

1-1-2013

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### Recommended Citation

FİDAN, FATMA; ÖZBULUT, ÖMER; AYÇİÇEK, APDULLAH; AŞIK, AHMET HAKKI; and ÜNLÜ, MEHMET (2013) "Effects of obstructive sleep apnea syndrome on temperament and character," *Turkish Journal of Medical Sciences*: Vol. 43: No. 1, Article 24. <https://doi.org/10.3906/sag-1206-65>  
Available at: <https://journals.tubitak.gov.tr/medical/vol43/iss1/24>

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## Effects of obstructive sleep apnea syndrome on temperament and character

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Received: 19.06.2012 • Accepted: 17.07.2012 • Published Online: 18.01.2013 • Printed: 18.02.2013

**Aim:** There are few studies that have evaluated personality characteristics in patients with obstructive sleep apnea syndrome (OSAS). We aimed to evaluate 2 groups, OSAS patients and controls, using a temperament and character inventory (TCI) questionnaire.

**Materials and methods:** Patients with OSAS symptoms and who underwent polysomnography in the sleep laboratory were included in the study. A TCI questionnaire was given to 52 patients. Those whose apnea-hypopnea index (AHI) was  $\geq 10$  were included as the OSAS group and those whose score was  $< 10$  were included as a control group.

**Results:** In the analysis of the TCI questionnaire of groups, NS4 (untidiness) from the seeking newness subgroup and HA4 (early fatigue and weakness) from the abstaining damage subgroup scores were significantly higher in the OSAS group than in the control group. In the correlation analysis between AHI and TCI parameters, there was a negative correlation between AHI and C1 (social approval) from the cooperation subgroup.

**Conclusion:** Newness search (NS) score from upper scales was significantly higher in OSAS patients than in the controls; differences in other TCI parameters were not significant. For a better understanding of how OSAS affects patients' temperament and character, we think that a wider group of patients and a re-evaluation with a TCI questionnaire after treatment are needed.

**Key words:** Obstructive sleep apnea syndrome, character, temperament

### 1. Introduction

Obstructive sleep apnea syndrome (OSAS) is a common disease that influences approximately 2%–4% of the adult population (1–3). OSAS is characterized by persistent and repetitive obstruction of the upper airways during sleep. While snoring is the most frequent night symptom of OSAS, excessive sleepiness is the most common daytime symptom (4,5). Patients with OSAS suffer fatigue, excess state of sleep, and depressive symptoms (6). Decreased interest secondary to daytime state of sleep, libido loss, decreased concentration, and cognitive disorders can be seen and all these symptoms reduce quality of life (7). Studies indicate that depression (8), hypochondriasis, conversive disorders, psychotic symptoms (9,10), and delirium are more common in OSAS patients. Personality changes such as aggressive behaviors, anxiety, or depression may be seen in patients with sleep-related breathing disorder (11,12).

There are many studies evaluating anxiety and depression scores in OSAS patients, while there is only one

study on personality characteristics using the Temperament and Character Inventory (TCI) (13). Therefore, in the current study, we aimed to investigate the effects of OSAS, which is a chronic disease, on temperament and character by evaluating 2 groups including subjects who had presented to a sleep laboratory and were diagnosed with OSAS based on polysomnography or as controls with a TCI survey.

### 2. Materials and methods

Subjects who presented to pulmonology and otorhinolaryngology departments in 2008, who had symptoms of OSAS, and who underwent polysomnography in a sleep laboratory were enrolled. The TCI was applied to 52 subjects who volunteered to participate in the study. Subjects with known systemic and psychiatric diseases were not enrolled. Patients with apnea hypopnea index (AHI)  $\geq 10$ , as indicated by polysomnography, were assigned to the OSAS group (n = 34) and subjects with

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AHI < 10 were assigned to the control group (n = 18). The height and weight of participants were measured and recorded. Body mass index (BMI) was calculated by dividing weight by height squared.

### 2.1. Polysomnography

One-night sleep recording was performed using a polysomnography device (Compumedics, Melbourne, Australia) in all patients. The following variables were monitored in polysomnography: 2-channel electroencephalogram according to the 10-20 system (C3-A2 and C4-A1), 2-channel electro-oculogram, bipolar submental and bilateral tibialis superficial electromyogram, movements of chest and abdominal walls, oxygen saturation with finger tip pulse oxymeter, body position, and snoring with a horizontally placed tracheal microphone. Sleep stages were scored in 30-s periods according to Rechtschaffen and Kales's standard criteria (14). All sleep studies were manually analyzed by the same physician using computer software. Apnea was defined as complete discontinuation of airway flow for at least 10 s. At least 50% reduction in respiratory amplitude in comparison with the baseline level together with minimum 3% reduction in oxygen saturation during sleep was regarded as hypopnea. The number of apnea and hypopnea episodes per hour was calculated as apnea hypopnea index (AHI). Patients with AHI  $\geq$  10 were assigned to the OSAS group, while subjects with AHI < 10 were assigned to the control group. Significant oxygen desaturation was determined as a minimum 4% reduction in oxygen saturation in comparison with the baseline level and number of significant desaturation events per hour was calculated as oxygen desaturation index (ODI) (13).

