

Tension-type Headache and Psychiatric Comorbidity

Bernadette Davantes Heckman, PhD, and Kenneth A. Holroyd, PhD

Corresponding author

Bernadette Davantes Heckman, PhD
Department of Psychology, Ohio University, Athens, OH 45701, USA.
E-mail: heckmanb@ohiou.edu

Current Pain and Headache Reports 2006, **10**:439–447
Current Science Inc. ISSN 1531-3433
Copyright © 2006 by Current Science Inc.

Much of the contemporary literature on headache disorders focuses on migraine headaches, despite the fact that tension-type headache (TTH) is highly prevalent and can be as debilitating as migraines. This article reviews the current literature on prevalence rates of psychiatric disorders in TTH populations, psychologic factors associated with TTH, and psychiatric disorders and their relationships with treatment outcomes in TTH. Key conclusions of this review include 1) prevalence rates of TTH vary across clinical and population-based samples; 2) greater TTH chronicity is associated with increased affective distress; 3) Axis II personality disorders may play an important role in TTH prevalence rates and psychologic functioning but have been understudied to date; and 4) maladaptive coping is common in persons with TTH.

Introduction

The association between headache and psychiatric disorders has received considerable attention, but almost all research has focused on mood and anxiety disorders in migraine [1–4]. Despite the fact that initial observations and conceptions of tension-type headache (TTH) linked depression and headache (chronic TTH [CTTH]) [5–8], little research has systematically examined psychiatric disorders in TTH.

TTH is the most common headache disorder, with more than 75% of the US population experiencing an episodic TTH (ETTH) or CTTH at some point in their lifetime (Table 1) [9]. Population data indicate 1) prevalence rates for CTTH may be increasing from 2% to 3% to the 2% to 5% range [10]; and 2) CTTH is associated with notable impairments in daily functioning and with reductions in work efficiency and employee attendance rates [9,11]. In clinic settings, CTTH patients exhibit impairments in quality

of life levels comparable to or more than those observed with other chronic pain conditions, such as arthritis and back pain [12]. High rates of psychiatric disorder are also observed with CTTH in clinic settings [13–18].

Comorbidity refers to two disorders that occur with greater than chance frequency. For example, in the US population, an episode of major depression in the previous 6 months would be expected by chance in roughly 7% of females and 3% of males with CTTH. Comorbidity can result from multiple and sometimes overlapping mechanisms. Thus, two conditions will be comorbid if the presence of either condition increases the risk of developing the other, or if the two disorders share environmental or individual risk factors (eg, childhood sexual abuse) or share underlying biological mechanisms. For example, the putative biological mechanism underlying CTTH is central sensitization, typically indexed by pericranial tenderness or allodynia [19,20]. Allodynia is associated with depression and anxiety in CTTH and in individuals free of pain problems [21,22] and thus may index a dysregulation in shared or interdependent biological mechanisms of pain and affect modulation.

Understanding the relationship between psychiatric disorders and TTH can provide insight into the role of psychological factors in the etiology and impact of TTH. We review the literature on psychiatric comorbidity in TTH, including prevalence, associated psychological factors, and influence on treatment outcomes.

Prevalence

We review only studies that used International Classification of Headache Disorders criteria and formal structured diagnostic interviews (eg, Structured Clinical Interview for DSM-III-R) or scaled measures with well-established psychometric histories (eg, Beck Depression Inventory, State-Trait Anxiety Inventory) for psychiatric evaluations. Prevalence rates of psychiatric disorders in TTH come almost exclusively from clinic samples because only two population studies provide prevalence data.

Population samples

In the study by Merikangas et al. [2], 1-year rates of anxiety or mood disorders in individuals in their late 20s did not differ in ETTH (11%) and controls without headache

Table 1. International Headache Society diagnostic criteria for episodic and chronic tension-type headache (2004 criteria)*

2.1 Episodic tension-type headache	2.2 Chronic tension-type headache
A. At least 10 previous headache episodes fulfilling criteria B–D listed below; number of days with such headache < 180/year (< 15/month)	A. Average headache frequency \geq 15 days/month (180 days/year) for \geq 6 months fulfilling criteria B–D listed below
B. Headache lasting from 30 minutes to 7 days	B. No duration criterion (headache may be unremitting)
C. At least two of the following pain characteristics: 1) pressing/tightening (nonpulsating) quality; 2) mild or moderate intensity (may inhibit, but does not prohibit, activities); 3) bilateral location; and 4) no aggravation by walking stairs or similar routine physical activity	C. Same
D. Both of the following: 1) no nausea or vomiting (anorexia may occur); and 2) photophobia and phonophobia are absent, or one but not the other is present	D. Both of the following: 1) mild nausea or vomiting; and 2) photophobia or phonophobia (but not both)
E. History, physical, and neurological examinations (and if called for, appropriate investigations) rule out secondary headache, or if present secondary headache does not occur in close temporal relation to tension-type headache	E. Same

