Psychiatry and Clinical Neurosciences (2004), **58**, 536–543

Regular Article

Temperament and character profiles of patients with tension-type headache and migraine

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Abstract The aim of this present study was to evaluate the temperament and character profiles of persons with tension-type headache (TTH) and migraine, and to compare the results with those of healthy controls. The study population consisted of 81 patients with TTH (60 female, 21 male) and 56 patients with migraine (34 female, 17 male) aged 18–50 years, according to the criteria of the International Headache Society with age and gender – matched healthy control subjects (54 female, 28 male). All participants were instructed to complete a self-administered 240-item temperament and character inventory (TCI) questionnaire and Beck Depression Inventory (BDI). The TCI assesses four dimensions of temperament, namely, novelty seeking (NS), harm avoidance (HA), reward dependence (RD), and persistence (P), and three dimensions of character, being self-directedness (SD), cooperativeness (C) and self-transcendence (ST). According to the TCI biosocial model, the temperament dimension HA is suggested to indicate central serotonergic turnover, which is further correlated with depressive state. It was found that mean BDI scores were significantly higher in patients with TTH and migraine than in those of the controls. The BDI scores were positively correlated with HA scores ($r = 0.295$, $P < 0.001$) and negatively correlated with SD ($r = –0.386$, $P < 0.001$) and C scores ($r = –0.164$, $P = 0.016$). Multivariate analysis showed that BDI scores had significant covariation for HA, SD and C. Despite using the BDI score as a covariate, TTH patients had higher HA scores ($P = 0.01$) than did the control subjects. No significant differences were found between the groups regarding main NS, RD, P, SD, C and ST scores. Based on the main results of this study, it is suggested that higher serotonergic activity related to HA scores in TTH patients and their relationship with depressive symptomatology supports the role of central serotonergic involvement in TTH.

Key words headache, migraine, personality, temperament and character, temperament and character inventory.

INTRODUCTION

Tension-type headache (TTH) and migraine are common medical complaints associated with a significant burden of disease. These disorders have been found to correspond with an increased lifetime rate of depression as well as some forms of personality disorder.[1–3] Over the years, many studies have focused on particular personality traits involved with headache syndromes. Many investigators have used the Minnesota Multiphasic Personality Inventory (MMPI) to investigate the personality profiles of headache sufferers.[4–13] Most studies have shown a neurotic triad (hypochondria, hysteria and depression) in TTH and migraine, thus, indicating that certain personality traits participate in the formation of headaches by increasing the vulnerability of a person to suffer headaches. Basic assumptions have been postulated as to whether migraine sufferers share common personality traits and if these traits differentiate such patients from normal control subjects. Nevertheless, other investigators have found that in migraine sufferers MMPI scores fall

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Received 10 December 2003; revised 23 February 2004; accepted 7 March 2004.

within normal ranges[6–9] in contrast to the abnormalities found in patients with chronic TTH.[14]

The dimensional approach of the Psychobiological Model of Personality by Cloninger, investigates seven personality traits referring to temperament and character and uses the Temperament and Character Inventory (TCI) as an instrument of evaluation.[15,16] In this instrument, novelty seeking (NS), harm avoidance (HA), reward dependence (RD), and persistence (P) are four dimensions of temperament with its genetic components ranging from 40% to 60%, while self-dejectedness (SD), cooperativeness (C) and self-transcendence (ST) emerge as three dimensions of character with its genetic components ranging from 10% to 15%, and a non-random environmental component ranging from 30% to 35%. Although the personality model of Cloninger has been based mainly on the 'trait' characteristics, it also allows for the influence of environment as well as 'state' characteristics.[15–17]

The characterological aspects of personality involve individual differences in self-concepts about goals and values, in contrast to the temperaments that involve differences in automatic emotional reactions and habits. Such self-concepts modify the significance or meaning of what is experienced, hence, also changing emotional reactions and habits. Accordingly, the three character dimensions involve both an intellectual perspective about self/non-self boundaries and an emotional perspective.[15–17]

Temperament dimensions were postulated to be independent of heritability and were considered to be related to the activity of a specific neurotransmitter system. Novelty seeking has been connected with low basal dopaminergic activity, HA with high serotonergic activity, RD with low basal noradrenergic activity, and P with glutaminergic activity.[15,16,18–22] The relationships between personality traits and neurotransmitter tone have been further supported by genetic, functional neuroimaging and biochemical studies. Recent studies suggest that HA is positively correlated with mood, depressive state and anxious personality disorders.[18,23–26]

In contrast, although the pathophysiology of TTH and migraine is highly controversial, current theories on the pathophysiology of headaches suggest the presence of disturbances in serotonin neurotransmission.[27] Furthermore, an ascending serotoninergic pain modulation pathway from the dorsal raphe nucleus to the parafascicular nucleus of the thalamus has recently been discovered and appears to be of particular relevance to headache syndromes.[28–34]

