The Foundations of Psychologically Informed Physical Therapy for Musculoskeletal Disorders

Travis C. Gunderson, PT, DPT, OCS, FAAOMPT
TRIA Orthopedic Center
Bloomington, Minnesota

Adjunct Faculty
Bellin College Orthopaedic Manual Physical Therapy Fellowship
Green Bay, Wisconsin

Terese L. Chmielewski, PT, PhD, SCS
TRIA Orthopedic Center
Bloomington, Minnesota

Affiliate Assistant Professor
Division of Rehabilitation Science
Department of Rehabilitation Medicine
University of Minnesota
Minneapolis, Minnesota

ABSTRACT

Physical therapist practice, like health care in general, is driven by a biomedical model that defines illness based on abnormal cellular processes or other physical findings that direct treatment strategy. At least 50 years ago, the biopsychosocial model for health and disease, which emphasizes the interrelatedness between biological, psychological, and social factors, was described as an alternative to the biomedical model. The biopsychosocial model helps explain the presence of illness in patients without known physical abnormality or continued illness after the resolution of physical abnormality. Psychologically informed practice was subsequently conceived for managing low back pain to progress from a biomedical model towards a biopsychosocial approach and to prevent the secondary development of chronic pain and disability. Assessment and treatment strategies for psychologically informed practice are based on various models and conceptual frameworks, with the cognitive behavioral model being the most influential. Psychologically informed practice has evolved since it was introduced in the literature in 2011, yet challenges remain in successfully implementing this musculoskeletal rehabilitation approach into physical therapy practice. This monograph provides physical therapists with foundational knowledge about psychologically informed practice, including a historical account of its introduction within the profession, a description of the underlying models and conceptual frameworks, and a discussion of potential challenges in its implementation into physical therapy practice.

Key Words: biopsychosocial, cognitive behavioral, rehabilitation

LEARNING OBJECTIVES

Upon completion of this course, the course participant will be able to:

1. Explain the scope of musculoskeletal pain and the implications for physical therapist practice.
2. Describe the biomedical model and its limitations in assessing and treating musculoskeletal pain and disability.
3. Compare and contrast the biomedical and biopsychosocial models.
4. Describe a psychologically informed practice approach for musculoskeletal rehabilitation, including evidence related to its use.
5. Identify models and conceptual frameworks that guide assessment and treatment strategies in psychologically informed practice.
6. Identify barriers to implementing a psychologically informed practice approach in musculoskeletal rehabilitation.

THE PROBLEM OF CHRONIC MUSCULOSKELETAL PAIN AND DISABILITY

A significant proportion of the global population experiences musculoskeletal pain in their lifetime.[1] It is estimated that more than 20% of adults have or develop low back, shoulder, or knee pain in a given time period.[2-4] For many people, musculoskeletal pain is transient and resolves in a relatively short time frame, whereas up to 25% of the United States population experience chronic pain, and up to 8% have high-impact chronic pain.[5,6] The burden of chronic musculoskeletal pain and disability contributes to many negative consequences, such as increased opioid use and opioid addiction, poorer quality of life, and increased use of medical resources and health care costs.[7] Thus, the management of musculoskeletal pain and disability, particularly preventing the development of chronic pain, is a high priority in all areas of health care, including physical therapy.

Physical therapists assess and treat a variety of physical impairments during rehabilitation to achieve the goal of improving a patient's pain and functional level. Sometimes, patients do not achieve pain resolution or their desired functional goal even when impairments appear to be adequately resolved. For example, patients post anterior cruciate ligament (ACL) reconstruction, who express a desire to return to sport participation and meet clinical criteria to initiate sport participation, may still not return to pre-injury sport participation within 2 years of surgery.[8] In contrast, some patients achieve significant pain improvement and achievement of their functional goal, despite their physical impairments not being resolved. For example, 6 months after total knee replacement, individuals may achieve pain relief and improvement in self-reported daily functional levels but continue to have quadriceps weakness and 6-minute walk test scores that are no better than pre-operative levels.[9] The

mismatch between physical impairments and pain or functional levels challenges the underlying premise of addressing only physical impairments to achieve pain relief and functional goal attainment. This discrepancy requires physical therapists to consider that self-reported pain and function may be strongly influenced by psychological domains that could be targeted for assessment and treatment within the overall physical therapy plan of care.[10,11]

This monograph discusses psychologically informed practice (PIP) as a rehabilitation approach for the assessment and treatment of musculoskeletal pain and disability, as well as the prevention of chronic pain or disability after musculoskeletal injury or surgery. Foundational knowledge about PIP will be reviewed, including a historical account of the evolution of PIP, models and conceptual frameworks that guide PIP assessment and treatment strategies, and potential challenges with implementing PIP into physical therapist practice. Knowledge obtained from this monograph will provide the basis for understanding the clinical application of PIP in the next two monographs of the series.