*The difference between 2004 and 1998 criteria is that mild nausea is included in the 2004 criteria for chronic tension-type headache.

problems (19%). Diagnoses at any point in the previous 10-year period also did not differ, although cumulative psychiatric diagnosis rates were relatively high (49% in ETTH and 50% in healthy controls). Wang et al. [23], using a sample of 1421 older adults living in China diagnosed with ETTH or CTTH, found that patients with CTTH were twice as likely as non-CTTH patients to be diagnosed with depression on the Geriatric Depression Scale.

Clinic samples

Studies of psychiatric disorders in TTH have yielded five observations (Table 2).

1. Rates of psychiatric conditions in clinic samples are higher than in population samples [2,13–18,23], which may simply reflect sampling bias [24]. In addition, rates of psychiatric disorder are higher in CTTH than in ETTH, although the rates are variable across clinic settings [13–18,25–29]. For example, ETTH patients are more likely to receive a mood (range = 0% to 29%; mean = 13%) or anxiety disorder (range = 18% to 51%; mean = 30%) diagnosis than has been observed in population studies, in which the 1-year prevalence rate of depression is 9.5% and an anxiety disorder is 13%.
2. As shown in Table 2, CTTH patients are more likely to receive a diagnosis of mood or anxiety disorder than are ETTH patients and report higher levels of symptoms of depression and anxiety. Indeed, levels of anxiety in TTH patients (see State-Trait Anxiety scores in Table 2) are comparable to patients with anxiety disorders.

3. Anxiety disorders appear to be the most common psychiatric disorder identified in CTTH patients [13,14,17,18], with generalized anxiety disorder the most frequently diagnosed [14,16]. Thus, the rate of anxiety disorder diagnoses ranged from 23% to 100% (mean = 48%), whereas mood disorder diagnoses ranged from 0% to 59% (mean = 30%).
4. High rates of psychiatric disorders are found with both standardized diagnostic interviews (shown in the upper portion of Table 2) or self-report instruments (shown in the lower portion of Table 2).
5. Rates of psychiatric disorders in CTTH patients appear to be comparable to, and sometimes higher than, rates found in migraine patients [13,15,25,26,28]. However, rates of psychiatric disorders are lower in episodic than in chronic (or transformed) forms of both disorders [16,18,25,26], suggesting that affective distress may be more related to headache frequency and headache-related disability than to headache diagnosis.

No information about Axis II personality disorders in TTH is available. Information about race, ethnicity, socioeconomic status, and rates of psychiatric diagnoses in TTH is also lacking. Heckman et al. [27] found that across several headache specialty settings blacks were more likely to be diagnosed with TTH and a psychiatric disorder than were whites, suggesting the need for additional research on race and TTH.

Psychological Factors

This section examines other psychological factors in TTH, focusing on anger and hostility, personality, and stress and coping. Almost all research used cross-sectional designs. The lack of longitudinal prospective designs undermines any cause-effect inferences (ie, does headache cause psychological variable X, does X cause headache, or are headache and X caused by a third variable?).

Anger and hostility

In general, persons with CTTH who report increased levels of affective distress, such as greater depression, anxiety, and anger, also report more headache-related disability [17,29], even when controlling for headache frequency and severity [17]. Greater depressive symptomatology in TTH patients is particularly common in women, older persons, and those with more extensive headache histories [16]. However, depression is also clinically related to psychological states such as anger and hostility, constructs that have been examined in several TTH studies. Moreover, the relationships among these highly inter-related variables—and how they may independently and jointly affect headache characteristics—are unclear.

In an attempt to better elucidate these interconnected constructs, Nicholson et al. [30••] surveyed 171 headache patients and 251 gender-matched individuals and assessed trait anxiety, trait anger, depression, hostility, and the extent to which individuals “held their anger in.” “Anger in” was the lone predictor of headache group after controlling for depression and anxiety, indicating that “anger in” contributes to the prediction of headache much more than one’s affective status. However, the headache group of Nicholson et al. [30••] included people with a diversity of headache disorders, such as migraine and TTH. Similar research that is conducted solely with samples of TTH patients will contribute to the literature by identifying psychological constructs, other than depression and anxiety, that impact headache characteristics in TTH patients.

