

Character and Temperament Dimensions of Patients with Temporomandibular Disorder

Alev DARCAN, Elif ONUR, Timur KÖSE, Tunç ALKIN, Adalet ERDEM

Abstract

Objective: The nature of the relationship between personality and temporomandibular disorder is an important, but still unexplored question. The objective of this study was to assess the personality profile of a sample of patients with temporomandibular disorder using the Temperament and Character Inventory (TCI).

Method: The study included 81 patients [17 male (21%) and 64 female (79%)] with temporomandibular disorder and 80 healthy control subjects [15 male (18.75%) and 65 female (81.25%)]. A Turkish version of TCI was used for personality self-assessment. The data were evaluated with multivariate analyses of variance.

Results: Multivariate analyses of variance showed that the temperamental dimension, novelty seeking ($F= 8.61$, $P= 0.004$), was associated with temporomandibular disorder. Higher novelty seeking is thought to be linked to higher impulsiveness, exploratory excitability, and disorderliness. Also, there were significant differences between patients and healthy subjects on fatigability, purposefulness, compassion, and principled subscales of TCI. Gender differences were also found for different temperament and character dimensions. Women scored significantly higher on the self-directedness dimension, whereas male patients with temporomandibular disorder had significantly higher scores on the temperamental dimension of harm avoidance and its sub-dimension, shyness.

Conclusion: Our study offers clinical evidence of the relationship between temporomandibular disorder and the personality profile of a high level of novelty seeking, which is considered to be associated with cluster B personality disorders. Assessing personality in patients with temporomandibular disorder should be considered while implementing treatment.

Key Words: Temporomandibular disorder, personality, temperament, character, Temperament and Character Inventory (TCI)

INTRODUCTION

Psychosocial factors seem to have a role in the development of temporomandibular disorder (TMD) which is a multi-dimensional problem characterized by pain that affects the chewing muscles, and the temporomandibular joint and related structures, or both (Griffiths 1983, Dworkin and LeResche 1992, Suvinen et al. 2005). TMD may cause sounds and limitations in the movements of jaw joint. The most common symptoms of TMD that cause patients to seek help are pain and difficulty in chewing or speaking.

Research focusing on the etiopathogenesis of TMD

have investigated tooth occlusion and para-functional activities and questioned the role of malocclusion, jaw position, and biomechanical factors (Gameiro et al. 2006). Psychological, behavioral, and environmental factors were investigated as well because TMD's etiology was unclear. After Laskin (1969) emphasized the effect of emotional factors on TMD, several studies were conducted on the psychological problems associated with TMD. The results indicated that stress and a series of psychosocial, neuropsychological, and cognitive factors had a role in development of symptoms related to TMD (Mercuri et al. 1979, van der Laan et al. 1988, Grzesiak 1991, Grossi et al. 2001, Suvinen et al. 2005). It was

Received: 31.08.2007 – Accepted: 01.01.2008

Alev Darcan MD., e-mail: alevdarcan79@myynet.com

revealed that TMD could be closely related to psychiatric conditions, such as alexithymia (Glaros and Lumley 2005), anxiety (Mercuri et al. 1979, Suvinen and Reade 1995, Ohrbach and McCall 1996, Friction, 1999), depression (Suvinen and Reade 1995, Madland et al. 2000, Wright et al. 2004), and somatization (Dworkin 1991, Yap et al. 2002, 2004). It was founded that accompanying psychopathologies predicted the development of chronic TMD in patients with acute TMD (Wright et al. 2004). All these studies clearly emphasized the significant role of psychosocial factors in the occurrence and persistence of symptoms related to TMD. Currently, it is generally considered that TMD is comprised of pain and psychosocial dysfunction.

Considering that personality traits may determine chronic pain related behaviors and the development of disability, personality traits that could be related to TMD have been also investigated. Studies that used the Minnesota Multiphasic Personality Inventory (MMPI) to assess personality characteristics reported that patients with TMD scored high on psycho-physiological reaction (Parker et al. 1993), and even more consistently on hypochondriasis, hysteria, and depression subscales (Eversole et al. 1985, Michelotti et al. 1998, Meldolesi et al. 2000) similar to patients with chronic pain. TMD patients scored higher on the neuroticism (Southwell et al. 1990, Pallegama et al. 2005) and introversion (Pallegama et al. 2005) dimensions of the Eysenck Personality Questionnaire, and scored higher on the depression and neuroticism scales of the Revised NEO Personality Inventory (Ferrando et al. 2004) than healthy subjects. Paranoid, obsessive-compulsive, histrionic, and borderline personality disorders are frequently comorbid with TMD (Gatchel et al. 1996, Wright et al. 2004); however, no consistent data is available concerning personality traits that may be specific to TMD (Suvinen et al. 2005).

