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Cognitive Strategies for Athletic Stress Management

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COGNITIVE STRATEGIES FOR ATHLETIC PAIN MANAGEMENT

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CERTIFICATE OF APPROVAL

MASTER OF SCIENCE PROJECT

This is to certify that the Master of Science Project of

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submitted in partial fulfillment of the requirements for the degree of Master of Science in the School of Health, Physical Education, and Recreation at Ithaca College has been approved.

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DEDICATION

This project is dedicated to my wife, Bambi, whose love, understanding, encouragement, and support have made this project possible.

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Chapter 1

INTRODUCTION

Traditionally athletic trainers, physical therapists, and others in related medical professions have viewed the reconditioning and rehabilitation of injured athletes strictly in physical terms. Redevelopment programs designed by athletic trainers and related professions are based upon gradual increments in strength, flexibility, and range of motion (ROM). Often these redevelopment programs employ pain as a measuring tool to determine the workload and/or intensity of an athlete's workout. Trainers also use a pain reaction as a signal to end a specific workout. These physically-oriented reconditioning programs are the mainstay of athletic training related professions and will probably remain as such in the years to come. However, the athletic training profession is beginning to introduce a new dimension into the traditional reconditioning programs. This new dimension is the use of cognitive strategies for coping with athletic related pain.

In the past little or no attention was focused upon aspects other than an athlete's physical redevelopment. Such things as the psychological adjustment to the injury, how to cope with the obvious pain, how the injury might affect future performance, and psychological rehabilitation were not considered as important a part of an athlete's redevelopment. Granted some sports medicine and physical therapy textbooks mention these psychological aspects, but little was done with them during the actual reconditioning process.

A recent trend in the coaching profession is the concern for their athletes' ability to cope with stress. It is quite obvious that during a stressful competitive situation, physical abilities and conditioning will not be the only factors deciding the outcome. If we look at a problem that is encountered numerous times by coaches, we will see why athletic trainers are becoming concerned with psychological as well as physical reconditioning of athletes.

The problem actually begins at the time of, or shortly after an athlete sustains an injury, but usually remains latent for a period of time. Some athletes begin to exhibit problems during the reconditioning process. These include such things as the inability to cope with pain and feelings of helplessness which may hinder the redevelopment process. Some athletes do not manifest any problems until they return to competition.

These curious events produce some thought-provoking questions, such as: What are the intangibles that determine how fast an athlete recovers Why do some athletes never regain their previous level of performance, while others overcome overwhelming odds and become superior athletes What are the abilities that certain athletes possess that others do not

One ability that is crucial in the eyes of the athletic trainer is the ability to cope with the pain associated with reconditioning.

Bearing these thoughts and questions in mind, my purpose in this project is multifaceted. The first is to impart an in-depth understanding of pain phenomena by reviewing the dominant pain theories and how they have evolved. In so doing, we will see how the present understanding of pain and the methods by which it is traditionally controlled have also evolved. The second is to look at how pain is perceived and how these perceptions are conveyed through language. The final aspect is to review some of the cognitive strategies that can be used to alleviate athletic pain. While reviewing these cognitive strategies, we will focus on the rationale behind them, learn how to implement and teach them, and suggest some strategies for specific athletic injuries.

Chapter 2

WHAT IS PAIN?

This question cannot be answered simply. Pain is a highly personal and complex phenomenon, yet it is such a common phenomenon that we rarely pause to define it in ordinary conversation. None who have ever worked on the problem of pain have ever been able to give it a definition that is satisfactory to all of their colleagues. Sternbach (1968) reported that all efforts to define this subjective sensation, whether by logical analysis or objective attempts at operational definitions, always seem to come full circle and end as imperfect communications of a subjective experience.

Melzack (1980) claimed that research on pain, since the beginning of this century, has been directed at a purely sensory experience. Yet pain also has a distinctly unpleasant, affective quality. Melzack also asserted that pain becomes overwhelming, demands immediate attention, and disrupts ongoing behavior and thought. Pain motivates people into activity aimed at stopping it as quickly as possible. To consider only the sensory features, and ignore its other properties, is to look at only part of the problem. This simplistic sensory viewpoint of pain implies a simplistic clinical view of treatment, which often leads to unfavorable outcomes. To stop pain, under this simplistic concept, all that is needed is to interrupt the pain pathway. However, Weisenberg (1977) reported that the results of such surgery indicate a rather disappointing record of success.

Even though studies that emphasized mainly sensory components of pain are limited by their exclusion of other components, they have added a major contribution to the scientific analysis of pain. Weisenberg (1980) pointed out that the laboratory studies conducted from this theoretical viewpoint led to the development of a finely controlled methodology. This includes the mapping of body sensitivity, analysis of neural pathways from peripheral to central areas, and the development of finely controlled methods of stimulation that can be used in some clinical situations.

Melzack (1973) reported that pain has obvious sensory qualities, but it also has emotional and motivational properties. It is usually caused by intense noxious stimulation, yet it sometimes occurs spontaneously without apparent cause. It is important at this point to clarify the term "noxious stimulation." Brena (1972) stated that the sensory input triggering a pain experience is often referred to as noxious stimulation. Actually there is little neurological evidence of noxious stimulation; each stimulus is only generating a wave of energy, an action potential, travelling along a certain neural pathway. What makes these volleys of stimuli noxious is the way a person perceives and recognizes them. Pain, therefore, is a labelled sensation making it somewhat akin to emotion, which is also labelled.

Pain reactions often convey a great deal more than a signal that tissue damage is occurring. Szasz (1957), Zborowski (1969), and others have pointed out that, in discussing human reactions to pain, communication aspects are frequently overlooked. Pain reactions can mean "Don't hurt me," "Help me," "It is legitimate for me to get out of my daily responsibilities," "Look, I am being punished," "Hey, look, I am a real man," or "I am still alive."

Melzack (1973) claimed that pain normally signals physical injury, but sometimes pain fails to occur even when extensive areas of the body have been seriously injured; at other times pain persists even after all the injured tissues have healed. The latter instance presents a crippling problem that may require urgent treatment. Dramatic proof of just such a problem was revealed by Beecher (1956) in his classic study of 215 seriously wounded men in the battle of Anzio beachhead, of which only 25% wanted narcotic relief for pain. In sharp contrast, in civilian life, with a similar surgical wound made under anesthesia, over 80% of a similar-sized group wanted relief. Beecher attributed the different reactions of the two groups to the significance assigned the wound. He reported the essential differences to be in the anxiety level, the attitude of the injured, and their reaction to the wound, rather than the extent of physical tissue damage.

There are many aspects to this puzzling phenomenon of pain. It has been studied in the laboratory by psychologists, physiologists, anatomists, and pharmacologists. It has also been examined in hospital clinics by neurologists, neurosurgeons, anesthesiologists, and other medical specialists. Each of these disciplines has made its own unique contribution toward the understanding of pain. But, these various approaches have also given rise to conflicting observations and interpretations. Each and every aspect of this phenomenon of pain is the subject of debate. The reason being, it is impossible to discuss pain without taking a theoretical point of view. Thus, in addition to the problems discussed previously, there is the difficulty of defining pain stimuli, in general, by pain responses. If there were a set of responses that were regularly and exclusively associated with the experience of pain, then the antecedent stimuli could be defined as those which produce that set of responses. Unfortunately, this is not possible because the responses do not always accompany the pain stimuli, and the responses sometimes occur in other situations.

