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# **Distraction and the Processing of Pain**

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## ABSTRACT

Distraction is useful for increasing pain thresholds and tolerances and reducing ratings of acute pain and is often incorporated in pain management programmes for chronic pain. However, its usefulness for chronic pain management is questionable. Rosenstiel and Keefe (1983) and Turner and Clancy (1986) both found that chronic pain patients who scored high on the Diverting Attention and Praying factor of the Coping Strategies Questionnaire also had high average pain.

The aim of the present study was to evaluate the utility of distraction for 8 male and 12 female chronic low back pain subjects in acute and chronic pain conditions. It was hypothesised that for the chronic pain condition distraction would not be effective in reducing pain ratings or increasing pain tolerances as the chronic pain perception has over time, come to be automatically processed. Under such circumstances distraction would not be effective as there would be no competition with pain processing for the limited attentional resources. Distraction however, would be effective in reducing acute pain as acute pain is of short duration and likely to be a controlled process. By implication, the third hypothesis proposed that chronic pain and acute pain are processed differently by chronic pain sufferers with the utility of distraction differing accordingly.

Subjects did the cold pressor test for the acute pain conditions, and a step-up exercise for the chronic pain conditions. These conditions were done with and without a shadowing distraction task. A post-test questionnaire was completed at the end of the study. Pain measures were pain ratings, pain tolerances, and also the number of step-ups for the chronic pain conditions.

Results showed that no effect of distraction on pain tolerances and post-test pain ratings. Not only was distraction found ineffective for chronic pain as hypothesised, but it was also ineffective for acute pain management. There was no interaction effect of distraction with acute/chronic pain to support the third hypothesis. Pain ratings and pain tolerances were significantly different between pain conditions.

Automatic processes are generally not effected by simultaneous controlled processes. The results from this study suggest that chronic pain may have developed over time into an automatic process as the distraction task had no effect on the pain measures, and there was no loss in accuracy on the distraction task across the chronic pain condition. Acute pain however should not have developed into an automatic process as it is of short duration and variably mapped. The ineffectiveness of distraction in dealing with acute pain suggests that maybe the subjects have become hypervigilant to all pain sensations, or that distraction loses its effectiveness over time.

The outcome of this study highlights the need to both determine the active components of cognitive strategies for chronic pain management and to investigate further the processing of chronic pain.

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## CHAPTER ONE

### Pain

#### Models of Pain

Pain has been defined as,

"an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage."  
(International Association for the Study of Pain (IASP), 1986, p. S217).

This definition incorporates the idea of both a physical, and a psychological or affective dimension to pain. The pain consists of two factors, the initial sensation and the reaction to the sensation (Beecher, 1959). The IASP definition sees the pain as independent of the stimulus - although it is viewed in terms of tissue damage it is not dependant upon actual tissue damage. Most relevant for the psychologist are the supplementary notes on usage of the term,

"Activity induced in the nociceptor and nociceptive pathways by a noxious stimulus is not pain, which is always a psychological state, even though we may well appreciate that pain most often has a proximate physical cause" (IASP, 1986, p. S217).

The recognition of other than solely sensory components to pain results from observations in practice and is a relatively recent innovation in our perspective on pain (Melzack & Wall, 1965). Pain then is viewed as a psychological experience and not synonymous with the physiological activity occurring within a neuron (Weisenberg, 1987).

Historically, pain tended to be viewed as either a psychological phenomenon or a purely sensory phenomenon (Turk & Rudy, 1986). Early writers such as Aristotle viewed pain as an emotion. In contrast in Descartes's classical dualistic approach pain was conceptualised as a purely sensory phenomenon determined exclusively by noxious sensory input. The Cartesian perspective conceived the pain system as a direct channel

from the skin to the brain (Melzack & Wall, 1982). Models such as this, which held sway until fairly recently posited a direct correspondence between sensory stimulation and pain representations (McCaul & Malott, 1984). This relationship suggests that the intensity of pain is proportional to the severity of the physical damage. However, according to Weisenberg (1977), such sensory models although making a major contribution to the scientific analysis of pain have limitations in practice.

Firstly, sensory models fail to explain large differences in distress responses by people with similar wounds who are in different situations. The classical study of Beecher (1959) demonstrated that the setting and interpretation of the pain situation can effect the pain reaction more than the actual tissue destruction. He reported of 150 men seriously wounded in battle, only 32% requested a narcotic for pain relief. In comparison, in civilian life, with similar surgical wounds made under anaesthesia, 83% of the group requested pain relief.

Other variables identified as effecting the perception of pain include culture (Sternbach & Tursky, 1965), past experience (Melzack & Scott, 1957), cognitive factors such as attention (Blitz & Dinnerstein, 1971; McCaul & Haugtvedt, 1982; Rybstein-Blinchik, 1979), anxiety (Spear, 1967), and feelings of control (Kanfer & Goldfoot, 1966). The effect of these variables on pain report argues against the simplistic stimulus-response concept of pain.