Personality

Several studies have examined personality and TTH. These studies have relied primarily on the Minnesota Multiphasic Personality Inventory (MMPI) to identify personality traits or “profiles” associated with headaches. Reasons for examining personality in persons with headache disorders include determining if personality characteristics predispose one to develop headache disorders, if personality disturbance is a consequence of the headache disorder, or if an underlying (or comorbid) causal mechanism exists that produces both conditions concurrently.

MMPI-based research

Investigations of MMPI profiles in patients with CTTH have found reliable increases in the “neurotic triad”

[5,31,32]. The neurotic triad is a group of elevated scores on the MMPI’s first three basic scales (ie, hypochondriasis, hysteria, and depression; Table 3). According to MMPI interpretations, these increased scores are characteristic of individuals who are highly conforming, preoccupied with bodily concern, anxious, pessimistic, and passive. They also desire affection and attention and feel worried or insecure if they do not receive this attention. It is thought that individuals with this profile are vulnerable to developing physical symptoms (eg, more frequent headaches) in response to stressful experiences. However, Ziegler and Paolo [33] found that persons with headache who scored higher on the neurotic triad were also more likely to seek medical treatment. As such, it is unclear if persons ranked high in the neurotic triad are actually more vulnerable to headache disorders or if they are more likely to present for treatment and be over-represented in clinical samples of persons with headache.

Non-MMPI-based research

Research has examined relationships among personality and TTH using assessment methodologies other than the MMPI, such as the Temperament and Character Inventory [34–36] and the Zuckerman-Kuhlman Personality Questionnaire [37]. Consistent with MMPI-based research, these studies also tend to find increased levels of anxiety, neuroticism, and harm avoidance in patients with TTH and, in particular, those with CTTH, even when controlling for depressive status [37].

Potential overlap also occurs between personality factors and somatic symptoms of TTH. For example, several items in the MMPI’s hypochondriasis and hysteria scales overlap with physical complaints common in headache disorders (eg, neck pain is assessed in the hypochondriasis scale and is also common in persons with headache disorders). As a result, some symptoms may be present in both conditions but are not necessarily causal, leading to illusory correlations.

Stress and coping

Wittrock and Myers [38] provided an excellent review of the literature published through the mid-1990s on stress and coping in TTH patients. Their review found that, in general, persons with TTH experienced more stressful events, particularly more daily stressors, than did nonheadache controls. They also concluded that as the number of stressors increased, persons with TTH reported disproportionately greater levels of stress than might be reported by non-TTH persons. Wittrock and Myers [38] also reviewed the literature to determine if persons with TTH truly experience more stressors than do non-TTH persons or if they simply are more likely to appraise situations or events as highly stressful. The research they reviewed that had been conducted in naturalistic settings suggested that persons with TTH did appraise stressors as being more severe, compared with appraisals of

Table 2. Studies on psychiatric comorbidity* and TTH[†] in clinic-based samples

Study, year	Psychiatric diagnostic instrument	ETTH	CTTH	Migraine [‡]	CM [§]	Control
Guidetti et al. [13], 1998	DSM-III-R (SCID)	(2/28) 7	(3/3) 0	(12/22) 55		(0/24) 0
Mitsikostas and Thomas [15], 1999	DSM-IV	(0/204) 0	(6/59) 10	(8/170) 5		
Puca et al. [14], 1999	DSM-III-R (CIDI-c)	(31/108) 29	(49/109) 45			
Juang et al. [16], 2000	DSM-IV (MINI)		(54/92) 59		(106/152) [¶] 70	
Holroyd et al. [17], 2000	Prime MD		(68/242) 28			(7/89) 8
Mongini et al. [18], 2004	DSM-IV [§]	(13/82) 16	(8/83) ^{††} 10	(20/125) 16	(33/97) 34	
Depression score,						
Siniatchkin et al. [25], 1999	BDI, STAI	(n = 21) 8	(n = 24) 21	(n = 26) 8	(n = 19) 22	
Mitsikostas and Thomas [15], 1999	Hamilton Anxiety and Depression Scale	(n = 204) 14	(n = 59) 17	(n = 170) 14		(n = 150) 6
Rollnik et al. [40], 2000	von Zerssen Depression Scale	(n = 37) 8	(n = 52) 11			
Holroyd et al. [17], 2000	BDI, STAI-T		(n = 245) 9			(n = 89) 5
Yucel et al. [58], 2002	BDI	(n = 53) 15	(n = 52) 16			(n = 70) 9
Cassidy et al. [26], 2003	BDI	(n = 21) 11	(n = 19) 16	(n = 107) 9	(n = 33) 18	
Gesztelyi and Bereczki [12], 2005	BDI	(n = 42) 9	(n = 134) 12	(n = 231) 8		(n = 114) 2
Bag et al. [59], 2005	BSI, STAI-T		(n = 55) 7	(n = 75) 7		(n = 73) 5

*Table does not include persons with both mood and anxiety disorders.

