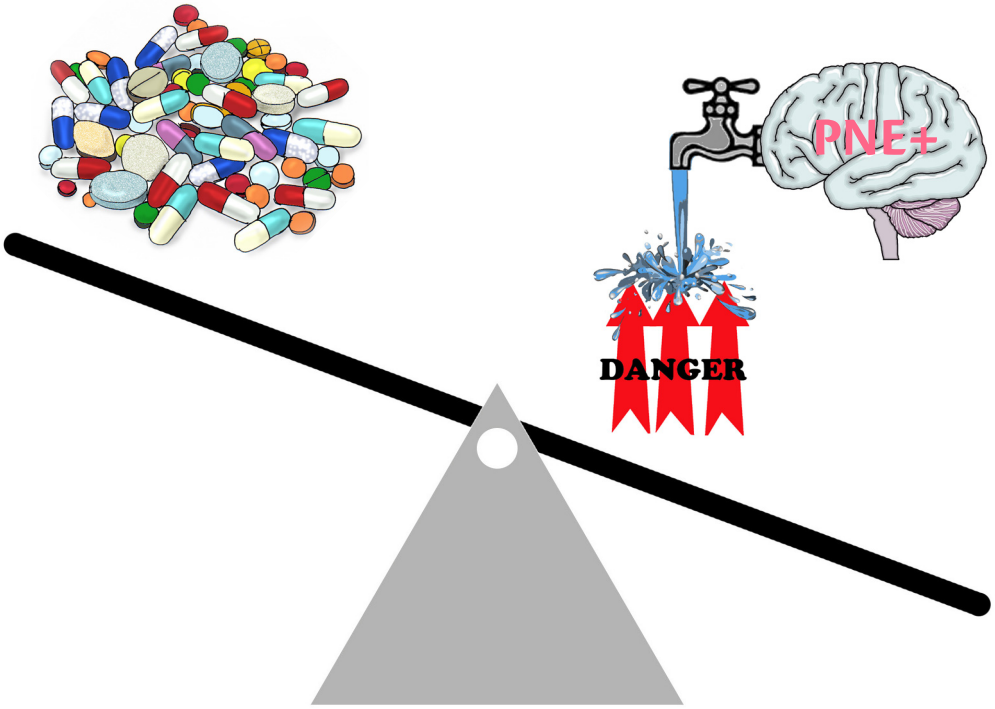
Opioid Epidemic and the PNE+ Program

The current opioid epidemic prompts both the public and healthcare providers to ask, "What do we do?" As you read through the various components of the PNE+ approach, we want you to see it from the perspective of the opioid crisis. As a whole, the PNE+ program should be used as an alternative to the pharmaceutical delivery of opioids to treat pain. The various treatments we are describing have been studied extensively for their ability to turn on the non-pharmacological, naturally occurring endogenous systems, thus decreasing the need for medicine. The body of evidence in favor of the PNE+ approach versus the current use of opioids is staggering. Additionally, it can provide significant benefit with little to no side effects. It is proposed that the PNE+ program, as it's delivered and built into a patient's recovery, should coincide with the physician's tapering off the pain medication and thus be part of the anti-opioid initiative. Therapists need to study this following concept, know it well and propagate the idea:

The PNE+ program facilitates naturally occurring endogenous mechanisms, is far more powerful than the current pharmaceutical approach, and has little to no side effects. As the various aspects of the PNE+ program are applied, tapering of pharmaceuticals should occur per physician discretion.

The evidence? Below is a listing of various PNE+ components and evidence for engaging the various endogenous mechanisms. Collectively, this program demonstrates the relative efficacy of PNE+ over pharmaceutical opioids:

- PNE[68-70]
- Nutrition[71-74]
- Breathing[75-77]
- Biofeedback[78-80]
- Graded motor imagery[81-83]
- Safe, healing environment with compassion and empathy[84-86]
- Manual therapy[87-89]
- Neural mobilization[90-92]
- Modalities[93-95]
- Yoga[96-98]
- Relaxation and meditation[76,99,100]
- Aerobic exercise[101-104]
- Humor[105-107]
- Aquatic therapy[108,109]
- Social interaction[110-112]
- Coping skills[113-115]
- Sleep hygiene[116-118]
- Soft tissue/trigger point therapy[119-121]
- Stabilization and resistance training[122-125]
- Journaling[126-128]
- Stretches, movement and body awareness[129,130]
- Posture and position of power and confidence[131,132]



Scientific Evidence:

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