According to the model developed by Cloninger (1987), which describes personality both dimensionally and psycho-biologically, personality has 2 basic structures: the dimensions of temperament and character. The combination of the 4 dimensions of temperament –novelty seeking (NS), harm avoidance (HA), reward dependence (RD), and persistence (PE)–, and the 3 dimensions of character –self-directedness (SD), cooperativeness (CO), and self-transcendence (ST)– form the personality (Cloninger 1987, Cloninger et al. 1993, Cloninger et al. 1994). Temperament dimensions, which are thought to be heritable, correspond to biological aspects of personality. On the other hand, character di-

mensions are affected by life events, culture, and social learning. The above-mentioned temperament and/or character dimensions might be involved in the development and maintenance of TMD, which is a muscular-skeletal pain disorder.

A literature review indicated that no previous study used the Temperament Character Inventory (TCI) to analyze TMD cases. The present study aimed to investigate the temperament and character traits of TMD patients by administering TCI and comparing the results to a normal control group. The main hypothesis of the present study was that TMD patients would score higher on the temperament dimension of HA and score lower on the character dimensions SD and CO which are closely related to psychopathology.

METHOD

Sample

The study included patients who sought care with symptoms of TMD at Ege University Faculty of Dentistry, Department of Prosthetics between May 2006 and January 2007. The study group consisted of 88 TMD patients aged 18-65 years (70 female [79.5%], 18 male [20.5%]) and the control group consisted of 81 participants without TMD (66 female [81.5%] and 15 male [18.5%]). The 2 groups were matched demographically. Socio-demographic information and the clinical signs observed in the participants were recorded in the Oral Diagnosis Department during dental examination.

The patients who didn't agree to participate in the study, who needed assistance during dental examination and interviewing, who had a known cognitive disorder or neurological and decompensated systemic disorder causing significant disability, who had undergone or had been undergoing psychiatric therapy in previous year, and who were illiterate were excluded from the study. In all, 7 participants from the study group and 1 participant from the control group were excluded because they didn't complete the questionnaire. The original study group therefore consisted of 81 patients (17 male [21%] and 64 females [79%]) and the control group consisted of 80 subjects (15 male [18.75%] and 65 female [81.25%]).

Patients diagnosed with TMD in the Oral Diagnosis Department were re-diagnosed by a researcher according to the Research Diagnostic Criteria (RDC) proposed by Dworkin and LeResche (1992). In the radiological diagnosis of TMD, lateral-graphy was used and patients' mouths were imaged both opened and closed. In total,

Table I. Socio-demographic characteristics of the TMD and healthy control groups (n= 161).

	TMD (n= 81)		Healthy (n= 80)		Total (n= 161)	
	n	%	n	%	n	%
Gender						
Female	65	80.0	65	81.0	130	78.1
Male	16	20.0	15	19.0	31	21.9
Age Groups						
18-20	3	3.0	1	1.2	4	2.4
21-25	13	16.0	4	5.0	17	10.5
26-30	9	11.0	15	18.7	24	14.9
31-40	15	18.5	33	41.2	48	29.8
41-50	31	38.2	20	25.0	51	31.6
51 and older	10	12.3	7	8.7	17	10.5
Marital Status						
Married	55	67.9	60	75.0	115	71.4
Single	18	22.2	17	21.2	35	21.7
Separated/Divorced	8	9.8	3	3.7	11	6.8
Education						
0-11 years	41	50.6	39	48.7	80	49.7
≥ 11 years	40	49.4	41	51.3	81	50.3

56 patients (69.1%) with long-standing complaints (6 months or more) were considered to have chronic TMD. Participants in the control group recruited from subjects who didn't present and seek treatment with any of the symptoms of TMD.

INSTRUMENTS

Temperament and character traits of all participants were assessed with the Temperament and Character Inventory (TCI) (Cloninger et al. 1994). TCI is a self-report instrument for use with anyone ≥ 17 years of age. The 240 questions of the TCI are answered as "correct" or "incorrect". TCI can be completed in approximately 30-45 min. TCI has 7 main scales of temperament and character and 24 subscales. The temperament scales are: novelty seeking (NS), harm avoidance (HA), reward dependence (RD), and persistence (PE). The character scales are: self-directedness (SD), cooperativeness (CO), and self-transcendence (ST) (Cloninger 1987, Cloninger et al. 1993, Cloninger et al. 1994). The NS scale has 4 subscales (exploratory excitability/stoic rigidity, impulsiveness/reflection, extravagance/reserve, and disorderliness/orderliness), HA has 4 subscales (anticipatory worry and pessimism/optimism, fear of uncertainty, shyness/gregariousness, and fatigability/rigor) RD has

3 subscales (sentimentality/tough mindedness, attachment/detachment, and dependence/independence) PE has only 1 subscale. SD has 5 subscales (responsibility/blaming, purposefulness/lack of goal direction, resourcefulness/inertia, self-acceptance/self-striving, and congruent nature/bad habits), CO has 5 subscales (social acceptance/social intolerance, empathy/social disinterest, helpfulness/egoistic and self-centered, compassion/revengefulness, and principled-self-serving), and ST has 3 subscales (self-forgetfulness/self-consciousness, transpersonal identification/self-isolation, and spiritual acceptance/rational materialism). The sum of the subscale scores account for the scores of main scales.