Theories of Pain

Ideally, pain theories should account for the entire range of pain phenomenon. However, as with definitions, no single pain theory is currently adequate to account for all pain phenomenon. Most theories have focused upon the neurophysiological structures related to pain. Two classical examples of this are the specificity and pattern theories.

Specificity Theory

Specificity theory proposes that a specific pain system carries messages from pain receptors in the skin to a pain center in the brain. A better understanding of the theory can be achieved by considering its origin. A classical description of the theory was provided by Descartes in 1644 (see Melzack, 1973), who conceived of the pain system as a straight-through channel from the skin to the brain. He suggested that the system is like the bell-ringing mechanism in a church. A person pulls the rope at the bottom of the tower, and the bell rings in the belfry. Descartes also proposed that placing an extremity (e.g., a foot) too near a flame would set particles in the foot into motion, and this activity would be transmitted up the leg and back into the head where, presumably, something like an alarm would be set off. The person, then, would feel pain and respond to it. Because of this kind of analogy, specificity theory is also known as the alarm-bell theory or push-button theory. Despite its apparent simplicity, specificity theory involves several major assumptions which will be examined shortly. First we will review the evolution of Descartes' theory over the last 3 centuries.

Specificity theory changed very little until the 19th century, when the experimental science of physiology emerged. One of the problems these 19th century physiologists faced was to account for the different qualities of sensation. Visual and auditory sensations are different from each other, just as skin sensations are obviously different from those of taste and smell. What is the basis of these different sensory qualities Early anatomists and physiologists began to study this problem. The results of their investigations revealed that the brain is aware of the outside world only by means of messages conveyed to it by the sensory nerves. The qualities of experience, therefore, are somehow associated with the properties of sensory nerves (Melzack, 1973).

In 1842 Johannes Muller (see Melzack, 1973) was the first to place these sensory qualities into scientific form, and his formulation become known as the "doctrine of specific nerve energies." Our present understanding of sensory processes is derived from Muller's statement that the brain receives information about external objects only by way of sensory nerves. Therefore, activity in nerves represents coded or symbolic data concerning the stimulus object. It is important to note that Muller recognized only five classical senses; namely, light, sound, taste, smell, and feeling or touch. For him, the sense of touch incorporated all the qualities of experience that we derive from stimulation of the body. This implies, then, that somaesthetic sensations are a function of a unitary sensory system. He was uncertain, at that time, whether the quality of sensation was due to some specific energy inherent in each of the sensory nerves themselves, or whether it was due to some special properties of the brain areas at which the nerves terminate. Muller's concept, then, was that of a straight-through system from the sensory organ to the brain center responsible for the sensation.

Max von Frey (see Boring, 1942) published a series of articles between 1894 and 1895 in which he proposed a theory of the cutaneous senses.

This theory was expanded over the next 50 years, and became the basis for the specificity theory. von Frey developed his theory from three kinds of information. The first was Muller's doctrine of specific nerve energies. It was apparent to him that Muller's notion of a single sense of touch or feeling was inadequate. von Frey expanded Muller's concept to include four major cutaneous modalities; namely, touch, warmth, cold, and pain. Each modality, presumably, had its own projection system to a brain center responsible for the appropriate sensation.

The second kind of information von Frey used was the distribution of warmth and cold sensitivity of the skin. His belief was that the skin comprises a mosaic of four types of sensory spots; namely, touch, cold, warmth, and pain.

The third kind of information was derived from the development of chemical techniques to study fine structures of body tissues. By observing under a microscope thin slices of chemically stained tissue from all parts of the body, anatomists found a variety of specialized structures. In order to achieve a sort of immortality, they named these specialized structures after themselves. Therefore, we still have Meissner corpuscles, Ruffini end-organs, Krause end-bulbs, and Pacinian corpuscles. The two most common types of structures were the free-nerve endings that branch out into upper layers of the skin, and the nerve fibers that are wrapped around hair follicles. von Frey used these three kinds of information in a remarkable example of scientific deduction. He reasoned as follows: Since free-nerve endings are most common, and pain spots are found almost everywhere, the free-nerve endings are pain receptors. Since Meissner corpuscles are frequently found at the fingers and palm where touch spots are most abundant and most sensitive, they are the touch receptors. Next he noted that the conjunctivum of the eye and the tip of the penis were both sensitive to cold, but the conjunctivum was not sensitive to warmth and the penis was not sensitive to pressure. Moreover, Krause end-bulbs are found in both locations. Therefore, he concluded, Krause end-bulbs are cold receptors. Finally, he had one major sensation, warmth, and one major receptor, Ruffini end-organs, left over so he proposed that Ruffini end-organs were warmth receptors.

von Frey's theory dealt only with receptors. Other scientists and researchers (Rose & Mountcastle, 1959; Sinclair, 1967) sought specific fibers from the receptors to the spinal cord while another (Keele, 1957) sought specific pathways in the spinal cord itself. Following up on von Frey's postulation of four modalities of cutaneous sensation, each having its own type of specific nerve ending, the separation of modalities was extended to peripheral nerve fibers. Experiments by Rose and Mountcastle (1959), and Sinclair (1967) were carried out to show that there is a one-to-one relationship between receptor type, fiber size, and quality of experience. These interpretations of modality separation in the peripheral nerve fibers is an extremely literal interpretation of Muller's doctrine of specific nerve energies. Since fiber-diameter groups are said to be modality specific, this theory imparts "specific nerve energy" based upon fiber size. Therefore, specificity theorists speak of A-delta fiber pain and C-fiber pain of touch and cold fibers as though each fiber group had a straight-through transmission path to a specific brain center.

In searching for the specific "pain pathway" in the spinal cord, Keele (1957), through his experiments with animals, determined that the anterolateral quadrant of the spinal cord was critically important for pain sensation. Other observations by Spiller (see Melzack, 1973) found that people who suffered damage to this area of the spinal cord felt no pain below the damage. Therefore, neurosurgeons began to perform surgery (anterolateral cordotomy) to cut this area of the spinal cord for pain relief. Consequently, this spinothalamic tract, which is part of the anterolateral cord, has become known as the "pain pathway" (Melzack, 1973).

Still a major source of debate among specificity theorists is the location of the "pain center." Head (1920) proposed that the "pain center" was located within the thalamus because cortical lesions or excisions rarely abolish pain. In fact they make pain worse. Thus, the thalamus is thought to contain the "pain center."

