CASE REPORT

Use of Therapeutic Neuroscience Education to address psychosocial factors associated with acute low back pain: a case report

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Abstract

Acute low back pain (LBP) from injuries is prevalent in the work place. It has been shown that patients with psychosocial factors often progress with persistent pain and lead to significant workers compensation costs. Therapeutic Neuroscience Education (TNE) has been shown to be beneficial in changing a patient’s cognition regarding their pain state, which may result in decrease fear, anxiety and catastrophization. A 19-year-old female who developed LBP from a work injury was the patient for this case report. A physical examination, Numeric Pain Rating Scale (NRPS), Oswestry Disability Index (ODI), Fear-Avoidance Beliefs Questionnaire (FABQ), Keele StarT Back Screening Tool (Keele SBST) and Acute Low Back Pain Screening (ALBPS) Questionnaires were assessed during initial physical therapy visit and discharge. Treatment consisted of use of TNE, manual therapy and exercises. She attended five total visits over a 2-week period prior to full discharge. During the initial visit the patient reported NRPS = 3/10, ODI = 36%, FABQ-PA = 23, FABQ-W = 30, Keele SBST = 4/9, ALBPS = 101. At discharge the patient reported a 0 on all outcome questionnaires with ability to return to full work and no pain complaints.

Introduction

Low back pain (LBP) is the most common and costly work related musculoskeletal disorder (Govindu and Babski-Reeves, 2012; Guo, Tanaka, Halperin, and Cameron, 1999; Guo et al, 1995; Klein, Jensen, and Sanderson, 1984). LBP from workers compensation claims in the US accounts for about one-fourth of all claims and a third of the compensation costs (Guo, Tanaka, Halperin, and Cameron, 1999). However, these costs are not evenly distributed among all claims. Hashemi, Webster, Clancy, and Volinn (1997) showed that 10% of the claims lead to 86% of the costs. A better understanding of early predictors that lead to increased costs may potentially lead to better management and intervention practices for high-risk workers, hopefully leading to a decrease in a large percent of the costs associated with work related LBP (Turner et al, 2008).

Prospective studies (Turner et al, 2006, 2008) have shown that a multi-domain model had excellent ability to differentiate workers who would have persistent disability over those that would not. The various domains that were shown to have significance were: socio-demographic; employment related; pain and function; clinical status; health care; administrative/legal and psychological. Injury severity was one of the stronger predictors of chronic disability as assessed through pain and function questionnaires and clinical status of pain radiating below the knee (Turner et al, 2008). Higher pain and disability ratings equated with increased duration of disability. Workers with radicular pain without reflex, sensory or motor deficits were almost twice as likely to be disabled at 1 year as those workers without radicular pain. If workers also had reflex, sensory or motor deficits with the radicular pain, they were 3.7 times more likely to be disabled at 1 year (Turner et al, 2008). Various psychosocial factors were also significant predictors after controlling for injury severity. Employment-related psychosocial factors such as supervisor/employee relations, heavy lifting requirements, hectic pace of job and availability of modified work were the most common. Healthcare domain factors were items such as first provider seen, prevention tips given and exercise program. Administrative/legal items such as time from injury to seeing health care provider and if attorney involved in claim were variables that could increase disability time. Primary psychological predictors were recovery expectations, mental health, catastrophizing and work fear-avoidance.

There has been widespread acknowledgement that psychosocial factors (fear, anxiety and catastrophizing) are important in LBP in regards to pain and disability (Gatchel, Polatin, and Mayer, 1995; Iles, Davidson, and Taylor, 2008; Pincus, Burton, Vogel, and Field, 2002; Schultz et al, 2004). These psychosocial factors were first termed “Yellow Flags” by Kendall, Linton, and Main (1998). They sought to improve reduction of long term LBP problems through improved early management of acute LBP. Various headings of risk factors while assessing for psychosocial factors often progress with persistent pain and lead to significant workers compensation costs. Therapeutic Neuroscience Education (TNE) has been shown to be beneficial in changing a patient’s cognition regarding their pain state, which may result in decrease fear, anxiety and catastrophization.

Keywords

Chronic pain/therapy, fear, low back pain/therapy, neuroscience/education, pain education as topic, treatment outcomes

History

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is harmful resulting in fear-avoidance behavior; use of extended rest and withdrawal from activities of daily living; lack of financial incentive to return to work; conflicting diagnosis and explanations; diagnostic language leading to catastrophizing and fear; history of manual work; job stress and job dissatisfaction. As these various factors become recognized in the care of an injured worker with LBP the physical therapist should use that information in their clinical reasoning process and adjust prognosis and intervention accordingly.