### 2.2. Temperament and Character Inventory (TCI)

The English version of TCI (Version 9, 240 items) was translated by Samet Köse into Turkish and back translation was performed by Kemal Sayar, who had never seen this scale ("blind translation"). The back-translated scale was compared with original scale by Samet Köse and items causing challenges in understanding were simplified. In order to ensure cultural validity of the TCI's Turkish version, items possibly difficult to understand in terms of cultural aspects were carefully examined and no item was found that was incompatible with the norms of Turkish society. The final version of the scale was approved by Cloninger in order to be used in a validity/reliability study by the authors (15). The scale is a self-assessment scale comprising 240 "Yes" or "No" items. The TCI comprises 7 high-order scales. Excluding persistence (P), all dimensions are divided into 3 to 5 subscales. For the dimension of temperament, novelty seeking (NS) is divided into 4 subscales, harm avoidance (HA) is divided into 4 subscales, and reward dependence (RD) is divided into 4 subscales; for dimension of character, self-directedness (SD) is divided into 5 subscales,

cooperativeness (C) is divided into 5 subscales, and self-transcendence (ST) is divided into 3 subscales. Scales comprise the sum of subscales. For example, total score of NS = NS1 + NS2 + NS3 + NS4. Temperament is composed of 12 low-order scales. NS (40 items) is composed of the NS1 (exploratory excitability, 11 items), NS2 (impulsiveness, 10 items), NS3 (extravagance, 9 items), and NS4 (disorderliness, 10 items) subscales. HA (35 items) is composed of the HA1 (anticipatory worry, 11 items), HA2 (fear of uncertainty, 7 items), HA3 (shyness, 8 items), and HA4 (fatigability, 9 items) subscales. RD (24 items) is composed of the RD1 (sentimentality, 10 items), RD3 (attachment, 8 items), and RD4 (dependence, 6 items) subscales. P (8 items) is the only temperament scale without a subscale. Character is composed of 13 low-order subscales. SD (44 items) is composed of the SD1 (responsibility, 8 items), SD2 (purposefulness, 8 items), SD3 (resourcefulness, 5 items), SD4 (self-acceptance, 11 items), and SD5 (enlightened second nature, 12 items) subscales. C (42 items) is composed of the C1 (social acceptance, 8 items), C2 (empathy, 7 items), C3 (helpfulness, 8 items), C4 (compassion, 10 items), and C5 (pure-hearted conscience, 9 items) subscales. ST (33 items) is composed of the ST1 (self-forgetfulness, 11 items), ST2 (transpersonal identification, 9 items), and ST3 (spiritual acceptance, 13 items) subscales. Several items are reverse scored when the TCI scale is examined. Items with wrong answers marked are given 1 point when those items are scored. Moreover, there are also items that are not scored even though they are included in the TCI (items 69, 75, 101, 111, 118, 134, 140, 170, 176, 190, 213, 230, 239, 240).

### 2.3. Statistical analysis

It was found that the groups were compatible with the normal distribution. A t-test was used for comparing demographics, polysomnographic findings, and TCI parameters of the groups. Results were expressed as mean  $\pm$  standard deviation. Pearson correlation analysis was performed between AHI and TCI parameters.  $P < 0.05$  was considered statistically significant.

## 3. Results

When the demographics of the groups were examined, no significant difference was found between the control and OSAS groups in terms of mean age or BMI. In the OSAS group, the proportion of males was significantly higher than that of females. When sleep stages were examined, duration of stage 1 was significantly longer and duration of stage 3-4 was significantly shorter in the OSAS group in comparison with the control group. No statistically significant difference was found between the groups in terms of duration of stage 2 or REM. Desaturation index was significantly higher in the OSAS group (Table 1).