The findings of recent experimental positron emission tomography studies have shown brain stem activation during migraine attacks. The areas of maximum increase appear to be the region of the dorsal raphe nucleus and the locus ceruleus; this strongly supports the notion that serotonin (5-HT) plays an important role in the genesis of migraines. However, it remains unclear whether the crucial site for 5-HT is located in the central pain control pathways, is found in the serotonergic projections to the cerebral cortex, acts directly on the cerebral blood vessels, or whether it is indeed all three.[35,36] The efficacy of some drugs used in the treatment of TTH and migraine, such as amitriptyline, which is thought to inhibit the presynaptic re-uptake of 5-HT and norepinephrine, suggests the involvement of the serotonergic and noradrenergic system in the pathophysiology of these diseases.[37–40]

A decrease in platelet serotonin has been observed in patients with chronic TTH. It has been proposed that the plasticity of the serotonin-dependent pain control system may facilitate the process of sensitization and that this results in the development of TTH.[31–33,41–44]

Serotonin dysfunction has also been implicated in depression.[45–47] It is of note that antidepressants, which act by stabilizing serotonin, are effective in treating depression and headache.[48,49] This finding in TTH and migraine provides further support for the role of the serotonergic and noradrenergic neurotransmitter system in the pathophysiology of TTH and migraine.

If a temperament and character profile associated with a high risk of TTH or migraine can be identified, this information may be helpful in the prevention of the disease or in treatment planning. Therefore, in this study we aimed to evaluate the temperament and character profiles of the patients with TTH and migraine, and to compare the results with those of healthy controls.

MATERIALS AND METHODS

In this prospective study, 81 TTH patients (45 episodic, 26 chronic) and 51 migraine patients (46 without aura, 5 with aura) according to the diagnostic criteria established by the Headache Classification Committee of the International Headache Society, were recruited from patients seeking treatment at our headache outpatient clinic.[50] Inclusion criteria were: the presence of episodic TTH, chronic TTH or migraine for at least 1 year, being 18–50 years of age, and having at least primary school education. In our study we excluded subjects older than 50 years of age to avoid, at least partially, the possible influence of age on TCI scores.[51] Exclusion criteria were: an inability or unwillingness to cooperate and the presence of concurrent medical conditions, such as nervous, cardiac, hepatic, renal, blood or circulatory disorders. We also excluded patients presenting with other types of headache, including combined TTH and migraine.

Age, gender and education level – matched, healthy, headache-free 82 control subjects (54 female, 28 male) aged 18–50 years, were chosen randomly from individuals accompanying the patients or from a random general population survey by face-to-face interview. The controls were checked to ensure they did not fulfill the diagnostic criteria of any primary headache disorders. The study was approved by the local ethics committee and informed consent was obtained from the participants after all procedures were fully explained. Those enrolled in the study underwent a medical examination, including a medical history and physical and neurological examinations.

Personality was assessed using the self-administered Turkish version of TCI (validated in a samples of 689 healthy subjects, internal consistency Cronbach alpha = 0.71) consisting of 240 self-descriptive, true/false items, assessing four temperament dimensions (NS, HA, RD, PS) and three character dimensions (SD, CP, ST).[52,53] NS includes four subdimensions: NS1, exploratory excitability versus stoic rigidity; NS2, impulsiveness versus reflection; NS3, extravagance versus reserve; and NS4, disorderliness versus regimentation. HA consists of four subdimensions: HA1, anticipatory worry and pessimism versus uninhibited optimism; HA2, fear or uncertainty versus confidence; HA3, shyness with strangers versus gregariousness; and HA4, fatigability versus vigor. The third dimension, RD, includes a further two subdimensions in our study: RD1, sentimentality; and RD3, dependence versus independence. P expresses the preservation of a form of behavior as resistance to frustration. The first character dimension of SD has a further five subdimensions: SD1, responsibility versus blame; SD2, purposefulness versus lack of goal or direction; SD3, resourcefulness; SD4, acceptance versus self-striving; and SD5, congruent second nature. C includes five subdimensions: C1, social-acceptance versus social intolerance; C2, empathy versus social disinterest; C3, helpfulness versus unhelpfulness; C4, compassion versus revengefulness; and C5, integrated conscience. ST includes three subdimensions: ST1, self-forgetfulness versus self-conscious experience; ST2, transpersonal identification versus self-isolation; and ST3, spiritual acceptance versus rational materialism.[15,16]

Depressive symptomatology was rated with a 21-item Turkish version of the Beck Depression Inventory (BDI), which verified validity and reliability.

All participants were instructed to complete the questionnaires on-site in a quiet room during a headache-free period.