TCI was translated to the Turkish population by Köse et al. (2004) and the back-translation was approved by Cloninger. Two different studies assessing the psychometric properties of TCI had similar results; Cronbach's α value were 0.55-0.85 for temperament dimensions and 0.80-0.85 for character dimensions (Köse et al., 2004; Arkar et al., 2005). The data indicated that both Turkish versions of TCI were reliable and valid. The present study used the version adapted by Arkar et al. (2005).

Statistical Analysis

Data were analyzed using SPSS (Statistical Package

Table II. TCI temperament and character total mean scores, and MANOVA's F and p values (n = 161) for gender effects on the subscales.

Dimension		Female (Mean, SD)		Male (Mean, SD)			F	P
Novelty Seeking	P	21.63	3.94	20.88	4.58	P>H	8.61	0.004
	H	19.42	4.46	18.07	5.04			NS
Exploratory Excitability	P	5.34	1.58	5.00	1.58			
	H	5.83	1.76	4.93	2.05			
Impulsiveness	P	7.23	1.63	7.06	1.20	P>H	13.42	<0.001
	H	5.68	2.52	5.60	2.44			NS
Extravagance	P	3.86	1.41	3.56	1.50			
	H	3.75	1.57	3.59	1.33			
Disorderliness	P	5.19	1.37	3.26	1.71	P>H	9.57	0.002
	H	4.15	1.71	5.24	2.22			
Harm Avoidance	P	17.16	4.27	4.27	5.47	Gr-Gen	7.47	0.007
	H	17.82	4.76	17.71	4.07			
Anticipatory Worry	P	4.92	1.94	13.40	2.37	Gr-Gen	4.76	0.031
	H	5.45	1.97	5.65	1.64			
Fear of Uncertainty	P	3.27	1.43	4.47	1.12	F>M	9.95	0.002
	H	4.09	1.70	2.53	1.96			
Shyness	P	4.05	1.42	2.87	1.41	Gr-Gen	7.97	0.005
	H	4.00	1.80	4.88	1.39			
Fatigability	P	4.92	1.49	3.07	1.80	P>H	13.96	<0.001
	H	4.28	1.47	4.65	1.81			0.012
Reward Dependence	P	15.84	3.05	3.00	3.10			NS
	H	14.82	3.13	15.53	3.17			
Sentimentality	P	7.16	1.84	15.07	1.42			NS
	H	6.91	1.86	7.13	1.36			
Attachment	P	5.16	1.86	5.35	1.27			NS
	H	4.88	2.07	4.87	1.96			
Dependence	P	3.53	1.41	3.59	1.46			NS
	H	3.03	1.56	3.07	0.96			
Persistence	P	4.52	1.50	4.53	1.50			NS
	H	3.03	1.56	3.07	0.96			

for the Social Sciences) for Windows version.14.0. The socio-demographic characteristics of the patient and control groups were compared by t-tests and chi square analysis where appropriate. Group differences between the patient and control groups were investigated with multivariate analysis of variance (MANOVA). MANOVA's had been re-done to the TCI dimensions and sub-dimensions if a group-gender interaction was detected.

The two-way statistical significance level was set to $p < 0.05$ for all comparisons.

RESULTS

The study group (mean age= 37.89, SD= 11.29 years) and healthy control group (mean age= 38.06, SD= 9.26 years) were similar in age ($t= 0.111$, $P= 0.912$). No significant difference was found between the demographic variables (gender, marital status, and education) of both groups (Table I). The model of multivariate analysis of variance of TCI's dimensions was statistically significant ($F= 4.21$, $P < 0.001$, Wilks' $\lambda= 0.838$). A comparison of TCI dimension and subscale mean scores, standard de-

Table II. Continued.