[†]Table does not include individuals dually diagnosed with both tension-type and migraine headache.

[‡]Migraine with and without aura are combined in this group.

[§]Transformed migraines included in this group.

[¶]Only significant pair-wise comparisons are shown.

^{**}Statistical comparisons of percentages not reported in original article.

^{††}Not shown in table. CTTH group had higher rates of both depression and anxiety (25%) relative to ETTH (6%).

BDI—Beck Depression Inventory; BSI—Brief Symptom Inventory; CIDI—Composite International Diagnostic Interview; CM—chronic migraine; chiatric Interview; NA—not available; SCID—Structured Clinical Interview for DSM-III-R; STAI—State-Trait Anxiety Inventory; T—trait anxiety

non-headache controls; however, laboratory-based research did not reveal this same pattern.

Wittrock and Foraker [39] later conducted research in response to the discrepant findings they observed with regard to stress appraisal in laboratory-based and naturalistic research. Using retrospective recall methodologies, they concluded that TTH patients and nonheadache controls experienced similar numbers of stressful events but that TTH patients were more likely to appraise stressors as more stressful than were non-headache controls.

Wittrock and Myers [38] concluded that recurrent TTH patients used maladaptive coping strategies, such as catastrophizing, avoidance, withdrawal, and wishful thinking,

more often than did nonheadache controls. Subsequent research on coping in headache populations conducted by Rollnik et al. [40] and Materazzo et al. [41] also found increased reliance on avoidant coping strategies in CTTH patients compared with nonheadache controls. In addition, Materazzo et al. [41] cross-sectionally investigated the relationship between affect and coping and found that catastrophic thinking correlated positively with depression and headache severity in TTH patients. Taken as a whole, these studies do seem to suggest, rather convincingly, that catastrophizing is an important coping mechanism in TTH patients and warrants additional research, primarily because this maladaptive form of coping is amenable to

Probability [†]	ETTH	CTTH	Migraine	CM	Control	Probability [†]
disorders, %	Diagnosed with anxiety disorders, %					
NA**	(6/28) 21	(3/3) 100	(14/22) 64		(0/24) 0	NA**
NA**						
CTTH > ETTH	(55/108) 51	(61/109) 56		(65/152) 43		CM > CTTH
CTTH > control		(23/92) 25			(2/89) 2	CTTH > control
CM > ETTH, migraine, and CTTH	(15/82) 18	(84/242) 35	(24/125) 19	(29/97) 30		CM > ETTH, migraine, and CTTH
mean/median	Anxiety score, mean/median					
CTTH > ETTH; CM > migraine	(n = 21) T = 50	(n = 24) T = 60	(n = 26) T = 43	(n = 19) T = 58		CM > migraine (T)
NA**	(n = 204) 18	(n = 59) 19	(n = 170) 17		(n = 150) 7	NA**
CTTH > control		(n = 245) 42			(n = 89) 31	CTTH > control
CTTH > ETTH; ETTH and CTTH > control						
NA**						
NA**						
NA**		(n = 55) 52	(n = 75) 53		(n = 73) 45	NA**

CTTH—chronic tension-type headache; ETTH—episodic tension-type headache; MD—mental disorder; MINI—Mini International Neuropsychon STAI; TTH—tension-type headache.

treatment. In addition, because some ways of coping (eg, catastrophizing and avoidance) are highly characteristic of cognitive symptoms of depression, future studies of coping and affect in TTH patients should use assessment methodologies that account for this overlap.

In summary, negative affective states—particularly depression and anxiety—are common in headache patients. These two conditions have been studied the most, but other emotions, such as anger and hostility, also play important roles in the adjustment efforts of persons with headache, although they have been studied less. Personality characteristics, particularly the neurotic triad of hypochondriasis, hysteria, and depression, are also strongly related to head-

ache characteristics (particularly headache frequency) in TTH patients, but the extent to which they are antecedents to, or consequences of, headache disorders remains unclear. Persons with TTH headache appear to use more frequently maladaptive ways of coping, such as catastrophizing and avoidance, coping strategies that are unlikely to resolve life stressors and that may result in continued and heightened levels of emotional distress.