Physical therapy interventions for the treatment of injuries typically have focused on procedural interventions in the literature. Patient/client related instructions and education are also a valuable interventional component in the patient/client management of an injury. Many patient education programs use a biomechanical model for explaining causation of pain and disability (DeRosa and Porterfield, 1992; Hoffmann, Del Mar, Strong, and Mai, 2013; Louw, Diener, Butler, and Puentedura, 2013). This educational model has shown limited effectiveness and may increase fear and catastrophizing leading to worse outcomes (Louw, Diener, Butler, and Puentedura, 2013; Moseley, 2003).

In contrast, Therapeutic Neuroscience Education (TNE) has been used by physical therapists to improve function and decrease disability in chronic LBP with increasing research findings to support this educational program (Clarke, Ryan, and Martin, 2011; Louw, Diener, Butler, and Puentedura, 2011; Louw, Puentedura, and Mintken, 2012; Moseley, 2002). TNE can be described as a form of cognitive behavioral therapy aimed at increasing a patient’s knowledge and understanding of pain, thus reducing fear associated with the musculoskeletal injury. The TNE presents detailed information on the neurobiology of pain and the physiology of the nervous system in patient friendly language using pictures, examples and metaphors (Moseley, 2003). Utilizing the TNE patient education strategy by discussing neurophysiology and neurobiology of pain and avoiding pathoanatomical descriptions can have a positive effect on pain, disability, catastrophizing and physical performance (Louw, Diener, Butler, and Puentedura, 2011) TNE has also been studied as a preventative strategy for LBP and found to have better effects then exercise (George et al., 2011). Unfortunately there has been little study in the use of TNE in patients with acute LBP. This case report looks at the use of a brief TNE intervention in the context of a regular physical therapy treatment intervention for a patient with acute work related LBP.

The purpose of this case report is to discuss how a brief TNE session can be used on initial and follow-up visits to help re-conceptualize pain in the acute phase of an injury to reduce risk of persistent symptoms and disability for the at-risk injured worker. Also described is the clinical reasoning process behind selection and explanation of procedural interventions so as to be concurrent with normal tissue healing and current neuroscience understanding of specific and non-specific mechanisms.

Case description

History

The patient was a 19-year-old female who sustained a low back injury and subsequent LBP while assisting with a patient transfer at the senior care center where she was employed as a Certified Nursing Assistant. She had immediate onset of pain in her right low back region with some pain spreading into the right leg. The patient was seen on the day of the injury by an Occupational Medicine physician who evaluated her and diagnosed her with a lumbar strain and right lower extremity radicular pain. The physician prescribed 800 mg ibuprofen to be taken up to four times per day and allowed her to continue at her work with restrictions of no lifting >10 pounds and no bending or twisting. On follow up 4 days later, she had no change in symptoms and was still reporting constant pain of 3/10 with increased pain of 7/10 with activity. Pain was reported as a burning sensation in her right low back region with occasional pain radiating down the right leg into her heel as seen in Figure 1. She was referred for physical therapy at that time and kept on the same medication and work restrictions. At the time of the physical therapy evaluation, which was 1-week post-injury date, she continued to complain of pain of 3/10 at rest and pain of 7/10 with activities. The pain and radiating symptoms were reported to increase with standing and walking for periods longer than 20–30 min. Through the use of a medical screening questionnaire and subjective history taking, she reported that her general health was good with no previous history of low back dysfunction or other related medical conditions. She reported smoking a half-a-pack of cigarettes per day. She also rated herself as a 4 on a 0–10 Patient Specific Functional Scale (Gross, Battie, and Asante, 2008; Stratford, 1995) with her abilities to perform her job. The patient’s goals were to alleviate pain to allow full return to work duties without restrictions.

Pain, psychosocial and disability measures

Before beginning further physical therapy test and measures, she was asked to complete intake questionnaires pertaining to pain, disability, fear avoidance beliefs and psychosocial yellow flags. These questionnaires were chosen based on the medical subjective history taken and ease of use in the clinic. The self-report questionnaires used for this patient included: Oswestry Disability Index (ODI); Fear-Avoidance Beliefs Questionnaire (FABQ); Keele STarT Back Screening Tool (Keele SBST) and Acute Low Back Pain Screening (ALBPS) Questionnaire.