Dimension		Female (Mean, SD)		Male (Mean, SD)			F	P
Self Directedness	P	23.59	5.64	21.06	5.12	F>M	3.92	0.049
	H	24.75	6.01	22.67	7.20			
Responsibility	P	3.98	2.02	3.06	2.01	F>M	4.16	0.043
	H	3.91	1.76	3.27	2.25			
Purposefulness	P	4.22	1.30	4.06	0.90	P<H	10.26	0.002
	H	5.12	1.47	4.87	1.41			
Resourcefulness	P	1.64	1.16	0.88	0.86	F>M	14.26	<0.001
	H	2.25	1.41	1.13	1.25			
Self Acceptance	P	6.36	2.23	5.65	2.29			NS
	H	5.80	1.95	5.93	3.06			
Congruent Nature	P	7.39	1.83	7.41	1.77			NS
	H	7.68	1.82	7.47	1.51			
Cooperation	P	23.78	3.74	23.00	5.27			NS
	H	26.20	4.80	23.93	4.83			
Social Acceptance	P	4.67	1.32	4.29	1.57			NS
	H	5.11	1.60	4.67	1.72			
Empathy	P	4.61	1.43	3.94	1.43			NS
	H	4.37	1.45	4.07	1.53			
Helpfulness	P	5.09	1.37	5.00	1.32			NS
	H	5.11	1.62	4.33	0.90			
Compassion	P	4.73	1.28	4.94	1.85	P<H	4.97	0.027
	H	5.80	2.26	5.47	1.60			
Principled	P	4.67	1.26	4.82	1.29	P<H	8.22	0.005
	H	5.80	1.59	5.40	2.16			
Self Transcendence	P	18.83	5.44	17.18	5.93			NS
	H	19.85	5.62	17.73	5.16			
Self-forgetfulness	P	6.19	2.35	5.71	2.47			IS
	H	6.72	2.14	5.47	2.07			
Transpersonal Identification	P	4.92	2.20	5.18	2.24			NS
	H	5.46	2.62	5.33	2.35			
Spiritual Acceptance	P	7.72	2.12	6.29	2.37	F>M	5.15	0.025
	H	7.66	2.64	6.93	2.46			

SD: standard deviation; P: TMD patient group; H: healthy control group; F: female; M: male; NS: Not significant; Gr-Gen: group-gender interaction.

viations, and F and P values are presented in Table II.

Differences between the TMD Group and the Healthy Group (HG)

The mean score of the TCI NS dimension mean to-

tal scores (TMD group= 21.47 ± 4.06 , HG= 19.16 ± 4.57 , $p=0.004$), and NS impulsivity (TMD group= 7.20 ± 1.54 , HG= 5.66 ± 2.49 , $p<0.001$) and disorderliness (TMD group = 5.20 ± 1.44 , HG= 4.18 ± 1.80 , $p=0.002$) subscale scores were higher in TMD group than in HG.

Table III. Analysis results (n= 161) for TCI dimensions and subscale scores that showed group-gender interaction in MANOVA.

Dimension		F	p
Harm Avoidance	PM > HM	6.233	0.018
	PF = HF	0.684	0.410
	PF = PM	0.197	0.660
	HF > HM	11.022	0.001
Anticipatory Worry	PM = HM	2.610	0.117
	PF = HF	2.323	0.130
	PM = PF	1.709	0.195
	HF = HM	3.191	0.078
Shyness	PM > HM	13.427	0.001
	PF = HF	0.027	0.870
	PM > PF	4.770	0.034
	HF = HM	3.525	0.064

PM: Male patients, HM: Healthy males, PF: Female patients, HF: Healthy females.

The HA fatigability subscale scores were higher in TMD group than in healthy group (TMD group= 4.86 ± 1.56 , HG= 4.04 ± 1.61 , $p < 0.001$).

The SD character dimension purposefulness subscale scores (TMD group= 4.19 ± 1.23 , HG= 5.08 ± 1.46 , $p = 0.002$) were lower in TMD group than in HG. Similarly, the CO compassion (TMD group= 4.78 ± 1.41 ; HG= 5.08 ± 1.46 , $p = 0.027$) and principled (TMD group= 4.70 ± 1.26 ; HG= 5.75 ± 2.15 , $p = 0.005$) subscale scores were lower in TMD group than in HG.

Gender Differences

According to gender-related assessments, the temperament of HA fear of uncertainty subscale (female= 3.64 ± 1.59 , male= 2.69 ± 1.53 ; $p = 0.002$) and fatigability subscale (female= 4.61 ± 1.55 , male= 3.91 ± 1.94 ; $p = 0.012$) mean scores were higher for females than for males. The TCI SD character dimension mean total scores (female= 24.33 ± 5.81 , male= 21.82 ± 6.03 ; $p = 0.049$) and the SD responsibility subscale (female= 4.01 ± 1.89 , male= 3.18 ± 2.06 ; $p = 0.043$) and resourcefulness subscale (female= 1.97 ± 1.33 , male= 0.96 ± 1.04 ; $p < 0.001$) scores were higher for females than for males. TCI ST character dimension spiritual acceptance subscale scores (female= 7.67 ± 2.35 , male= 6.57 ± 2.36 ; $p = 0.025$) were also higher for females than for males.

TCI Main Dimensions and Subscales with Group-Gender Interactions

A group-gender interaction was observed between the HA temperament dimension ($p = 0.007$), and the

HA anticipatory worry and pessimism ($P = 0.031$), and HA shyness ($p = 0.005$) subscales. Multivariate variance analyses were performed separately for groups and gender for the main scales and subscales with group-gender interaction (Table III).