Psychiatric Influence on Treatment Outcomes

In managing TTH, psychiatric disorders must also be assessed and treated. Mood or anxiety disorders increase

Table 3. Studies on personality (MMPI assessment) and TTH

MMPI scales	Andrasik et al. [5] (1982), muscle contraction HAs		Aguirre et al. [31] (2000), CTTH	Mongini et al. [32] (2005), CTTH
L	51		50.8	53.32
F	54		53.5	55.12
K	55		44	44.94
Hs	64		69	69.76
D	64		64.5	63.38
Hy	66		63	67.32
Pd	58		53.3	57.5
Mf	X		50.4	51.5
Pa	60		55.8	57.53
Pt	60		59.4	58.03
Sc	60		58.4	58.97
Ma	55		47.5	49.88
Si	57		58.2	53.93
	No HA control	Migraine	No HA control	Chronic migraine
L	49	50	47.1	54.8
F	51	54	47	55.54
K	56	54	53.8	44.37
Hs	49	61	49.6	71.27
D	49	58	52	63.1
Hy	53	62	50.9	67.15
Pd	51	57	51.4	60.17
Mf	X	X	48.9	50.88
Pa	53	56	47	55.22
Pt	49	55	48.5	59.05
Sc	50	56	46.6	58.95
Ma	49	56	43.9	49.24
Si	54	56	49.2	55.32

CTTH—chronic tension-type headache; HA—headache; MMPI—Minnesota Multiphasic Personality Inventory; TTH—tension-type headache.

headache-related disability [17], the likelihood of treatment adherence problems [42], and quite possibly the risk of headache progression [43,44]; psychiatric disorders also deserve treatment in their own right.

The treatment of TTH with either preventive drug therapy (at least the tricyclic antidepressants that have been studied) or with behavioral therapy, particularly cognitive-behavioral therapy [45–49], appears to improve, although not necessarily eliminate, symptoms of anxiety and depression. With behavioral headache therapies, reductions in psychological symptoms do not appear to be simply a function of improvements in tension headaches [46,47]. In contrast, reductions in psychological symptoms with tricyclic antidepressant therapy may be primarily a function of improvements in tension head-

aches, with the antidepressant and anti-anxiety effects of tricyclics emerging only at higher doses than typically used for TTH [50–52].

Mood or anxiety disorders, at least when mild to moderate in severity, do not appear to alter the efficacy of CTTH therapy as has sometimes been assumed [50,53–55]. Thus, mood and anxiety disorders that are mild to moderate in severity failed to affect either reductions in CTTH or headache-related disability achieved with tricyclic antidepressant therapy, cognitive-behavioral stress-management therapy, or their combination in the CTTH trial [56,57]. Only placebo responses were altered by the presence of a mood or anxiety disorder. When a mood or anxiety disorder was present, no improvement in headache-related disability was

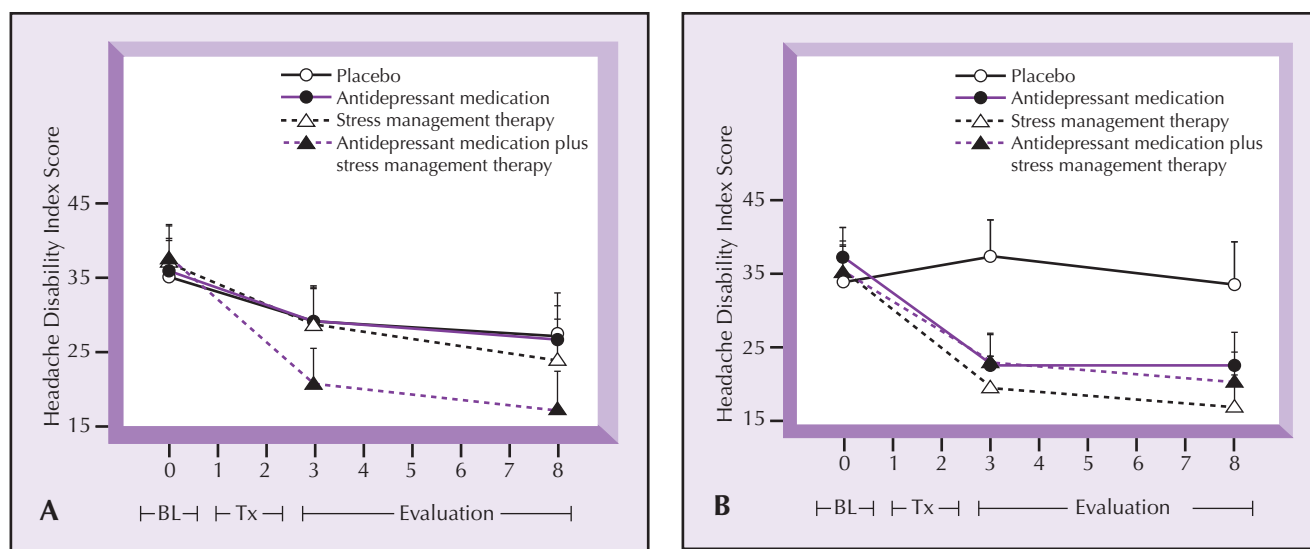


Figure 1. Baseline (BL) mood or anxiety disorder diagnosis moderates improvements in headache-related disability (Headache Disability Inventory) with placebo; estimated values and 95% confidence intervals. X-axis is measured in months. **A**, No mood or anxiety diagnosis. **B**, Mood or anxiety diagnosis. Tx—treatment.

observed with placebo; however, in the absence of a psychiatric disorder, the notable improvement with placebo was similar in magnitude to that observed with drug or behavior therapy alone (Fig. 1).