Oswestry Disability Index

The ODI is a 10-item questionnaire that assesses various aspects of physical function. Every item is scored from 0 to 5, with the higher the number the greater the disability for each item. All items are added up and then multiplied by 2 and expressed as a percentage. The ODI is a reliable and valid measurement of pain and disability for LBP (Copay et al, 2008; Fairbank and Pyntsen, 2000). She scored 36% on her ODI demonstrating a moderate disability.

Fear Avoidance Belief Questionnaire

The FABQ is a 16-item questionnaire that was developed to quantify fear and avoidance beliefs in individuals with LBP. Each statement is graded on a 7-point Likert scale (0=completely disagree, 6=completely agree). The FABQ consists of two subscales: (1) the physical activity subscale scores 4 of the 5 total questions about fear avoidance beliefs and (2) the work subscale scores 7 of the 11 total questions for fear avoidance beliefs. The FABQ has also been shown to be a reliable and valid measurement in LBP (Cleland, Fritz, and Chil, 2008; Grotle, Vøllestad, and Brox, 2006; Waddell et al, 1993). She scored 23/24 and 30/42 for physical activity and work subscales, respectively, showing significant scores for high fear avoidance in physical activity and moderate in the work subscale.

Keele STarT Back Screening Tool

The Keele SBST is a 9-item questionnaire that contains questions that are established predictors for disabling back pain. Each item is responded to as “agree” or “disagree”, except the bother-someness item which uses a Likert scale of “not at all” to “extremely”. The overall score is used to separate into low and medium risk subgroups. The distress subscale is used to separate...
medium risk subgroup into medium and high risk (Hill et al., 2008, 2010). It is used to identify potential “at-risk” patients for potential long-term chronic problems. These patients need careful assessment and intervention with suitable cognitive and behavioral strategies. On the 9-item tool, she scored 4 on the total score and 1 on the distress subscale demonstrating a medium risk for potential long-term (chronic) problems.

**Acute Low Back Pain Screening Questionnaire**

The ALBPS Questionnaire has 21-items that are scored to help identify “at-risk” patients for long-term problems by assessing psychosocial yellow flags. The first 3 questions are multiple check-box questions and the remaining 18 are scored on 0–10 Likert scale. Each question is scored and all the scores are added to come up with a final score that is put into high, medium or low term risk for chronicity (Hurley et al., 2001; Linton and Hallén, 1998). Scores on the questionnaire $\geq 105$ enable the therapist to identify around three-quarters of long-term cases. Scores between 90 and 105 will include a portion of at-risk patients for medium-term problems. On this questionnaire, she scored a 101 putting her in the medium risk category for potential persistent problems.

