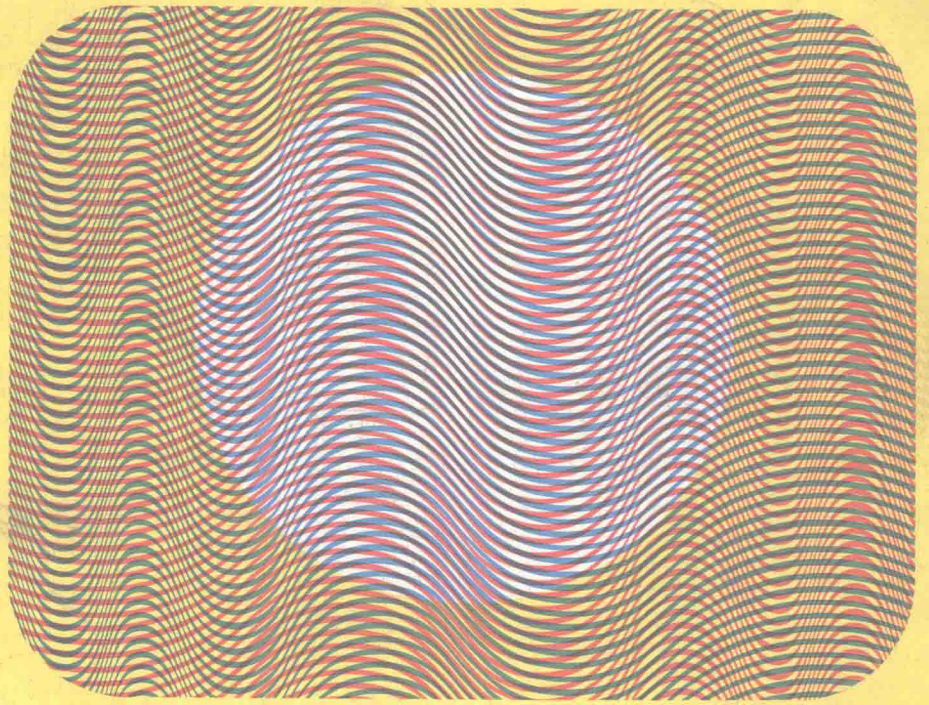
pain

clinical and experimental perspectives



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Preface

Pain is one of the most dramatic, complex, and universal phenomena. Adequate definitions of it are hard to state. To the person experiencing pain it signifies a hurt, physical damage, impending danger, fear, anxiety, punishment, and love or loss of it. It can also be a means for communicating to others, a reason for obtaining or avoiding treatment, a means of judging how good the treatment is, or any combination of the above. To the professional it is an important area of research in psychology, sociology, anthropology, psychiatry, physiology, neurology, pharmacology, and anesthesiology. It is also a major reason for the dispensing of clinical treatment by health practitioners over a wide range of specialties.

Researchers and clinicians alike are aware of the complexity of factors that influence the pain reaction. They are aware of the differences between laboratory and clinical pathological pain. Whereas in the laboratory it is possible to achieve more accurate measurement of stimulus and response parameters, the circumstances may be considered artificial, lacking the intensity, fear, and anxiety concerning impending death or disfigurement that is found in clinical pathological pain. In the clinic there is less control of both the stimulus and the response. Objective measurement becomes difficult and clinical acumen must be relied on. If there is one point of agreement, it is that no single discipline has the answer. Each field can contribute to the developing pool of information. There has thus become an increasing interest in teaching comprehensive, multidisciplinary courses on pain in schools of dentistry, medicine, and nursing. However, teaching and research material is scattered throughout the many journals in a dozen different fields. Hence, the purpose of this book is to assemble, in one place, selected samples from the voluminous literature dealing with pain.

In most cases the articles selected present data based on research. In a few cases articles without data beyond the single case history were included when they illustrated an important point.

The book contains eight major groups of readings and an annotated bibliography on pain. Preceding each major section there are comments by me regarding some of the basic concepts and issues covered in the selected readings.

In almost every section selections were made of both experimental and clinical studies in the area. Readings were chosen to present both a general and a detailed view of pain from the perspective of different research and clinical disciplines. Illustrations of pain reactions and their correlates were also selected from several different types of diseases commonly associated with pain.

From an experimental view the emphasis has been on the measurement of pain, its correlates, and the variables that have been used to manipulate the pain reaction. From a clinical view the emphasis has been

on measurement, surgery, and clinical techniques independent of drugs for the relief of pain.

It is hoped that this collection of readings can provide researchers with new insights, stimulate clinicians to new treatment approaches, and perhaps thereby lessen human suffering somewhat.

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MATISYOHU WEISENBERG

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Contents

Introduction

Sensory psychologists and physiologists have mostly viewed pain as a separate sensation along with temperature and other cutaneous senses (Geldard, 1972; Kenshalo, 1971; Mountcastle, 1974; Hardy, Wolff, and Goodell, 1952). Each author mentions that emotional factors are very important in affecting the reaction to pain. However, they then proceed to an almost purely sensory discussion of pain. They describe the qualities of pain (pricking, burning, and aching), compare laboratory methods for arousing pain, and discuss the specific nervous pathways.