Secondly, in cases such as chronic low-back pain, given the number of potential causal factors, the diagnosis of back pain from medical factors alone is difficult and uncertain in accuracy. Additional complicating factors in diagnosis include: (1) the relative inaccessibility of the spine for examination, and (2) the low correlation of pathological changes in the spine with symptoms of low-back pain (Feuerstein, Papciak & Hoon, 1987). Nachemson (1983) estimated that only 20-30% of patients with low back pain are found to have "objective" signs of disease. The majority of patients have subjective symptoms with pathophysiological processes insufficient to explain the pain and disability associated with the back disorder. It appears that environmental, psychological, and psychobiological factors overlay the purely physical components and help to account for the apparent discrepancy among pathology, report of pain, and functional ability (Feuerstein et al., 1987).

Thirdly, despite major advances in the understanding of the nervous system and the development of potent analgesic preparations, amelioration of pain is often not achieved (Turk & Rudy, 1986). A sensory approach implies that all that is needed, is to interrupt the pain pathway. Unfortunately pain persists for many in spite of the best efforts of the medical profession to interrupt the sensory pathway. Indeed most chronic pain patients may be characterised as failures of extensive therapy aimed at elimination of pain (Urban, 1982).

These inconsistencies in pain responding demonstrate the complexity of examining and defining the pain response. Unidimensional models of pain are clinically inadequate. It is apparent that both emotional and psychological factors can effect pain. Pain then must be viewed as a complex phenomenon (Weisenberg, 1977). Melzack and Wall (1965, 1982) introduced their Gate Control Theory of Pain to account for the psychological influences on pain. They rejected both popular sensory theories to date; the specificity theory that is based upon a specific set of peripheral nerve fibres that are nociceptive in function (Weisenberg, 1977), and the pattern theory that suggests pain perception is based upon stimulus intensity and central summation (Goldscheider, 1894, cited in Melzack & Wall, 1982).

### **Gate Control Theory of Pain**

Conceptually gate control theory proposes a gating mechanism in the substantia gelatinosa which modulates sensory input by the balance of activity of small and large diameter fibres. Activity of large fibres closes the gate and prevents synaptic transmission to centrally projecting cells, whereas small diameter fibres open the gate and facilitate activity to the central cells once a critical level is reached. A central control trigger can also influence the gate. Thus, cognitive processes can either open or close the gate. The gate theory with its emphasis on parallel processing systems, provides the conceptual framework for integration of the sensory, affective and cognitive dimensions of pain (Melzack & Wall, 1982). More than other theories it emphasises the different aspects of pain perception. Pain has a sensory component that is similar to other sensory processes. It is discriminable in time, space, and intensity (Weisenberg, 1977). However pain also has an essential aversive cognitive-motivational and emotional component that leads to behaviour designed to escape or avoid the stimulus.

With pain which persists over time and becomes chronic, successful pain control often involves changing the motivational component while the sensory component remains intact. While specific neural components of the gate control theory have required modification over time, the conceptual basis of the model is now generally accepted as best explaining the complexity of pain perception (Weisenberg, 1987).

### Classifications of Pain

The time and course of the pain are the arbitrary dimensions that distinguish the different categories of pain. Transient pain is of brief duration having little consequence and generates not more than fleeting attention. Little or no damage has been done. If the pain persists, or was initially more severe, the pain is known as acute pain and is the transitional period between coping with the cause of the injury and preparing for recovery (Melzack & Wall, 1982). It has a recent onset, short duration and is generally well understood and managed (Sternbach, 1987).

Pain that has persisted for a period of at least six months be it recurrent or continual is known as chronic pain (Feuerstein et al., 1987). Turk, Meichenbaum, and Genest (1983) identified three types of chronic pain. Chronic, periodic pain where the pain is acute but intermittent for example with migraine headaches; chronic, intractable, benign pain which is present most of the time with intensity varying, as for low back pain; and chronic, progressive pain often associated with malignancies. Chronic benign pain is the pain of interest in this study.

With chronic benign pain the underlying cause has often been identified or treated but the pain persists. Thus the pain is no longer a warning sign for an underlying disorder that needs to be treated, but rather a false alarm that serves no purpose and has a destructive, debilitating effect (Sternbach, 1987). Conventional treatments for acute pain are usually ineffective for chronic pain (Keefe, 1982).

Chronic pain affects a surprisingly large proportion of the population. Sternbach (1987) reported that 12.8% of American adults reported chronic pain, with associated interruptions to their daily routines, their ability to concentrate and their ability to enjoy leisure activities. The average individual surveyed lost 23 days a year due to a pain

problem. Those with chronic pain frequently complain of sleep disturbance, exhaustion, irritability, loss of appetite, social withdrawal and depression (Sternbach, 1987). They typically also tend to exhibit behaviours specifically related to their pain (Fordyce, 1976). These effects can have a crushing impact on family life (Linton, 1987). Flor, Turk and Scholz (1987) reported that pain patients and their spouses experienced change in marital and sexual satisfaction due to the effect of the chronic illness.

