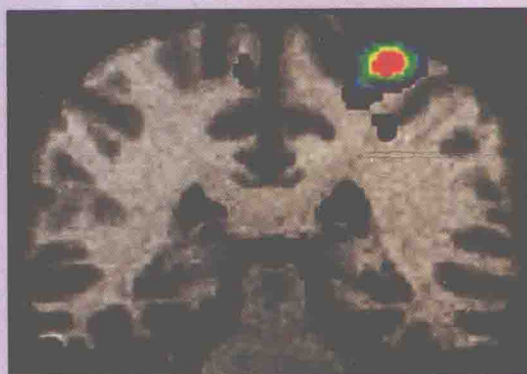


PSYCHOLOGICAL METHODS OF PAIN CONTROL: BASIC SCIENCE AND CLINICAL PERSPECTIVES

Donald D. Price
M. Catherine Bushnell
Editors



Attention to Pain



Distraction from Pain

Progress in Pain Research and Management

VOLUME 29

Progress in Pain Research and Management
Volume 29

Psychological Methods of Pain Control: Basic Science and Clinical Perspectives

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International Association for the Study of Pain®

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Library of Congress Cataloging-in-Publication Data

Psychological methods of pain control : basic science and clinical perspectives / editors, Donald D. Price, M. Catherine Bushnell.

p. ; cm. -- (Progress in pain research and management ; v. 29)

Includes bibliographical references and index.

ISBN 0-931092-52-3 (alk. paper)

1. Pain--Psychosomatic aspects. 2. Chronic pain--Alternative treatment. 3. Analgesia. 4. Placebo (Medicine) I. Price, Donald D. II. Bushnell, M. Catherine, 1949- III. Series.

[DNLM: 1. Pain--psychology. 2. Pain--therapy. WL 704 P97332 2004]

RB127.P835 2004

616'.0472--dc22

2004048277

Published by:

IASP Press

International Association for the Study of Pain

909 NE 43rd Street, Suite 306

Seattle, WA 98105-6020 USA

Fax: 206-547-1703

www.iasp-pain.org

www.painbooks.org

Printed in the United States of America

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Foreword

Since its inception, the International Association for the Study of Pain (IASP) has promoted the concept that pain is a multidimensional phenomenon that is a function of sensory, emotional, motivational, and evaluative processes. Within this theoretical framework, it is not surprising that neuroscientists and psychologists have been able to inspire one another and collaborate in endeavors such as the creation of this book.

Recent years have seen a considerable growth of interest in the placebo effect and in psychological factors related to this phenomenon. With the use of sophisticated psychophysical methodologies and human brain imaging, scientists are now able to examine the neural underpinnings of psychological influences on pain. The recent spate of placebo-related articles in top international journals and the high standard of scientists involved speak for themselves. IASP has been at the forefront of scientific interest in the study of the placebo effect and of the more general influence of psychological state on pain. It is within this atmosphere that the Special Interest Group on Placebo was founded in 1996 at the 8th World Congress on Pain in Vancouver. Interest grew rapidly, as was expressed at the 9th World Congress on Pain in Vienna, which included a session on placebo that featured talks by Donald D. Price, Fabrizio Benedetti, and Patrick D. Wall. The session caused intense interest and excitement, and from this meeting emerged the idea of writing a book that would integrate the ideas of both clinicians and scientists to better reveal how psychological factors can influence pain.

Dr. Price and his coeditor, M. Catherine Bushnell, have brought together an international team of scientists and clinicians to synthesize the most recent research on psychological aspects of pain perception and pain treatment. The historical perspective surrounding this book is unusual; in only a few years our understanding of such phenomena as hypnotic and placebo analgesia and the role of psychological factors in pain has expanded rapidly, so that we are beginning to understand for the first time the neural mechanisms underlying these phenomena.

This book discusses the influence of placebo, hypnosis, expectation, attention, emotions, and suggestions in a structured manner that gives nurturance and direction to further developments in the field. The content, meaning, and style come together in a manner that will stimulate and inspire the reader.

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Preface

The past decade has seen remarkable developments in studies of psychological factors that influence pain, including attention, emotions, and suggestions, and improved developments of psychological methods of pain control, such as hypnosis. These developments have several sources, including improved designs of both experimental and clinical studies and the interface of brain imaging with thoughtful questions. Yet this new information comes at a time of some skepticism about the role of psychological influences on pain, such as the insistence that placebo analgesic effects are nothing beyond the changes seen in natural history.

