Understanding Chronic Pain and the Mind-Body Connection

Ruth McCaffrey, ARNP, ND  ■  Terri L. Frock, EdD, MSN, ARNP, BC  ■  Heidi Garguilo, MSN, ARNP

This article investigates the mind-body connection in chronic pain. A discussion of pain physiology is designed to identify the role of the neurological system in chronic pain perception. The gate control theory and the neurotransmitter theory of pain are explored. A description of mind-body and pain management methods, and an illustrative case study are provided. The information presented concerning mind-body connection in chronic pain perception will enable practicing nurses to be more fully aware of the chronic pain phenomenon, and lead to better chronic pain assessment, management, and evaluation. **KEY WORDS:** chronic pain, mind-body connection, pain physiology Holist Nurs Pract 2003;17(6):281–287

Pain affects people of all ages, socioeconomic groups, and ethnic backgrounds. In fact, pain is the most common chief complaint in primary care, with chronic pain reported in 20% of the visits to primary care providers. Traditionally, the focus of pain inquiry has been primarily biological, often ignoring psychological, emotional, and cultural differences inherent in pain perception. The mind-body connection of chronic pain underscores all of these factors with the explicit understanding that while external forces create a biological cascade of pain sensation, cognitive awareness and emotional response contribute to the chronic pain experience. Chronic pain can produce feelings of hopelessness and helplessness that exacerbate pain perception. Some emotional responses to chronic pain such as anger and stoicism are personal coping strategies to distract the mind from the perception of chronic pain.

Not recognizing the mind-body connection in chronic pain management can result in suboptimal patient outcomes. Katz identified that a patient’s pain symptoms are influenced by the health care practitioner’s actual attitude toward pain. Furrow reported that chronic pain is often undertreated and poorly managed in all health care venues of the American health care system. These findings compel advanced practice nurses to consider chronic pain and its management using knowledge of pathophysiology, psychology, and the mind-body connection. Not understanding the patient’s past pain experiences, current emotional state, and personal and cultural meaning of pain can greatly decrease the health care provider’s ability to assess and treat the patient’s chronic pain.

Managing pain involves accurate assessment, adequate intervention, and frequent evaluation. Every advanced practice nurse is affected by the challenge of accurately assessing and relieving chronic pain. The goal of this article is to assist advanced practice nurses to better understand the physiologic causes of chronic pain and the mind-body connection that controls the way chronic pain is perceived, and apply the mind-body connection to an actual patient situation.

**DEFINITION OF PAIN**

Some definitions of pain include the mind-body connection. McCaffrey defines pain as “whatever the experiencing person says it is, existing whenever he or she says it does.” Aronoff has defined pain as “a subjective, personal, unpleasant experience involving sensations and perceptions that may or may not relate to bodily or tissue damage.” Both of these definitions illustrate the view that the perception of

---

From the Christine E. Lynn College of Nursing, Florida Atlantic University, Boca Raton (Dr McCaffrey), Davie Campus, Davie (Dr Frock), Fla; and the John F. Kennedy Medical Center, Lake Worth, Fla (Ms Heidi).

Corresponding author: Ruth McCaffrey, ARNP, ND, Christine E. Lynn College of Nursing, Florida Atlantic University, 777 Glades Rd, Boca Raton, FL 33431 (e-mail: rmccaffr@fau.edu).
pain is discerned individually and may differ among persons with the same injury or disease.

**CHRONIC PAIN**

Chronic pain is defined as prolonged pain that usually lasts at least 6 months. Unlike acute pain, chronic pain is persistent and becomes the center of focus for the person experiencing it. Chronic pain "is a multidimensional experience with sensory, affective, and cognitive evaluative components, each of which interacts and contributes to the final pain response." Depression and anxiety often accompany chronic pain; coexisting psychological distress is a predictor of more recalcitrant chronic pain. In persons with chronic pain, the degree of pain and suffering experienced is not reliably associated with the amount of tissue damage incurred, and may last long after the noxious stimuli have been removed. Purvis believes that "pain itself should be classified as the disease, regardless of objective evidence of injury or the original cause."

The American Pain Society has defined the cycle of chronic pain. The cycle begins with a heightened focus on the pain and physical impairment. Its obsession can often lead to social isolation and depression. Depression increases feelings of fatigue, and can exacerbate chronic pain. Functional impairment, inappropriate dosing of pain relief medications, emotional distress, and the disruption of interpersonal relationships are outcomes of the uninterrupted cycle of chronic pain. Furthermore, inappropriate treatment of chronic pain may even enhance rather than diminish it. Chronic pain is difficult to treat; patients experiencing chronic pain are often sent from one provider to another in search of help with this debilitating condition.