**Test and measures**

Systems review and medical screening was unremarkable and she did not present with any “red flags” that would prevent further testing or indicate a need for medical referral. Vital signs were taken: blood pressure 120/64; heart rate 76 beats per minute and resting respirations 16 per minute. Since this patient was at medium risk for potential persistent pain problems, this was taken into consideration during the initial examination (and interventions) to minimize provoking symptoms and any fear or anxiety during therapy encounter. She demonstrated relatively normal sitting and standing postures with no significant deviations or lateral shift noted. She did demonstrate some guarded and aberrant movements with transitional movements from sit to stand; sit to supine and rolling supine to prone during examination. Visual estimation of lumbar range of motion (ROM) was utilized on a single movement of forward and backward bending along with right and left side bending, secondary to the patient reporting increased pain during movements and at end ranges. While visual estimation is not as accurate as inclinometer measurements of spinal motion (Youdas, Carey, and Garrett, 1991), the clinical decision of the treating therapist was to not put the patient through repeated movements to gain the inclinometer measurement. The movements were pain provoking and the intent of examination was to get relevant information for patient management and limit pain along with fear and anxiety of the therapy encounter. Understanding that there is limited correlation with ROM measurements and patient impairments, it was not seen as crucial to have the more accurate measurement to assist in the clinical reasoning process to assist the patient with interventions for her individual condition (Nattrass et al., 1999; Nitschke et al., 1999). Both forward and backward bending demonstrated a limitation of 75% of normal ranges (15° and 5°, respectively). With side bending right and left, she demonstrated being limited 50% of full motion (15° each). Hip internal rotation was measured with a bubble inclinometer in the prone position on the right at 20° and 45° on the left. She reported increased pulling sensation into the low back area with movement of the right leg during the hip internal rotation measurement. The patient did not present with any lower extremity myotome or dermatome deficits with testing, along with normal ankle and knee reflexes. Sacroiliac (SI) joint provocation cluster tests were done per Laslett (2008). Distraction, right Thigh Thrust and Gaenslen’s on the right and left were positive for familiar pain reproduction; while left Thigh Thrust, Compression and Sacral Thrust were negative for familiar pain reproduction. She had increased muscle guarding and tone noted in the right lumbar paraspinal musculature.
with increased hypersensitive tender points just off the spine in the right lower lumbar region. It was difficult to fully assess segmental mobility of the lower lumbar segments secondary to muscle guarding and some increased pain prior to getting to the onset of resistance of the segments. Lumbar segmental testing was stopped short of pain provocation again to limit any increased pain during the examination process. Upper lumbar segments demonstrated normal joint mobility. Neurodynamic tests showed straight leg raise on the right of 50° prior to increased leg symptoms of pain in back of leg into low back region. Symptoms increased in leg and back with dorsiflexion of the foot and ankle. The patient demonstrated a left straight leg raise of 70° back with dorsiflexion of the foot and ankle. The patient was now able to tolerate 1–2 h of standing and walking around the day of the initial examination, the patient received a 20-min one-on-one TNE session (Louw, Diener, Butler, and Puenteleda, 2011; Puenteleda and Louw, 2012) on pain mechanisms that coincided with normal tissue healing and explanations of diagnosis, prognosis and treatment interventions with limited pathoanatomical descriptions and avoidance of pain provocative language, as described in the Appendix section. She then received manual physical therapy treatment with Maitland-based joint mobilizations in left side lying consisting of lumbar rotation and posterior-to-anterior (PA) glides utilizing grade II (large amplitude short of resistance) for pain modulation. Patient education on beneficial mechanism of this treatment intervention centered on increasing movement and blood flow to assist with creating a healthy environment for tissue healing to occur and decreasing nerve sensitivity. She was instructed on home exercises for gentle neurodynamic mobility (Cleland, Childs, Palmer, and Eberhart, 2006; Coppieters and Butler, 2008; Ellis and Hing, 2008) with supine hook lying trunk rotation technique and seated slump sliders to be performed 4–6 times per day, to continue the treatment benefits offered through manual therapy. Also Kinesio Tex Tape® was applied to the right lumbar extensors to provide low grade sensory input to assist with pain control (Hwang-Bo and Lee, 2011). The patient was encouraged to gradually increase daily and work activities to tolerance utilizing a pacing program with the understanding that movements would be “more sensitive” but “safe” to perform and not risk increased injury. This explanatory model was based on TNE and an interactive (Jacobs and Silvernail, 2011) and biopsychosocial model designed to encourage resumption of normal movement while reducing neurodynamic sensitivity and reconceptualizing attitudes and beliefs regarding pain. Simple movements and ongoing patient education about the biology of pain mechanisms and normal innate healing were introduced. The therapist avoided discussion of any specific biomechanical defect in need of correction (Nijs et al, 2013).

Visits #2 and #3
The patient continued with two more physical therapy visits prior to her recheck with the Occupational Medicine physician, 1-week post-initial physical therapy evaluation. These appointments consisted of continued TNE during the course of the treatment intervention to provide current neuroscience explanations for symptoms and treatment providing up-to-date research on pain neuroscience and reassurance of normal tissue healing with progress. Manual therapy with joint mobilizations were progressed to grade III (large amplitude into resistance of movement) while still maintaining patient comfort during interventions. Dermoneuromodulation (Jacobs, 2009) was also utilized as a manual therapy soft tissue technique. This technique is based on the skin and neural modulation processes with touch through potential specific and non-specific mechanisms. While performing skin stretching, mechanoreceptors (ruffini endings) on the skin are activated on the dorsal lumbar rami to attempt modulation of nerve input to assist with descending inhibition.