Accordingly, HA dimension mean scores were significantly higher in males in TMD group than in HG; no significant difference was found between the females in both groups. HA scores were significantly higher in females in HG than in the males in TMD group ($p = 0.001$); no significant difference was found between genders in TMD group. The significant gender-group interaction on the HA anticipatory worry and pessimism subscale was found to be insignificant after a second MANOVA analysis.

No significant gender difference was observed for HA shyness subscale scores in HG, but a significant gender difference was observed in TMD group ($p = 0.034$). Males' mean scores were higher than females' for this subscale. Furthermore, when females and males were studied separately, no significant difference was found between the females in TMD group and those in HG; yet, shyness scores of the males in TMD group were higher than those of the males in HG ($p = 0.001$).

DISCUSSION

The main finding of the study is the higher NS temperament dimension total scores in TMD group than in healthy control group. In addition, higher levels of fatigability and disorderliness together can be considered another important finding. People with this profile, which is also seen in TMD patients, are found to be ambivalent, neurotic, pessimistic, and having interpersonal difficulties (Cloninger et al. 1993, Cloninger et al. 1994).

The NS temperament dimension confers exploratory activities in new situations. Those that scored high on this dimension are more apt to get excited easily, impulsive, quick-tempered and to be disordered and unsystematic. The disadvantage of being a high scorer on the NS scale is being more likely to experience excessive anger in response to conflicts and being more prone to giving up easily. Accordingly, these traits cause an individual to be unstable and impatient in interpersonal relationships (Cloninger 1987, Cloninger et al. 1993, Cloninger et al. 1994). Previous research indicates that, those that score high on the NS scale are more likely to have a cluster B personality disorder (Svrakic et al. 1993, Mulder et al. 1994, Mulder et al. 1999, de la Rie et al.

1998). The finding of increased NS dimension scores in patients with TMD are consistent with several previous studies that revealed a relationship between TMD and a high MMPI hysteria profile, and reported more interpersonal stresses and higher dysfunction while coping on the Eysenck Personality Questionnaire (Eversole et al. 1985, Southwell et al. 1990, Philips et al. 2001, Pallegama et al. 2005). High NS and low character dimension scores are considered indicators of personality disorders. Cloninger (2000) described (a) low SD, (b) low CO, (c) low ST, and (d) low affective stability characteristics as core traits of personality disorders. According to Cloninger (2000), having any 2 of these traits predict the presence of a personality disorder and having more than 2 predict the severity of personality psychopathology. Other researchers reported that a higher NS score or a "high NS accompanying to low SD and/or CO" profile were related to borderline personality disorder (Battaglia et al. 1996, Mulder et al. 1999). The present study, in contrast to our expectation, didn't reveal a difference in character dimensions between TMD patients and healthy subjects. However, patients with TMD had lower scores on the SD purposefulness subscale, and the CO compassion and principled subscales, and higher score on the NS scale than the healthy subjects. Taken together these results may indicate the presence of personality disorders in TMD group. Furthermore, Philips et al. (2001) reported that patients with chronic TMD are more predisposed to experience depression, anxiety and borderline personality disorder, and Axis II disorders significantly more than patients with acute TMD. More than 2/3 of patients in our study group were also chronic TMD. Thus it is more likely that personality pathology was a prominent feature in this group of TMD patients. Somatization disorder was highly prevalent among patients with TMD (Yap et al. 2002, Yap et al. 2004). The most common co-morbid diagnoses are anxiety disorders in acute TMD and somatoform disorders in chronic TMD (Gatchel et al. 1996). High NS scores were related to somatization disorder in female patients (Battaglia et al. 1998). Accordingly, high NS scores as measured by TCI might possibly be related to a vulnerability to both TMD and somatization disorder.

Increased HA dimension scores which indicates inhibition of behavior also associated with being avoidant, insecure, overcautious, worried, and pessimistic (Cloninger et al. 1993, Cloninger et al. 1994). Studies conducted with clinical and normal samples consistently reported that high HA scores are closely related to depression and anxiety (Brown et al. 1992, Joffe et al.

1993, Tanaka et al. 1998, Svrakic et al. 2002, Jyllhä and Isometsä 2006, Cloninger et al. 2006) in a manner that, high HA scores are virtually accepted as a marker for depression and anxiety. Moreover, it was reported that high HA scores are the most common personality profile in different pain patient groups, such as patients with diverse headaches and patients with nonspecific musculoskeletal disorders (Pud et al. 2004, Boz et al. 2004, Malmgren-Olson and Bergdahl 2006, Sanchez-Roman et al. 2007). The results of our study didn't show gender or group differences, but indicated a group-gender interaction in HA dimension. As expected HA total scores are higher in healthy females than in healthy males in accordance with the normative data obtained from healthy subjects (Cloninger et al. 1991, de la Rie et al. 1998, Hansenne et al. 1999, Miettunen et al. 2007). On the other hand, consistent with the results of studies on painful musculo-skeletal disorders (Malmgren-Olson and Bergdahl 2006, Sanchez-Roman et al. 2007), male patients with TMD had higher HA scores than healthy males. Additionally, male TMD patients were shyer than both healthy males and healthy females.