**TYPES OF CHRONIC PAIN**

*Somatic pain* results from localized injury to the skin and subcutaneous tissue or deep somatic pain in muscles, tendons, ligaments, bone, joints, and arteries. This type of pain commonly radiates to adjacent areas. Arthritis is a type of chronic somatic pain. Pain in body organs is termed *visceral pain*. Pain receptors in the viscera are not sensitive to lacerations, heat, or pinching injuries, but are sensitive to stretching, ischemia, infection, or inflammation. Cancer pain and chronic pancreatitis are some examples of visceral pain.

*Neuropathic pain* comes from damage to the peripheral nerves or dysfunction of the central nervous system. This type of pain starts from an excitation of specific pain receptors (nociceptors). Neuropathic pain is often described as burning, tingling, or electric shock–like in quality and is unrelieved by traditional pain medications such as opioids. Diabetic neuropathy, phantom limb pain, and postherpetic neuralgia are examples of neuropathic pain.

**PATHOPHYSIOLOGY OF PAIN**

There are 3 major components within the nervous system that cause the sensation and perception of pain. These 3 entities are afferent pathways, central nervous system, and efferent pathways. The afferent pathways are composed of nociceptors, with the largest number of nociceptors found on the skin. Pacinian corpuscles are nerve endings distributed in the skin, which mediate sensations including pain, pressure, and itch. These nerve endings, when stimulated by vibrations such as massage or sound wave vibration, can reduce the perception of the chronic pain of rheumatoid arthritis.

The free nerve endings of nociceptors are sensitive to mechanical, thermal, electrical, or chemical stimuli; they are responsible for transmitting sensory pain information. Nociceptor stimulation flows through peripheral sensory nerves (afferent pathways) to the spinal cord where they ascend through a series of relay neurons to the brain.

Once the pain signal reaches the central nervous system the pain stimulus is evaluated and interpreted by the limbic system, reticular formation, thalamus, hypothalamus, medulla, and cerebral cortex. The brain’s interpretation of pain is based on the physical pain stimulus and psychological aspects, such as prior experiences with pain, cultural aspects of pain perception and pain expression, and personal attitudes toward pain. The interpretation of pain is then relayed back through the peripheral nervous system (efferent) pathways, which are made up of fibers connecting the reticular formation, midbrain, and substantia gelatinosa. Pain modulation takes place in the efferent neural pathways from the brain, and may involve chemical factors, such as neuropeptides, that can increase the sensitivity of the afferent pain receptors to
particular noxious stimuli. These pathways result in the sensation and perception of pain.\textsuperscript{13}

Pain can be considered a mind-body phenomenon receptive to mind-body therapies. Mind-body therapies are modalities that assist the mind and body to communicate with one another and resolve symptoms that accompany pain. Chronic pain has a mind-body connection and therefore, mind-body therapies can assist persons in reducing symptoms of chronic pain. Examples of mind-body therapies are meditation, relaxation, guided imagery, art therapies, biofeedback, and cognitive behavioral counseling. Evidence has emerged throughout the past several decades that suggest factors such as emotion, attitudes, and stress can also directly influence physiologic function and health outcomes.\textsuperscript{14}

THE GATE CONTROL THEORY OF PAIN

The gate control theory of pain is one explanation of how the mind plays an essential role in pain perception. In 1965, psychologists Melzack and Wall\textsuperscript{15} suggested that a “gating system” in the central nervous system opens and closes pain pathways. The gates can be opened to let pain proceed through the afferent and efferent pathways to and from the brain or the gates can be closed to block these pain pathways. The gate control mechanism for opening and closing can be influenced by nerve impulses in the efferent pathways. Efferent nerve impulses are affected by an enormous variety of psychological factors known to influence the brain.

The message sent from the brain through the efferent pain pathways to the area where pain is felt can be influenced by the mind’s interpretation of the pain sensation. Many external factors impact the interpretation of the pain such as emotions and prior experience with pain and anxiety.\textsuperscript{11} This pain theory integrates the physiological, psychological, cognitive, and emotional components that regulate the perception of pain.