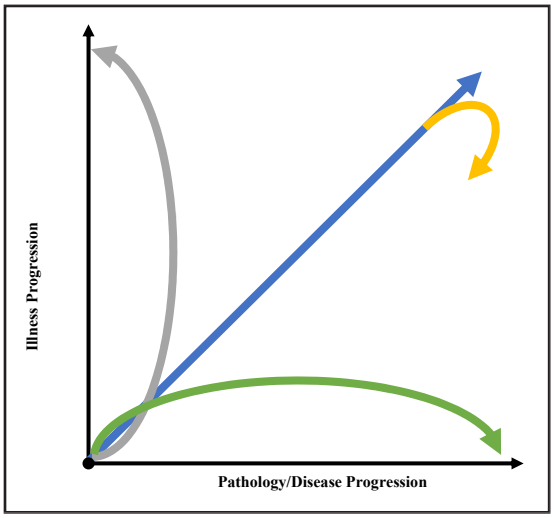
BIOMEDICAL MODEL OF ILLNESS AND DISEASE

The biomedical model of illness and disease has dominated the practice of medicine from its inception to the present day. This model describes a purported causal link between illness and disease and assumes that the cause of a patient's symptom(s) (illness) can be reduced to a singular component of cellular or tissue abnormality (disease or pathology).[12] Rudolph Virchow, a 19th-century Prussian physician-scientist, established the roots of "medical reductionism" through his work on cellular biology and the pathophysiology of venous thrombosis. This work was the first, and perhaps most influential, in arguing that the origin of disease was caused by cellular pathology.[12] He theorized that an entire organism did not become diseased; instead, disease could be reduced to the pathology of specific cells. This theory would later be termed "cellular pathology." Ultimately, Virchow's contributions became the cornerstone for many biomedical advances in the 20th century.[13]

The biomedical model has resulted in many advances in diagnosing and treating numerous human diseases. Reducing the patient's illness and subsequent disease down to singular cells, groups of cells, or individual systems (eg, gastrointestinal system, musculoskeletal system, etc) simplifies complex and variable patient presentations, and indeed there are volumes of scientific evidence that support the use of biomedical principles in diagnosing and treating illness and disease.[14,15] However, the biomedical model has inherent assumptions[12,16-18]: (1) illness is caused by pathology/disease; (2) pathology/disease within the body systems gives rise to illness, and this relationship is linear and not related to other factors (**Figure 1, blue line**); (3) to be healthy means to have no pathology/disease; (4) mental experiences (distress, delusions) are a product of the brain and are separate from the body (eg, mind-body dualism); (5) the patient has little agency over the illness or pathology/disease and has little responsibility over the presence or absence of illness or pathology/disease; (6) when treatment is sought, the patient passively receives treatment provided by the medical practitioner, and (7) intervention successfully provided for the amelioration of pathology/disease will proportionally reverse or cure the illness and pathology/disease (**Figure 1, yellow line**).

Limitations arise with strict adherence to the biomedical model. For example, patients may present to health care providers with unexplained illnesses, yet extensive medical testing shows no signs of pathology or disease (**Figure 1, gray line**).[16-19] For these patients, guidelines may suggest grouping signs and symptoms into recognizable patterns termed "functional somatic syndromes" (eg, chronic back pain, fibromyalgia, chronic fatigue syndrome, irritable bowel syndrome), and all are biomedically unexplained.[19] Many patients, including those with functional somatic syndromes, have a strong expectation for a precise diagnosis. Some report that validating their illness via diagnosis is even more important than obtaining effective treatment.[16,20,21] Despite the potential to give the patient's illness a label, arriving at the diagnosis can be delayed in functional

Figure 1. Assumptions and Limitations of the Biomedical Model[a]



Assumptions: Blue line = Linear relationship between pathology/disease and illness. Yellow line = Intervention directed at pathology/disease reverses illness and pathology/disease.