Pain is defined as a reaction related to actual or impending tissue damage on the basis of the stimuli that arouse it and on the basis of the responses measured to indicate evidence of its presence. Stimuli that arouse pain are mechanical (pressure), electrical (shock), thermal (radiant heat), and chemical (bradykinin) (see Section two). Responses measured are verbal (expressions of hurt), behavioral (withdrawal), and physiological (changes in blood pressure).

These sensory approaches have made a major contribution to the scientific analysis of pain. Laboratory study has led to the development of a finely controlled methodology for the exploration of pain phenomena. This methodology includes the mapping of the surface of the body for sensitivity, an analysis of neural pathways from the periphery to central areas, and the development of finely controlled methods of stimulation that can be used in some clinical situations.

However, as clinical experience has demonstrated, these studies have great limitations because the so-called emotional component of pain has been excluded from them. For example, the definition of pain as a reaction to actual or impending tissue damage would imply that the greater the tissue damage, the greater the reaction. Aside from the problem of spatial summation, the classical study of Beecher (1956) has demonstrated how the setting can affect the reaction more than the actual tissue destruction. Of 215 men seriously wounded in battle, only 25% wanted a narcotic for pain relief. In comparison, over 80% of civilian patients studied wanted relief from the pain of a surgical wound made with the patient under anesthesia. Beecher attributes the difference in reaction to the significance assigned to the wound rather than to the extent of physical tissue damage. In battle the wound meant a ticket to safety, but in civilian life the surgery meant disaster.

A simplistic view of pain as merely a sensation has also implied a simplistic clinical view, and the outcomes of such a view have been unfavorable. A simplistic view regarding pain in the same manner as any other sensation suggests that there are straightforward pain pathways. To stop pain, all that would be needed, therefore, would be to interrupt the pain pathway. Surgical results, however, indicate a rather disappointing record of success (see Section seven).

Defining pain in stimulus and response terms is inadequate clinically; pain for which no apparent stimuli can be demonstrated exists. Psychiatric illness, especially depression, has been associated with complaints of pain (see Reading 41). In instances of central pain observed pathology outside of the nerves, spinal cord, or brain is not present in sufficient degree to account for the pain (Loeser, 1975). Peripheral input does not seem to account for central

pain, nor is there a favorable result with peripheral surgical procedures (except for tic douloureux).

The paradoxical aspect of some pain, such as causalgia (a burning pain associated with deformation of nerves by bullets and other high-velocity missiles), is that it persists months after the tissue damage has healed.

The problems involved in the experimental study of pain do not mean that this study should be abandoned. Even something as difficult to explain as phantom limbs has been experimentally studied (Melzack and Bromage, 1973). The sensation of a phantom limb occurs in most amputees almost immediately following an amputation. As described by Melzack (1973), in about 8% to 10% of patients, a pain develops that is often very severe. It endures after the stump tissues have healed and can be triggered in certain zones of the body by gentle pressure or even a pinprick on another limb of the body. It develops mostly in patients who have had pain in the limb for some time prior to the amputation. The pain is sometimes permanently abolished by the injection of a local anesthetic into the stump tissue even though the anesthesia wears off in a couple of hours.

These mysterious aspects of pain demonstrate the complexity of defining and examining the pain response. Experimental study of pain must include a great deal more than the examination of simple sensory processes. Over the past 10 years there has been an increase in experimental studies that have viewed pain as a complex psychological phenomenon that includes cognitive, emotional, and affective components. Central processes have been given a much stronger role (Melzack, 1973). The reaction to pain has been shown to be manipulatable and affected by cultural and other background factors. The principles of learning and social influence have been used effectively to modify pain reactions. Unfortunately, many clinicians are still not aware of the many possible ways, other than surgical or pharmacological, of influencing the pain reaction.

On the other hand, it is only very recently that distress and suffering have come into the laboratory as important variables (see Reading 24). It is through the clinical examination of pain that many of these forgotten and important variables have been brought to the attention of the experimentalist. Importantly, pain reactions often convey a great deal more than a signal that tissue damage is occurring. As Szasz (1957), Plainfield and Adler (1962), Zborowski (1969), and others have pointed out in discussing human reactions to pain, communication aspects are frequently overlooked. Pain reactions can mean "Don't hurt me"; "Help me"; "It's legitimate for me to get out of my daily responsibilities"; "Look, I'm being punished"; "Hey, look, I'm a real man"; or "I'm still alive."

It is hoped that the following sections will convey to the experimentalists some of the many variables that should be examined under controlled conditions. In turn, it is hoped that clinicians will become aware of the variety of methods for influencing the reactions to pain. We are still at a stage in our knowledge where multidisciplinary contributions would enhance our understanding and ability to control one of the human race's most demanding problems—pain and suffering.

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SECTION ONE

General and theoretical concepts of pain reactions

There have been many theories of pain. Some have looked at pain as an emotion; others have looked at pain as a unique sensation with all the characteristics of any other sensory modality. Hardy, Wolff, and Goodell (1952) have reviewed the earlier views of pain. Melzack and Wall (1965) have critically examined current concepts of pain processes and presented their famous gate control theory of pain. Reading 1 is an updated version of Melzack and Wall's earlier paper.