On the basis of his beliefs about the different types of influences that can alter the perception of pain, Melzack\textsuperscript{11} postulated that a person could modulate his/her pain using external forces. His ideas about the interpretative aspects of pain form the basis of the gate control theory. The gate control theory explains why pain is diminished when the brain is experiencing a distracting sensation such as soothing music or the attention of a loved one. In these circumstances, the perception of pain is decreased because the interpretation of pain is modulated by the distracting pleasant experience.

NEUROTRANSMITTER MODULATION OF PAIN

Neurotransmitters are endogenous chemical messengers that affect the perception of pain. These neuromodulators include serotonin, norepinephrine, endorphins and enkephalins, and substance P. Endogenous neurotransmitters are actively secreted, crossing nerve synapses to cause an action potential and affect pain perception.\textsuperscript{16} Serotonin and norepinephrine are monoamines found in the brain, spinal cord, and sympathetic autonomic nervous system synapses. These substances are responsible for both inhibitory and excitatory functions within the medulla and pons of the brain. Their release in the brain can inhibit or increase the sensation of pain at the synapse. They can affect mood, anxiety, and sleep, which ultimately can affect the perception of pain.\textsuperscript{16}

Endorphins and enkephalins are neuropeptides that are distributed widely throughout the central and peripheral nervous system. These neuropeptides generally inhibit pain by binding with the opiate receptors on the cell membrane, blocking the release of neurotransmitters responsible for increasing pain perception. Endorphins are thought to act within the body in the same way that morphine acts when administered, and therefore are often called the body’s natural opioids. Studies have demonstrated that the body increases the production of endorphins during emotionally pleasurable experiences such as laughing, hugging, and quiet relaxation.\textsuperscript{16} Substance P is an excitatory neuropeptide that has been identified as the primary nociceptive transmitter in the afferent sensory fibers. It is released in response to noxious stimuli or injury, and increases conduction of the pain stimulus to the brain. Recent biological studies\textsuperscript{17,18} have demonstrated that substance P is present in neurons throughout the peripheral and central nervous system and is responsible for the integration of pain, stress, and anxiety. One recent study\textsuperscript{18} found that substance P was present in the limbic system, hypothalamus, and amygdala of the brain, areas associated with emotional response to stimuli. Stimulation of the amygdala in the brain, in response to fear or anxiety, caused the release of substance P and an increased perception of pain.\textsuperscript{18}
MIND-BODY TREATMENT FOR CHRONIC PAIN

Once chronic pain has been assessed and a diagnosis established, intervention is needed for pain elimination, improved functioning, increased quality of life, and patient healing. Nonpharmacologic mind-body treatment for pain management is often used in conjunction with pharmacological agents. Petit reported that heat and cold therapy, exercise, mobilization, transcutaneous electrical nerve stimulation, and acupuncture are often effective pain treatment modalities. Furthermore, complementary practices such as meditation, massage, and yoga, have surfaced as desirable alternatives when conventional therapies are ineffective.

Research into mind-body therapies and chronic pain has suggested strong evidence of effectiveness. Table 1 lists types of pain, symptoms, effective pharmacological treatments, and effective mind-body treatments. A 1990 meta-analysis of mind-body therapies demonstrated the effectiveness of biofeedback and relaxation techniques in treating the chronic pain of recurrent migraine headaches. A 1997 study evidenced that stress management training was as effective as tricyclic antidepressants in the management of chronic tension type headaches, suggesting that combining these 2 therapies, biofeedback and relaxation techniques, may be beneficial. Chronic lower back pain and chronic cancer pain have shown improvement with mind-body therapies such as music therapy, art therapy, cognitive-behavioral therapies, and biofeedback. These complementary therapies can be used in conjunction with medications to enhance and extend chronic pain relief. Strategies that have been studied and found to be effective in reducing chronic pain are distraction, cognitive-behavioral therapies such as reflection, guided imagery, and meditation; and therapeutic touch. Acupuncture and acupressure relieve chronic pain by working with energy centers in the body that are regulated by the mind. These therapies use the mind’s ability to alter the bodily perception of pain, and to redirect attention away from pain areas.

CASE STUDY

Individuals seeking medical care for pain frequently challenge advanced practice nurses. Heidi is such an example. Heidi is a 39-year-old college-educated, single, white female certified public accountant, who is employed by a very busy financial firm. She has worked long hours for many years to achieve her success. During certain times of the year, and especially at tax time, Heidi is extremely anxious, totally overwhelmed, and stressed out, as her workload increases.