Limitations: Gray line = Illness present, but no pathology/disease presence or progression. Green line = Pathology/disease present, but no illness presence or progression.

[a]Adapted from Puentedura and Louw.[17]

somatic syndromes,[22] and these labels may frustrate or even anger patients when the underlying mechanisms and definitive treatments cannot be sufficiently explained.[19,23,24] Another limitation is that many patients show pathology/disease on medical tests,[25,26] but report no past or present illness, and the medical test results do not predict future illness (**Figure 1, green line**). This limitation is illustrated by patients who undergo radiographs or magnetic resonance imaging (eg, knee or spine) where incidental findings are discovered or for prospective research.[27,28] A final limitation is that many diagnostic labels imply a structural cause is at fault for the patient's pain or disability (eg, degenerative disc disease, osteoarthritis, subacromial impingement). Yet, when intervention is provided based on the diagnostic label, the patient's symptoms may improve substantially but to no greater extent than when inert or unrelated interventions are provided.[29-31] Problematically, diagnostic labels such as degenerative disc disease may reflect cultural beliefs (eg, "wear and tear occurs as we age") rather than a causative medical disease which calls into question the value of labels in improving health outcomes.[12,32,33]

In conclusion, the biomedical model is ubiquitous in health care, including for the management of musculoskeletal pain. Clinicians, researchers, and patients have traditionally focused on identifying a specific diagnosis for treating disease. In musculoskeletal pain, it is assumed that the source of the disease should be visualized to guide effective treatment.[34-36] The exclusive use of the biomedical model for musculoskeletal pain has limitations, which may contribute to substantial associated societal costs that exceed cancer, heart disease, and diabetes combined.[37,38] Meanwhile, less attention, resources, and research funds are given to treatment approaches for musculoskeletal pain that focus on effective, lower-cost alternatives to the biomedical model.[6,39-42]

Limitations of the Biomedical Model: Low Back Pain as an Example

Perhaps no other musculoskeletal condition has beguiled health care providers who use the biomedical model as much as low back pain.[43] The underlying assumption that a specific structural pathology of the musculoskeletal system causes low back pain has dominated nearly all diagnostic and treatment approaches for decades. This assumption has led to a cascade of expensive, ineffective, and sometimes harmful diagnostic imaging, medical treatments, and surgical procedures in the late 20th and early 21st centuries.[44] For example, patients presenting to the emergency room or their primary care physician with acute low back pain in the 1990s and 2000s were likely to undergo radiographs and magnetic resonance imaging (to identify underlying structural disease) and were given a prescription for opioids or anti-inflammatory medications (to treat the underlying cellular pathology) within the first 6 weeks of symptoms.[45,46] Similarly, those patients presenting to tertiary care spinal surgery centers in the 1990s and 2000s with chronic low back pain increasingly received spinal fusion surgery to correct the assumed structural and biomechanical cause of chronic disabling back pain.[44,47] The ineffective and potentially harmful nature of these practices has been described in the literature,[48-52] and globally, there has been little change in the use of these approaches to treat low back pain more than two decades into this century.[53,54] Encouragingly, there may be signs of reduced opioid prescription for chronic pain (including chronic low back pain) in the United States since 2016.[6]

BIOPSYCHOSOCIAL MODEL OF HEALTH AND DISEASE

George Engel was credited for introducing the biopsychosocial model of health and disease in 1977.[55] He described the need for an alternative to the biomedical model because psychiatrists often treat illnesses without biochemical pathology, and medical doctors often use psychological and social indicators to diagnose illnesses.[56] For example, patients may not seek medical care until a change in perception (eg, it hurts), behavior (eg, walking with a limp), and social function (eg, unable to perform activities of daily living) identifies the illness and makes the symptoms more than just a problem of living. Importantly, Engel viewed the biopsychosocial model as an extension, not a replacement, for the biomedical model.[56] In 1974, just before Engel's commentary, an occupational therapist named Anne Mosey published a paper with the term "biopsychosocial model" in the title.[57] Her main reason for rejecting the biomedical model was her belief that occupational therapists do not treat acute disease or pathology but are more interested in long-term psychosocial dysfunction. Additionally, she believed the biomedical model was not good for health because it largely ignored chronically ill persons and was geared toward what patients have (ie, disease/illness). In contrast, patients were mainly concerned about their limitations. Other papers discussing the psychosocial aspects of disability can be found in the literature more than a decade prior.[55,58] Thus, the biopsychosocial model has existed for more than 40 years, as has an awareness of psychosocial contributors to musculoskeletal pain and the need for addressing them in rehabilitation.