The questionnaires were then coded using a standard key and all data were analyzed with the SPSS for Windows program (SPSS, version 10.0; SPSS Inc., Chicago, IL, USA). Data analysis has considered both the seven main dimensions and the 25 subdimensions of the TCI. Visual and statistical examinations of the measures met the criteria for normal distribution, while statistical analysis relied on parametric measures. Data on the age, sex, BDI score and education level of the TTH, migraine and control group subjects were compared using one-way ANOVA for continuous variables and the χ^2 test for categorical variables. Post-hoc Tukey tests were used to analyze possible differences between the groups. Pearson's correlation coefficient and the level of statistical significance of the correlations were computed for correlations between seven main TCI dimension scores and the BDI. Descriptive statistics for the seven main dimensions and the 25 subdimensions of the TCI were obtained. We performed ANCOVA to evaluate the TCI scores among the TTH, migraine and control groups. Because the TCI score was shown to be influenced by depressive state and age, we used BDI and age as covariates.[15,16] If overall ANCOVA revealed significant difference, pairwise comparisons were made using Bonferroni's joint confidence intervals.

RESULTS

Table 1 displays the age, sex, duration of education and BDI scores of the three groups. There were no statistically significant differences in age, education levels, and sex distribution between the groups.

Mean BDI scores were significantly higher in patients with TTH and migraine than in those of the controls. The BDI scores were positively correlated with HA scores ($r = 0.295$, $P < 0.001$) and were negatively correlated with SD ($r = –0.386$, $P < 0.001$) and C scores ($r = –0.164$, $P = 0.016$).

Descriptive statistics and comparisons of the TCI scores between TTH, migraine and normal subjects are shown in Table 2. ANCOVA revealed BDI scores to be a significant covariate for HA (d.f. = 1, $F = 7.92$, $P = 0.005$), SD (d.f. = 1, $F = 21.23$, $P < 0.001$) and C (d.f. = 1, $F = 4.17$, $P = 0.042$), suggesting that it is able to account for a significant amount of variance in HA, SD and C scores. Even though BDI scores were taken into account, there were still significant differences among the groups regarding HA scores. We did not find age to be a significant covariate for mean TCI scores in this study.

The comparison of the main TCI dimension scores between the groups revealed significantly higher HA scores in patients with TTH than in the controls ($P = 0.011$). Our subdimension level analysis of HA, showed higher scores for HA1 and HA2 in TTH patients than in the controls ($P < 0.001$ and $P = 0.01$, respectively). We failed to find any significant differ-

Table 1. The age, sex, duration of education and Beck Depression Inventory scores of the three groups

	TTH $n = 81$	Migraine $n = 51$	Controls $n = 82$	df	F	P
Female/Male	60/21	34/17	54/28			0.471
Age	26.78 ± 7.68	28.24 ± 0.85	25.84 ± 6.26	2	1.72	0.182
Education duration	11.59 ± 2.14	11.49 ± 2.46	11.62 ± 2.02	2	0.08	0.910
BDI score	15.79 ± 8.13**	11.90 ± 8.87*	7.46 ± 5.76	2	25.06	<0.001

Values for sex are number. Age, duration of education and BDI scores are presented as mean ± SD. P-values are from χ^2 for sex and from ANOVA for age, duration of education and BDI scores.

*$P = 0.003$ in post-hoc comparison of migraine versus controls; **$P < 0.001$ in post-hoc comparison of TTH versus controls and $P = 0.011$ TTH versus migraine.

TTH, tension-type headache; BDI, Beck Depression Inventory.

ences in main and subscale-level HA scores of migraine patients when compared to those of the controls.

No significant differences could be found in other higher dimensions of temperament (NS, RD and P) and character SD, C (ST) scores for TTH or migraine patients over those of the controls.

Regarding subdimension level analysis, SD1 scores were significantly lower in TTH patients than in the controls ($P = 0.01$). SD5 scores were found to be lower in migraine patients than in the controls ($P < 0.001$), while C1 scores were significantly lower in TTH patients than in the controls ($P = 0.005$).

DISCUSSION

Using the TCI, we found higher main HA scores in patients with TTH than in the control subjects. We did not find any differences between the migraine and control groups in main HA dimension scores. NS, RD, P, SD, C and ST main scores did not differ significantly for the TTH or migraine groups compared to the controls.

In the subscale level analyses, we found higher HA1 and HA2 subscale scores and lower SD1 and C1 scores in patients with TTH than in the control subjects. In migraine patients, SD5 subscale score was lower in migraine patients than in the controls.

Individuals with high HA1 and HA2 scores are described as cautious, passive, fearful and insecure, negativist or pessimistic even in situations that do not worry other people. They are inclined to inhibit their behavior in relation to harmful stimuli and react to stressful events with high rates of depression.[15,16] These types of individuals might be characterized as having tendencies to anticipate pain and failure with pessimistic thoughts and to not bear humbling or embarrassing experiences, to which they would react with longstanding ruminations. The fact that TTH patients have higher HA scores than control subjects may indicate that patients with TTH have a generic temperamental predisposition toward the development of TTH as a reaction to stress.