A comparison of TCI parameters between the groups is given in Table 2. NS4 (disorderliness) and HA4

**Table 1.** Demographics and polysomnographic findings of the groups.

	Control (n = 18)	OSAS (n = 34)	P value
Age (Mean ± SD)	46.9 ± 8.5	50.1 ± 9.1	0.231
Sex (F/M) (%)	38.9 / 61.1	14.7 / 85.3	<b>0.049</b>
BMI (Mean ± SD)	30.7 ± 4.8	30.9 ± 4.9	0.818
AHI (Mean ± SD)	4.4 ± 2.6	38.3 ± 27.5	<b>0.000</b>
Stage 1 (%)	6.2 ± 4.6	11.6 ± 10.0	<b>0.010</b>
Stage 2 (%)	52.4 ± 10.1	58.7 ± 15.3	0.125
Stage 3–4 (%)	21.4 ± 9.3	11.8 ± 8.3	<b>0.000</b>
REM (%)	18.1 ± 8.0	17.3 ± 9.1	0.760
Desaturation index	8.8 ± 6.6	25.9 ± 25.1	<b>0.001</b>

**Table 2.** Comparison of TCI parameters between groups.

	Control (n = 18) Mean ± SD	OSAS (n = 34) Mean ± SD	P value
<b>Novelty seeking</b>	22.8 ± 5.6	24.6 ± 4.7	0.222
NS1 (Exploratory excitability)	5.6 ± 2.5	5.9 ± 2.2	0.620
NS2 (Impulsiveness)	5.8 ± 2.1	6.1 ± 1.7	0.558
NS3 (Extravagance)	5.3 ± 2.0	5.4 ± 2.0	0.852
NS4 (Disorderliness)	6.0 ± 1.4	7.1 ± 1.6	<b>0.019</b>
<b>Harm avoidance</b>	15.2 ± 5.4	17.1 ± 4.4	0.163
HA1 (Anticipatory worry)	4.4 ± 2.0	5.0 ± 2.1	0.355
HA2 (Fear of uncertainty)	2.6 ± 1.6	2.5 ± 1.1	0.832
HA3 (Shyness)	4.7 ± 1.7	4.8 ± 1.3	0.809
HA4 (Fatigability)	3.4 ± 1.6	4.8 ± 2.3	<b>0.024</b>
<b>Reward dependence</b>	10.6 ± 2.3	9.7 ± 2.6	0.212
RD1 (Sentimentality)	2.9 ± 1.5	2.6 ± 1.3	0.465
RD3 (Attachment)	3.5 ± 1.4	3.6 ± 1.7	0.901
RD4 (Dependence)	4.2 ± 0.9	3.5 ± 1.4	0.059
<b>Persistence</b>	2.7 ± 1.4	2.2 ± 1.7	0.279
<b>Self-directedness</b>	18.4 ± 5.2	15.4 ± 6.2	0.091
SD1 (Responsibility)	4.4 ± 1.9	3.4 ± 1.8	0.065
SD2 (Purposeful)	2.5 ± 1.4	2.2 ± 1.3	0.461
SD3 (Resourcefulness)	1.6 ± 1.2	1.3 ± 1.2	0.367
SD4 (Self-acceptance)	5.7 ± 2.7	4.9 ± 2.4	0.307
SD5 (Enlightened second nature)	4.2 ± 2.1	3.6 ± 2.0	0.338
<b>Cooperativeness</b>	14.1 ± 5.5	11.9 ± 4.5	0.124
C1 (Social acceptance)	2.8 ± 1.7	2.0 ± 1.4	0.070
C2 (Empathy)	3.1 ± 1.7	3.0 ± 1.4	0.899
C3 (Helpfulness)	3.1 ± 1.5	2.5 ± 1.2	0.126
C4 (Compassion)	2.8 ± 2.2	2.6 ± 2.3	0.773
C5 (Pure-hearted conscience)	2.4 ± 1.5	1.8 ± 1.4	0.175
<b>Self-transcendence</b>	12.6 ± 4.4	14.0 ± 5.7	0.368
ST1 (Self-forgetful)	4.1 ± 2.0	5.1 ± 2.5	0.143
ST2 (Transpersonal identification)	3.1 ± 2.3	3.0 ± 2.2	0.899
ST3 (Spiritual acceptance)	5.4 ± 2.1	5.9 ± 2.5	0.450

(fatigability) scores were significantly higher in the OSAS group than in the control group. No significant difference was found between the groups in other TCI parameters.

When correlations between AHI and TCI parameters were considered, a negative correlation was found between C1 (social acceptance) score and AHI (Table 3).

Mean TCI parameters of male subjects were examined in the control and OSAS groups in order to eliminate any influence of sex on TCI parameters. Since the number

of female subjects was low, a subgroup examination was not conducted only in female subjects. In male subjects, NS4 (disorderliness;  $5.8 \pm 1.5$  and  $7.2 \pm 1.4$ , respectively;  $P = 0.010$ ) and HA4 (fatigability;  $3.3 \pm 1.9$  and  $4.9 \pm 2.1$ , respectively;  $P = 0.030$ ) scores were significantly higher in the OSAS group than in the control group. RD3 (attachment) score was significantly lower in the OSAS group in comparison with the control group ( $4.4 \pm 0.8$  and  $3.5 \pm 1.3$ , respectively;  $P = 0.047$ ).