Analysis of Specificity

It was stated earlier that despite the apparent simplicity of the specificity theory, it holds three major assumptions. The first is that receptors are specialized, which is physiological in nature, and has achieved vast acceptance as a biological law. The second two assumptions are anatomical and psychological, but have not been supported by facts. von Frey's assumption that skin receptors are differentiated to respond to particular stimulus represents an extension of Muller's concept of "specific irritability" of receptors. This physiological specialization of skin receptors concept is the strength behind von Frey's theory and appears to be the reason for its survival over the years.

von Frey's most specific assumption, the psychological, is also the least relevant and most incorrect. His postulated correlation of specific receptors and modalities was based on logical deduction rather than experimental evidence. Regarding the correlation between cold and Krause's end-organs, von Frey (1895; see Melzack, 1973) noted that "out of this supposition arises an obviously serious difficulty, because the ability to feel cold appears not only at the spots but also at the surrounding skin" (p. 133). von Frey also stated that "whether the number of end-organs in the skin is sufficient to account for all cold spots is a question that has yet to be decided" (p. 133). Melzack and Wall (1962) reported at least a dozen experiments making histological examinations of the skin under carefully mapped temperature spots without one investigator finding any support for von Frey's anatomical correlations.

von Frey made a psychological assumption that each stimulus to a given type of receptor bears a one-to-one relation with each psychological dimension. This assumption is the most questionable of his theory. Melzack and Wall (1965) made this analysis of von Frey's psychological assumption:

> To say that a receptor responds only to intense, noxious stimulation of the skin is a psychological statement of fact; it says that the receptor is specialized to respond to a particular kind of stimulus. To call a receptor a "pain receptor," however, is a psychological assumption: it implies a direct connection from the receptor to the brain center where pain is felt, so that the stimulation of the receptor must always elicit pain and only the sensation of pain. It further implies that the abstraction or selection of information concerning the stimulus occurs entirely at the receptor level and that this information is transmitted faithfully to the brain. (p. 136)

Pattern Theory

Goldscheider (1894; see Melzack, 1973), initially one of the true believers of von Frey's specificity theory, was first to propose that stimulus intensity and central summation were the critical determinants of pain. His pattern or summation theory proposed that the particular patterns of nerve impulses that evoke a pain response are produced by the summation of skin sensory input at the dorsal horn cells. According to this concept, pain results when the total output of the cells exceeds a critical level, or when pathological conditions enhance the summation of impulses produced by normally non-noxious stimuli. Goldscheider claimed that persistent pain or delays in pain reactions were caused by abnormally long-time periods of summation.

Several theories emerged from Goldscheider's pain conceptualization. These included the periperhal pattern theory, central summation theory, sensory interaction theory, and affect theory. All of these theories recognize the concept of patterning of input and central interpretation, but some ignore the aspects of physiological specialization.

The central summation theory introduced by Livingston (1943) was the first to suggest that specific central neural mechanisms account for pain syndromes, such as phantom limb pain, causalgia, and neuralgias. Livingston proposed that pathological stimulation of sensory nerves initiates activity in reverberatory circuits in neuron pools in the spinal cord. This abnormal activity, then, may be triggered by normally non-noxious inputs, which in turn generate volleys of nerve impulses that are interpreted centrally as pain. This reverberatory activity may spread to adjacent neurons in the lateral and ventral horns, producing autonomic and muscular manifestations. These, in turn, produce further sensory input, creating a vicious circle between central and peripheral processes. Livingston's theory, however, did not take into account that surgical lesions of the spinal cord often do not abolish pain. If the crucial mechanism was located in the dorsal horns, then cutting the sensory routes should stop the pain.

The sensory interaction theory proposed the existence of a rapidly conducting fiber system, which inhibits synaptic transmission in a more slowly conducting system that carries the signals for pain. The latest of these sensory interaction theories, proposed by Noordenbos (1959), conceived the small fibers as carriers of nerve impulse patterns that are pain-producing, while the large fibers inhibit transmission. Another important concept of Noordenbos was his idea of a multi-synaptic afferent system in the spinal cord. This is a great contrast to the idea of a straight-through system, and has the power to explain why a cordotomy may fail to abolish pain. Both Noordenbos' theory and Livingston's theory represented major theoretical advances towards the understanding of pain.

Melzack (1973) reported that the affect theory of pain dates back to the time of Aristotle, when pain was considered to be an emotion--the opposite of pleasure--rather than a sensation. Marshall (1894; see Melzack, 1973) proposed that pain was an emotional quality that colors all sensory events. All sensory inputs, as well as thoughts, could have a painful dimension to them. Marshall spoke of the pain of bereavement and the pain of listening to badly played music. This suggested an important yet neglected dimension of pain. Pain does not have just sensory qualities; it has strong negative affective qualities that drive us into activity aimed at stopping it. These behaviors are in the realm of emotion and motivation.

With the extensive development of sensory physiology during the 20th century, the concept of pain as a sensation has overshadowed the role of affective and motivational processes. Physiologists relegated cognitive processes and motivation to the role of reactions to pain and made them secondary considerations. It is apparent, however, that sensory, motivational, and cognitive processes occur in parallel, interacting systems at the same time.

When all these preceding theories are examined, it is apparent that each makes an important contribution to the understanding of pain and the associated mechanisms. However, they all fail to comprise a satisfactory general theory of pain. Despite their seemingly small differences, each contains a major conceptual idea that has had a powerful impact on pain research and therapy.

Gate-Control Theory

The gate-control theory of pain contains elements of both the specificity and pattern theories. It attempts to account for psychological influences on pain perception, as well as the spread of pain and the persistence of pain after tissue healing. Melzack and Wall (1965) proposed the gate-control theory in an attempt to integrate four major requirements into a comprehensive pain theory. These requirements include:

1. The high degree of physiological specialization of receptor fiber units and of pathways in the central nervous system.

2. The role of temporal and spatial patterning in the transmission of information in the nervous system.

3. The influence of psychological processes on pain perception and response.

4. The clinical phenomena of spatial and temporal summation, spread of pain, and persistence of pain after healing. (p. 153)

The theory proposed that neural mechanisms in the dorsal horns of the spinal cord act like a gate, which can increase or decrease the flow of nerve impulses from peripheral fibers to the central nervous system. Therefore, potential pain stimuli are subjected to a modulating influence before they produce pain perception and response. The degree to which the gate increases or decreases the sensory transmission is determined by relative activity in large diameter (A-beta) and small diameter (A-delta and C) fibers and by descending influences from the brain. When the amount of information that passes through the gate exceeds the critical level, it activates the neural areas responsible for pain experience and response.

Like all theories, the gate-control theory has two facets: the conceptual model which is the basis of the theory, and the explanatory mechanisms to show how the model functions. The conceptual model is based upon the following five propositions (Melzack, 1973):

1. The transmission of nerve impulses from afferent fibers to spinal cord transmission (T) cells is modulated by a spinal gating (SG) mechamism of the dorsal horns.

2. The spinal gating mechanism is influenced by the relative amount of activity in large-diameter (L) and small-diameter (S) fibers: activity in large fibers tends to inhibit transmission (close the gate) while small fiber activity tends to facilitate transmission (open the gate).

3. The spinal gating mechanism is influenced by nerve impulses

that descend from the brain.

4. A specialized system of large-diameter, rapidly conducting fibers (the central control trigger) activate selective cognitive processes that then influence, by way of descending fibers, the modulating properties of the spinal gating mechanism.

5. When the output of the spinal cord transmission (T) cells exceeds a critical level, it activates the action system--those neural areas that underlie the complex, sequential patterns of behavior and experience characteristic of pain. (pp. 154-155)

The small (A-delta and C) fibers play a highly specialized and important role in pain processes. They activate the T cells directly and contribute to their output. The activity of these high-threshold small fibers, during intense stimulation, may play an important role in raising the T cell output above the critical level necessary for pain. Melzack and Wall (1965) claimed that the small fibers do much more. They facilitate transmission (open the gate) and thereby provide the basis for summation, prolonged activity, and spread of pain to other areas of the body. This facilitatory influence provides these small fibers with greater power than what was foreseen under the concept of pain fibers. At the same time these small fiber impulses are susceptible to modulation. This multifaceted role of the small fibers is compatible with the psychological, clinical, and physiological evidence.