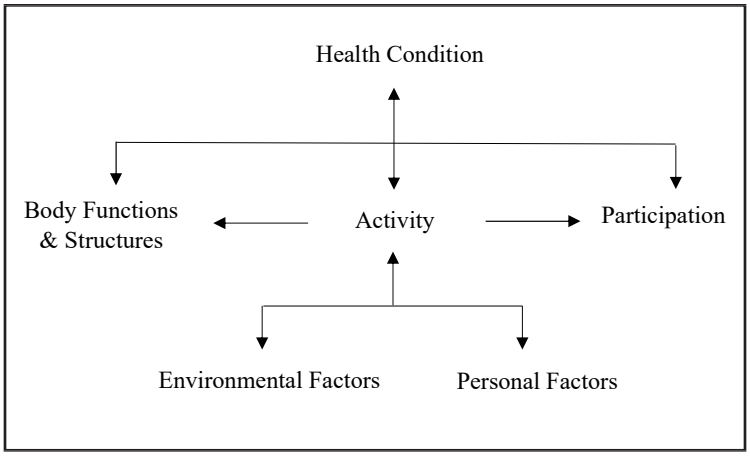
This early work also presented potential changes to how health care was provided to align itself with a biopsychosocial approach. For example, clinicians would need to use skillful history-taking and interview strategies to put symptoms in the context of biological (eg, anatomical, physiological, and biochemical), psychological, social, and cultural terms.[56] Clinicians must also identify the patient's knowledge, skills, attitudes, and learning needs. Subsequently, clinicians would need to adopt a teaching role, shifting focus from treating to teaching-learning, and a patient's change in behavior would be part of the clinical outcome.[56] Clinicians might also need to adopt skills commonly associated with those of a psychotherapist. However, it was recognized that not all clinicians would have the appropriate skills, and outside referral might be necessary.[56,59]

Finally, patients would need to participate actively in the evaluation, treatment, learning processes, and goal setting.[56,57]

In 2002, the World Health Organization published the International Classification of Functioning, Disability and Health (ICF). The ICF incorporates a biopsychosocial perspective for understanding and studying health and health-related states. The framework has two parts: (1) functioning and disability, which includes body functions and body structures, activities, and participation, and (2) contextual factors, which include environmental and personal factors (**Figure 2**).[60] Function and disability result from the interaction between the health condition and contextual factors. The ICF was endorsed by the World Confederation for Physical Therapy in 2003 and by the American Physical Therapy Association (APTA) House of Delegates in 2008.[61] It was later recognized that the ICF and biopsychosocial model could be incorporated into physical therapist practice by administering psychosocial assessment questionnaires in accordance with the *Guide to Physical Therapist Practice* (*The Guide*), which specifies the use of assessment questionnaires, tests, and interventions in physical therapy.[61,62]

The biopsychosocial model is generally accepted as an appropriate and valid approach to describe illness and disease; it has even been integrated into clinical practice guidelines, yet it is not without criticism.[58] A primary criticism is that the complex interaction between biological, psychological, and social domains makes it difficult to implement into clinical practice consistently.[14] This is evidenced by the slow increase in papers devoted to biopsychosocial concepts since its inception.[58,63] Despite these criticisms, the biopsychosocial model underpins current concepts such as person-centered care, goal setting in rehabilitation, and cognitive-behavioral-based treatments that have been shown to improve rehabilitation outcomes.[58]

Figure 2. The International Classification of Functioning, Disability and Health



PSYCHOLOGICALLY INFORMED PRACTICE

Psychologically informed practice (PIP) is a term coined by Main and George in 2011 for a clinical approach to managing low back pain that focuses on the secondary development of chronic pain and disability.[64] A key component of PIP is early screening for pain-related psychological distress (ie, yellow flags) via standardized questionnaires. Based on patient answers and scores on standardized questionnaires, the risk of developing persistent pain and disability is assessed.[64] Patients with yellow flags receive treatment to address modifiable psychosocial factors based on cognitive behavioral principles. Psychologically informed practice is perceived as a middle ground between impairment-based physical therapy driven by the biomedical model and cognitive-behavioral approaches developed for treating mental illness. In essence, PIP represents a clinical application of the biopsychosocial model.