Chronic low-back pain is one form of chronic pain that has received a lot of attention due to the severely debilitating physical and psychological consequences for the sufferer (McArthur, Cohen, Gottlieb, Naliboff & Schandler, 1987).

### Chronic Low-Back Pain

Musculoskeletal problems, particularly of the lower back, commonly become chronic pain problems (Webb, 1983). Benign chronic low-back pain (CLBP) has been characterised by Vazuka (1962) as,

"varying degrees of low-back discomfort or back stiffness with difficulty bending, decreased back mobility, skeletal muscle spasm and tenderness, concern or preoccupation with the back and with general concomitant disability" (cited in Hoon, Feuerstein & Papciak, 1985, p. 379)

In its most severe form the chronic low back pain sufferer is minimally able to accomplish the most ordinary of tasks, let alone partake in exercise or hold gainful employment. They frequently have a history of twisting, lifting, bending or falling that can be associated with the pathogenesis of the chronic pain (Spengler, 1983). Psychological distress tends to be very high, exacerbated by repeated failures at obtaining relief from pain by medication or surgery (McArthur et al., 1987).

Society is also hit hard by the high incidence of low back pain. Chronic back pain is one of the most costly ailments in terms of medical expenses and lost work time (Kelsey & White, 1980). It affects up to 18% of the general population (Feuerstein et al., 1987). Twenty five percent of New Zealanders can expect to sustain back injuries in their

lifetime (Hickey, 1978). Accident Compensation Corporation (ACC) back injury claims with a 1981 accident date showed that half of all compensation for New Zealand men aged 20-59 was paid to claimants where incapacity exceeded six months (ACC, 1984). 50 million dollars compensation was paid out by ACC for back injuries in 1989 (ACC, 1990). The socioeconomic impact of chronic back pain is heightened by the fact that most sufferers are employees in their prime productive working years (Spengler, 1983). The implications of chronic back pain both to the individual and society highlights the need for the development of a better understanding of the etiology, treatment and prevention of the pain.

### **Behavioural Model of Pain**

Behaviours can indicate the level of pain a sufferer is perceiving. With chronic pain these behaviours can become established over time. Fordyce (1976) developed a behavioural model of pain which attempts to understand chronic pain by the integrating available physiological and psychological data on chronic pain. The behavioural model of pain is similar to the Gate Control Theory in that it acknowledges the psychological components of pain, however it ignores the affective, cognitive and to some extent sensory components of the pain experience (Turk & Rudy, 1986).

The behavioural view is based on the notion that when we observe a pain patient, it is behaviour that we are observing. In chronic pain, pain behaviours such as wincing, guarded movements, verbal reports, and avoidance behaviours, may originate initially as a consequence of body injury stemming from reflex reactions. These pain behaviours may be followed by reinforcing contingencies, such as increased attention from others or release from strenuous work, which can potentially maintain or increase the initial pain behaviour. In this environment productive of conditioning effects, the pain behaviours may continue long past healing time for reasons quite different than those eliciting them at the time of injury (Fordyce, 1976). Thus respondent pain behaviours may become operant in nature through the process of learning and may occur even in the absence of nociceptive stimulation (Turk & Rudy, 1986).

In situations then, the antecedents and consequences of pain and pain behaviour can act to perpetuate the chronic pain condition. The impact of the consequences of pain behaviour on responding are demonstrated by Cairns and Pacino (1977) who systematically varied physical therapist feedback response in a series of nine chronic pain patients exercising to tolerance. Patient performance was shown to improve markedly and systematically when the therapist was delivering praise. In this study environmental factors, in this case social feedback, can exert influence on exercise performance under the constant instruction to exercise to tolerance.

Environmental differences and verbal/nonverbal discrepancies in pain responding can be evidenced in everyday situations where the antecedents and consequences vary. A back pain patient may complain about the discomfort experienced from an activity such as sitting at a desk and yet may experience minimal discomfort when sitting fishing. This highlights the fact that behaviours, verbal and nonverbal, can receive different consequences. Equally it demonstrates that we are capable of focusing our attention on certain incoming sensory information to the exclusion of other inputs. The person who enjoys fishing may become engrossed in that activity to the extent that their pain is secondary to their involvement in catching fish. Working however may not be as enjoyable with attention being allowed to waver to the tension or aching in their back. The process of attention can exert considerable influence on the perception of pain stimuli as well as on the ensuing responses or pain behaviours.

The degree that attention can be directed away from a pain sensation and the perception of pain consequently be reduced, is a component of pain management which has recently received much interest within clinical and cognitive psychology. Attention, in particular pain focused attention, is a central issue both in formulating a model of pain and in the management of pain.