Individuals with low SD1 scores are described as immature and blaming. Low SD1 scores in the TTH group suggest that TTH patients are characterized by a tendency to consider other people and situations as being responsible for the frustrations they have to bear, and that their behavior is largely determined by influences beyond their control or against their will.[15,16] A lower C1 score in patients with TTH suggests that TTH patients are more intolerant than normal controls.[15,16] In contrast, we found lower SD5 scores in migraine patients, suggesting they display a tendency to manifest behavior unfavorable to the pursuit of their goals and show poor strength of will, thus, being unable to resist their temperamental impulses.

According to the biosocial model of personality, the temperament dimension of HA is suggested to indicate central serotonergic turnover.[15,16] Relationships between serotonin and TCI scores have also been shown in biochemical studies. Peirson *et al*. found a significant inverse correlation between HA and serotonergic activity, while SD was positively correlated with serotonergic activity.[54]

The role of serotonin in personality and depression has been outlined in previous studies, however, the exact relationship between serotonergic activity and personality and depression is unclear.[55,56] Recent studies have shown higher HA and lower SD in association with high levels of depressive state, as was also shown in our study. Thus, it has been proposed that part of the congruence between personality and depressive disorders may stem from the involvement of the serotonergic system in both these aspects of human behavior.[21–23,25,57–59] Chien *et al*. also found in depressed

Table 2. Descriptive statistics and comparisons of the temperament and character inventory scores between tension-type headache, migraine and normal subjects. Temperament and character inventory scores are presented as mean ± SD (adjusted means)

	TTH $n = 81$	Migraine $n = 51$	Controls $n = 82$	F df = 2	P
NS	18.23 ± 4.01 (18.22)	18.10 ± 5.28 (18.19)	17.85 ± 4.63 (17.81)	0.16	0.856
NS1	5.51 ± 1.82 (5.56)	6.35 ± 2.19 (6.41)	6.11 ± 1.92 (6.02)	2.94	0.055
NS2	4.19 ± 1.67 (4.10)	3.63 ± 2.18 (3.60)	3.49 ± 1.99 (3.59)	1.50	0.226
NS3	4.42 ± 1.84 (4.60)	4.27 ± 1.97 (4.31)	4.54 ± 1.80 (4.34)	0.49	0.613
NS4	4.12 ± 1.52 (3.96)	3.84 ± 1.78 (3.87)	3.74 ± 1.71 (3.89)	0.05	0.954
HA	21.81 ± 5.50 (21.18)*	19.00 ± 6.93 (18.90)	17.46 ± 5.94 (18.15)	4.63	0.011
HA1	7.09 ± 1.81 (6.96)*	6.14 ± 2.21 (6.13)	5.44 ± 2.09 (5.57)	7.95	0.000
HA2	5.28 ± 1.68 (5.19)*	4.57 ± 1.92 (4.52)	4.07 ± 2.10 (4.20)	4.61	0.011
HA3	4.19 ± 2.16 (4.21)	3.90 ± 1.89 (3.90)	3.77 ± 2.23 (3.82)	0.34	0.670
HA4	5.26 ± 2.40 (4.90)	4.39 ± 2.38 (4.35)	4.16 ± 2.19 (4.54)	0.98	0.375
RD	15.04 ± 2.98 (15.25)	14.90 ± 2.50 (14.97)	14.27 ± 3.36 (14.02)	2.98	0.053
RD1	7.43 ± 1.67 (7.38)	7.39 ± 1.44 (7.37)	6.74 ± 1.87 (6.81)	2.36	0.097
RD3	4.28 ± 1.76 (4.47)	4.08 ± 1.60 (4.15)	4.45 ± 1.81 (4.22)	0.63	0.534
RD4	3.32 ± 1.25 (3.39)	3.43 ± 1.33 (3.45)	3.07 ± 1.46 (2.99)	2.11	0.124
P	4.42 ± 1.88 (4.45)	4.51 ± 1.86 (4.46)	4.89 ± 1.90 (4.89)	1.15	0.319
SD	25.89 ± 6.10 (26.87)	27.65 ± 5.85 (27.85)	29.88 ± 5.74 (28.79)	1.93	0.147
SD1	3.60 ± 1.88 (3.90)*	4.94 ± 1.87 (5.01)	5.29 ± 2.44 (4.96)	5.99	0.003
SD2	5.68 ± 1.59 (5.88)	5.20 ± 1.44 (5.20)	5.98 ± 1.69 (5.77)	3.07	0.054
SD3	3.12 ± 1.26 (3.26)	3.71 ± 1.62 (3.75)	3.48 ± 0.98 (3.31)	2.67	0.071
SD4	5.17 ± 2.40 (5.29)	5.92 ± 2.34 (5.97)	5.76 ± 2.66 (5.61)	1.13	0.323
SD5	8.30 ± 1.87 (8.51)	7.86 ± 1.73 (7.90)**	9.38 ± 1.64 (9.14)	7.75	0.001
C	28.56 ± 6.02 (29.00)	31.14 ± 4.70 (31.24)	29.85 ± 6.20 (29.35)	2.53	0.082
C1	5.17 ± 1.66 (5.25)*	5.88 ± 1.32 (5.91)	6.18 ± 1.48 (6.09)	5.55	0.004
C2	4.48 ± 1.50 (4.55)	4.80 ± 1.54 (4.86)	4.66 ± 1.58 (4.56)	0.79	0.456
C3	5.35 ± 1.57 (5.46)	5.67 ± 1.19 (5.69)	5.33 ± 1.92 (5.20)	1.34	0.265
C4	6.56 ± 2.43 (6.64)	7.25 ± 1.81 (7.25)	6.35 ± 2.57 (6.27)	3.97	0.077
C5	7.00 ± 1.37 (7.10)	7.45 ± 1.55 (7.46)	7.32 ± 1.90 (7.22)	0.73	0.481
ST	19.43 ± 5.49 (19.22)	18.63 ± 4.98 (18.53)	18.66 ± 5.46 (18.93)	0.25	0.782
ST1	6.30 ± 2.37 (6.08)	5.65 ± 2.30 (5.61)	5.65 ± 2.06 (5.88)	0.69	0.504
ST2	5.05 ± 1.96 (5.07)	4.78 ± 2.11 (4.73)	4.59 ± 2.27 (4.60)	0.84	0.433
ST3	8.09 ± 2.72 (8.07)	8.20 ± 2.13 (8.19)	8.43 ± 2.98 (8.45)	0.34	0.711

