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ARAŞTIRMA / RESEARCH

Psychological profile of patients with obstructive sleep apnea

Obstrüktif uyku apneli hastaların psikolojik profili

Fatma Özlem Orhan[1], Nursel Dikmen[2], Saime Sağıroğlu[3], Adem Doğaner[4], Seyfettin Çakmak[1]

[1]Kahramanmaraş Sütçüimam University Faculty of Medicine, Department of Psychiatry, [3]Department of Otorhinolaryngology, [4]Department of Biostatistics and Medical Informatics, Kahramanmaras, Turkey.
[2]Mustafa Kemal University Faculty of Medicine, Department of Chest Disease, Antakya, Turkey.

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Abstract

Purpose: We aimed to compare the psychological profile and personality characteristics of mild-to-severe obstructive sleep apnea (OSA) groups and snorers. The other purpose of our study to assess the correlation of psychological profile and personality characteristics with sleep parameters.

Materials and Methods: Patients with OSA symptoms were assessed using the Eysenck Personality Questionnaire-Revised Abbreviated form (EPQR-A), Type D personality scale, and the Hospital Anxiety and Depression Scale (HADS). In addition to PSG, the Pittsburgh Sleep Quality Index (PSQI) and the Epworth Sleepiness Scale were used for sleep parameters.

Results: In the analysis of the EPQR-A of groups, neuroticism scores were significantly higher for the moderate OSA group than the snorer group, and the other EPQR-A parameters did not differ between the four groups. In the correlation analysis of the EPQR-A and PSQI parameters, there was a positive correlation between the neuroticism scale and PSQI scores.

Conclusion: This study showed that the "neurotic" personality trait was higher in patients with moderate OSA. We also demonstrated a positive correlation between subjective sleep quality, sleep latency, sleep disturbances, PSQI global scores, and neuroticism.

Key words: obstructive sleep apnea, personality, sleep quality

Öz

Amaç: Hafif-şiddetli obstrüktif uyku apne (OUA) gruplarının ve horlayanların psikolojik profili ve kişilik özelliklerini karşılaştırmayı amaçladık. Çalışmamızın diğer amacı, psikolojik profil ve kişilik özellikleri ile uyku parametreleri arasındaki ilişkiyi değerlendirmektir.

Gereç ve Yöntem: OUA semptomları olan hastalar, Eysenck Kişilik Anketi-Gözden Geçirilmiş Kısaltılmış Formu (EKA-GGK), Tip D kişilik ölçeği ve Hastane Anksiyete ve Depresyon Ölçeği (HADS) kullanılarak değerlendirildi. Uyku parametreleri için PSG'ye ek olarak Pittsburgh Uyku Kalitesi İndeksi (PUKİ) ve Epworth Uykuluk Ölçeği kullanıldı.

Bulgular: Grupların EKA-GGK analizlerinde, nevrotiklik skorları orta düzeyde OUA grubunda horlayan gruba göre anlamlı derecede yüksekti ve diğer EKA-GGK parametreleri dört grup arasında farklı değildi. EKA-GGK ve PUKİ parametrelerinin korelasyon analizinde, nevrotiklik ölçeği ile PUKİ skorları arasında pozitif bir korelasyon vardı.

Sonuç: Bu çalışma orta düzeyde OUA'lı hastalarda "nevrotik" kişilik özelliklerinin daha yüksek olduğunu ortaya koymuştur. Ayrıca, öznel uyku kalitesi, uyku latansı, uyku bozuklukları, PUKİ genel puanları ve nevrotiklik arasında pozitif bir korelasyon olduğunu gösterdik.

Anahtar kelimeler: obstrüktif uyku apnesi, kişilik, uyku kalitesi,

INTRODUCTION

Obstructive sleep apnea (OSA) is a highly widespread sleep-related breathing disorder in adults. OSA is characterized by persistent and repetitive obstruction of the upper airways during sleep. In terms of severity, OSA is categorized into mild, moderate, and severe groups. The apnea/hypopnea index (AHI) describes the severity of OSA according to standard criteria as follows: mild as an AHI between 5 and 15 events/h, moderate as an AHI between 15 and 30 events/h, and severe as an AHI superior a 30 events/h[1].