This skepticism is surprising, because it has been known since antiquity that psychological factors and interventions can powerfully modulate the experience of pain. Recently we have learned that pain can be influenced by factors as straightforward as giving the patient one or two simple suggestions or as subtle as changing the clinical or experimental context. What are these factors or interventions that modify pain, and how do they work? And if they do work, could understanding of their mechanisms facilitate their use in clinical contexts? With these types of questions in mind, in editing this book we had two overall objectives. The first is to explain some of the fundamental principles by which pain is modulated by psychological factors, such as suggestion, expectations, attention, emotions, and cognitive reframing. The second is to show how these principles can be applied to the treatment of patients who have acute or chronic pain.

The book is divided into four sections; each section contains chapters that analyze pain modulation from clinical or basic science perspectives or both. The first section is about the general mechanisms of psychological control of pain. The chapters of this section are written from the perspective that pain is multidimensional and that pain experience can be modified at different neural levels and within specific dimensions (e.g., sensory, immediate affective, secondary affective). The second section is about general psychological factors that modulate pain, such as attention, emotions, and environmental factors. The third section is about placebo analgesia, a topic currently of intense and productive investigation. The final section is about hypnotic analgesia and contains a chapter written by cognitive neuroscientists and a chapter written by a psychologist who has had extensive clinical experience using hypnosis to control pain. The topics of this book by no means include all psychological methods of pain control, yet they are cho-

sen to reflect how understanding of underlying mechanisms can contribute to the way in which clinical practice is conducted.

This book, inspired and organized in part by the IASP Special Interest Group on placebo, is intended to reflect basic science and clinical knowledge about how pain can be psychologically modulated by factors that occur naturally in clinical and experimental contexts and by explicit therapeutic interventions. Although the book can serve partly as a practical guide to the clinical use of psychological factors such as expectation, attention, and emotions in pain treatment, it does not include a definitive “how to” manual for psychological interventions. For such details, readers are referred to other sources.

The editors are grateful for the editorial assistance of Elizabeth Endres and others at IASP Press and for the timely efforts of our authors.

DONALD D. PRICE, PhD
M. CATHERINE BUSHNELL, PhD

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Part I

General Mechanisms of Pain Modulation

1

Overview of Pain Dimensions and Their Psychological Modulation

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Milton Erickson, a world-renowned practitioner of medical hypnosis during the last century, was known to powerfully alter symptoms through the use of well-designed indirect suggestions (Haley 1967). An example was that of a patient, "Joe," who was terminally ill and in unremitting pain. Erickson spent several sessions with Joe talking about a tomato flower, interspersing suggestions such as "You have seen movies of flowers *slowly*, *slowly* opening, giving one a *sense of peace*, a *sense of comfort*." Joe's outward demeanor gradually changed from distress to serenity, his behavior suggestive of severe pain subsided, and although he was still terminally ill, gradual improvements were noted in his physical condition. This dramatic example of pain reduction by hypnotic intervention is as mysterious as it is inspiring. What was in Joe's experience that accompanied changes in pain? What dimensions of pain were altered by this intervention? Did Joe still experience the same burning, piercing, or aching sensations or was there just a profound alteration in the meanings of these sensations? Did Joe become "dissociated" from his body or did he experience his body in a radically different manner? Similar questions can be asked about situational factors that alter pain or pain behavior. Beecher's battleground observations at the landing at Anzio point to the critical influence of context and meaning in pain (Beecher 1959). He found that soldiers wounded in battle complained much less and requested much less pain medication than civilians similarly injured in street accidents. What was different about their pain experience? Did the meanings associated with these two contexts bring about differences in perceived sensory intensity, in emotional dimensions, or only in pain-related behavior?

Clearly, psychological factors can sometimes influence pain in powerful ways, yet the myriad questions about how this takes place need not remain forever mysterious or unanswerable. The purpose of this book is to review evidence concerning the mechanisms by which psychological factors modulate pain both in clinical and experimental contexts. These reviews should be helpful for pain researchers who seek a scientific understanding of psychological modulation of pain as well as for clinicians who wish to optimize the influence of psychological factors in their treatment of pain patients.

The examples described above serve to remind us that the experience of pain is never an isolated sensory event and that it never occurs without the influence of context and meaning. Pain is influenced by beliefs, attention, expectations, and emotions, regardless of whether it occurs during the most controlled laboratory circumstances or during circumstances of physical trauma or emotional distress. The chapters in this book explore the mechanisms and the consequences of psychological modulation of pain from both clinical and experimental perspectives. In order to provide a preliminary foundation for these discussions, the first part of this chapter provides very general and somewhat simplified psychological and neurophysiological overviews of pain-processing mechanisms. The remaining chapters explore these mechanisms in greater detail and precision. As a starting point for discussion, one can think of pain modulatory mechanisms as those that can intervene in the pathways outlined in Figs. 1 and 2.

