Chapter 74

Psychological Mechanisms of Tension-Type Headaches

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Tension-type headache (TTH) can be conceptualized within the framework of Gate Control Theory (25) and its recent extension, Neuromatrix Theory (23). According to these theories, pain is a multidimensional event that includes not just a sensory event, but also cognitive, affective, and behavioral input. Most research on TTH has focused on stress and muscle involvement, and we review these factors in detail. However, the importance of cognitive processing and its emotional consequences has increasingly been recognized as important in the experience of pain, so we also address the contributions of these factors to the experience of TTH. Finally, we devote some attention to the impact of TTH on the patient's life.

STRESS AS A FACTOR IN TENSION-TYPE HEADACHE

The relationship between stress and TTH has been explored for over 4 decades, and the volume of available research is extensive. The hypothesis that stress is causally related to pain is plausible based on pain theories. Melzack (24) has discussed the integrated relationship between stress and pain in detail. Prolonged activation of the stress system, resulting in high levels of cortisol, is related to a number of physiologic changes that can produce pain. Stress is also directly linked to negative affect, which in turn influences pain (12). Therefore, there are strong arguments for closely investigating the link between stress and chronic pain syndromes.

Wittrock and Myers (43) conducted a systematic examination of the empirical literature comparing individuals with recurrent TTH with headache-free controls with respect to stress appraisal and coping and psychophysiologic responses. Their review was guided by a model that incorporates the transactional model of stress (19) and adds to it the role that pain itself plays in the experience of headache, especially when it is of a chronic, unremitting nature (Fig. 74-1). Briefly, the model begins with occurrence of an event that is potentially stressful. Emphasis is on *potential* because stress is experienced in an idiosyncratic manner; stress rests within an individual's cognitive interpretive framework. That is, what determines whether any given event is stressful is more a function of how the patient appraises the event. If an event is judged to be both relevant and a threat (step 1 in the model), then a coping response is required (step 2). Unsuccessful attempts at coping lead to physiologic arousal and pain (step 3). Onset of pain can lead to further negative appraisals (step 4), which then intensify attendant pain (step 5), promote further, perhaps more desperate, efforts to cope (step 6), and ultimately exacerbate headache.

Wittrock and Myers (43) theorize that individuals with TTH may differ from nontension headache sufferers in one or more of five different ways. These hypotheses can be stated in a clear and testable manner and are provided in Table 74-1. The brief literature review to follow will discuss how studies have examined these aspects and summarize evidence relating to each hypothesis (drawing upon the observations and conclusions of Wittrock and Myers).

Exposure to Stress

Studies of exposure to stress use scales that focus on distal and/or proximal events. Distal scales typically inquire about major events (positive as well as negative) that have occurred over an extended time period (6 months or more) and that have been assigned a weight indicative of the stress demand. Proximal measures, on the other hand, assess everyday stressors over much briefer time frames (e.g., The Daily Stress Inventory, [8]).

Available studies reveal a fairly consistent picture (43). TTH patients typically do not experience a greater

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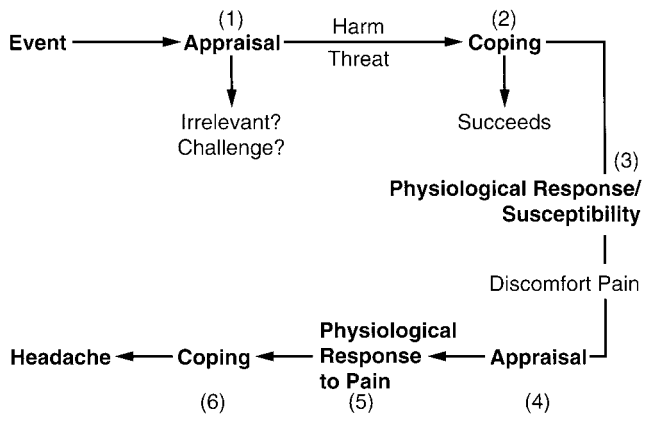

FIGURE 74-1. A model for the appraisal and coping process in tension-type headache. (From ref. 43, with permission.)

number of major stressful events over extended time periods; however, TTH sufferers typically do experience a greater number of everyday life stresses (minor ups and downs or hassles) and judge them to have more impact (13,28).