Yazışma Adresi/Address for Correspondence: Dr. Fatma Özlem Orhan, Kahramanmaras Sutcuimam University Faculty of Medicine, Department of Psychiatry, Kahramanmaras, Turkey e-mail: fozlemorhan@yahoo.com
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The disturbance of sleep quality and continuity that is associated with many sleep disorders predisposes individuals to the development or exacerbation of psychological distress and mental illness[2]. Moreover, sleep apnea can lead to serious health consequences, including marked psychological distress[3]. Long-term sleep deprivation is known to affect mood[4], and several studies[5] have found depressive symptoms to be prevalent in patients with OSA. Among the adverse consequences, an association between OSA and mood disturbances and anxiety disorders has been shown in a large body of epidemiological studies[6–9]. The prevalence of depression ranges from 7%[10] to 63% in the OSA population[11]. The prevalence of anxiety ranges from 11% to 70%[12] in OSA patients[13], whereas the relationship between anxiety and OSA is unclear[12]. For example, the severity of OSA was not found in previous investigations to be related to accompanying anxiety[12,14,15]. Previous studies on the relationship between Minnesota Multiphasic Personality Inventory (MMPI) profiles and OSA have reported a large variety of psychiatric symptoms, personality features, and psychological difficulties in subjects diagnosed with OSA[16].

Only a few studies have evaluated psychological profile and personality characteristics in patients with OSA; however, no research has been conducted on this topic in the OSA groups. These parameters may differ for mild-to-severe OSA groups and snorers. Thus, we compared these groups' psychological profiles and personality characteristics. Additionally, we examined the correlation between psychological profile and personality characteristics with sleep parameters.

MATERIALS AND METHODS

Sleep data were selected from patients referred to the Necip Fazıl State Hospital sleep laboratory over the period of March 2016 to November 2016 for probable OSA. A structured interview was conducted prior to the polysomnography, and data relevant to this investigation were medication (with attention to psychoactive drugs), substance abuse, alcohol intake, a history of neurological disorders, head injuries, and psychiatric diseases. Exclusion criteria included a known diagnosis of diabetes mellitus on medications, acromegaly, chronic renal failure, systemic steroid treatment, and hormonal replacement therapy. The inclusion criteria for patients were as follows: aged above 18 years, undertook an overnight PSG for suspected OSA, and diagnosed with OSA [AHI ≥ 5/h]. An AHI of 5–15 is considered mild, 16–30 moderate, and >30 severe OSA[17]. A snorers diagnosis was based on demonstration of an AHI between 1.0 and 4.9 while undergoing PSG for suspected OSA. None of the patients had previously used nasal CPAP/BPAP for the treatment of OSA.

We did not exclude patients whose HADS scores were over the threshold of depression or anxiety disorder if they had not been previously diagnosed with a psychiatric disorder or were taking medication for the treatment of their condition. This study was approved by the ethics committee of Kahramanmaras Sutcu Imam University, Faculty of Medicine. Furthermore, all eligible patients were informed both verbally and in writing; informed consent was obtained from all participants prior to inclusion.

Psychiatric measurements

All tests used in the evaluation of snoring subjects and OSA patients were carried out in a sleep laboratory. On the night of the PSG, patients completed a battery of questionnaires. The following instruments were used:

Sociodemographic data form

This form was developed by researchers to obtain data related to demographic and organizational characteristics of the sample, including age, gender, marital status, and occupation.

Pittsburgh Sleep Quality Index (PSQI)

Sleep quality was measured using the PSQI. This 19-item questionnaire includes seven component scores, including (1) subjective sleep quality, (2) sleep onset latency, (3) sleep duration, (4) habitual sleep efficiency, (5) sleep disturbance, (6) the use of sleep medications, and (7) daytime functioning. The PSQI refers to the majority of days and nights over the previous month. The seven component scores are summed to provide a global score that ranges from 0 to 21, with higher scores indicating worse quality sleep. A global PSQI score >5 indicates a significant level of sleep disturbance [18]. This questionnaire's significance is that it provides a reliable, valid, and standardized measure of sleep quality and is able to distinguish between "good" and "poor" sleepers. The PSQI has good internal consistency (α=0.83) and test–retest reliability (r=

0.85)[19]. Agargün et al. tested the PSQI's validity and reliability for Turkey (Cronbach's alpha=0.80)[20].