Much of the physiological evidence for explanation of the conceptual model is well established, however, some indirect evidence must be used in order to speculate about some aspects of the model.

Melzack and Wall (1965), and Wall (1964) reported the most likely site of the spinal gating mechanism to be the substantia gelantinosa. It forms a functional unit that extends the full length of the spinal cord on each side. The substantia gelantinosa is able to influence the activity of cells that project to the brain by receiving afferent input from large and small fibers. On that basis, Melzack and Wall (1965) proposed that it acts as a spinal gating mechanism by modulating the conduction of nerve impulses from peripheral fibers to spinal cord transmission cells.

Melzack and Wall (1965, 1970) proposed that sensory fibers transmit patterned information, depending on the specialized properties of each receptor-fiber unit, about pressure, temperature, and chemical changes at the skin. These nerve impulses either excite the spinal cord T cells that project the information to the brain or activate the SG which modulates the amount of information projected to the brain by the T cells.

Melzack (1973) reported that cognitive or "higher central nervous system processes" such as attention, anxiety, anticipation, and past experience exert a powerful influence over sensory input. This control of spinal cord transmission by the brain may be exerted through several systems. These include (a) reticular projections, (b) cortical projections, and (c) central control trigger.

The gate-control theory proposed that the action system responsible for pain experience and response is triggered when the integrated firing level of the dorsal horn T cells reaches or exceeds a critical level. Stimulation at noxious intensities produces activity in the projection systems which may alter pain perception and response. It is assumed by Melzack and Casey (1968) that three categories of activity, the sensory-discriminative, motivation-affective, and cognitive-evaluative, interact to provide: (a) perceptual information regarding the location, magnitude, and spatiotemporal properties of the noxious stimulus, (b) motivational tendency toward escape or attack, and (c) cognitive information based on analysis of multimodal information, past experience, and probability of outcome of different response strategies. All three forms of activity could then influence motor mechanisms responsible for the complex pattern of overt responses that characterize pain.

The gate-control theory has provided additional power to explain some of the most puzzling phenomena of pain by the inhibitory influence of the central biasing mechanism. A portion of the brainstem acts as the central biasing mechanism by exerting an inhibitory influence, or bias, or transmission at all synaptic levels of the sensory projection system, including the SG. To modulate this influence could therefore play an important role within the gate-control theory.

The interaction of the gate-control and action systems can account for hyperalgesia, spontaneous pain, and other characteristics of pathological pain. Each case would depend upon the type of fiber input and amount of stimulus being projected and whether or not any inhibitory influence is being exerted.

The gate-control theory also suggests that psychological processes such as past experience, attention, and emotion may influence pain perception and response by acting on the spinal gating mechanism. Some of these psychological activities may open the gate while others may close it.

Pain Perception

Chapman (1980) reported that in normal life the brain maintains a moment-to-moment awareness of both the body and the surrounding physical environment. Chapman also reported that with each new stimulus the brain takes notice, organizes, interprets, and then evaluates each event using information from a host of sources. These sources include cultural learning, past experience, and the meaning of the specific situation. This ongoing process of awareness is called perception. The experience of pain is one aspect of this phenomenon of perception. If we look carefully at perception and its components we may begin to understand the individual differences that makes each of us respond in a unique fashion (Melzack, 1961).

If we compare the perception of pain with vision or hearing, pain seems quite simple and primitive. But experiments have shown that pain is not always perceived after an injury has occurred. This non-perception of an injury can be explained by the gate-control theory of pain. The sensory input (injury) is modulated by descending influences of the higher centers of the brain. A good example is the athlete who sustains an injury during the excitement of a game but does not realize the injury has occurred until the game has ended. Therefore, we know that the perception of pain goes far beyond the problems associated with injury and sensory signals.

Melzack (1973) reported that pain is much more variable than many people have believed in the past. Pain differs from person to person and from culture to culture. Melzack also explained how cultural values play an important role in how a person perceives and responds to pain. A stimulus that produces pain in one person may be easily tolerated by another. For example, in the western culture childbirth is considered by many to be one of the worst pains a human can undergo. Yet anthropologists have observed cultures throughout the world in which women show virtually no distress during childbirth.

The evidence that pain is influenced by cultural factors leads to an examination of the role of early experience in adult behavior to pain. The influence of early experience on the perception of pain has been demonstrated experimentally. Melzack and Scott (1957) raised Scottish terrier dogs in isolation cages so that they were deprived of normal environmental stimuli such as bodily knocks and scrapes. They found that these dogs, at maturity, failed to respond normally to a variety of noxious stimuli. Many of the dogs poked their noses into a flaming match, but did not pull away. These dogs also endured pin pricks with little or no evidence of pain. Reflex movements made by the dogs during contact with the fire and pin pricks indicate that they felt something; but the lack of observable emotional disturbance suggests that their perception of damage to the skin was highly abnormal. These results suggest that the significance or meaning of environmental stimuli acquired during early experience plays an important role in pain perception.

The meaning attached to a potential pain-producing situation influences the degree and quality of pain the individual feels. A study discussed earlier, Beecher (1959), is a classic example. Those soldiers severely wounded in battle perceived little or no pain because they had a ticket home. They were thankful to escape, alive, from the battlefield. Thus, the meaning they attached to the wound determined the severity of the pain experience.

Another aspect of perception that will help to determine an individual's unique response to stimuli is explained by Chapman (1980):

> Perception depends on the constant monitoring of the multiple barrages of impulses from the many intero-, proprio-, and

exteroceptors and the filtering of this input to select for awareness that information which is relevant and useful, excluding that which is of secondary importance or which carries no new information. This process of selection and integration of sensory input from the external and internal environment is the process of attention. It is sometimes described as the process of focusing the perceiver's sensory and cognitive abilities on certain configurations of input from internal or external sources or on internally generated imagery or thought patterns. (p. 113)

In fact, Melzack (1973) states that almost any situation that attracts a sufficient degree of intense, prolonged attention may provide the conditions for other stimulation (e.g., injury) to go unnoticed, including injury that would normally cause considerable pain. This statement is of the utmost importance, for it is the basis for many of the coping strategies that will be covered in the next chapter.

The one major problem encountered by researchers is trying to measure perception. Perceptual experiences are unobservable phenomena that cannot be directly measured. Perceptual experiences can only be inferred from some form of behavioral or physiological response. Such responses as a verbal report, a withdrawal motor response, or an increase in heart rate imply the existence of a subjective awareness (Chapman, 1978). Thus, athletic trainers and members of medical professions are bound to these verbal and physiological responses in their attempt to determine the type and intensity of the pain experience.

Language of Pain

As reported by Melzack (1973), pain refers to a category of complex experiences, not to a specific sensation that varies only along a single intensity dimension. The word "pain" is a linguistic label that categories an endless variety of qualities. Each type of pain (e.g., headaches, sprained ankle, ulcer) is characterized by its own unique qualities. The description of these qualities is the key to injury evaluation and may even suggest a certain course of therapy. Therefore, we rely heavily upon the language of pain for diagnosis and treatment of injuries.