Appraisal of Stress

This aspect has been investigated most commonly by presenting various groups of subjects with taxing laboratory tasks (e.g., mental arithmetic, vigilance, items from intelligence tests, and stressful mental imagery). With few exceptions, available research studies have not found headache subjects to report increased stress in response to these stimuli. A few studies have found that TTH subjects reveal higher baseline levels of stress, but any increases are proportional to those exhibited by the nonheadache comparison groups (43). Exposure to identical stressors in controlled laboratory settings leads to similar increases in stress by TTH subjects. However, the salience of the laboratory stressors used may be questioned.

TABLE 74-1 Possible Roles That Stress Might Play With Respect to Tension-Type Headache

1. People with tension-type headache may be exposed more frequently to stressful events.
2. People with tension-type headache may be more likely to appraise situations as stressful.
3. People with tension-type headache may show increased physiologic reactivity to stress.
4. People with tension-type headache may have an increased sensitivity to pain and/or a decreased threshold for pain.
5. People with tension-type headache may cope with stress in a way that increases its impact.

Physiologic Reactivity to Stress

Although research investigations abound in this area (Wittrock and Myers [43] reported nearly 40 such studies in 1998), methodologic complexities have hampered progress. The ideal investigation would (1) examine physiologic responding during adaptation, baseline, stress, and recovery conditions with long time-intervals; (2) include multiple physiologic measures, multiple stress stimuli that simulate real-life circumstances and are personally relevant, multiple comparison groups (carefully matched nonheadache controls and carefully matched other headache types), to permit tests of specificity; (3) conduct assessments when patients were free from headache, when headache was present, and during headache induction; (4) require subjects to abstain from using substances that are known to affect physiology for a set period prior to study entry (e.g., nicotine, caffeine, and medication); and (5) use appropriate measurement and analysis procedures that take gender into account (2). No single study has been able to meet all or even most of these criteria. (Most of these rigorous criteria need consideration when evaluating laboratory investigations of stress appraisal and pain sensitivity and thresholds as well.) Finally, few studies have distinguished between episodic and chronic TTH and none have used the most recently proposed categories (infrequent, frequent, and chronic), and this may be a critical shortcoming (43). In the face of this complexity, it should not be surprising that few findings have been unequivocal or consistently replicated. An earlier review showed promising findings implying increased electromyogram (EMG) responses to stress in patients with recurrent headache (14). A more recent meta-analysis showed that TTH sufferers reveal in the nonheadache state no consistent differences in resting levels or in response to stress (42). However, when headache is present, EMG levels do appear to be more elevated (43). Few studies have realized the importance of tracking headache status at the time that assessments are conducted. Greater attention to this aspect in the future may help to clarify matters.

Sensitivity and Threshold Effects

Investigators have used various stimuli to induce mild pain or discomfort in the controlled laboratory setting: thermal (cold pressor and direct application of ice), pressure (pressure algometer and blood pressure cuff), and other (shock and light). These stimuli have been applied to the head, arm, and finger while various psychophysiologic measures, including assessments of muscle tenderness and subjective or self-report measures (pain intensity, threshold, and tolerance), have been collected (43). Findings here are sometimes complicated and difficult to interpret. With respect to subjective reports, when differences emerge, they are typically of the nature of TTH sufferers

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reporting greater sensitivity and a reduced threshold. Analysis of responding in the presence of headache reveals greater pain sensitivity.

Researchers have recently begun to examine muscle tenderness, and available findings are fairly consistent in showing increased tenderness for TTH patients versus controls (nonheadache and other headache types [20]). A body of accumulating research is beginning to shed more light on pathophysiologic mechanisms. Recent reviews of this literature (17,27) point both to peripheral sensitization (primarily for infrequent, more recent onset of headaches) and central sensitization (as headaches evolve into chronic forms).