Epworth Sleepiness Scale (ESS)

The ESS is a simple method for measuring the general level of daytime sleepiness or sleep propensity in adults[21,22]. The ESS is a brief, self-administered questionnaire that asks the subject to rate on a four-point scale (0–3) his or her chances of dozing in each of eight specific situations that are commonly met in daily life (0=would never doze; 3=high chance of dozing). The ESS score is the sum of the eight item-scores and can range from 0 to 24. It provides a measurement of the subject's average sleep propensity in daily life.

Eysenck Personality Questionnaire-Revised Abbreviated Form (EPQR-A)

The EPQR-A includes 24 items in four personality traits: The "neuroticism/stability" trait was used to assess the stability of emotion; the "extraversion/introversion" trait was used to assess the tendency of extraversion and introversion; "psychoticism/socialization" was used to assess the subjects' psychiatric characteristics, and "lie" was used as the validity scale[23]. Similar to the original scale, factor analysis of the Turkish version yielded 4 factors; the neuroticism, extraversion, psychoticism, and lie traits. The reliability and validity of the questionnaire were supported in a Turkish university student sample[24].

Type D Personality Scale (DS-14)

The DS-14, developed by Denollet et al. (2006), aims to determine the characteristics of type D personality in individuals[25]. The reliability and validity of the scale in Turkey has been established by Alcelik et al. (2012)[26]. It is a 5-grade Likert-type scale (0-4 points) ranging from "false" to "true" and consists of a total of 14 items. The scale has two sub-dimensions of negative emotions and social suppression scored by the first and last 7 items, respectively with a total score of 0 to 28 for each subdimension. A score of 10 or over on each sub-dimension indicates the presence of type D personality traits[26].

Hospital Anxiety and Depression Scale (HADS)

The HADS is a self-reported questionnaire for hospital outpatients in medical or surgical departments used to assess anxiety and depression as two dimensions. The scores for each subscale range from zero to 21: the higher the score, the worse the status with respect to that particular category. The validation and reliability studies of the HADS developed by Zigmond and Snaith (1983)[27], were carried out by Aydemir et al.[28]. The HADS has been prepared to screen for anxiety and depression in patients with physical disease and contains anxiety and depression subscales. The cut-off points in the Turkish version of the scale are 10 for the anxiety subscale and 7 for the depression subscale.

Polysomnography

Participants were evaluated overnight at the sleep disorders unit using a PSG. Respironics Alice 5 (55 channel polysomnography, Sleepware G3 (USA)) PSG was used for the test. Measurements performed during PSG testing were 4 channel electroencephalograpy (EEG) (C3-A2, C4-A1, O1-A2, 02-A1), 2 channel electrooculogram (EOG), electrocardiogram (ECG), electromyogram (EMG) monitoring (submental and tibialis anterior muscle), oronasal airflow, thoracoabdominal movements, recording of snoring, body position, and oxygen saturation with a fingertip pulse oximeter. Sleep scoring was conducted according to the criteria of Rechtschaffen and Kales[29]. OSA was diagnosed based on the International Classification of Sleep Disorders (ICSD-3) classification, defined as presence of one or more of the criteria including snoring, witnessed apnea or daytime sleepiness, and a >5 AHI score identified on PSG[30].

Statistical analysis

The normal distribution of the variables was evaluated by the Shapiro-Wilk test in the statistical evaluation of the data. One-way ANOVA was applied to the group comparisons of normal distribution variables; Tukey's test and the Tamhane T2 test were applied to post-hoc tests. Correlations of variables were examined by the Pearson correlation test. The exact test was used when categorical variables were examined. Data were summarized by mean ± SEM parameters. Statistical significance was accepted as $p < 0.05$. The SPSS version 22 (IBM SPSS for Windows version 22) package program was used to evaluate the data.

RESULTS

The sociodemographic characteristics of patient groups are listed in Table 1. Of the original sample

of 211, 174 had OSA; 55 (26.1%) had mild OSA, 32 (15.2%) moderate OSA, 87 (41.2%) and severe OSA, while 37 (17.5%) were snorers. The four groups revealed no significant difference in gender, marital status, occupation, smoking status, and maras powder usage, but there was a difference in the education and socioeconomic status.