F and P-values are from ANCOVA (Beck Depression Inventory and age were used as covariates).

*Indicate significant differences of TTH patients than controls on pairwise comparisons ($P = 0.011$ for HA; $P < 0.001$ for HA1; $P = 0.01$ for HA2; $P = 0.01$ for SD1 and $P = 0.005$ for C1). **Indicate significant differences of migraine patients than controls on pairwise comparisons ($P < 0.001$).

NS, novelty seeking; HA, harm avoidance; RD, reward dependence; P, persistence; SD, self-dejectedness; C, cooperativeness; and ST, self-transcendence; TTH, tension-type headache; TCI, temperament and character inventory.

patients increased HA scores, which moved toward normal control subject values after successful treatment.[60] Our findings indicate that individuals with higher HA scores are more at risk of suffering comorbid depression and TTH. Multivariate analysis showed the significant effect of BDI on HA scores. However, TTH patients had higher HA scores even after examining BDI as a covariate. This suggests that higher HA could be related to more than just depressive status in patients with TTH.

The involvement of the serotonergic system in TTH has been shown in previous studies.[28,31,41,42] It has been revealed that plasma 5-HT levels increase during a headache episode in TTH patients, while there is a significant negative correlation between plasma 5-HT and headache frequency in patients with chronic TTH.[32,34] Hyposerotonergic status and increased nitrous oxide synthetase activity have been found in chronic TTH patients, thus, suggesting a contributory role in the central sensitization of chronic TTH patients.[61] Although it is not clear whether peripheral changes in 5-HT actually do reflect similar mechanisms in the central neurons, serotonergic dysfunction has been implicated as a contributor to the central mechanism. However, the

efficacy of selective serotonin reuptake inhibitor in patients with non-depressed TTH may also indicates central serotonergic involvement in the pathogenesis of TTH.[62]

Our observations further support the hypothesis that the serotonergic system may be involved in the pathophysiology of TTH. Furthermore, TCI changes suggesting serotonergic involvement in TTH and high correlations between BDI and HA scores imply that TCI changes related to serotonergic activity may simply share the underlying pathophysiology of depression and TTH. Trait dependent component of temperament may have a role in this shared underlying biologic and causal pathophysiology of depression and TTH. In addition, depression seems to have an influence on TCI scores in patients with TTH. The co-occurrence of primary headaches and temperament and character changes may also suggest that these conditions may reciprocally influence each other.

The literature on personality characteristics and TTH still present considerable discrepancies, as regards both the eventual pathogenic role of personality characteristics and the possible association between certain personality traits and TTH. However, the role of personality as cause of TTH is at best inferential. The accumulating evidence of various studies suggest that individuals with TTH have high scores on the hypochondria, depression, hysteria, and psychasthenia scales.[63,64] While some authors[10,65] maintain that a patient's neurotic profile and the depressive component of their personality can be correlated with the duration and the intensity of headache, others[66] consider these traits to be characteristics of the patients and not correlated with the duration of the headache. The question remains whether personality disorders predispose to TTH, and consequently, whether personality profiles before treatment might predict treatment outcome.