Wittrock and Myers (43) reported that investigations of psychophysiologic responding to pain stressors have consistently revealed no major differences with respect to EMG measures. However, differences have emerged with respect to cardiovascular parameters in the direction of revealing heightened sympathetic arousal, to neurochemical measures (β-endorphins, serotonin, and substance P in platelets), and to various measures of sensitization (nociceptive flexor reflex, supraspinal modulation, etc.).

Coping Styles

The literature addressing coping styles is limited and inconsistent. Studies assessing coping responses to laboratory stressors have found no differences between TTH patients and controls. Studies quantifying how people cope with life events that disrupted or caused major schedule changes suggest that TTH sufferers tend to report greater use of nonoptimal strategies (e.g., withdrawal, avoidance, self-criticism [11,15]).

One coping strategy that has recently been described as successful in helping individuals cope with chronic pain is acceptance. Acceptance is characterized by a state of remaining in contact with feelings and thoughts without making an active effort to change or attend to them (21). McCracken and colleagues report that acceptance is related to lower levels of pain, avoidance, depression, and disability in individuals who suffer from chronic pain (22), which was supported by Viane et al. (41). To date, acceptance has not been assessed in individuals with TTH, but this appears to be a potentially useful coping strategy to assess in this population.

One other coping-related concept that deserves mention is catastrophizing. Catastrophizing involves rumination about an aversive event that is accompanied by a magnification of the extent of the problem and a feeling of helplessness. Catastrophizing is widely linked to chronic pain, particularly the subjective experience of pain (15). This link has been found in headache; in response to pain stimuli, female TTH sufferers show a greater tendency to catastrophize (40) than headache-free controls.

Cognitive Factors

Neuromatrix theory proposes that cognitive factors will play a significant role in the experience of pain. There is a growing literature that suggests that individuals who experience chronic pain have an attentional bias that leads them to be overresponsive to pain-related stimuli (32). Pain interrupts and demands attention, since it is an alarm signal for action (9). This may be particularly true for individuals with a high level of fearfulness about pain (18). There is evidence that TTH sufferers have an attentional bias. Earlier we reported evidence that TTH sufferers rate events as being more stressful and have a lower threshold and tolerance to pain. Both of these involve subjective interpretations of events that are influenced by attention. Direct evidence for a pain-related attention bias in TTH sufferers is currently sparse. However, there is evidence to suggest that TTH sufferers are more responsive to threatening words, particularly when they are concerned about the impending occurrence of a negative event (37). Evidence also suggests that exposure to a negative stimulus produces a quicker response to pain-related words than neutral words in TTH sufferers than in controls (5). This is another promising area of research in the search for mechanisms of the TTH experience.

Much can be learned from psychologic mechanisms found in a related area—that of chronic back pain. Cognitive concepts like pain vigilance and somatic awareness have been found relevant here (9,10) and might be studied in TTH patients too.

PSYCHOLOGIC THEORIES ON TENSION-TYPE HEADACHE

Theories on mental processes can be subdivided into those that emphasize the role of emotional processes and those that focus on cognitive processes. These views can be used to explain many symptoms in addition to those of TTH, not only physical symptoms but psychologic disturbances as well.

Emotional Theories

The psychologic theory with the longest history, and both strongly favored and disputed, is that of psychoanalysis. According to this view, psychogenic pain can be considered a solution for an unconscious conflict within the individual. By the presentation of complaints of pain, a person might satisfy either his or her aggressive impulses against other people or his or her own conscience, which forbids its overt expression. Instead of being expressed as an outward reaction, the aggression is directed toward oneself (1,35). Although several empirical researchers have found that TTH patients are consciously troubled by hostile

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feelings and anxiety (3,6,34), the unconscious conflicts have seldom been empirically investigated to date. One study (31) did not find an abnormal pattern of defense mechanisms in these patients.