Guidetti et al. [13] similarly found no indication that the presence of a psychiatric disorder was associated with poor long-term (ie, 8-year) outcomes. Although numbers were small, poor TTH outcomes tended to be more frequent in the absence (61% of individuals) than in the presence (38% of individuals) of a psychiatric disorder. However, consistent with clinical observations, complicated or severe psychiatric problems are associated with poor outcomes and relapse. Tension headache outcomes were very poor (86% of individuals) in the handful of patients with multiple psychiatric disorders.

In summary, the efficacy of treatments for CTTH does not appear to be affected by psychiatric disorders but appears to improve at least mild to moderate symptoms of depression and anxiety. However, headache treatment is likely to be compromised by and unlikely to adequately manage moderate or severe mood or anxiety disorders, or other severe psychiatric problems.

Conclusions

A review of the TTH literature conducted over the past three decades reveals several relatively consistent themes. First, there is a consistent relationship between TTH, psychological distress, and coping. Second, increased frequency (eg, “chronic” headache diagnosis) of TTH is associated with higher rates of psychiatric disorders, with anxiety disorders appearing to be more prevalent than depression. Furthermore, persons with more frequent TTH tend to exhibit higher rates of neurotic personality traits (eg, hypochondriasis) than those without headache disorders. However, and

perhaps most importantly, these conclusions are based on research that is almost exclusively cross-sectional in nature. As such, and no matter how intuitive relationships may seem, it is impossible to make any cause-effect inferences in several important areas related to the treatment of TTH. Cause-effect inferences can only be made after additional research is conducted that uses longitudinal research designs. When these causal relationships and mechanisms are accurately delineated, headache researchers and practitioners can better identify individuals who are at increased risk for developing headache disorders and can conceptualize treatments that prevent and alleviate headaches and psychiatric conditions that often accompany TTH.

References and Recommended Reading

Papers of particular interest, published recently, have been highlighted as:

- Of importance
 - Of major importance
1. Breslau N, Davis GC, Andreski P: **Migraine, psychiatric disorders, and suicide attempts: an epidemiologic study of young adults.** *Psychiatry Res* 1991, 37:11–13.
 2. Merikangas K, Merikangas J, Angst J: **Headache syndromes and psychiatric disorders: association and familial transmission.** *J Psychiatry Res* 1993, 27:197–210.
 3. Breslau N: **Psychiatric comorbidity in migraine.** *Cephalalgia* 1998, 18:58–61.
 4. Sheftell FD, Atlas FJ: **Migraine and psychiatric comorbidity: from theory and hypotheses to clinical application.** *Headache* 2002, 42:934–944.
 5. Andrasik F, Blanchard EB, Arena JG, et al.: **Psychological functioning in headache sufferers.** *Psychosom Med* 1982, 44:171–182.
 6. Hatch J, Moore P, Borcharding S, Cyr-Provost M: **Electromyographic and affective responses of episodic tension-type headache patients and headache-free controls during stressful task performance.** *J Behav Med* 2002, 15:89–112.