**Table 3.** Correlation between apnea-hypopnea index and TCI parameters.

	Correlation with AHI	
	r value	P value
<b>Novelty seeking</b>	0.168	0.234
NS1 (Exploratory excitability)	0.170	0.229
NS2 (Impulsiveness)	-0.035	0.806
NS3 (Extravagance)	0.113	0.427
NS4 (Disorderliness)	0.197	0.161
<b>Harm avoidance</b>	0.169	0.231
HA1 (Anticipatory worry)	0.166	0.241
HA2 (Fear of uncertainty)	0.062	0.663
HA3 (Shyness)	0.085	0.548
HA4 (Fatigability)	0.129	0.363
<b>Reward dependence</b>	-0.099	0.487
RD1 (Sentimentality)	-0.093	0.513
RD3 (Attachment)	0.018	0.897
RD4 (Dependence)	-0.120	0.396
<b>Persistence</b>	-0.010	0.945
<b>Self-directedness</b>	-0.246	0.078
SD1 (Responsibility)	-0.142	0.317
SD2 (Purposeful)	-0.130	0.357
SD3 (Resourcefulness)	-0.177	0.211
SD4 (Self-acceptance)	-0.234	0.095
SD5 (Enlightened second nature)	-0.113	0.424
<b>Cooperativeness</b>	-0.137	0.333
C1 (Social acceptance)	-0.399	<b>0.003</b>
C2 (Empathy)	0.152	0.281
C3 (Helpfulness)	-0.101	0.474
C4 (Compassion)	-0.060	0.673
C5 (Pure-hearted conscience)	-0.024	0.863
<b>Self-transcendence</b>	0.192	0.172
ST1 (Self-forgetful)	0.174	0.218
ST2 (Transpersonal identification)	0.175	0.214
ST3 (Spiritual acceptance)	0.090	0.525

#### 4. Discussion

OSAS is a chronic and common disease that is related to a serious decline in quality of life. To the best of our knowledge, only one study has examined personality characteristics in OSAS patients with a TCI survey (13). In the present study, subjects with  $AHI \geq 10$  (OSAS group) and subjects with  $AHI < 10$  (subjects with simple snoring) were compared and it was reported that among high-order scales examined by TCI survey, NS score was significantly higher in OSAS patients. No statistically significant difference was found between the groups in terms of P, HA, RD, SD, C, or ST scores, all among high-order scales. However, low-order scales were not evaluated in the current study. NS4 (disorderliness) and HA4 (fatigability) scores were significantly higher in the OSAS group than in the control group in the current study. Moreover, there was a negative correlation between C1 (social acceptance) score and AHI. It was considered that those findings could be dependent on the fact that duration of deep sleep shortens in OSAS patients, sleep quality is poor, and hypoxemia occurs due to nocturnal desaturations.

In addition to excess daytime state of sleep, fatigue and depressive symptoms are common in patients with OSAS. There are limited studies evaluating the contribution of severity of the disease and depressive symptoms on fatigue in OSAS patients (16,17). A further study should be conducted on a large patient sample using psychiatric diagnosis criteria in order to clarify this issue.

Different results can be obtained for male and female subjects with the TCI. It was demonstrated that, in comparison with male subjects, female subjects get

significantly higher scores in the higher NS, HA, and RD subscales of the temperament dimension and in the C subscale of the character dimension (15). Therefore, only male subjects were examined in our study in order to eliminate the effects of sex on TCI parameters. NS4 (disorderliness) and HA4 (fatigability) scores were significantly higher and RD3 (attachment) scores were significantly lower in male subjects of the OSAS group than in the control group. Since the number of female subjects was low, female subjects were not enrolled in the examination.

The limitations of our study were as follows: the number of patients was low and the control group comprised subjects with OSAS symptoms but  $AHI < 10$  as indicated by polysomnography rather than healthy subjects without any complaint. However, we considered that it would be difficult and ethically controversial to get asymptomatic subjects to agree to undergo the polysomnography test. We think that an examination should be conducted on a larger patient population and subjects re-examined with a TCI survey after the treatment is completed in order to better understand how OSAS affects patients' temperament and character.

We think that for patients who present to the outpatient clinic of psychiatry departments with complaints of disorderliness, fatigability, and social nonacceptance but who have no or mild symptoms of depression, an evaluation should be conducted with regard to OSAS. It is beneficial to examine those patients in terms of symptoms of OSAS and to refer patients with positive symptoms to a sleep laboratory for further examination.

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