The key components of PIP for managing musculoskeletal pain have been identified,[65] and these align with clinical care ideas expressed when the biopsychosocial model was developed.[55,56] An overarching component is patient-centered communication, including motivational interviewing and shared decision-making skills, that elicit the patient's perspective. Patient-centered communication can augment information from the interview and standardized assessment with patient-reported measures, including psychological questionnaires. It can be used alongside treatment options, including traditional physical therapy interventions such as manual therapy and exercise, and techniques to improve pain coping skills such as problem-solving, relaxation, pacing, and mindfulness. Treatment options also may include behaviorally based interventions (eg, graded exposure or graded activity) to prevent disability resulting from activity avoidance. During treatment, the physical therapist uses cognitive and behavioral interventions to encourage patient behaviors that help recovery. Importantly, these intervention strategies are tailored to the patient's condition, expectations, context, beliefs, and experiences. Additionally, the physical therapist monitors the patient's response to treatment by regularly reassessing yellow flag screening questionnaires and subjective reports. Psychologically informed practice differs from traditional physical therapy because it explicitly addresses patient cognitions, emotions, and behaviors individually.[65] However, it is thought to be an extension of skills physical therapists already possess.[64]

Psychologically informed practice was initially introduced to the physical therapy profession for managing low back pain following the growth of evidence on the contribution of psychological factors to low back pain outcomes. Since the introduction of PIP, its use has expanded to other musculoskeletal disorders, such as ACL reconstruction,[66] total knee replacement,[67] and

whiplash-associated disorders.[68] Additionally, exploratory clinical trials have been conducted for low back pain and generally support the effectiveness of PIP.[69,70] Conversely, pragmatic trials have not shown the same efficacy. They have reported implementation challenges such as poor treatment fidelity, clinicians not matching psychological screening results to recommended treatments, and health system barriers.[71,72] While it is likely that some components of PIP are relevant for all patients (eg, patient-centered communication), there may also be patients who benefit from only specific components of a PIP approach. Moreover, the influence of psychological factors on clinical outcomes is still being defined in populations where pain is not the primary concern, such as athletes recovering from a traumatic injury.[73] These findings point to the ongoing challenge of translating the biopsychosocial model from research to clinical practice.

BASIS OF PSYCHOLOGICALLY INFORMED PRACTICE

This section describes models and conceptual frameworks that underlie assessment and treatment strategies used in PIP. The first model that will be presented is the cognitive behavioral model (CBM), which is considered fundamental to most psychologically-based theories and is strongly linked with PIP.[74] It also serves as the basis for subsequent models presented in this section.[74] Each model attempts to characterize potential psychological factors (**Table 1**) and processes that may be related to patient outcomes and distill these complex processes down to logical and simple components for both the researcher and clinician. No one model can describe all outcomes, and most will be updated over time, but the models selected for this monograph provide a starting point for understanding PIP in musculoskeletal rehabilitation (**Table 2**).

Cognitive Behavioral Model

In the 1950s and 1960s, a psychologist named Aaron Beck was developing ideas for a new therapy for the treatment of depression. These ideas gave rise to the CBM, which describes the relationship between patients' maladaptive cognitions and beliefs that maintain unwanted behaviors.[75] This model of human behavior was revolutionary for psychologists at the time because it changed the strictly behavioral (classical and operant conditioning) and psychoanalytic approaches of the early and mid-1900s.[75] Since its development, the CBM has been used to create cognitive behavioral interventions that address a range of populations and conditions, such as depression, anxiety, obesity, eating disorders, post-trauma stress disorder, whiplash-associated disorder, and chronic back pain. Psychologists, counselors, nurses, dietitians, physicians, and physical therapists have administered cognitive behavioral interventions effectively.[66,76,77] No matter the discipline, format, setting, or condition, the theoretical underpinnings of the CBM remain consistent.