7. Inan L, Soykan C, Tulunay FC: MMPI profiles of Turkish headache sufferers. *J Head Face Pain* 1994, 34:152-154.
 8. Sheftell F: Chronic daily headache. *Neurology* 1992, 42(Suppl 2):32-36.
 9. Rasmussen BK, Jensen R, Olesen J: Impact of headache on sickness absence and utilization of medical services: a Danish population based study. *J Epidemiol Community Health* 2002, 46:443-446.
 10. Lynberg AC, Rasmussen BK, Jorgensen T, Jensen R: Has the prevalence of migraine and tension-type headache changed over a 12-year period? A Danish population survey. *Eur J Epidemiol* 2005, 20:243-249.
 11. Schwartz BS, Stewart WF, Lipton RB: Lost workdays and decreased work effectiveness associated with headache in the workplace. *J Occup Environ Med* 1997, 39:320-327.
 12. Gesztelyi G, Bereczki D: Disability is the major determinant of the severity of depressive symptoms in primary headaches but not in low back pain. *Cephalalgia* 2005, 25:598-604.
 13. Guidetti V, Galli F, Fabrizi P, et al.: Headache and psychiatric comorbidity: clinical aspects and outcome in an 8-year follow-up study. *Cephalalgia* 1998, 18:455-462.
 14. Puca F, Genco S, Prudenzeno MP, et al.: Psychiatric comorbidity and psychosocial stress in patients with tension-type headache from headache centers in Italy. *Cephalalgia* 1999, 19:159-164.
 15. Mitsikostas DD, Thomas AM: Comorbidity of headache and depressive disorders. *Cephalalgia* 1999, 19:211-217.
 16. Juang K, Wang S, Fuh J, et al.: Comorbidity of depressive and anxiety disorders in chronic daily headache and its subtypes. *Headache* 2000, 40:818-823.
 17. Holroyd K, Stensland M, Lipchik G, et al.: Psychosocial correlates and impact of chronic tension-type headaches. *Headache* 2000, 40:3-16.
 18. Mongini F, Ciccone G, Deregibus A, et al.: Muscle tenderness in different headache types and its relation to anxiety and depression. *Pain* 2004, 112:59-64.
 19. Bendtsen L: Central sensitization in tension-type headache-possible pathophysiological mechanisms. *Cephalalgia* 2000, 20:486-508.
 20. Bendtsen L, Detlef Treede R: Sensitization of myofascial pain pathways in tension-type headaches. In *The Headaches*. Edited by Olesen J, Goadsby PJ, Ramadan NM, et al.: Philadelphia: Lippincott Williams & Wilkins; 2006:637-642.
 21. Janke EA, Holroyd KA, Romanek K: Depression increases onset of tension-type headaches following laboratory stress. *Pain* 2004, 111:230-238.
 22. Janke EM, Holroyd KA: Pericranial muscle tenderness is associated with widespread pain sensitivity, psychiatric comorbidity and dysfunctional psychological responses to pain in healthy young adult females. In *Headache Clinics: Organization, Patients and Treatments*. Edited by Jensen R, Diener HC, Olesen J. London: Oxford University Press; In press.
 23. Wang S, Liu H, Fuh J, et al.: Comorbidity of headaches and depression in the elderly. *Pain* 1999, 82:239-243.
 24. Berkson J: Limitations of the application of fourfold table analysis to hospital data. *Biometrics* 1946, 2:47-53.
 25. Siniatchkin M, Riabus M, Hasenbring M: Coping styles of headache sufferers. *Cephalalgia* 1999, 19:165-173.
 26. Cassidy EM, Tomkins E, Hardiman O, O'Keane V: Factors associated with burden of primary headache in a specialty clinic. *Headache* 2003, 43:638-644.
 27. Heckman B, Holroyd KA, O'Donnell FJ, et al.: Race, psychiatric comorbidity and headache. Poster presented at the Society of Behavioral Medicine Annual Meeting. Boston, MA; April 13-16, 2005.
 28. Diamond S, Baltes BJ: Chronic tension headache treated with amitriptyline--a double blind study. *Headache* 1971, 11:110-116.
 29. Gesztelyi G, Bereczki D: Disability is the major determinant of the severity of depressive symptoms in primary headaches but not in low back pain. *Cephalalgia* 2005, 25:598-604.
 - 30.●● Nicholson RA, Gramling SE, Ong JC, Buenavar L: Differences in anger expression between individuals with and without headache after controlling for depression and anxiety. *Headache* 2003, 43:651-663.
- First study to examine the confound between depression and anger.
31. Aguirre J, Gallardo R, Pareja JA, Pérez Miranda M: Cluster of MMPI personality profiles in chronic tension-type headache and predictable response to fluoxetine. *Cephalalgia* 2000, 20:51-56.
 32. Mongini F, Rota E, Deregibus A, et al.: A comparative analysis of personality profile and muscle tenderness between chronic migraine and chronic tension-type headache. *Neurol Sci* 2005, 26:203-207.
 33. Ziegler D, Paolo A: Headache symptoms and psychological profile of headache-prone individuals. *Arch Neurol* 1995, 52:602-606.
 34. Nylander PO, Schlette P, Brandstrom S, et al.: Temperament and character. *J Psychiatry Res* 1996, 30:359-368.
 35. Boz C, Velioglu S, Mehmet O, et al.: Temperament and character profiles of patients with tension-type headache and migraine. *Psychiatry Clin Neurosci* 2004, 58:536-543.
 36. Di Pietro V, Bruti G, Venturi P, et al.: Aminergic tone correlates of migraine and tension-type headache: a study using the tridimensional personality questionnaire. *Headache* 2001, 41:63-71.
 37. Cao M, Zhang S, Wang K, et al.: Personality traits in migraine and tension-type headaches: a five factor model study. *Psychopathology* 2002, 35:254-258.
 38. Wittrock DA, Myers TC: The comparison of individuals with recurrent tension-type headache and headache-free controls in appraisal and coping with stressors: a review of the literature. *Ann Behav Med* 1998, 20:118-134.
 39. Wittrock DA, Foraker S: Tension-type headache and stressful events: the role of selective memory in the recall of stressful events. *Headache* 2001, 41:482-493.
 40. Rollnik JD, Karst M, Fink M, Dengler R: Coping strategies in episodic and chronic tension-type headache. *Headache* 2000, 41:297-302.
 41. Materazzo F, Cathcart S, Pritchard D: Anger, depression, and coping interactions in headache activity and adjustment: a controlled study. *J Psychosom Res* 2000, 49:69-75.
 42. DiMatteo M, Lepper H, Croghan T: Depression is a risk factor for noncompliance with medical treatment: Meta-analysis of the effects of anxiety and depression on patient adherence. *Arch Intern Med* 2000, 160:2101-2107.
 43. Scher A, Lipton R, Stewart W: Risk factors for chronic daily headache. *Curr Pain Headache Rep* 2002, 6:486-491.
 44. Scher AI, Stewart WF, Ricci JA, Lipton RB: Factors associated with the onset and remission of chronic daily headache in a population study. *Pain* 2003, 106:81-89.
 45. Andrasik F, Blanchard EB: Task Force report on the biofeedback treatment of tension headache. In *Biofeedback Studies in Clinical Efficacy*. Edited by Hatch JP, Rugh JD, Fisher JG. New York: Plenum; 1987:281-321.
 46. Blanchard EB, Andrasik F, Appelbaum KA, et al.: Three studies of the psychological changes in chronic headache patients associated with biofeedback and relaxation therapies. *Psychosom Med* 1986, 48:73-83.
 47. Blanchard EB, Steffek BD, Jaccard J, Nicholson NL: Psychological changes accompanying non-pharmacological treatment of chronic headache: the effects of outcome. *Headache* 1991, 31:249-253.
 48. Holroyd K, Stensland M, Hill K: Separate and combined effects of cognitive-behavior therapy and antidepressant medication in the treatment of chronic tension-type headache: psychosocial outcomes. *Headache* 2005, 45:776.