Therapeutic exercises progressed with neurodynamic exercises moving into more aggressive tensioners sandwiched between sliders as patient tolerated (Coppieters and Butler, 2008). Awareness through movement or Feldenkrais exercises (Wildman, 2006) were done in sitting and quadruped for lumbar movement neuromuscular re-education. Use of Kinesio Tex Tape® was discontinued after the third visit as symptoms decreased. At the 1 week recheck with the Occupational Medicine physician, she was now able to tolerate 1–2 h of standing and walking around prior to increase in symptoms, which now were at 1/10 at rest and 5/10 at maximum. Range of motion was only limited 50% with
forward and backward bending (30° and 15°, respectively). She remained on work restrictions, but was given increased lifting restriction to 15 pounds and allowed minimal bending/twisting. Treatment continued with ibuprofen but reduced to PRN and she was to return for continued physical therapy.

Visits #4 and #5

She continued with two more physical therapy sessions prior to her next weekly recheck with the Occupational Medicine physician. She continued to progress with exercises working on general trunk exercises consisting of chop and lift diagonal patterns utilizing elastic tubing in standing, dynamic work simulated activities of lifting and pushing/pulling to meet critical job demands of her work. We used decreased amounts of manual therapy intervention over each session as pain levels decreased and functional activities increased.

Outcomes

The patient was seen for a total of 5 physical therapy visits over a 2-week period prior to being released back to her full work duties. The initial visit with evaluation took 1 hr, and subsequent follow up visits lasted 25 min, except the final visit which only lasted 15 min to evaluate return to work status and provide final instructions for an ongoing home exercise program. On her final visit, she demonstrated full ROM in the lumbar spine and tolerated lifting 50#, meeting job requirements (Table 1). No signs of any neurodynamic mobility deficits were noted. Pain levels were reported at 0/10 and she tolerated standing and walking around without limitations. Oswestry Disability Index score was 0/50 along with scores for Keele SBST (0/9) and ALBPS (0) (Table 2). All of the changes exceeded the reported minimal detectable change (MDC) scores for each outcome measure. She also reported her Patient Specific Functional Scale of being able to do her job duties as 10/10 and overall Global Rate of Change (GROC) as +5 (“quite a bit better”) on an 11 point scale from the time of injury.

Table 1. Functional measurements at initial visit, after 1 week and at discharge from physical therapy.

<table>
<thead>
<tr>
<th>Functional measurement</th>
<th>Initial</th>
<th>1 week</th>
<th>2 week (D/C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lumbar range of motion: flexion</td>
<td>15°</td>
<td>30°</td>
<td>60°</td>
</tr>
<tr>
<td>Lumbar range of motion: extension</td>
<td>5°</td>
<td>15°</td>
<td>25°</td>
</tr>
<tr>
<td>Standing tolerance</td>
<td>20–30 min</td>
<td>1–2 h</td>
<td>Unlimited</td>
</tr>
<tr>
<td>Lifting tolerance (pounds)</td>
<td>10</td>
<td>15</td>
<td>50</td>
</tr>
</tbody>
</table>

Table 2. Outcome measures at initial visit and at discharge and their associated minimal detectable change scores.

<table>
<thead>
<tr>
<th>Outcomes measures</th>
<th>Initial</th>
<th>Discharge</th>
<th>Minimal detectable change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oswestry Disability Index</td>
<td>18/50</td>
<td>0/50</td>
<td>10</td>
</tr>
<tr>
<td>Numeric Pain Score</td>
<td>3/10</td>
<td>0/10</td>
<td>2.1</td>
</tr>
<tr>
<td>FABQ (PA)</td>
<td>23</td>
<td>0</td>
<td>5.4</td>
</tr>
<tr>
<td>FABQ (W)</td>
<td>30</td>
<td>0</td>
<td>6.8</td>
</tr>
<tr>
<td>Keele SBST</td>
<td>4/0</td>
<td>0/9</td>
<td>N/A</td>
</tr>
<tr>
<td>ALBPSQ</td>
<td>101/210</td>
<td>0/210</td>
<td>12</td>
</tr>
<tr>
<td>PSFS</td>
<td>4/10</td>
<td>10/10</td>
<td>2.1</td>
</tr>
</tbody>
</table>

Discussion

Low back pain from injuries at work are a common musculoskeletal complaint found in outpatient physical therapy clinics and treatment can be varied (Battie et al., 1994). Studies have shown that the majority of the costs from these complaints come from a small portion of the actual injuries when pain persists (Hashemi, Webster, Clancy, and Volinn, 1997). While most acute non-specific low back pain caused by an injury at work should recover through normal innate tissue healing mechanisms, multiple input factors (cognitive-evaluative, sensory-discriminative and motivational-affective) can lead to pain and disability persisting beyond normal tissue healing based on current pain models (Grifford, 1998; Melzack, 2001). The patient presented with potential tissue injury from the mechanism of the incident, but also showed risk factors with fear avoidance beliefs and psychosocial yellow-flags as evident through responses to pain and psychosocial questionnaires completed during the evaluation process.