PSYCHOLOGICAL STAGES OF PAIN PROCESSING

Pain contains both sensory and emotional dimensions and is often accompanied by desires to terminate, reduce, or escape its presence (Hardy et al. 1952; Buytendyck 1961; Melzack and Wall 1965; Melzack and Casey 1968). By definition, pain has both unique sensory qualities and involves unpleasantness and sometimes other emotional feelings, largely due to the fact that the sensory qualities of physical pain dispose us to feel unpleasantness in most contexts. Thus, sensory qualities associated with pain are usually unpleasant for the same reasons that nausea and air hunger are perceived as unpleasant, as indicated by the path from nociceptive sensations to immediate unpleasantness in Fig. 1. In addition, however, there are parallel contributions to pain unpleasantness because the meaning of these sensory qualities is shaped by context and by a person's ongoing anticipations and attitudes. These contextual and cognitive factors are partly the result of the fact that pain often occurs within a situation that is threatening, such as during physical trauma or disease. Part of the affective dimension of pain is

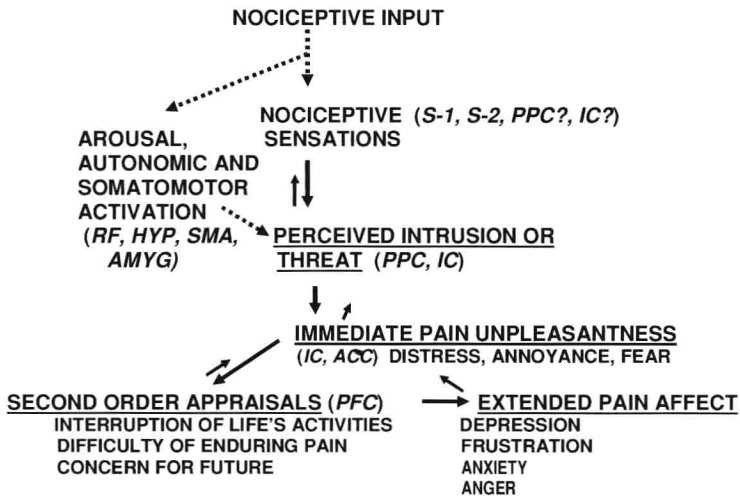


Fig. 1. A schematic used to illustrate interactions between pain sensation, pain unpleasantness, and secondary pain affect (solid arrows). Neural structures likely to have a role in these dimensions are shown by abbreviations in adjacent parentheses. HYP = hypothalamus; IC = insular cortex; PFC = prefrontal cortex; PPC = posterior parietal complex; RF = reticular formation; S1, S2 = first and second somatosensory cortical areas; SMA = supplemental motor area. Dashed arrows indicate nociceptive or endogenous physiological factors that influence pain sensation and unpleasantness.

its moment-by-moment unpleasantness, comprising emotional feelings that pertain to the present or short-term future, such as annoyance, fear, or distress. This component of pain-related emotional feeling will be referred to as *immediate pain unpleasantness* both in this chapter and Chapter 2. Immediate pain unpleasantness is often—although not always—closely linked to both the intensity and the unique qualities of the painful sensation. Another component of pain affect, *extended pain affect*, includes emotional feelings directed toward the long-term implications of having pain (e.g., “suffering”), as shown in Fig. 1 by the path extending from immediate pain unpleasantness to extended pain affect.

PSYCHOLOGICAL INTERRELATIONSHIPS BETWEEN SENSORY AND EMOTIONAL DIMENSIONS OF PAIN

Multiple factors contribute to immediate pain unpleasantness. Several sensory attributes of pain tend to create unpleasant emotional feelings. The foremost among these is that sensations of pain are often more intense than other types of somatic sensations. It is commonly accepted that perceived