It was reported that acute TMD is 3 to 6 times more common in females than males and that being female is a risk factor for TMD becoming chronic (Philips et al. 2001). It was suggested that treatment-seeking behavior, sex hormones, pain threshold differences, stress, etc. causes gender differences; however, the reason of the difference still remains unclear. Accordingly, temperament and character differences between males and females found in the present study, might be gender specific vulnerability or protective factors related with the development of TMD. For instance, a high HA score can be a risk factor for development of TMD only in males and may determine the co-occurrence of depression and anxiety. On the other hand, the findings showing that females are more energetic and social and that males are shyer could possibly have affected the participants' treatment-seeking behavior and thus the rate of receiving treatment.

Studies conducted with normal samples revealed gender specific differences in temperament and character dimensions. A meta-analysis of 32 studies conducted with healthy populations (including the study conducted by Arkar et al. 2005) reported that females scored higher on the HA and RD scales than did males, whereas, there were no differences between the NS and PE scores of males and females (Miettunen et al. 2007). In terms of gender differences, females scored higher on the HA fear of uncertainty and fatigability subscales, which is

consistent with the normative tendency that has been observed in almost all studies. Females were reported to have scored higher in most studies on the RD temperament dimension, which is subject to cultural influences and associated with the level of socialization (Cloninger et al. 1991, de la Rie et al. 1998, Mendlowicz et al. 2000). The present study didn't reveal a significant gender-based difference in RD dimension, which may have been resulted from cultural factors. The only study that didn't reveal a relationship between gender and RD score in the above-mentioned meta-analysis was from Turkey (Miettunen et al. 2007, Arkar et al. 2005). In the present study, females had higher SD dimension total scores, and responsibility and resourcefulness subscale scores, in contrast to Arkar et al. (2005). These results can't be explained by socio-cultural factors, but could be specific to the studied sample.

The present study's results are of clinical importance to dentistry. TMD primarily affects the stomatognathic system and is frequently diagnosed in dental practice. However, many patients with TMD can't be treated by otorhinolaryngologists and dentists with merely medical methods and their complaints become chronic. Co-morbid Axis I and II disorders should be treated, and personality and behavioral characteristics that are associated with these disorders should also be considered as well. Information on temperament-character profiles of TMD patients would help to tailor relevant psychopharmacological therapy (mainly for temperament problems) and psychotherapy (for character problems) options (Svrakic et al. 2002) complementary to dental interventions. Individualized and comprehensive early intervention would ameliorate the occurrence of new psychological or

medical problems and could prevent TMD from becoming chronic, and consequently, the treatment of TMD would become more time efficient and less expensive.

The present study has some limitations. As it had a cross-sectional design it is impossible to determine precisely if the observed differences in temperament and character profile were etiological or precipitant factors. Secondly, despite the fact that patients who had undergone psychiatric therapy within the previous year were excluded, Axis I disorders, such as mood and anxiety disorders that could possibly affect TMD weren't assessed with structural interviews. Consequently, while interpretation the data it should be considered that the NS and HA dimensions could have been affected by Axis I disorders (Goldman et al. 1994). Finally, the present sample may not be representative of patients in the community that never sought treatment. Further studies that prospectively assess TMD patients with structured clinical interviews for axis I and II disorders in addition to temperament and character inventories are necessary.

In conclusion, TMD patients were somehow different than the healthy control group in terms of temperament and character. According to the results of the present study, TMD patients with this personality profile were more likely to develop cluster B personality disorders and somatization, and male patients were liable to depression and anxiety, both of which are known to accompany TMD. A bio-psychosocial treatment approach, including psychopharmacological and psychotherapeutic approaches, and also a multidisciplinary teamwork regarding the principles of consultation-liaison psychiatry should be considered in cases meeting these personality profiles.