Although one cannot presume cause and effect from a single case report, the findings demonstrates how use of TNE with a patient with acute LBP appeared to prevent the development of persistent pain problems, especially in this at-risk patient. TNE was done in a brief 20-min session after the initial examination, and short 5-to-10-min follow-ups during the regular treatment interventions in subsequent visits to help the patient reconceptualize her pain experience based on current neuroscience. Manual therapy and exercise interventions were all introduced, explained and applied within the context of the TNE and delivered in an interactive model to minimize patient fear, anxiety and catastrophizing; and maximize patient self-efficacy throughout the treatment. Constant attention was also applied to words used by the physical therapist in a biopsychosocial explanatory model of the patient’s injury and recovery to minimize any possible nocebo effects (Benedetti, Lanotte, Lopiano, and Colloca, 2007).

Conclusion

In this case report, much of the outcome can be attributed to normal healing with procedural interventions primarily providing a healthy healing environment and gradually monitored progression back to regular work activities. Most acute injuries should heal with minimal to no intervention needed. Patients, like the one presented in this case study, with higher psychosocial yellow flags and fear avoidance are at increased risk to progress to persistent pain states. The course of care for this patient was of short duration and did not progress into persistent pain symptoms. This case report demonstrates potential low-cost interventional methods used within the context of TNE and biopsychosocial treatment model to reduce the progression of persistent pain for at-risk patients. Further research should be done to validate if there is a reduced progression into persistent pain patients with utilization of TNE for acute patients compared to control groups.

Declaration of interest

Each author certifies that he/she has no commercial associations (e.g., consultancies, stock ownership, equity interest and patent/licensing arrangements) that might pose a conflict of interest in connection with the submitted article. Each author also certifies that he/she has not/will not receive payments or benefits from a commercial entity related to this work.

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Appendix

Description of the Therapeutic Neuroscience Education (patient language)

Qualitative studies show that patients want answers to specific questions. TNE was designed to answer these questions: (Gifford, 2013; Verbeek, Sengers, Riemens, and Haafkens, 2004)

• What is wrong with me?
• How long will it take?
• What can I (the patient) do?
• What can you (the PT) do?

What is wrong with me?

We reviewed clinical examination findings and absence of red flags that ruled out severe pathological findings. This was done to reduce fear that major injury might have occurred that may threaten her future with significant disability.

Next was a review of physician diagnosis and any other information she had received in regards to her injury and diagnosis. This was done to diminish any erroneous beliefs or misinterpretation of what she was experiencing to reduce threat of them. Her diagnosis of lumbar strain and right leg radiculopathy was redefined into more patient friendly language with the injury being to some of the structures of the back (muscles, ligaments and joints) which was like spraining an ankle, and the pain that was sometimes going into her leg was like when she hit her ‘funny bone’ and the pain spread down her arm. This was done for continued reassurance that tissue damage was not major due to the lack of significant red flag signs and that these injuries would heal.

To assist with patient understanding of normal tissue healing, utilization of analogy to scraped knee when she was a child was used. The tissue was injured but it went through a normal healing process. No special treatment was needed to make her knee heal, it just happened automatically by her body. She was reminded, she could not stop it from healing and healing always happened. To increase patient interaction during TNE session she was often asked questions for her to respond to, in order to evaluate patient learning through teach back method. For example: she was asked if she had ever had a scraped knee, cut or bruise that did not heal? This reaffirmed that tissues may be injured but they also heal.