The clinical, anthropometric and nocturnal sleep, and respiratory findings of the patient groups are listed in Table 2. Among the parameters, the results showed significant differences in all the measures, except for PSG stage 2. There were statistically significant differences between the clinical, anthropometric, and nocturnal respiratory findings of the OSA and snorer groups (Table 2).

Table 3 showed the between-groups comparison of sleep and psychological parameters (Figure 1, 2, 3, 4). There was no difference between the PSQI global scores of the four groups. But when the components of PSQI were analyzed, statistically significant differences were found; the subjective sleep quality scores of the severe OSA group were significantly different from the snorer group, sleep disturbances of the moderate and severe OSA groups were different from the snorer group, and the daytime disfunction of the moderate OSA group was significantly different from the snorer group and the mild OSA group. In the analysis of the EPQR-A of groups, neuroticism scores were found significantly higher in the moderate OSA group than in the snorer group, but there was no difference between the OSA groups. The DS-14 of the four groups did not differ. The difference between the HADS depression scores of the severe OSA group and the snorer group was statistically significant. In addition, the HADS anxiety scores of the moderate OSA group was significantly different from the mild and severe OSA groups.

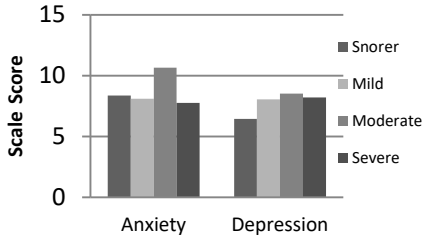

Figure1. Comparison of the HAD score of the groups.

In the correlation analysis of the EPQR-A and PSQI parameters, there was a positive correlation between subjective sleep quality, sleep latency, sleep disturbances, the PSQI global score, and the neuroticism scale of the EPQR-A. Additionally, there was a positive correlation between sleep latency and the ESS and EPQR-A lie scores. HADS depression, HADS anxiety, and DS-14 had positive corelations with EPQR-A neuroticism scores.

There was also a positive correlation between PSG stage 1 and EPQR-A neuroticism scores. However, we could not identify any correlation between the other PSG parameters and EPQR-A scores (Table 4). There was a positive correlation between the PSQI global score and HADS anxiety, HADS depression, EPQR-A-neuroticism subscale, DS-NA, and DS-SI (Table 5). We did not find a correlation between the PSG parameters (except stages 1 and 2) and HADS anxiety, HADS depression, DS-NA, and DS-SI scales (Table 6).

Table 1. The sociodemographic characteristics of OSAS and snorer groups

		Snorer (n:37)		**Mild (n:55)**		**Moderate (n:32)**		**Severe (n:87)**		
		n	%	n	%	n	%	n	%	p
Gender	Female	20	25.3	18	22.8	11	13.9	30	38.0	0.166
	Male	17	13.1	36	27.7	21	16.2	56	43.1	
Marital status	married	30	16.0	49	26.2	29	15.5	79	42.2	0.741
	single	5	33.3	4	26.7	2	13.3	4	26.7	
	Divorced or widowed	2	22.2	2	22.2	1	11.1	4	44.4	
Occupation	White collar worker	3	13.6	7	31.8	3	13.6	9	40.9	0.225
	laborer	4	7.4	16	29.6	11	20.4	23	42.6	
	housewife	19	30.2	11	17.5	6	9.5	27	42.9	
	unemployed	2	33.3	1	16.7	1	16.7	2	33.3	