Despite the frequent use of these descriptive adjectives, there are few studies of their use and meaning. However, Melzack and Torgerson (1971) made a start towards the understanding of these qualities of pain. In the first part of their study, subjects were asked to classify 102 words, obtained from the clinical literature relating to pain, into smaller groups that describe different aspects of the experience of pain. On the basis of that data, the words were categorized into three major classes and 16 subclasses. The classes are:

1. Words that describe the sensory qualities of the experience in terms of temporal, spatial, pressure, thermal, and other properties.

2. Words that describe affective qualities, in terms of tension, fear, and autonomic properties that are part of the pain experience.

3. Evaluative words that describe the subjective overall intensity of the total pain experience. (p. 50)

Each subclass consisted of a group of words that were considered by most subjects to be qualitatively similar. The distribution of a portion of the words is shown in Melzack (1973), Figure 3 (pp. 42-43).

The second part of Melzack and Torgerson's study was an attempt to determine pain intensities implied by the words within each subclass. Subjects were asked to assign an intensity value to each word, using a numerical rating scale ranging from least (mild) pain to worst (excruciating) pain. Melzack (1980) reported that because of the high degree of agreement on the intensity relationships among pain descriptors, it was possible to develop a questionnaire to use as a measuring instrument in experimental studies. The McGill Pain Questionnaire (Melzack, 1973) was administered to 95 patients suffering from one of eight syndromes in an attempt to determine common pain descriptors. Results showed that there are appreciable and quantifiable differences in the way various types of pain are described. The results also showed that patients with the same pain syndrome used similar words to communicate what they feel. Thus, it is assumed that athletes who experience similar injuries communicate with similar words. Then if we know what words are common to certain injuries, we have an advantage in determining the type and extent of the athletic injury related pain.

Athletic Pain

Normally when people in medical and related professions speak of pain experiences they refer to one of two categories. These two categories are acute pain and chronic pain. With that in mind we must ask the question: Which category houses the pain associated with athletic injuries If we first examine the two categories and present the criteria for each, we can determine what athletic pain is, and in which category it should be placed.

Bresler (1977) defined acute pain as short-term pain that is usually associated with a well-defined cause such as a bang on the elbow or a burned finger. Melzack and Dennis (1978) stated that acute pain normally has a characteristic time-course and vanishes after healing has occurred. Melzack and Dennis also stated that acute pain usually has a rapid onset, or phasic component, and then a tonic component that persists for variable periods of time. Therefore, acute pain usually arises from a sudden trauma, then persists for a variable, short period of time, and usually disappears after healing has occurred.

The other category, chronic pain, accounts for different kinds of pain experiences. Chronic pain may begin as acute pain but will persist long after healing has occurred. Melzack and Dennis (1978) stated that chronic pain not only persists but may also spread to adjacent or more distant body areas. They also stated that chronic pain is resistant to surgical control and traditional methods for control of acute pain. Chronic pain's prolonged time-course is characteristically associated with high levels of anxiety and depression. This anxiety and depression usually results from feelings of helplessness and lack of self-control of the pain experience. Bresler (1977) stated that chronic pain does not get better by itself, if anything it gets worse. Examples of chronic pain include arthritis, headaches, low-back pain, and pain in other areas of the body to name a few. Melzack (1973) suggested that this prolonged intense pain produces self-sustaining neural activity that sub-serves memory-like processes related to pain. This speculation is important because the memory-like mechanisms may account for pain in the absence of a detectable lesion or any other peripheral input. Thus, chronic pain experiences are of a prolonged nature, do not get better by themselves, are usually not explained by peripheral stimulation, and are normally not affected by methods used to control acute pain.

The greater percentage of athletic injury related pain is caused by sudden onset or trauma. Thus, most athletic pain is acute in nature. However, some athletic pain is brought on by repeated stress or overuse which tends more toward chronic. Often athletes sustain an acute injury, which by Bresler's definition would after a short time get better by itself. However, many athletes continue to compete after sustaining these acute injuries thereby increasing their severity. Occasionally these acute injuries become chronic in nature because of the repeated stresses placed upon them. These injuries are called chronic injuries by athletic trainers, but are not chronic by strict definition. They are, however, chronic to the athlete and athletic trainer. These injuries would normally get better if the athlete stopped competition, whereas, true chronic injuries would not. Therefore, we can say that most athletic pain is acute in nature. But, because athletes deem it necessary to continue competing with these acute injuries, they become more chronic. So, if we think of a continuum with acute pain at one end and chronic pain at the other, athletic pain would lie near the acute end.

Chapter 3

COGNITIVE STRATEGIES

The objective of this chapter is to introduce several different types of cognitive coping strategies for athletic pain management. Each strategy presented will include its own explanation, rationale, as well as how it is implemented. Each strategy will be presented separately with some suggestions for athletic trainers as to the type of injuries for which each strategy is best suited and situations in which each strategy is most effective.

The use of cognitive strategies for the treatment of pain, as reported by Meichenbaum and Turk (1976), has a long history but only a short past. They are inferring that individuals have utilized cognitive strategies for as long as pain has been experienced. For example, Turk (1981) reported that stoic philosophers believed that individuals could get the better of pain by force of reason, by the "rational repudiation" of pain. Meichenbaum and Turk (1976) reported that Descartes and Spinoza recommended that pain should be overcome through the "permeation of reason." Meichenbaum and Turk also provided an excellent example of one of the oldest cognitive techniques, distraction or attention diversion, employed by the philosopher Kant:

> For a year I have been troubled by morbid inclination and very painful stimuli which from others' descriptions of such symptoms I believe to be gout, so that I had to call a doctor. One night, however, impatient at being kept awake by pain, I availed myself to the stoical means of concentration upon some different object of thought such for instance as the name of "Cicero" with its multifarious associations, in this way I found it possible to divert my attention, so that pain was soon dulled . . . . Whenever the

attacks recur and disturb my sleep, I find this remedy most useful. (p. 28)

The short past of the cognitive-skills-oriented approach to treatment of pain comes from the fact that only recently have cognitive coping techniques been explored in laboratories and clinical settings. The success of these strategies has been substantiated by many researchers using several different techniques in the treatment of experimentally induced and clinical pain. Several investigators (Beers & Karoly, 1979; Hackett & Horan, 1980; Hackett, Horan, Buchanan, & Zumoff, 1979; Spanos, Radtke-Bodorik, Ferguson, & Jones, 1979) found significant levels of analgesia on the cold pressor test using various cognitive strategies. The cold pressor test involves immersion of an extremity into ice cold water, usually for as long as possible. This testing procedure has significance for athletic trainers in that a large percentage of injury treatments and reconditioning programs use various forms of ice therapy.

Several other investigators (Chaves & Barber, 1974; Scott & Barber, 1977) found increased pain tolerance from experimentally induced pressure pain. The pressure pain was induced by the Forgione-Barber pain stimulator, which places a 2,000-gm weighted plexiglass wedge on the index finger. Increased pain tolerance was achieved using various cognitive strategies.

The use of cognitive strategies by other investigators (Andrew, 1970; Horan, Layng, & Pursell, 1976) have been effective with clinical pain, such as recovery from surgery and relief of dental discomfort.

The cognitive strategies that will be covered in this chapter have been grouped by Turk (1981) into two major categories, based upon their use or non-use of images. The first group to be examined are the non-image strategies, which are all based upon the role of attentional focus.