Heidi presents to your office complaining of diffuse aching type muscle pain and tenderness throughout her upper back and neck, which she rates as an 8 on a 0 to 10
pain scale. She reports that she has experienced this type of pain for about 5 years. Her pain intensifies as the day progresses. She also notes that her neck muscles are particularly stiff upon awakening in the morning, and this feeling lasts approximately 1 hour. She denies any muscle weakness. Heidi has had this chronic pain for several years.

Heidi reports that periodically both of her hands seem to swell and develop numbness and a “pins and needles” sensation. Heidi denies ever experiencing any trauma to her head, neck, or shoulder areas. She has tried neck-stretching exercises every morning with minimal positive change in her pain and stiffness index. Heidi describes frequent throbbing bilateral temporal headaches, and takes Excedrin on occasion with variable relief. Heidi denies photophobia. She feels very tired most of the time, and tells you that she is easily awakened about 4 times per night, but has no difficulty getting back to sleep. Heidi denies any fevers, night sweats, or tick bites. There are no reported changes in her eating patterns or any weight loss. She takes no medications, except the Excedrin P.R.N., and one multivitamin per day. Her family history is unremarkable. Because you have performed her yearly well-women examination for the past 3 years, Heidi has developed a trust in you as her health care provider. She reveals her reticence to seek treatment for this pain because she feels she should be able to take care of it herself. But the pain has now become a real problem, and is beginning to affect her active lifestyle. Heidi admits that she has recently stopped going out socially because the pain keeps her from having fun. The pains in her neck and shoulders, headaches, and fatigue have begun to affect her daily life in many ways, limiting exercise and increasing depression.

Heidi appears healthy. On physical examination she exhibits pain to palpation throughout the neck and upper back, with multiple tender points in the occipital muscle insertions, trapezius muscle groups, and supraspinatus areas near the medial border, and above the scapular spine. There are no nodules or spasms in the muscle and no twitches upon palpation of the tender points. She also has decreased range of motion in her neck with more reduction upon right lateral rotation. Heidi has full range of motion in her neck upon flexion, extension, and hyperextension.

Heidi has strong and equal hand grasps and her bilateral biceps and triceps deep tendon reflexes are graded at 2+. There are no joint or soft tissue deformities or inflammation and no muscle atrophy. There is full range of motion for both shoulders. The rest of her physical examination is normal.

Based on the history and physical examination, the most likely clinical diagnosis is fibromyalgia syndrome (FMS). This conclusion is based on the dominant manifestations of widespread musculoskeletal pain, multiple tender points, sleep disturbance, mood changes, and presence of comorbid conditions. The patient also meets the American College of Rheumatology criteria of having widespread pain for at least 3 months, and pain in 11 of 18 tender points on digital palpation. Additionally, no laboratory or diagnostic tests are available or needed to confirm this condition.

The pathophysiological basis for FMS pinpoints neuroendocrine axis disturbances. The findings indicate substance P cerebrospinal fluid levels 3 times the normal, low cortisol production from disturbances in the hypopituitary-adrenal axis, and alpha wave progression into stages 3 and 4 of the sleep cycle.

Katz believed that it is still unclear what causes FMS but what is certain is that the syndrome involves “abnormal nociception, central sensitization to pain, and an abnormally low pain threshold.” Leake reported that FMS management entails correcting the patient’s symptoms to improve the quality of life. One major goal is to reduce chronic pain. To accomplish this, pharmacological agents are often prescribed. Commonly, antidepressant medications, such as selective serotonin reuptake inhibitors, have been shown to be effective in moderating symptoms.

Other treatment modalities include exercise, physical rehabilitation, occupational therapy, cognitive-behavioral therapy, relaxation and stress reduction techniques, complementary therapies, and diet recommendations. A significant research study examined the use of complementary therapies for FMS. Barbour questioned 60 individuals with FMS and found that the complementary therapies rated the most effective by the respondents were reading FMS literature, aromatherapy, support group participation, heat therapy, and massage therapy.

A multifaceted treatment approach for chronic pain management is important because there is a direct interrelationship between the biological basis for diseases such as fibromyalgia and the psychosocial aspects of health quality. The concept of mind-body therapies for chronic pain is generating interest, as evidenced by recent authors’ search of the Internet (see Table 2), with the discovery of a government-sponsored clinical trial using a mind-body intervention for those with fibromyalgia.

