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# Know Pain, Know Gain? A Perspective on Pain Neuroscience Education in Physical Therapy

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**C**hronic pain is incredibly complex, and so are decisions as to its treatment. During physical therapy care, pain neuroscience education (PNE) aims to help patients understand more about their pain from a biological and physiological perspective. Accompanying the growing evidence for the ability of PNE to reduce pain and disability in patients with chronic pain is an increased interest in PNE from scientists, educators, clinicians, and conference organizers.

However, the rise in popularity of PNE has highlighted a historical paradox of increased knowledge not necessarily corresponding with improved care. This Viewpoint discusses the growth and popularity of PNE as well as critical future considerations such as clinical application, clinical research, appropriate outcome measures, and the blending of pain education with exercise and manual therapy.

Pain is a normal human experience and essential to survival. Living with pain, however, is not normal and typically culminates in the sufferer seeking help. This help-seeking behavior is well documented in the history of humankind. Since the earliest recordings of

man, people suffering in pain were seeking ways to obtain relief. The history of pain treatments and philosophies provides a fascinating window into the prevailing beliefs and knowledge of society of that time period. Ancient practitioners were heavily influenced by religious and spiritual beliefs, and for hundreds of years pain was seen as a spiritual issue. Not until the Renaissance period was there a significant shift in understanding pain from a religious and spiritual experience to a phenomenon worthy of study under the microscope, a shift that resulted in the discovery of receptors and sensors and the science of neurobiology. These discoveries led to the belief that pain was a phenomenon of overstimula-

tion of receptors, which in turn propagated the development and delivery of various pharmacological agents to treat pain. The culmination of the increased neurobiological understanding of pain resulted in the gate control theory proposed by Melzack<sup>9</sup> in 1965.

Gate control served humankind for more than half a century as a key element in the understanding and treatment of pain.<sup>9</sup> Then, in the early 1990s, with the introduction of functional brain scans, we saw another major shift. The pain neuromatrix explained our knowledge and understanding of the functional and structural changes in the brains of people suffering from chronic pain.<sup>9</sup> Along the way, scientists gave us exciting new research into central sensitization, peripheral sensitization, neuroplasticity, glial cell activation, cytokine signaling, endocrine changes, and more.<sup>10,12</sup> Additionally, the neurobiology field became more and more aware of the psychological factors in pain, resulting in parallel growth in the understanding of fear avoidance, pain catastrophization,

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patient expectations, cognitions, and beliefs.<sup>4</sup> Collectively, these developments have dramatically increased our understanding of pain science.<sup>9</sup>

Despite our growing understanding and knowledge of pain, 25.3 million adults suffer from daily chronic pain and, of those, 10.5 million individuals state that they have a lot of pain every day.<sup>5,11</sup> It is estimated that 126.1 million adults in the United States experience some pain over a 3-month reporting period, which means that more adults in the United States experience pain than those who do not.<sup>5,11</sup> Within these staggering prevalence numbers is the associated cost of persistent pain in the United States, which adds an economic burden of \$560 to \$635 billion dollars annually.<sup>5,11</sup> But beyond the financial costs lie the psychological and social consequences to the individual and to those closely connected to that person.

## DISCUSSION

Patients who are in pain, especially those with chronic pain, are often interested in learning more about the causes and mediators of their pain experience. It is argued that biomedical models commonly used in physical therapy, including anatomy, biomechanics, and pathoanatomy, fall short in explaining some of the complex issues of pain such as central sensitization, peripheral sensitization, inhibition, facilitation, neuroplasticity, etc.<sup>10</sup> Additionally, it is well documented that these biomedical models may induce fear and anxiety, which may further fuel fear avoidance and pain catastrophization.<sup>6</sup> Pain neuroscience education, on the other hand, aims to teach patients more about their pain experience from a biological and physiological perspective, thus increasingly embracing the biopsychosocial approach.<sup>6,13</sup> One of the first documented uses of PNE as a treatment for pain stems from the late Louis Gifford, a zoologist turned physical therapist, at the International Association on the Study of Pain conference in Austria in 1999. Since then, various scientists be-

gan exploring the efficacy of PNE, leading to various randomized controlled trials and 2 systematic reviews.<sup>3,6</sup> The systematic review by Louw et al<sup>6</sup> showed that for musculoskeletal pain, PNE provides compelling evidence of reductions in pain, disability, and pain catastrophization, and improvement in physical movement. Since then, regional, national, and international physical therapy conferences have seen an influx of presentations about emerging PNE information.

Given this newfound knowledge of pain neuroscience, are physical therapists going down the same path as their clinical predecessors who, with their increasing knowledge, increasingly limited its clinical application? Studies have shown that a physical therapist will increase his or her knowledge of pain after a PNE presentation. However, does increased knowledge translate to clinical practice, the individual pain sufferer, and ultimately the pain epidemic? We would argue that there is a long way to go. Knowing more about pain neuroscience is not enough and doesn't negate other substantial clinical gaps in improving a patient's pain. Physical therapy is notorious for painstakingly studying the smallest possible details of human movement and function in the belief that theory will translate to improved clinical outcomes. For example, a plethora of papers have been dedicated to a mere 20-millisecond delay of abdominal muscle contraction, yet despite the enormous amount of time, money, and energy spent on this science, clinically it has yet to provide results superior to those of any other form of exercise for low back pain when applied without subgrouping.<sup>8</sup> Could PNE follow the same trend?