Attention Diversion

There are sufficient differences in the actual devices employed in attention diversion to merit a subdivision of this technique into several different ones. The first of these three subdivisions reported by Meichenbaum and Turk (1976) is attention diversion via explicit, external distraction. This includes such things as attending to a series of slides or listening to a taped story. It is an ideal technique for use by athletic trainers during different types of ice therapy such as ice packs, ice massage, or immersion in a slush bucket. One means of external attention diversion used by doctors and dentists, which could also be used by athletic trainers, is soft background music. This would create a more relaxed atmosphere in the training room which in turn creates more of a sense of well being for the athlete. Both Kanfer and Goldfoot (1966), and Kanfer and Seidner (1973) employed attention diversion against experimentally induced pain and reported effective tolerance of the aversive stimulus. Attention diversion can be used as an adjunct for any of a number of treatment modalities employed by the athletic trainer. It is easily implemented without any required learning or practicing of skills. An athlete will derive the benefits of the therapy treatment simply by watching, listening, or observing the disguised strategy. The athletes may never be aware that their attention is being diverted from the therapy.

The next subdivision is attention diversion via self-generated distraction. Examples include such things as adding aloud, counting backwards from 100 by sevens, or counting the ceiling tiles in the room. In other words, these coping behaviors are usually devised by the individuals themselves. Skinner (1953) called these behaviors selfcontrolling mechanisms. He defined self-control as "a process in which a person makes a response that alters the probability of the occurence of another response" (p. 55). Coping behaviors are an individual's unique way of dealing with the experience of pain. Self-generated attention diversion can be effective with counterirritation therapy but the highly subjective nature of the coping behavior itself makes effectiveness difficult to measure. In most cases athletes using this type of attention diversion employ methods that are non-observable by the athletic trainer.

The last of the three subdivisions is attention diversion via imagery. This will be covered in detail, later in this chapter, under a separate imagery heading.

Somatization

This coping strategy is explained by Turk (1981) as focusing attention in a dissociative manner on the part of the body receiving the intense sensation. Examples from Turk (1981) include analyzing the sensations of one part of the body and comparing these to another part of the body; reflecting on the nature of the intense stimulation as if preparing to write a biology report describing these phenomena; and studying the sensations and physical changes and comparing these to feelings experienced in other similar situations. Blitz and Dinnerstein (1968, 1971) used dissociative focusing of attention on two different types of experimentally induced pain (cold pressor and pressure) and achieved significant elevations in pain thresholds with both instruction groups.

As with the other types of strategies using attentional focus, this dissociative method would be excellent for use by trainers on athletes who are receiving traditional treatment modalities. The athletic trainer might explain this strategy to athletes receiving contrast baths, whirlpools, or ice therapy. These therapy techniques are normally on one body part at a time. Thus the athlete can make a comparison to the body part not being treated. Another treatment modality where dissociation might work well is trigger point therapy. Trigger point therapy is the concentration of electrical stimulation upon areas of referred pain. This activates Melzack's (1973) central biasing mechanism to produce an inhibitory influence upon the already painful area. Occasionally a problem arises with an athlete who is frightened of the electrical stimulation on the body; some athletes perceive the stimulation painful. In these cases the athletic trainer might employ somatization to complete the treatment in order to relieve the athlete's pain. An essential component of trigger point therapy that lends itself to the enhancement of somatization is the need to keep in constant verbal contact with the athlete. This, in itself, is a dissociative technique.

Progressive Relaxation

Relaxation training history involved two distinct phases. The first phase was the work of Jacobson (1934), who developed a physiological procedure for combatting tension and anxiety. Jacobson concluded that tension involved the effort manifested in shortening of muscle fibers. This tension occurred when an individual reported "anxiety," and that such anxiety could be removed by eliminating the tension. The second phase was the modification of those procedures by Wolpe in 1948 (see Bernstein & Borkovec, 1973), who applied them in a systematic program of treatment. The results of numerous research experiments since these pioneering concepts were developed prompted Bernstein and Borkovec (1973) to write their Progressive Relaxation Training Manual.

Progressive relaxation training consists of learning to sequentially tense and then relax various groups of muscles throughout the body, while at the same time paying close and careful attention to the feelings associated with both tension and relaxation. It is learning to recognize and pinpoint tension and relaxation as it appears in everyday situations, as well as during sessions.

Progressive relaxation was developed for those people who experience high-level tension responses, which interfere with the performance of their other behaviors (Bernstein & Borkovec, 1973). These include such afflictions as insomnia, tension headaches, and tight nerves. Progressive relaxation provides excellent benefits for people with tension-related problems. Some athletes under certain circumstances might fall into this category. Situations such as preparing for surgery, beginning to recondition post-surgery, and beginning to recondition after prolonged immobilization could produce high levels of tension. Caution must be exerted, however, because relaxation training is not a panacea.

Progressive relaxation training is presented using three major steps: (a) persuasion, (b) education, and (c) implementation. Bernstein and Borkovec (1973) stated that the first training session is perhaps the most important because it is at this point that the user's feelings of confidence in the technique and in the teacher are instilled. Individuals must also develop an enthusiasm for carrying out their homework. Learning these skills is much like learning any other kind of skill, such as golf or swimming. In order to achieve proficiency at "relaxing" practice is needed. Bernstein and Borkovec expressed an important concern that progressive relaxation training will not do anything to you. It is merely introducing you to the technique and directing your attention to various aspects of it.

The implementation should begin with the athlete being comfortably dressed, sitting in a comfortable chair, such as a padded recliner, in a dimly lit room. The procedure is a sequence of events with each of 16 different muscle groups (Bernstein Borkovec, 1973). The sequence is as follows:

1. The client should be focused on the muscle group.
2. At a predetermined signal from the therapist, the muscle group is tensed.
3. Tension is maintained for a period of 5-7 seconds.
4. At a predetermined cue, the muscle group is relased.
5. The client's attention is maintained upon the muscle group as it relaxes. (p. 25)

There are several situations in which relaxation would be helpful for injured athletes. First of all the technique would be practiced best at home or in an apartment with an atmosphere more conducive to relaxing than a noisy training room. As mentioned previously, athletes who are aware of their need for surgery might benefit from relaxation training. Athletes who are preparing for surgery should have a clear understanding of what the surgery will do. The more they know about the entire process, the better their understanding. Let them know they have some control over their situation, and can regulate some of the pain themselves. A sense of some control will alleviate some of the feelings of helplessness, and help restore self-confidence.

Injured athletes who have previously had surgery and frequently experience pain after their daily reconditioning could benefit. Athletes who have nearly completed their reconditioning and are experiencing feelings of anxiety about the upcoming competition might also be helped by relaxation training.

Progressive relaxation training is considered a non-image based strategy. Its presentation at this time is a prelude to the upcoming image-based strategies. All of the image-based strategies to be presented employ relaxation prior to the imagery introduction. The skills acquired from progressive relaxation training have their own usefulness and may also be carried over and used in preparation for the imagery strategies.