CONCLUSIONS

The mind-body connection participates in the regulation of the perception of chronic pain. It is important to consider that the mind delivers messages via the neuropeptides and their receptors. Pert describes neurotransmitters as “the molecules of emotion.” It is this link between mind and body that translates “information into physical reality, literally transforming mind into matter.”

Advanced practice nurses cannot assess using only physiologic measures the chronic pain that the patient is experiencing. While the most accurate method of assessing pain is the patient’s self-report, nonverbal
### Table 2. Web sites for complementary and alternative medicine for chronic pain

<table>
<thead>
<tr>
<th>Mind-body, Complementary and alternative medicine (CAM), Chronic pain, and Fibromyalgia Web sites</th>
<th>Web site address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr Andrew Weil’s Integrative Medicine site (Harvard-educated MD, now affiliated with the University of Arizona Medical School providing an overview of complementary and alternative treatments)</td>
<td><a href="http://www.drweil.com">www.drweil.com</a></td>
</tr>
<tr>
<td>Association for Applied Psychophysiology &amp; Biofeedback (professional organization)</td>
<td><a href="http://www.aapb.org">www.aapb.org</a></td>
</tr>
<tr>
<td>Nurse Healers – Professional Associations International (The Official Organization of Therapeutic Touch)</td>
<td><a href="http://www.therapeutic-touch.org">www.therapeutic-touch.org</a></td>
</tr>
<tr>
<td>National Institutes of Health Complementary &amp; Alternative Therapy official Web site (government site with research on alternative treatment topics)</td>
<td>nccam.nih.gov</td>
</tr>
<tr>
<td>American Massage Therapy Association (professional organization)</td>
<td><a href="http://www.amtamassage.org">www.amtamassage.org</a></td>
</tr>
<tr>
<td>The National Association for Holistic Aromatherapy (professional organization)</td>
<td><a href="http://www.naha.org">www.naha.org</a></td>
</tr>
<tr>
<td>American Holistic Nurses Association (professional organization)</td>
<td><a href="http://www.anha.org">www.anha.org</a></td>
</tr>
<tr>
<td>Alternative Medicine (general site with links)</td>
<td><a href="http://www.altmedicine.com">www.altmedicine.com</a></td>
</tr>
<tr>
<td>Alternative Medicine Magazine (journal)</td>
<td><a href="http://www.alternativemedicine.com">www.alternativemedicine.com</a></td>
</tr>
<tr>
<td>Partners Against Pain (pain management)</td>
<td><a href="http://www.partnersongainstpain.com">www.partnersongainstpain.com</a></td>
</tr>
<tr>
<td>American Chronic Pain Association (patient information support)</td>
<td><a href="http://www.theacpa.org">www.theacpa.org</a></td>
</tr>
<tr>
<td>American Society of Pain Management Nurses (ASPMN)</td>
<td><a href="http://www.aspmn.org">www.aspmn.org</a></td>
</tr>
<tr>
<td>Arthritis Foundation (professional association)</td>
<td><a href="http://www.arthritis.org">www.arthritis.org</a></td>
</tr>
<tr>
<td>National Institute of Arthritis and Musculoskeletal and Skin Diseases (government site profiling fibromyalgia)</td>
<td><a href="http://www.niams.nih.gov">www.niams.nih.gov</a></td>
</tr>
<tr>
<td>National Fibromyalgia Research Association</td>
<td><a href="http://www.nfria.net">www.nfria.net</a></td>
</tr>
<tr>
<td>Fibromyalgia Association USA</td>
<td><a href="http://www.fibromyalgiaassnusa.org">www.fibromyalgiaassnusa.org</a></td>
</tr>
<tr>
<td>Fibromyalgia Network (patient information and support)</td>
<td><a href="http://www.fmnetnews.com">www.fmnetnews.com</a></td>
</tr>
</tbody>
</table>

**cues such as crying, grimacing, and guarding may assist advanced practice nurses to comprehend the extent of the patient’s pain.** In addition to the use of pharmacotherapy, nurses can manage pain more effectively by using the patient’s self-report to classify the type of pain the patient is experiencing, and consider the mind-body connection that regulates pain perception.

Advanced practice nurses who understand the physiology and the mind-body connection in pain will be aware of the pain phenomenon, thus enhancing pain assessment and management planning. Such knowledge can assist in patient education concerning modulation of pain. A greater understanding of the mind-body connection in pain may significantly improve patient outcomes.

**REFERENCES**