Melzack and Wall review the specifity and pattern theories of pain perception and reject them. There may be specialization such as that found with A-delta and C fibers at receptor sites that respond to particular types and ranges of physical energy. However, specialization is not specificity. Specificity implies responding to one, and only one, given kind of stimulus. Melzack and Wall reject specificity and accept specialization. Many things happen at various levels of energy stimulation; aside from the activation of specific fibers, changes occur in the total number of neurons responding, as well as in their temporal and spatial relationships. However, a pattern theory of pain by itself appears to contradict physiological evidence.

Pain has a sensory component similar to other sensory processes. It is discriminable in time, space, and intensity. However, pain also has an essential aversive cognitive-motivational and emotional component that leads to behavior designed to escape or avoid the stimulus. Different neurophysiological mechanisms have been described for each system.

Pain perception can be modulated by the peripheral gating mechanism that can prevent pain stimulation from entering the system. It can also be controlled by a central control process that can modify stimulation once it has entered the system. Exact neurophysiological connections involved in each mechanism are still not firmly established. Strong criticism of the gate control model has thus been made because specific neurophysiological mechanisms do not support it. "I think therefore that one ought at this stage to strongly support Schmidt in his attempt to prevent the Gate hypothesis from taking root in the field of neurology" (Iggo, 1972, p. 127).

However, regardless of the accuracy of the specific wiring diagrams involved, the gate control theory of pain has been the most influential and important current theory of pain perception. It ties together many of the puzzling aspects of pain perception and control; it has had profound influence on pain research and the clinical control of pain; and it has generated new interest in pain perception, stimulating a multidisciplinary view of pain for research and treatment. There is little doubt that research will produce changes in the original gate control conceptions. There is also little doubt that the theory has had a great impact on the field.

Pain is a psychological experience. Behavioral and emotional variables can affect the manner in which it is perceived. Emotional and psychological factors can also cause pain. Merskey (Reading 2) reviews evidence of these factors exhibited in medical and psychiatric practice. Thirty-

eight percent of patients with pain and 40% of patients without pain at a medical clinic were found to be there because of psychological illness (Devine and Merskey, 1965).

Merskey views pain as an unpleasant experience primarily associated with tissue damage, described in terms of tissue damage even when none is apparent, or by a combination of the two. Psychogenic pain is caused mainly or wholly by psychological factors, and organic pain is caused mainly or wholly by physical factors. From the patient's viewpoint, the subjective experience may not be different.

Psychogenic pain occurs under three main circumstances: (1) as hallucinations (schizophrenia), (2) with muscle tension caused by psychological factors (tension headaches), and (3) by conversion hysteria.

Pain due to stress has become the focus of new treatment approaches. One of the most exciting of these new approaches is the use of biofeedback, a procedure whereby a biological function is continuously measured and played back to the person being measured. Through these means the person is able to learn to control many difficult body processes. Muscle tension feedback, for example, is now being used in the treatment of tension headache (Budzynski, Stoyva, and Alder, 1970).

Whether pain is mainly psychogenic or organic is not always easy to determine. Multidisciplinary clinics can be most helpful in this regard. It is often very easy to place the cause of pain on a physical lesion, yet it is not always easy to prove that the lesion is the cause since there may be many people who have a similar lesion without any complaints of pain. In turn, it is possible to have a patient with a history of conversion symptoms whose pain this time is really being caused by a lesion. A multidisciplinary approach would more likely consider both of these issues.

There are many psychological variables that affect the reactions to pain. Murray (Reading 3) has reviewed some of the cognitive and affective variables that affect the pain reaction. Of these, anticipation and anxiety have been found to be extremely important. Many implications can be derived from studies that have been made in the clinic and in the laboratory, both for the clinical treatment of pain and for a theory of pain. Distraction, for example, is one way of reducing the reaction to pain. It seems that the human body cannot simultaneously accept two competing stimuli—that of distraction and that of pain.

Keele (Reading 4) looks at the importance of pain sensitivity for the evaluation of symptoms presented to a physician. Using myocardial infarction as an illustration, Keele points to the great variation in patient behavior. There are some patients who, even when having a severe myocardial infarction, do not react much. Other patients react a great deal even to mild physical damage. Having an independent estimate of pain sensitivity would allow the physician to know what the proper treatment should be. Tursky (1975) has argued that an individual's unique way of reacting to pain should become a routine part of a medical record, along with blood pressure and other vital signs. Knowing this information would provide for pain control efforts best suited to the condition. For some patients morphine might be indicated, but for others reassurance concerning their prognosis would be adequate.

This section includes readings to give the reader an appreciation of some of the major experimental and clinical approaches to pain control. In subsequent sections many of these topics are expanded or applied. The reading by White (Reading 38, Section eight) for example, shows how a counterirritant can produce relief from pain. The reading does not mention it directly, but this approach is a direct application of the gate control theory of pain.

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