Mental Imagery

Medical and psychophysiological research is finding out more and more about the relationship between the body and the mind. Silva and Miele (1977) reported that, of all the different, seemingly unrelated efforts, there is a fascinating consistency about the findings. The mind plays a mysteriously important and powerful role in the control of pain. Silva also claimed, "it is an inescapable fact that we already know enough to strengthen with our minds the body's repair forces so that illnesses can be combatted more successfully" (p. 74). Silva and Miele (1977) provided a specific example of the power the mind has over pain: A lady was on a convention trip in Texas with her husband. She dived into the swimming pool and ruptured an eardrum. Being miles from any town, she did not want to leave in the middle of the convention. So she put her hand over her ear, concentrated on the pain area and said "gone, gone, gone". The bleeding stopped immediately and the pain left. When she finally arrived at the doctor's office, he was speechless because she had endured the severe pain of such an injury, for an extended period of time, using only her own coping strategy.

It is sad to think that people do not take advantage of the vast power of the mind to resolve their problems and provide themselves with better mental and physical health. One technique that is excellent for the control of pain is that of imagery. However, we must first learn how to activate our minds and focus them on a particular problem. An excellent explanation of imagery is provided by Bresler (1977) in his cassette, Learning to Control Pain.

Verbal control is used to control the voluntary nervous system. If I give my body a verbal command to "raise my hand," the body knows how to do that and does so. But if I try to use verbal control on the autonomic nervous system by saying something like "raise my blood pressure" or "pain go away," the body does not understand that type of language. Another type of communication system controls the involuntary or autonomic nervous system. This communication system is the higher order language, the language of symbolism, the language of imagery. You do not have to tell the body how to do it, it already knows. For example, if you imagine a lemon, and begin to think about cutting it, then sucking on it, and tasting the sour taste, the body will automatically react by salivating. What we need to do is to get in touch with the way this other part of the nervous system experiences pain and then deal with that image.

Bresler (1977) suggested two types of approaches for the use of guided imagery. The first is a straight symptomatic approach. This means simply guiding your image toward giving symptomatic relief. For example, an athlete with a sprained ankle would create an image of the entire foot and ankle being numb.

The second type of approach Bresler uses is to establish an "advisor in the mind" with which to discuss all aspects of the pain situation. For example, athletes might first prepare themselves, with some relaxation training, to take a mental trip to a very pleasant place such as a beach. Once there, athletes can make themselves comfortable and relaxed. The first person who approaches and begins to talk to them becomes the athlete's personal advisor. Then each time a critical situation occurs, athletes can always refer to their advisor as to how best solve their problems.

Total Mind Power

Total mind power, developed by Wilson (1976), advocates that most people use approximately 10% of their brain, and the other 90% lies dormant or relatively inactive. Total mind power is a self-directed technique aimed at harnessing that large unused portion of the brain. The implementation of total mind power is carried out using a three-step approach:

Step 1: A Focusing of Awareness

Drifting of the mind into a state of focused awareness. This is achieved in an environment of relaxation without any outside disturbing interferences or stimuli. The focused state of awareness is when you zero in on a limited set of stimuli.

Step 2: Directing Your Mind

Directing your thoughts towards the problem or situation you want to change and visualizing or sensing as clearly as possible the ideal solution.

Step 3: Sequencing Your Mind Directions

Sequencing of your thoughts to bring about the desired change.

The first step of the total mind power technique is similar to the progressive relaxation that was discussed earlier. If progressive relaxation training had been previously learned, its procedures could be used in place of the first step. The second step of total mind power is drawn from your experiences and information to attain a solution for your specific situation or problem. Wilson (1976) stated that "during this step every possible sense and appropriate emotion must be used to get the job done" (p. 50). Step three, in essence, is the proper repetition of the first two steps.

The only tools needed for the total mind power technique are transcripts. Transcripts are your paths leading into the state of focused awareness. They are simple directions to yourself, which can be written or committed to memory, to aid in focusing your mind on the problem and the resolving of it. For an athlete, total mind power would have to be practiced at home rather than the noisy training room. This technique would also be excellent for athletes preparing for surgery, or trying to overcome the pain of reconditioning post-surgery. An example of a total mind power transcript (Wilson, 1976) is as follows:

Step 1: Make yourself very comfortable and relaxed.

Close your eyes and imagine in your mind's eye
a beautiful,
helium-filled balloon.

You see yourself very,
very comfortable in the basket of the balloon as it
is about to be launched from a large, open field.

You feel comfortable and very confident about the journey you are about to take,
and you have great expectations of happiness as the balloon lifts gently off the field.

You see the balloon lifting into the air,
and it's a bright,
warm,
sunny summer afternoon.

The balloon shimmers in the sunlight with a deep, blue-green color.

As the balloon lifts up higher and higher,
you find yourself more and more relaxed,
and your mind expands into an overwhelming feeling of joy and exhilaration.

You become very interested in all the sights around you,
and you can hear the gentle floating of the balloon through the air.

You are not familiar with the landscape that the balloon is drifting over,
but you take great interest in it because of its beauty.

There isn't a cloud in the sky

You can see a full moon coming up over the horizon,
even though it's still afternoon

The balloon drifts very slowly,
very comfortably across open meadows and fields,

passing over rivers and streams,
and you can breathe the freshness of the air that surrounds you.

With each breath you take,
you find yourself feeling more and more exhilarated. (pp. 54-55)

Step 2: Now visualize an intricate system of wire-like nerves that run the entire length of your body.
These wires can pick up or leave messages at any point throughout the body.
Notice these wires resemble electrical or telephone wires.
Notice, also, that the wires are various sizes and colors.
Each colored wire has a different size diameter.
Notice the black wires are the thickest,
enabling them to carry the most pain information to the brain.
Now visualize the wire system as it winds its way to the brain.
See the red, green, blue and yellow wires as they weave their way over, around, and through the muscles and bones on their path to the brain.
Each wire winds its way up the legs and arms.
You see the wires meet and form a large bundle in your back.
Notice this bundle runs straight up your back towards the brain.

As they approach the brain the wires become
noticeably thicker, enabling them to carry
more information.
At the thickest part, just before they enter the
brain, the wires go through a switch box equipped
with a lever for turning "current" on or off.
Now, before the "current" leaves the pain site,
practice turning the switch box off at will.
Focus on the labels on the side of the switch box
marked "on" and "off."
Direct your mind to pull the lever to the
"off" position.
You will now be able to react more quickly
to the flow of "current" from the pain site.
You have the means for controlling the flow
of "current" into the brain.
Now each time as the "current" flows from
the pain site, visualize the switch box and
direct your mind to turn it off.
Notice the pain diminishes each time you turn
the switch box off.
You will begin to notice a decrease in the flow
of current from the pain site.
Finally, you will be able to leave the
switch box in the off position.

Total mind power is similar to the skill aspect for a conditioned athlete in that the technique must be kept in shape. You must practice the mental exercise, as an athlete does physical exercise, in order to resolve your problem.

Stress Inoculation

The stress-inoculation strategy, developed by Meichenbaum (1975), exposes subjects to a host of different coping techniques, which can be tailored to their own needs and styles. Operationally, stress-inoculation training involves three phases: (a) educational phase, (b) rehearsal phase, and (c) application phase. The first phase was designed to provide subjects with an explanation for understanding the nature of their responses to painful events. The conceptual framework offered was Melzack and Wall's (1965) gate-control theory of pain.

The second phase of stress-inoculation training was designed to provide the subject with a variety of coping techniques to employ at each of the various phases of the coping process. The third phase is the rehearsal and implementation of the skills acquired during the first two phases.