The underlying principle of the CBM is that when an individual faces any situation, their interpretation of the situation will influence their emotional, behavioral, and physiological response to a greater extent than the situation itself (**Table 3**).[78] For example, if you were to meet a friend for dinner at a café at noon and they still have not shown up at 1:00 PM, your thought could be, "I wonder if something terrible has happened to my friend because I believe them to be very reliable." Your cognitions and beliefs, in this case, would likely cause an emotion of fear or worry, which would then directly cause the behavior of calling your friend to check on them to see if they are okay. In this way, the cognitive aspect of the CBM proposes that unhelpful thinking and beliefs perpetuate emotions that drive behaviors, ultimately reinforcing cognitions and beliefs.

Table 1. Common Psychological Responses to Pain or Injury[a]

Psychological response	Description	Common examples in physical therapy
Cognitions	Thoughts and beliefs about pain and disability.	"Pain means something in my body is injured." "The only way to fix the pain is with surgery."
Emotions	Feelings about pain, injury, or disability.	Fear of movement, fear of re-injury, frustration about lack of progress in rehabilitation, guilt about not doing a home exercise program.
Overt behaviors	Conscious or unconscious physical responses to pain, injury, or disability.	Avoidance of return to sport, holding one's breath during movement, co-contraction of the abdominal muscles when lifting.
Attention	Pain or injury competes for attention to deal with the threat.	Regularly checking for pain in a body part. Anticipation of pain onset while bending.

[a]Adapted from Linton and Shaw.[101]

Table 2. Models Relevant to Assessment and Treatment in Psychologically Informed Practice

Model	Description
Cognitive behavioral model	In each situation, it is one's thoughts that create feelings which ultimately influence their behaviors, that impact pain and function. Undesirable/unhelpful feelings and behaviors can be altered by re-framing thoughts.
Allostatic load model	Physical and non-physical stressful events activate neural and hormonal pathways to maintain a homeostatic environment ("allostasis") promoting survival. When stressors are frequent and/or severe enough these pathways become dysregulated, with negative impacts on musculoskeletal health outcomes.
Fear-avoidance model	Negative thoughts about pain create fear, hypervigilance, and avoidance behaviors, leading to disuse, depression, disability, and more pain.
Acceptance and commitment model	Entrenched beliefs (eg, pain equals damage or needs to be cured) block attainment of life goals. The development of psychological flexibility helps the patient focus efforts towards their values.
Integrated model of response to sport injury	The psychological response to sport injury includes cognitive appraisal, emotional response, and behavioral response that are influenced by personal and situational factors and impact recovery.
Social cognitive theory	An individual's cognitions and environment interact to produce behavior. Key components are modeling, reinforcement, self-efficacy, and outcome expectation.
Self-determination theory	Intrinsically motivated behavior requires autonomy, competence, and relatedness, and leads to psychological growth and well-being.
Common sense model	A patient's representation (sense-making) of their health problem, along with their feelings, directly influences the actions they take, and subsequently the health outcome.
Transtheoretical model	Model of intentional behavior change that describes why, how, and when people are ready (or not) to act on a new health behavior.

Table 3. Application of "Thought Challenging" Within the Cognitive Behavioral Model

Situation	Cognition	Emotion	Overt behavior	Thought challenge
Pain has increased in the morning	"Oh no, here we go again."	Frustration, anger	Give up on treatment. Increased muscle tension.	"My pain is no better, but I have been able to walk farther than before. I've succeeded at things in the past, I can do this."
Bend to lift child	"My back is going to really hurt."	Fear, anxiety	Tense and hold breath, avoid trunk flexion.	"If my back pain increases, I'll be okay because I know this movement is safe, and I will be able to control the pain quickly."

If a clinician were to use the CBM with a patient, it would be directed towards helping the patient examine the validity of their thoughts and beliefs to decide if they fall into a range of "cognitive distortions" (**Table 4**). This can be done by engaging in "thought challenging" exercises that aim to shift thinking to a more balanced view of the situation. A more balanced thought about the situation changes the associated emotions, reducing unhelpful overt behaviors. To illustrate this, a patient with a rotator cuff tear might believe their shoulder tendon could be further torn by reaching overhead, resulting in fear of reaching into their cupboard (**Figure 3**). To deal with this fear, they reduce how high and often they reach overhead (avoidance