Our findings suggest that TTH patients have certain personality traits which measured by TCI than migraine patients have. Since migraine is thought to be a disease related to a dysfunction of serotonergic innervation of vessels in the brain, hypothetical alterations in the other serotonergic-mediated functions, for example HA, could be expected. However, in this study we failed to show a link between migraine and neurotransmitter-related functions of TCI. Nylander *et al*. also failed to find any differences in main temperament and character scores in a large Swedish family of 28 people suffering from migraine when compared to control subjects.[67] This inability to determine differences between migraine patients and controls in serotonergic mediated functions such as HA, probably means that there are differences in basic serotonergic regulation between migraine and HA scores on the TCI. The fact that the current pathophysiology of migraine defined as a transient neurovascular dysfunction, seems to be based on more biological change than that of TTH and may explain why TTH patients have more specific temperament trait than those of migraine patients.[28–30,32] There have been conflicting reports on the relationship between migraine and personality for more than 50 years. However, most studies did not find different personalities in migraine patients than those in controls.[6–9] An important consideration in studies of a possible link between migraine and personality, is to recognize that most migraineurs also have TTH.[68] Subjects with both migraine and TTH showed relatively high neuroticism scores, whereas, those with pure migraine did not.[69] Therefore, the high personality disorders in migraineurs demonstrated in previous studies may be due instead to the high proportion of migraineurs with coexisting TTH.

Although our study was not planned primarily to evaluate depressive symptomatology, we found higher BDI scores in patients with TTH and migraine. BDI scores were also higher in TTH patients than in migraine patients. Although research on depression comorbidity has mainly focused on migraine rather than on TTH, depressive symptomatology is more frequently related to TTH than migraine, thus, the International Headache Society classification lists depression as a potential cause of TTH while no suggestions are given for migraine.[50]

The fact that this study was performed on a selected sample of patients seeking treatment in a specialty center, is a notable limitation of our study. Headache patients in specialized clinics are not representative because many people never seek treatment. Thus, some psychological characteristics of our patients might be associated with seeking care for the headache disorder. Our presumptions about the role of serotonergic involvement in the pathophysiology of TTH are only indirect interpretations, since our speculations are based on a self-administered questionnaire and no physiological variables actually assessed in this study.

Further research is needed to investigate TCI variables in headache disorders, particularly the effects of prophylactic therapy, such as antidepressants, on TCI scores in TTH patients.

REFERENCES

1. Puca F, Genco S, Prudenzano MP *et al.* Psychiatric comorbidity and psychosocial stress in patients with tension-type headache from headache centers in Italy. The Italian Collaborative Group for Study Psychopathol Factors Primary Headaches. *Cephalalgia* 1999; **19**: 159–164.