It is time that physical therapy embrace and demand more clinical research, including reports from the "experts" in the clinic, the clinicians. In previous years, platforms/breakout sessions at national and international conferences featured "gurus" of the profession sounding off about "what works" in clinical practice. There has now been a powerful

shift to the other end of the spectrum, to scientists. Science has to be a focal point in advancing the profession forward and should be more skewed to evidence and research. But attendees who are clinicians need to answer the "So what?" question in applying research to clinical practice. Perhaps regional, national, and international conferences should dedicate a percentage of the presentations to clinical application of research concepts. For too long now, we have only heard from scientists who stopped treating patients in the clinic. This Viewpoint should also serve as a call for scientists to strongly consider shifting some resources to clinical application research. Once a theory or approach has been established, a dedicated portion of the science should investigate the clinical application. Though research, by its nature, is exclusive and carefully controlled, it must be extrapolated to clinical settings aimed at the problem at hand—in this case, individual patients suffering from chronic pain.

A future potential issue regarding PNE concerns research itself, but it should also (per our mandate) apply to clinicians. Traditional physical therapy research and clinical practice have focused on measuring pain and function. Some consider pain ratings to be controversial, with discussion surrounding how they are "only subjective," how they increase the pain experience, or the individual nature of pain, cultural and gender differences, etc. Function, albeit measured by more reliable and validated tools, may also too often be subjective in nature. This issue has been discussed before.<sup>2</sup> From the pain neuroscience perspective, however, there is another issue: pain as a normal human experience.<sup>10</sup> By focusing research and clinical questioning only on pain and physical function, we may be missing another effect of PNE. In all health care education, be it smoking cessation, weight loss, or breaking addiction, the ultimate goal is behavior change. We want the smoker to stop smoking, the overweight person to start walking and lose weight, and the addict to stop the addiction. In

pain science, we may need to look at behavior change, starting with the phrase “despite the pain.” One of the foundational elements of PNE is to educate patients about which various pain experiences are normal and expected. Nociception and pain are not necessarily synonymous. Then, “despite the pain,” goal setting, pacing, and graded exposure to movement will increase the patient’s activity and return the patient to function and a higher quality of life.<sup>4</sup> This would imply that we can measure function, but in ways beyond the physical, such as in the psychological, behavioral, and social realms.

As health care changes loom and physical therapy fights for its rightful place, it is unlikely that justifying the necessity of physical therapy by mere functional improvements will impact meaningful policy changes or the allocation of resources. We therefore strongly urge scientists to focus on measuring true behavior change, including health care utilization and cost, along with societal effects.<sup>4,7</sup> It is imperative that all physical therapy clinical research include some measure of health care expenditure. For chronic pain, this may be the key indicator of meaningful behavioral change. Despite experiencing pain and residual functional deficits, a patient’s increased knowledge of the pain experience via PNE may alleviate the need for additional medical care (imaging, medical consultation, testing, etc). In 2014, Louw et al<sup>7</sup> reported the 1-year outcome of a multicenter randomized controlled trial of preoperative PNE for lumbar radiculopathy. One year after surgery, the group that received PNE in addition to standard preoperative education had rates of pain, disability, fear-avoidance beliefs, and catastrophization similar to those of patients who did not receive PNE, but demonstrated a statistically significant greater satisfaction with the surgical experience. More importantly, the PNE group also demonstrated a substantial reduction in postoperative medical utilization. Despite having ongoing pain and disability, the PNE group spent 45% less on health care in the year

following surgery compared to the non-PNE group. A key element of the preoperative PNE was that pain after lumbar surgery was to be expected and normal, and over time would lessen. 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 United States alone, and if the cost savings per patient were to be applied to each person undergoing a discectomy in the United States, it would account for an annual savings of \$1.2 billion. For clinicians, this study, along with the premise of PNE, implies less focus on pain as the ultimate goal and more focus on behavior change in a patient’s progress, with “despite the pain” being a key issue.<sup>7,10</sup>

A final issue concerning the application of PNE is the controversy regarding whether it should be provided with a “hands-on” versus a “hands-off” approach. Unfortunately, many therapists who are minimally familiar with PNE think of this strategy solely as an educational and cognitive intervention diametrically opposed to movement strategies, such as manual therapy and exercise—that one must provide either manual treatment or exercise for a patient in pain or a cognitive intervention such as PNE. However, high-level randomized controlled trials and systematic reviews of PNE have reported on various studies that combine a movement/manual approach with PNE.<sup>6</sup> Clinical trials have shown that PNE alone (education only) can benefit a patient<sup>6,7,15</sup>; however, when PNE is combined with either exercise or manual therapy,<sup>1,6,14</sup> it is far superior in reducing pain compared to education alone.

## CONCLUSION

Chronic pain is incredibly complex, and so are decisions as to its treatment. Pain neuroscience education has been around for only 15 years. As with all new therapeutic tools, researchers are excited to research it and clinicians are excited to use it clinically. Evidence supports the use of

PNE, especially in chronic pain. But researchers must provide clinically relevant findings and clinicians must translate research findings into sound evidence-based practice. Both researchers and clinicians may need to consider new outcome measures to assess improvements in pain. Is there true behavior change and did the treatment change the individual’s quality of life? Pain neuroscience education warrants continued investigation from both scientists and clinicians to understand its effects on behavior change and quality of life of the individual in pain. Pain neuroscience education has the potential, when combined with appropriate movement-based strategies, to change both patient outcome and clinician outlook, which may ultimately prove invaluable to society. Thus the heuristic, “Know pain, know gain.” ●

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## [ VIEWPOINT ]

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