REFERENCES

- Arkar H, Soriaş O, Tunca Z et al. (2005) Mizaç ve Karakter Envanteri'nin Türkçe formunun faktör yapısı, geçerlik ve güvenilirliği. *Türk Psikiyatri Derg*, 16: 190-204.
- Battaglia M, Przybeck TR, Bellodi L et al. (1996) Temperament dimensions explain the co-morbidity of psychiatric disorders. *Compr Psychiatry*, 37: 292-298.
- Battaglia M, Bertella S, Bajo S et al. (1998) An investigation of the co-occurrence of panic and somatization disorders through temperamental variables. *Psychosom Med*, 60: 726-729.
- Boz C, Sayar K, Velioğlu S et al. (2004) Kronik gerilim tipi baş ağrılı hastalarda mizaç ve karakter profili. *Türk Psikiyatri Derg*, 15: 105-111.
- Brown SL, Svrakic DM, Przybeck TR et al. (1992) The relationship of personality to mood and anxiety states: a dimensional approach. *J Psychiatr Res*, 26: 197-211.
- Cloninger CR (1987) A systematic method for clinical description and classification of personality variants. *Arch Gen Psychiatry*, 44: 573-588.
- Cloninger CR, Przybeck TR, Svrakic DM (1991) The Tridimensional Personality Questionnaire: US normative data. *Psychol Rep*, 69: 1047-1057.
- Cloninger CR, Svrakic DM, Przybeck TR (1993) A psychobiological model of temperament and character. *Arch Gen Psychiatry*, 50: 975-990.
- Cloninger CR, Przybeck TR, Svrakic DM et al. (1994) The Temperament and Character Inventory (TCI): a guide to its development and use. St Louis, Missouri, USA: Center for Psychobiology of Personality.
- Cloninger CR (2000) A practical way to diagnose personality disorder: a proposal. *J Personality Disord*, 14: 99-108.
- Cloninger CR, Svrakic DM, Przybeck TR (2006) Can personality predict future depression? A twelve-month follow-up of 631 subjects. *J Affective Disord*, 92: 35-44.
- De la Rie SM, Duijsens IJ, Cloninger CR (1998) Temperament, character and personality disorders. *J Personality Disord*, 12: 362-372.
- Dworkin SF (1991) Illness behavior and dysfunction: review of concepts and application to chronic pain. *Can J Physiol Pharmacol*, 69: 662-671.