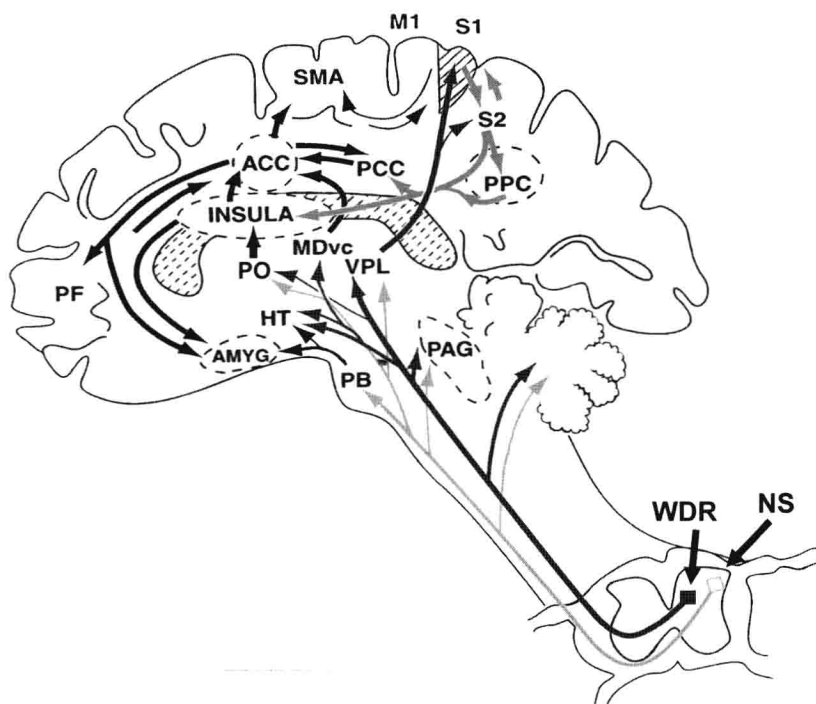


Fig. 2. A schematic of ascending pathways, subcortical structures, and cerebral cortical structures involved in processing pain. ACC = anterior cingulate cortex; PO = posterior nuclear complex; AMYG = amygdala; HT = hypothalamus; M1 = primary motor area; MDvc = ventrocaudal part of the medial dorsal nucleus; NS = nociceptive specific; PAG = periaqueductal grey; PB = parabrachial nucleus of the dorsolateral pons; PCC = posterior cingulate cortex; PF = prefrontal cortex; PPC = posterior parietal complex; S1, S2 = first and second somatosensory cortical areas; SMA = supplementary motor area; VPL = ventroposterior lateral nucleus; WDR = wide dynamic range.

intensity is a salient factor that contributes to the unpleasantness of pain, and this may be the reason that very loud sounds and bright lights are sometimes metaphorically referred to as “painful.” In addition, pain presents characteristics of slow adaptation (i.e., persistence), temporal summation (increased sensation as a function of stimulus repetition for some types of pain), spatial spread of sensation at suprathreshold levels (i.e., radiation), spatial summation (increased sensation as a function of the size of the affected area), and unique sensory qualities, as implied by words such as stinging, burning, and aching (Price 1999, 2000). Qualities of sensations evoked by tissue-damaging stimuli or by stimuli that would produce tissue damage if maintained (i.e., *nociceptive* stimuli) dispose us to perceive pain as invasive and intrusive for both the body and consciousness (Buytendyck 1961). Both neural

and psychological processes related to sensory qualities of pain can be conceived as important causal links in the production of pain-related emotional disturbance. The persistence of these sensory qualities over time enhances unpleasantness. Thus, there exists a serial interaction between pain sensation intensity and immediate pain unpleasantness (Fig. 1).

Perhaps the most direct demonstration of this serial interaction is a study by Rainville et al. (1999). These investigators found that hypnotic suggestions targeted toward unpleasantness could selectively decrease or enhance ratings of immediate unpleasantness of a 47°C stimulus without changing pain sensation intensity. In contrast, when suggestions were directed *only* toward changing pain sensation intensity, both pain sensation intensity and pain unpleasantness ratings changed in parallel. The combination of these two sets of results helps to establish that pain sensation intensity is a cause of pain unpleasantness and not vice versa. These results also have neurophysiological correlates, as will be described in Chapter 11.

Immediate pain unpleasantness, in turn, causes extended emotions related to pain because it can provide an immediate cue for the meanings related to pain-related negative emotions once these meanings have been established over time (Barber and Adrian 1982; Price 1999). For example, the sudden exacerbation of pain in a cancer patient serves as an instant reminder of the progress of the disease with its implications for deterioration and death. In addition, the difficulty of having to endure immediate pain unpleasantness over long periods of time (days, weeks, months) can lead to pain-related negative emotions because this difficulty provokes reflection and meanings related to suffering. Parallel influences on extended pain-related emotions also can occur because unpleasantness and extended negative emotions can be enhanced or diminished by arousal, contextual meanings, and other psychological factors that are present.

Nociceptive, exteroceptive (e.g., sight, sound), and interoceptive sensory processes (e.g., startle, increased visceral responses) may provide parallel contributions to pain affect (Price 1999). Pain itself can be conceptualized as both an exteroceptive and interoceptive phenomenon depending on the type of tissue that is stimulated and the types of sensory qualities that are present during pain. Consistent with Damasio's (1994) neurological view of the mechanisms of emotion, pain unpleasantness reflects the contribution of several sources, including pain sensory qualities, arousal, and visceral and somatomotor responses. Thus, these psychophysiological sources of input, in combination with appraisal of the context in which they occur, give rise to a felt meaning of what is happening to the body and self, often not necessarily accompanied by specific thoughts. This felt meaning derives largely from the experience of the body and constitutes the immediate