As part of the healing process, inflammation was explained. Any time tissues are injured they utilize a series of chemical processes we call inflammation. This is normal tissue healing, that inflammation/chemicals ‘wakes up’ the nerves around the area. Explanation of her nervous system as an alarm system was done at this time. She was asked, “if she stepped on a rusty nail, would she want to know about it?” This was to reaffirm that while pain is unpleasant, it is useful as protective mechanism. It was explained that nerves always have a ‘buzz’ to them and if enough sensors ‘wake up’ then it sends a danger signal to the brain or what we call medically, ‘nociception’. Action potentials, ion channels and nociception were discussed in this way along with pictures and drawings used to help with learning. Further explanation about increased nerve sensitivity was done through pictures of action potential buzzing a little closer to the firing line of the nerve, which makes it easier to send a danger signal. Sensitivity was demonstrated with an example of sunburn or a burn on the hand. The experience of sunburn was used as this was an experience that she had previously to help her reconsolidate this current experience to a previous experience to help decrease fear, anxiety and catastrophization. She was reminded about warm water from a shower that touched her skin felt hot as if it was burning her, even though it was not actually hot enough to burn her skin. The water did not get hotter but the body increased its sensitivity to the environment so it felt like the water was burning hot. At this time we also discussed many of the ion channels on those nerves: temperature, stress, movement, immune, blood flow and chemicals. Examples of each of them were given that she may have experienced through normal daily activities and how those different things could make her current state more sensitive. Further reassurance was given that her hurting at this time after the injury was just her nervous system protecting her and part of normal healing, not that she was getting further injured. She was referred back to the scraped knee example and asked if her pant leg touched the scraped knee or she knelt on the knee the next day, if it would hurt? Then she was asked if she injured it any further so it would not heal? This was done to continually reinforce throughout the TNE that tissues heal and increased sensitivity is normal. The greater the understanding of normal biological processes with her current condition the less fear, anxiety and catastrophization was likely to occur.

The idea of peripheral and central sensitization was briefly introduced at this time because she was at risk for persistent pain problems. It was stated that sometimes the nerves will stay sensitive even after the injury has healed. This explanation was done in conjunction with the use of the picture from Moseley’s (2005) fMRI scan case report, which was why we were spending time helping her understand her pain better. We further explained at this time that we could also reduce these risks of persistent symptoms by giving the nerve what it needed, which was some movement and blood flow through the exercises she could do and the manual treatments we would help provide. This was done to leave a window open later to return to with additional TNE if she did develop persistent pain problems and also begin to build a foundation of what she can do and what I (the PT) can do to help for compliance with the treatment intervention.

We then reviewed what we had covered with the TNE: Some tissues were injured, but no major red flags have been found to confirm that she has significant tissue damage. Tissues healed, but her nervous system “woke up” to protect her. We can with our treatment provide a healthy healing environment for her tissues to heal the best they can along with gradually turning the nervous system sensitivity down.

How long will it take?

It was explained that typically an injury such as hers should be better in a couple of weeks, but it could take up to 6–8 weeks for the tissues to completely heal. She was also reminded that sometimes pain can persist beyond tissue healing, again to leave window open if persistent pain occurred. It was important that she understands that pain does not equal injury, we returned to the example of touching the scraped knee the next day to further reinforce this idea.

What can I (the patient) do?

We reviewed the home exercises that she would be taught during initial visit and how these would provide blood flow and movement to the tissues.
nervous system, along with blood flow to assist with healing the tissues. Information about how the brain and the 45 miles of nerves in the body only weight 2–3% of her body weight, yet almost 25% of her blood is needed for them to reinforce the importance of blood flow. She was going to give the nervous system what it wanted, which was a lot of appropriate safe movement and blood. So exercises and movements were going to be done often, but in a way that was safe. She could safely touch the edges of the movement that were sensitive and still be safe to not injure anything. She was reminded of mantras such as: “hurt does not always mean harm”, “sore but safe”, “motion is lotion” and “pace it do not race it”.

What will you (the PT) do?

I then explained that I, the physical therapist, will utilize some manual techniques to assist with movement continuing to give the nervous system what it wanted. Other manual treatments would be used to help catalyze her descending inhibition mechanisms to reduce pain through touch. Also a primary role I would play was to continue to help explain and understand any questions that she had so she better understood why she hurts. She was encouraged at this time to continue to ask questions throughout therapy sessions to increase her understanding of pain. I (the PT) lastly will help gradually return her to her job with a steady program of movement and exercises to regain mobility, strength and endurance to do her job safely again.

Throughout the initial and follow up TNE sessions drawings and pictures are used to further explain the various items discussed, such as action potentials, ion channels, sensitization. Various metaphors, examples and other stories were used to continually help with patient understanding throughout additional sessions to further enhance her understanding of pain and reconceptualize it as a useful protective mechanism that will stay more sensitive for a while and that can be turned down as the tissues heal.