

# Pain, Mind, and Movement

## *An Expanded, Updated, and Integrated Conceptualization*

Maureen J. Simmonds, PhD, PT,\* G. Lorimer Moseley, PhD, PT,†  
and Johan W. S. Vlaeyen, PhD‡§

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Chronic pain and its often associated movement dysfunction are pervasive, intriguing, and complex problems and many factors can account for their persistence into chronic pain disability. Conceptualization of pain and movement dysfunction as 2 aspects of an integrated system has increased our understanding of both. However, that conceptualization remains incomplete until it also includes the mind. Indeed, pain, mind, and movement are each complex constructs and are each a component of an integrated system complex.

For many years pain was conceptualized, managed, and studied as a symptom of pathology or injury and as a sensory phenomenon only. Movement dysfunction, and psychosocial distress were deemed a consequence of that sensory problem. Research over the last few decades has shown that pain is not just a symptom but that it can persist and become a pathophysiologic condition in and of itself. Movement dysfunction is not just a consequence of anticipating and minimizing pain but is the motor component of a much broader problem; and, psychologic factors (cognitions and emotions) and social and environmental factors effectively mediate and moderate the perception and the behavioral component of chronic pain as a complex multidimensional construct.

The limited success to date in solving the challenge of pain, mind, and movement difficulties is in part due to the fact that research studies have frequently focused on isolated factors, and management methods have adopted a “one size fits all” approach. Pain and the person with pain must be researched and managed within a complex, individualized system of proximate and distal biologic

and environmental factors, using an intensive, integrative, and interdisciplinary approach. To be effective, such an approach requires coalescing basic and clinical scientists and practitioners who specialize in pain from a broad range of perspectives.

This special issue of the *Clinical Journal of Pain* represents a series of papers from the first Pain, Mind, and Movement conference, a satellite conference of the International Association for the Study of Pain 11th World Congress of Pain in Cairns, Australia. This focussed satellite conference brought together basic and clinical scientists and clinical practitioners from a range of disciplines in a forum aimed to facilitate synergies of expertise and to afford an understanding of the integrated complexities and challenges relative to mechanisms, measurement, and optimal management of pain, mind, and movement problems. A key theme from the conference was the notion that pain and movement difficulties must be conceptualized, investigated, and managed in a multidimensional, integrated manner; basic research must address both afferent and efferent systems and the integration of both, and translational research must proceed in an iterative, bidirectional way that uses multimeasure, multimethod approaches. The papers in this special issue individually and as a whole illustrate the state of the science, the art, and the thinking in this exciting and important area.

An integrated model of pain, mind, and movement is argued in Sullivan’s review paper. Using a biopsychomotor conceptual model he proposes that there are 3 distinct behavioral aspects of movement related to pain: protective behavior, communicative behavior, and social behavior. Clearly these 3 behavioral characteristics involve the mind at a conscious or unconscious level. As such the model provides a useful framework on which to temporarily “hang” and test the integrity of hypotheses relevant to pain, mind, and movement.

Arendt-Nielsen and Graven-Nielsen presents the results of systematic experimental research that has focussed on muscle response to painful stimuli at rest and during movement. By delivering noxious stimuli to the muscle in individuals with or without pain, they have examined the relationship between pain and muscle activity, both at rest and during movement. Contrary to popular clinical belief, they have found that electromyographic activity is not increased at rest in painful muscles. However, consistent with clinical research.

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From the \*School of Physical and Occupational Therapy, McGill University; †Department of Physiology, Anatomy and Genetics, Oxford University, UK; ‡Department of Psychology, University of Leuven, Belgium; and §Department of Clinical Psychological Science, University of Maastricht, Netherlands.

Reprints: Maureen J. Simmonds, PhD, PT, School of Physical and Occupational Therapy, McGill University, 3654, Promenade Sir William Osler, Montreal, Quebec, Canada H3G1Y5 (e-mail: Maureen.simmonds@mcgill.ca).

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They demonstrated that painful muscles show a decline in range of movement, force production, and endurance. They further show that antagonist muscle activity is increased during movement and during isometric contractions in particular. This movement-related cocontraction is consistent with findings in clinical pain populations including those in whom pain is not confined to muscle tissue, for example, low back pain. For example, in patients with pain from spinal problems (eg, low back pain) and in those with cancers, pain that is not confined to muscle and indeed illness (eg, cancer) results in muscle cocontraction during task performance, and slowed velocity of movement which is physiologically and temporally inefficient. Inefficiency of movement can help account for patients' symptoms of fatigue and their report of relatively higher levels of perceived effort during task performance than healthy age and sex-matched controls.<sup>1</sup>

Hoffman's paper focuses on pain and the mind as opposed to pain and the muscle. He uses virtual reality (VR) paradigms as a means of influencing attentional focus during painful clinical procedures thereby decreasing perceived pain. This is a novel area of research that needs systematic study to tease out the scientifically sound applications of the technology from the technological advances alone. Hoffman has demonstrated that distraction using VR has analgesic effects in children undergoing painful medical procedures and decreases pain-related brain activity as investigated by functional magnetic resonance imaging. Given that the effects of VR analgesia is robust, and is robust across pain conditions, it remains to be seen what aspects of the virtual environment are relevant and what if any level of interaction (emotional, cognitive, or behavioral) with the environment is important.

With regard to VR as an analgesic intervention, it is possible that in addition to the obvious effect of distraction, the VR technology and novelty of the approach could increase the magnitude of the analgesic effect through analgesic expectancies. Expectancies have been shown to have a significant nonspecific effect on outcome, credibility has not been well studied. Smeets et al examined the effect of outcome expectancy and treatment credibility for the more usual treatments of active physical therapy (PT), cognitive behavior therapy (CBT), and the combination of PT and CBT. The results of the study were mixed. They showed that expectancies

do predict treatment outcome but the effects are treatment specific that is, expectancies about PT predicted outcome of PT. Likewise treatment credibility predicts outcome but that too is treatment specific that is, treatment credibility of CBT predicted outcome of CBT. An interesting finding is that low outcome expectancy was associated with higher pain-related fear, suggesting that this patient subgroup might be more difficult to engage in a pain management program. Although the results can contribute to better customization of our treatments, essentially, these results suggest that more study is needed to identify the principles and patterns of patient and practitioners' treatment-related beliefs.

The focus on patients and practitioners treatment beliefs and preferences is further developed by Wittink et al. Wittink and colleagues discuss the persistent problems of pain management in clinical practice. They ask and discuss the question of whether the methods and measures often used to guide and refine clinical research and clinical practice are the best ones to use. Specifically, they discuss the limited external validity of randomized controlled trials that restricts the application of findings to individual patients. This is especially relevant given the complex, heterogeneous nature of individual patients with pain, mind, and movement difficulties. A key point of the paper is the notion that the personal beliefs of patients and practitioners about treatments and treatment decisions, requires urgent, systematic study to better understand the issues and how to measure and manage them.

In summary, pain, mind, and movement, are each complex constructs and are each a component of an integrated system complex. Optimum management is predicated on optimum understanding of the person with the problem within the healthcare milieu. The papers in this special issue focus on mechanisms, measurement, and management of the problem. Individually and as a whole they illustrate the state of the science, the art, and the thinking in this exciting and important area and set a course for future research.

## REFERENCE

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