The first phase presents the gate-control theory in order that the subjects might better understand the nature of the pain. The gate-control theory suggests that the pain experience consists of three different components: (a) sensory-discriminative, (b) motivational-affective, and (c) cognitive-evaluative. Melzack (1973) indicated that these three components interact in a complex fashion, but each component will be discussed separately to better understand the stress-inoculation training procedures.

The control of sensory input or the sensory-discriminative component is achieved by such means as physical and mental relaxation and by attending to slow, deep breathing. Dick-Read (1959) offered an illustration of how one's expectations concerning pain increases anxiety, which in turn fosters muscle tension and leads to more pain. Paul (1966) and Meichenbaum (1973) have been successful in interrupting this cycle by the use of relaxation procedures.

A simple technique developed by Wenger (1979) for control of this sensory-discriminative component is called "noise-removal breathing." It is an easy way for athletes to get comfortable with pain, discomfort, or distress. Through his insight Wenger found that there is a breathing pattern to every kind of experience. Not just physically exerting experiences, but intellectual, aesthetic, and emotional experiences as well. He found that not only do various types of experiences cause various types of breathing, but various types of breathing can be used to predispose various types of experiences. Noise-removal breathing is a simple 5-10 minute exercise that can be used by athletic trainers with athletes who are experiencing pain. Once the athletic trainer has explained the above rationale the exercise can begin. The exercise consists of six steps which are as follows:

> Step 1: With each breath in, begin imagining that your air is coming in through the bottoms of your feet, all the way up from there. Breathe in as if you had to pull your air all the way up through ankles, legs, and body, up to where you can breathe out through normal channels. Continue for several minutes.
>
> Step 2: Picture or imagine piles of dried leaves or other debris being swirled up with each breath, out of your tissues and cells. Sweep all that stuff cleanly out of you with your breath.
>
> Step 3: As these clouds of "noise" sweep cleanly out of you on your slowly, deeply, calmly exhaled breath, as all of this debris

hits the open air see it flaming into showers of bright sparks.

Step 4: Breathe in not only through your feet but through whatever parts of your body come to your attention in this context--breathe in against the pull of the air having to swirl up as much "noise" as you can with each breath in; blowtorch out as much released energy in bright hot spark-showers as you can, with each breath.

Step 5: In the same manner, use your breath to breathe up and away whatever could have in the slightest stood between you and even more profound levels of relaxed awareness.

Step 6: For several minutes before any task, picture your goal for that activity and breathe up and away whatever could in the slightest have impeded full swift rich clean attainment of that goal. (pp. 25-26)

For Melzack (1973), the motivational-affective component includes the feelings a person has while experiencing pain. Such feelings as helplessness and the absence of control aggravate the painful experience. To counteract these feelings Meichenbaum and Turk (1976) offered a variety of strategies. These included (a) attention diversion, (b) somatization, and (c) imagery manipulations. These strategies have been discussed previously, however, Meichenbaum and Turk have developed some specific categories concerning the latter. Imagery involves changing or transforming the pain experience by means of fantasy. The more elaborate, detailed, and involved the fantasy, the greater the amount of pain tolerance. The different imagery manipulations offered by Meichenbaum and Turk (1976) included:

1. Imaginative inattention, which is engaging in "goal-directed

fantasies" that are incompatible with the pain experience. An example fantasy might be enjoying a relaxing afternoon lying on the beach.

2. Imaginative transformation of pain, which means interpreting the pain as something other than pain or minimizing the sensations as unreal or trivial. For example, thinking of the painful area as being injected with novacaine and going completely numb.

3. Imaginative transformation of context, which means transforming the setting in which the pain is occurring. An example fantasy might be imagining that you just caught a Superbowl winning touchdown pass while being hit by two defenders simultaneously. These imagery procedures can be viewed by the individuals as providing themselves with a plan to deal with pain; especially at "critical moments" when the pain seems almost unbearable and they are on the verge of giving up.

Combining these imagery coping strategies with the previously discussed strategies of attention diversion and somatization gives individuals a variety of strategies they can choose from "cafeteria style." The availability of such strategies would help control the motivational-affective component of pain.

Meichenbaum and Turk (1976) reported that one way of dealing with the cognitive-evaluative component of pain was to conceptualize the painful experience as consisting of several stages, such as preparing for the painful stressor, confronting and handling the pain, coping with feelings at critical moments, and reinforcing self-statements for having coped. In collaboration with the trainer individuals could draw up a list of self-statements for use at each stage painful experience. An excellent example of these verbalizations is provided by Turk (1975):

<u>Stage 1</u>: <u>Preparing for the painful stressor</u>

What is it you have to do

You can develop a plan to deal with it.

Just think about what you have to do.

Just think about what you can do about it.

Don't worry; worrying won't help anything.

You have lots of different strategies you can call upon.

<u>Stage 2</u>: <u>Confronting and handling the pain</u>

You can meet the challenge.

One step at a time; you can handle the situation.

Just relax, breathe deeply and use one of the strategies.

Don't think about the pain, just what you have to do.

This tenseness can be an ally, a cue to cope.

Relax. You're in control; take a slow deep breath.

Ah. Good.

This anxiety is what the trainer said you might feel. That's right; it's the reminder to use your coping skills.

<u>Stage 3</u>: <u>Coping with feelings at critical moments</u>

When pain comes just pause; keep focusing on what you have to do.

What is it you have to do

Don't try to eliminate the pain totally; just keep it manageable.

You were supposed to expect the pain to rise; just keep it under control.

Just remember, there are different strategies; they'll help you stay in control.

When the pain mounts you can switch to a different strategy; you're in control.

Stage 4: Reinforcing self-statements

Good, you did it.

You handled it pretty well.

You knew you could do it

Wait until you tell the trainer about which procedures worked best.

In the stress-inoculation procedures subjects from the beginning become collaborators, helping to develop from their own experiences and with advice from the trainer individualized coping packages which they can employ at their discretion.

Chapter 4

SUMMARY

To address the problem of the injured athlete effectively, athletic trainers must understand the phenomenon of pain. They must also understand how athletes will react to certain pain-producing injuries. When first trying to determine a specific pain problem, Bresler (1977) advocated a complete understanding of the problem before assigning any method to resolve it. However, once this complete understanding is attained, all available, relevant techniques at the trainers' disposal must be used for resolution of the problem.

Melzack (1973) stated that all approaches to the reduction of pain, be they physical, pharmacological, or psychological do not exclude one another. In fact they work together, that is, their effects are synergistic. In other words two procedures together may be more effective than many alone. This is the essence of the interdisciplinary approach athletic trainers must take to alleviate the pain associated with athletics.

It seems obvious that most current methods employed for pain relief by athletic trainers are generally less than adequate. These methods only seek to do something _to_ athletes. Once the treatment is finished, the relief will quickly fade and the pain will return. Then the athletes must wait until they can return to the trainer for another treatment, for more pain relief.

The use of cognitive strategies gives the athlete the means to deal with pain whenever the pain arises. Numerous investigators with widely diverse orientations have employed several types of cognitive coping strategies in experimental as well as clinical settings. These investigators have shown cognitive strategies effective in alleviating or reducing the pain experience. Athletic trainers would, thus, benefit by employing these strategies to alleviate the pain associated with athletics. They could be used to enhance traditional treatments, allow trainers to complete traditional treatments, and be employed at home by themselves. Since their use does not require machines, medical equipment, or medication, their use seems ideal.

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