49. Tobin DL, Holroyd KA, Baker A, et al.: Development and clinical trial of a minimal contact, cognitive-behavioral treatment for tension headache. *Cognit Ther Res* 1988, 12:325–339.
50. Diamond S, Baltes BJ: Chronic tension headache treated with amitriptyline--a double blind study. *Headache* 1971, 11:110–116.
51. Holroyd KA, Nash JM, Pingel JD, et al.: A comparison of pharmacological (amitriptyline HCl) and nonpharmacological (cognitive-behavioral) therapies for chronic tension headaches. *J Consult Clin Psychol* 1991, 59:387–393.
52. Walker Z, Walker RWH, Robertson MM, Stansfeld S: Antidepressant treatment of chronic tension-type headache: a comparison between fluoxetine and desipramine. *Headache* 1998, 38:523–528.
53. Blanchard EB, Andrasik F: *Management of Chronic Headaches: A Psychological Approach*. Elmsford, NY: Pergamon Press; 1985.
54. Blanchard EB, Andrasik F, Arena JG, et al.: Prediction of outcome from the non-pharmacological treatment of chronic headache. *Neurology* 1983, 33:1596–1603.
55. Jacob RG, Turner SN, Szekely BC, Edelman BH: Predicting outcome of relaxation therapy in headaches: the role of "depression." *Behav Ther* 1983, 14:457–465.
56. Holroyd KA, Labus J: Treatment of chronic tension-type headache: moderators of response to drug and behavior therapy. *J Pain* 2005, 6:S54.
57. Holroyd KA, O'Donnell FJ, Stensland M, et al.: Management of chronic tension-type headache with tricyclic antidepressant medication, stress-management therapy, and their combination: a randomized controlled trial. *JAMA* 2001, 285:2208–2215.
58. Yucel B, Kora K, Ozyalcin S, et al.: Depression, automatic thoughts, alexithymia, and assertiveness in patients with tension-type headache. *Headache* 2002, 42:194–199.
59. Bag B, Hacıhasanoglu R, Tufekci FG: Examination of anxiety, hostility and psychiatric disorders in patients with migraine and tension-type headache. *Int J Clin Pract* 2005, 59:515–521.