Penzien et al. (34) reviewed nearly 200 headache studies reporting psychologic data for headache patients. Of those studies that included headache-free subjects for comparison, 71% found increased maladaptive behavior/psychologic test scores for the headache patients. Most studies report heightened psychologic test scores for TTH patients. The remaining 29% found no significant differences between patients and normative or control samples. Although significantly different (statistically), the levels of psychologic symptoms rarely fell into the clinically significant range. In studies reporting clinical significance, only 5 to 15% of headache patients typically fall into the psychopathology category. These conclusions parallel the findings of Merikangas et al. (26), who found no major differences between TTH sufferers and control subjects 27 to 28 years of age selected from the general population, but they are at odds with a recent study of psychiatric comorbidity conducted with headache clinical patients. Members of the Italian Collaborative Group (36) carefully assessed 217 TTH sufferers from 10 different Italian headache centers and found a high percentage of the cases to meet diagnostic criteria for anxiety, depression, and somatoform disorders. Prevalence rates for anxiety disorder were similar for episodic and chronic cases; chronic cases revealed higher prevalence rates for depression and somatoform disorders. Thus, findings varied significantly as a function of the sample studied. Finally, preliminary findings suggest that TTH patients may suppress and hold in anger (4). It is still unclear if the psychologic distress often reported by TTH patients results more from a pain-filled history or serves as an independent source to form an eliciting factor for the headaches. Blanchard et al. (7) offered evidence suggesting that psychopathology may contribute directly to headache for a certain proportion of tension-type patients.

Cognitive Theories

An influential theory that emphasizes the role of attentional processes in the report of symptoms is that of Pennebaker (33). According to Pennebaker, sensations of an internal bodily source compete with those from the environment for gaining the attention of the person. Under conditions of low environmental stimulation (such as stimulus deprivation) or high physiologic activation (such as stress), physical sensations have a higher probability of being perceived. These perceptions can be interpreted as bodily symptoms when the individual structures these perceptions by a cognitive scheme focused on the idea of having a disease. The interpretation of innocent body signals as indications of a life-threatening affliction (e.g., a brain tumor in case of tension headache) might intensify the attention to these signals and lower the threshold for perceiving these as pain. Although this theory has been supported for the perception of symptoms of nasal congestion and pain in general, so far it has not been tested with regard to headache complaints.

Cognitive processes are generally accepted as fundamental for experiencing specific emotions. The anxiety, which is elicited by the interpretation of pain as a symptom for a severe disease, forms the motivating force behind the obsession that chronic patients have for their pain. In addition, these negative emotions contribute to the dissatisfaction that tension-type patients experience with their life (see below).

Another theory that emphasizes the role of attentional processes in the development of psychosomatic complaints is the physiologic disregulation theory proposed by Schwartz (38). Schwartz stated that, when attention is diverted from one's physiologic state and corrective action to return to normal functioning does not occur, physical dysfunction might be the outcome. Teaching the patient to attend to the afflicted organ by biofeedback can restore proper functioning. So far, some evidence has been collected supporting the theory regarding its usefulness for TTH (16).

CONSEQUENCES OF TENSION-TYPE HEADACHE

Although the intensity of migraine headaches may lead to relatively short but intense interruptions of daily activities, TTH, with its longer duration, greater frequency, and moderate intensity, tends more to envelop the person's life in a nebula of fatigue and depressive moods. Although absence from school and work as a consequence of these headaches might be found as well, clinical observations indicate that its negative effects are more apparent in the emotional life of the person.

Results from a preliminary investigation of functional impairments in social, behavioral, cognitive, and recreational domains found TTH patients to be less disabled on one measure (composite functional impairment index, which represented the average level of impairment during a day when either a typical or a worst headache occurred) than either migraineurs or those with migraine combined with TTH (44). However, scores for the total functional impairment index (which represented the overall average level of impairment regardless of headache severity) revealed no differences between the three headache groupings. The authors speculated that the three headache groups may differ in the amount of impairment experienced during particular headache episodes but that they may not differ in overall level of impairment endured (due to the more frequent occurrence of TTH). More recent

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studies have found that TTH patients are as impaired in their lives as are migraine patients (29,39). It is plausible, although not investigated yet, that those TTH patients who use coping techniques like catastrophizing have a lower quality of life, as has been found in migraine patients (30).

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