2. 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.
3. Marazziti D, Toni C, Pedri S *et al.* Headache, panic disorder and depression: comorbidity or a spectrum? *Neuropsychobiology* 1995; **31**: 125–129.
4. Mongini F, Ibertis F, Barbalonga E, Raviola F. MMPI-2 profiles in chronic daily headache and their relationship to anxiety levels and accompanying symptoms. *Headache* 2000; **40**: 466–472.
5. Inan L, Soykan C, Tulunay FC. MMPI profiles of Turkish headache sufferers. *Headache* 1994; **34**: 152–154.
6. Invernizzi G, Gala C, Buono M, Cittone L, Tavola T, Conte G. Neurotic traits and disease duration in headache patients. *Cephalalgia* 1989; **9**: 173–178.
7. Sternbach RA, Dalessio DJ, Kunzel M, Bowman GE. MMPI patterns in common headache disorders. *Headache* 1980; **20**: 311–315.
8. Kudrow L, Sutkus BJ. MMPI pattern specificity in primary headache disorders. *Headache* 1979; **19**: 18–24.
9. Weeks R, Baskin S, Rapoport A, Sheftell F, Arrowsmith F. A comparison of MMPI personality data and frontalis electromyographic readings in migraine and combination headache patients. *Headache* 1983; **23**: 75–82.
10. Ellertsen B. MMPI profiles. *Cephalalgia* 1992; **12**: 68.
11. Pfaffenrath V, Hummelsberger J, Pollmann W, Kaube H, Rath M. MMPI personality profiles in patients with primary headache syndromes. *Cephalalgia* 1991; **11**: 263–268.
12. Robinson ME, Geisser ME, Dieter JN, Swerdlow B. The relationship between MMPI cluster membership and diagnostic category in headache patients. *Headache* 1991; **31**: 111–115.
13. Dieter JN, Swerdlow B. A replicative investigation of the reliability of the MMPI in the classification of chronic headaches. *Headache* 1988; **28**: 212–222.
14. Stewart WF, Linet MS, Celentano DD, Van Natta M, Ziegler D. Age- and sex-specific incidence rates of migraine with and without visual aura. *Am. J. Epidemiol.* 1991; **134**: 1111–1120.
15. Cloninger CR, Svrakic DM, Przybeck TR. A psychobiological model of temperament and character. *Arch. Generalpsychiatry* 1993; **50**: 975–990.
16. Cloninger CR. Temperament and personality. *Curr. Opin. Neurobiol.* 1994; **4**: 266–273.
17. Cloninger CR. A systematic method for clinical description and classification of personality variants. A proposal. *Arch. Gen. Psychiatry* 1987; **44**: 573–588.
18. Tse WS, Bond AJ. Serotonergic involvement in the psychosocial dimension of personality. *J.Psychopharmacol.* 2001; **15**: 195–198.
19. Peirson AR, Heuchert JW, Thomala L, Berk M, Plein H, Cloninger CR. Relationship between serotonin and the temperament and character inventory. *Psychiatry Res.* 1999; **89**: 29–37.
20. Gerra G, Avanzini P, Zaimovic A *et al.* Neurotransmitters, neuroendocrine correlates of sensation-seeking temperament in normal humans. *Neuropsychobiology* 1999; **39**: 207–213.
21. Mulder RT, Joyce PR, Cloninger CR. Temperament and early environment influence comorbidity and personality disorders in major depression. *Compr. Psychiatry* 1994; **35**: 225–233.
22. Joyce PR, Mulder RT, Cloninger CR. Temperament and hypercortisolemia in depression. *Am. J. Psychiatry* 1994; **151**: 195–198.
23. Svrakic DM, Draganic S, Hill K, Bayon C, Przybeck TR, Cloninger CR. Temperament, character, and personality disorders: etiologic, diagnostic, treatment issues. *Acta. Psychiatr. Scand.* 2002; **106**: 189–195.
24. Marijnissen G, Tuinier S, Sijben AE, Verhoeven WM. The temperament and character inventory in major depression. *J. Affect. Disord.* 2002; **70**: 219–223.
25. Hansenne M, Reggers J, Pinto E, Kjiri K, Ajamier A, Ansseau M. Temperament and character inventory (TCI) and depression. *J. Psychiatr. Res.* 1999; **33**: 31–36.
26 Tanaka E, Sakamoto S, Kijima N, Kitamura T. Different personalities between depression and anxiety. *J. Clin. Psychol.* 1998; **54**: 1043–1051.
27 Lipton R, Dalessio D. Overview, diagnosis and clasification of Headache. In: Lipton R, Dalessio D (eds). *Wolff's Headache and other Head Pain.* Oxford University Press, Oxford, 2001.
28. Goadsby PJ. Pathophysiology of headache. In: Silberstein S (ed). *Wolff's Headache*. Oxford University Press, Oxford, 2001.
29. Sanchez dR, Reuter U. Pathophysiology of headache. *Curr. Neurol. Neurosci. Report* 2003; **3**: 109–114.
30. Edvinsson L. Pathophysiology of primary headaches. *Curr. Pain Headache Report* 2001; **5**: 71–78.
31. Jensen R. Peripheral and central mechanisms in tension-type headache: an update. *Cephalalgia* 2003; **23** (Suppl. 1): 49–52.
32. Jensen R. Mechanisms of tension-type headache. *Cephalalgia* 2001; **21**: 786–789.
33. Bendtsen L. Central sensitization in tension-type headache – possible pathophysiological mechanisms. *Cephalalgia* 2000; **20**: 486–508.
34. Bendtsen L, Jensen R, Hindberg I, Gammeltoft S, Olesen J. Serotonin metabolism in chronic tension-type headache. *Cephalalgia* 1997; **17**: 843–848.
35. Kaube H, Katsarava Z, Przywara S, Drepper J, Ellrich J, Diener HC. Acute migraine headache: possible sensitization of neurons in the spinal trigeminal nucleus? *Neurology* 2002; **58**: 1234–1238.
36. Weiller C, May A, Limmroth V *et al.* Brain stem activation in spontaneous human migraine attacks. *Nat. Med.* 1995; **1**: 658–660.
37. Kunkel RS. Clinical manifestations of migraine. *Clin. Cornerstone* 2001; **4**: 18–25.
38. Bigal ME, Rapoport AM, Sheftell FD, Tepper SJ. New migraine preventive options: an update with pathophysiological considerations. *Rev. Hosp. Clin. Fac. Med. Paulo.* 2002; **57**: 293–298.
39. Morillo LE. Migraine headache. *Am. Fam. Physician* 2002; **65**: 1871–1873.
40. Lin JN. Overview of migraine. *J. Neurosci. Nurs.* 2001; **33**: 6–13.