- Dworkin SF, LeResche L (1992) Research diagnostic criteria for temporomandibular disorders: review, criteria, examinations and specifications, critique. *J Craniomandib Disord*, 6: 301-355.
- Eversole LR, Stone CE, Matheson D et al. (1985) Psychometric profiles and facial pain. *Oral Surg Oral Med Oral Pathol*, 60: 269-274.
- Ferrando M, Andreu Y, Galdon MJ et al. (2004) Psychological variables and temporomandibular disorders: distress, coping, and personality. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*, 98: 153-160.
- Fricton JR (1999) Masticatory myofascial pain: an explanatory model integrating clinical, epidemiological and basic science research. *Bull Group Int Rech Sci Stomatol Odontol*, 41: 14-25.
- Gameiro GH, Andrade AS, Nouer DF et al. (2006) How may stressful experiences contribute to the development of temporomandibular disorder? *Clin Oral Investig*, 10: 261-268.
- Gatchel RJ, Garofalo JP, Ellis E et al. (1996) Major psychological disorders in acute and chronic TMD: an initial examination. *JADA*, 127: 1365-1374.
- Glaros AG, Lumley MA (2005) Alexithymia and pain in temporomandibular disorder. *J Psychosom Res*, 59: 85-88.
- Goldman RG, Skodol AE, McGrath PJ et al. (1994) Relationship between the Tridimensional Personality Questionnaire and DSM-III-R personality traits. *Am J Psychiatry*, 151: 274-276.
- Griffiths RH (1983) Report of the Presidents Conference on Examination, Diagnosis and Management of Temporomandibular Disorders. *JADA*, 106: 75-77.
- Grossi ML, Goldberg MB, Locker D et al. (2001) Reduced neuropsychologic measures as predictors of treatment outcome in patients with temporomandibular disorders. *J Orofac Pain*, 15: 329-339.
- Grzesiak RC (1991) Psychologic considerations in temporomandibular dysfunction. A biopsychosocial view of symptom formation. *Dent Clin North Am*, 35: 209-226.
- Hansenne M, Reggers J, Pinto E et al. (1999) Temperament and Character Inventory (TCI) and depression. *J Psychiatr Res*, 33: 31-36.
- Joffe RT, Bagby RM, Levitt AJ et al. (1993) The Tridimensional Personality Questionnaire in major depression. *Am J Psychiatry*, 150: 959-960.
- Jyllh  P, Isomets  P (2006) Temperament, character and symptoms of anxiety and depression in the general population. *Eur Psychiatry*, 21: 389-395.
- K se S, Sayar K, Ak I et al. (2004) Miza  ve Karakter Envanteri (T rk e TCI): Ge erlik, g venirli i ve fakt r yapısı. *Bull Clin Psychopharmacol*, 14: 107-131.
- Laskin DM (1969) Etiology of the pain-dysfunction syndrome. *JADA*, 79: 147-153.
- Madland G, Feinmann C, Newman S (2000) Factors associated with anxiety and depression in facial arthromyalgia. *Pain*, 84: 225-232.
- Malmgren-Olsson EB, Bergdahl J (2006) Temperament and character personality dimensions in patients with nonspecific musculoskeletal disorders. *Clin J Pain*, 22: 625-631.
- Meldelosi G, Picardi A, Accivile E et al. (2000) Personality and psychopathology in patients with temporomandibular joint pain-dysfunction syndrome. A controlled investigation. *Psychother Psychosom*, 69: 322-328.
- Mendlowicz MV, Jean-Louis G, Gillin JC et al. (2000) Sociodemographic predictors of temperament and character. *J Psychiatr Res*, 34: 221-226.
- Mercuri LG, Olson RE, Laskin DM (1979) The specificity of response to experimental stress in patients with myofascial pain dysfunction syndrome. *J Dent Res*, 58: 1866-1871.
- Michelotti A, Martina R, Russo M et al. (1998) Personality characteristics of temporomandibular disorder patients using M.M.P.I. *Cranio*, 16: 119-125.
- Miettunen J, Veijola J, Launonen E et al. (2007) Sex differences in Cloninger's temperament dimensions-a meta-analysis. *Compr Psychiatry*, 48: 161-169.
- Mulder RT, Joyce PR, Cloninger CR (1994) Temperament and early environment influence comorbidity and personality disorders in major depression. *Compr Psychiatry*, 35: 225-233.
- Mulder RT, Joyce PR, Sullivan PF et al. (1999) The relationship among three models of personality psychopathology: DSM-III-R personality disorder, TCI scores and DSQ defences. *Psychol Med*, 29: 943-951.
- Ohrbach R, McCall WD (1996) The stress-hyperactivity-pain theory of myogenic pain: proposal for a revised theory. *Pain Forum*, 5: 51-66.
- Pallegama RW, Ranasinghe AW, Weerasinghe VS et al. (2005) Anxiety and personality traits in patients with muscle related temporomandibular disorders. *J Oral Rehab*, 32: 701-707.
- Parker MW, Holmes EK, Terezhalmy GT (1993) Personality characteristics of patients with temporomandibular disorders: diagnostic and therapeutic implications. *J Orofac Pain*, 7: 337-344.
- Philips JM, Gatchel RJ, Wesley L et al. (2001) Clinical implications of sex in acute temporomandibular disorders. *JADA*, 132: 49-57.
- Pud D, Eisenberg E, Sprecher E et al. (2004) The tridimensional personality theory and pain: harm avoidance and reward dependence traits correlate with pain perception in healthy volunteers. *Eur J Pain*, 8: 31-38.
- Sanchez-Roman S, Tellez-Zenteno JF, Zermeno-Phols F (2007) Personality in patients with migraine evaluated with the "Temperament and Character Inventory". *J Headache Pain*, 8: 94-104.
- Southwell J, Deary IJ, Geissler P (1990) Personality and anxiety in temporomandibular joint syndrome patients. *J Oral Rehabil*, 17: 239-243.
- Suvinen TI, Reade PC (1995) Temporomandibular disorders: a critical review of the nature of pain and its assessment. *J Orofac Pain*, 9: 317-339.
- Suvinen TI, Reade PC, Kempainen P et al. (2005) Review of aetiological concepts of temporomandibular pain disorders: towards a biopsychosocial model for integration of physical disorder factors with psychological and psychosocial illness impact factors. *Eur J Pain*, 9: 613-633.
- Svrakic DM, Whitehead C, Przybeck TR et al. (1993) Differential diagnosis of personality disorders by the seven-factor model of temperament and character. *Arch Gen Psychiatry*, 50: 991-999.
- Svrakic DM, Draganic S, Hill K et al. (2002) Temperament character and personality disorders: etiology, diagnostic, treatment issues. *Acta Psychiatr Scand*, 106: 189-195.
- Tanaka E, Sakamoto S, Kijima N et al. (1998) Different personalities between depression and anxiety. *J Clin Psychol*, 54: 1043-1051.
- van der Laan GJ, Duinkerke AS, Luteijn F et al. (1988) Role of psychologic and social variables in TMJ pain dysfunction syndrome (PDS) symptoms. *Community Dent Oral Epidemiol*, 16: 274-277.
- Wright AR, Gatchel RJ, Wildenstein L et al. (2004) Biopsychosocial differences between high-risk and low-risk patients with acute TMB-related pain. *JADA*, 135: 474-483.
- Yap AU, Tan KB, Chua EK et al. (2002) Depression and somatization in patients with temporomandibular disorders. *J Prosthet Dent*, 88: 479-484.
- Yap AU, Tan KB, Chua EK et al. (2004) Relationships between depression/somatization and self-reports of pain and disability. *J Orofac Pain*, 18: 220-225.