41. Vandenheede M, Schoenen J. Central mechanisms in tension-type headaches. *Curr. Pain Headache Report* 2002; **6**: 392–400.
42. Schulman EA. Overview of tension-type headache. *Curr. Pain Headache Report* 2001; **5**: 454–462.
43. Jensen R, Olesen J. Tension-type headache: an update on mechanisms and treatment. *Curr. Opin. Neurol.* 2000; **13**: 285–289.
44. Goadsby PJ. Chronic tension-type headache: where are we? *Brain* 1999; **122**: 1611–1612.
45. Syvalahti EK. Biological aspects of depression. *Acta. Psychiatr. Scand. Suppl.* 1994; **377**: 11–15.
46. Owens MJ, Nemeroff CB. Role of serotonin in the pathophysiology of depression: focus on the serotonin transporter. *Clin. Chem.* 1994; **40**: 288–295.
47. Staley JK, Malison RT, Innis RB. Imaging of the serotonergic system: interactions of neuroanatomical and functional abnormalities of depression. *Biol. Psychiatry* 1998; **44**: 534–549.
48. Tomkins GE, Jackson JL, O'Malley PG, Balden E, Santoro JE. Treatment of chronic headache with antidepressants: a meta-analysis. *Am. J. Med.* 2001; **111**: 54–63.
49. Silberstein SD. Comprehensive management of headache and depression. *Cephalalgia* 1998; **18** (Suppl. 21): 50–55.
50. *Headache Classification Committee of the International Headache Society.* Classification and diagnostic criteria for headache disorders cranial neuralgias and facial pain. Headache Classification Committee of the International Headache Society. *Cephalalgia* 1988; **8** (Suppl. 7): 1–96.
51. Casey JE, Joyce PR. Personality disorder and the Temperament and Character Inventory in the elderly. *Acta Psychiatr. Scand.* 1999; **100**: 302–308.
52. Kose S, Sayar K, Kalelioglu U, Reeves R, Cloninger RC. *Reliability and Validity of the Turkish Version of the Temperament and Character Inventory.* 22 November 2002. 38th National Psychiatry Congress.
53. Kose S. A Psychobiological Model of Temperament and Character: TCI. *Yeni Symposium (New Symposium)* 2003; **41**: 86–97.
54. Peirson AR, Heuchert JW. The relationship between personality and mood: comparison of the BDI and the TCI. *Personality Individual Differences* 2001; **30**: 391–399.
55. Pelissolo A, Corruble E. Personality factors in depressive disorders: contribution of the psychobiologic model developed by Cloninger. *Encephale* 2002; **28**: 363–373.
56. Delgado PL, Price LH, Miller HL *et al.* Serotonin and the neurobiology of depression. Effects of tryptophan depletion in drug-free depressed patients. *Arch. Gen. Psychiatry* 1994; **51**: 865–874.
57. Grucza RA, Przybeck TR, Spitznagel EL, Cloninger CR. Personality and depressive symptoms: a multi-dimensional analysis. *J. Affect. Disord.* 2003; **74**: 123–130.
58. Joyce PR, Mulder RT, Cloninger CR. Temperament predicts clomipramine and desipramine response in major depression. *J. Affect. Disord.* 1994; **30**: 35–46.
59. de la Rie SM, Duijsens IJ, Cloninger CR. Temperament, character, and personality disorders. *J. Personal. Disord.* 1998; **12**: 362–372.
60. Chien AJ, Dunner DL. The Tridimensional Personality Questionnaire in depression: State versus trait issues. *J. Psychiatric Res.* 1996; **30**: 21–27.
61. Ashina M, Bendtsen L, Jensen R, Lassen LH, Sakai F, Olesen J. Possible mechanisms of action of nitric oxide synthase inhibitors in chronic tension-type headache. *Brain* 1999; **122**: 1629–1635.
62. Boz C, Altunaoglu V, Velioglu S, Ozmenoglu M. Sertraline versus amitriptyline in the prophylactic therapy of chronic tension-type headache. *J. Headache Pain* 2003; **4**: 72–78.
63. Andrasik F. Stress, personality, and headache: searching new territories. *Cephalalgia* 1999; **19**: 541.
64. Andrasik F. Behavioral treatment approaches to chronic headache. *Neurol. Sci.* 2003; **24** (Suppl. 2): S80–S85.
65. Ziegler DK, Paolo AM. Headache symptoms and psychological profile of headache-prone individuals. A comparison of clinic patients and controls. *Arch. Neurol.* 1995; **52**: 602–606.
66. Williams DE, Raczynski JM, Domino J, Davig JP. Psychophysiological and MMPI personality assessment of headaches: an integrative approach. *Headache* 1993; **33**: 149–154.
67. Nylander PO, Schlette P, Brandstrom S *et al.* Migraine: temperament and character. *J. Psychiatr. Res.* 1996; **30**: 359–368.
68. Rasmussen BK, Jensen R, Schroll M, Olesen J. Interrelations between migraine and tension-type headache in the general population. *Arch. Neurol.* 1992; **49**: 914–918.
69. Rasmussen BK. Migraine and tension-type headache in a general population: psychosocial factors. *Int. J. Epidemiol.* 1992; **21**: 1138–1143.