	retired	2	6.5	10	32.3	5	16.1	14	45.2	
	Self-employed	6	18.8	8	25.0	6	18.8	12	37.5	
	student	1	33.3	2	66.7	0	0.0	0	0.0	
Shift	yes	0	0.0	5	21.7	6	26.1	12	52.2	0.039
	no	37	19.8	50	26.7	25	13.4	75	40.1	*
Education	illiterate	1	4.3	3	13.0	6	26.1	13	56.5	0.041
	Read and write	0	0.0	1	16.7	1	16.7	4	66.7	*
	Primary school	12	16.4	15	20.5	13	17.8	33	45.2	
	Secondary school	6	24.0	3	12.0	3	12.0	13	52.0	
	Highschool	11	24.4	16	35.6	5	11.1	13	28.9	
	university	7	17.9	17	43.6	4	10.3	11	28.2	
Residence	village	2	7.1	4	14.3	8	28.6	14	50.0	0.171
	town	6	14.3	12	28.6	6	14.3	18	42.9	
	city	29	20.6	39	27.7	18	12.8	55	39.0	
Socioeconomic status	low	4	9.1	7	15.9	9	20.5	24	54.5	0.009
	medium	30	18.4	47	28.8	23	14.1	63	38.7	*
	high	3	75.0	1	25.0	0	0.0	0	0.0	
Smoking status	yes	9	18.8	11	22.9	10	20.8	18	37.5	0.784
	no	28	17.3	44	27.2	22	13.6	68	42.0	
Maras powder	yes	1	7.1	1	7.1	4	28.6	8	57.1	0.128
	no	36	18.3	54	27.4	28	14.2	79	40.1	

Exact test; α:0.05; * Difference of group distributions is statistically significant

Table 2. The clinical. anthropometric and nocturnal respiratory findings of OSAS and snorer groups

	Snorer (n:37)	**Mild OSAS (n:55)**	**Moderate OSAS (n:32)**	**Severe OSAS (n:87)**	
	Mean±SEM	Mean±SEM	Mean±SEM	Mean±SEM	p
Age	42.84±1.52[d]	45.24±1.54	45.81±2.23	48.66±1.20[a]	0.048*
BMI	27.33±0.54[d]	30.56±0.61[d]	31.06±0.94[d]	34.59±0.87[a.b.c]	p<0.001*
Waist circumference	104.43±1.69[d]	111.45±1.80	109.66±2.47[d]	116.47±1.83[a.c]	p<0.001*
Neck circumference	39.49±0.44[c.d]	41.15±0.43	41.56±0.63[a]	42.44±0.35[a]	p<0.001*
ESS	1.65±0.30[b.c.d]	3.89±0.39[a.c.d]	6.91±0.49[a.b.d]	12.86±0.44[b.c.d]	p<0.001*
AHI	2.56±0.25[c.d]	10.11±0.41[c.d]	21.73±0.76[a.b.d]	61.05±3.02[b.c.d]	p<0.001*
Stage 1	18.45±2.49[d]	21.62±1.62[d]	25.11±2.08	28.13±1.42[a.b]	0.001*
Stage 2	56.72±2.14	54.54±1.59	52.89±1.98	55.29±1.48	0.648
Stage 3	14.63±1.77[d]	14.81±1.39[d]	14.45±1.60	9.57±0.98[a.b]	0.003*
REM	10.66±1.04[d]	9.15±1.02	7.88±1.35	6.40±0.71[a]	0.011*
Sleep efficiency	80.25±1.82	84.01±1.34[d]	83.11±2.02[d]	75.67±1.59[b.c]	0.001*
Total sleep time	304.16±12.01	332.74±6.85[d]	332.57±12.01[d]	294.77±7.71[b.c]	0.003*
DSI	1.27±0.23[d]	6.07±0.42[d]	13.61±0.96[d]	52.45±7.34[a.b.c]	p<0.001*
Minimum oxygen saturation	89.81±0.77[c.d]	86.67±0.52[d]	81.91±1.17[a.d]	71.64±1.71[a.b.c]	p<0.001*
Mean oxygen saturation	95.59±0.21[d.]	94.35±0.21[d]	93.81±0.31[d]	90.89±0.53[a.b.c]	p<0.001*

One-Way Anova; Post-Hoc: Tukey Test. Tamhane T2 Test;α:0.05;
*Difference is statistically significant
[a] Difference with snorer group is statistically significant
[b] Difference with mild group is statistically significant
[c] Difference with moderate group is statistically significant
[d] Difference with severe group is statistically significant

Table 3. Comparison of sleep and psychological parameters between groups

	Snorer (n:37)	**Mild OSA (n:55)**	**Moderate OSA (n:32)**	**Severe OSA (n:87)**	
	Mean±SEM	Mean±SEM	Mean±SEM	Mean±SEM	p
HADS-Anxiety	8.36±.68	8.11±.59[c]	10.65±.80[b,d]	7.76±.42[c]	0.010*
HADS-Depression	6.44±.50[d]	8.04±.50	8.53±.60	8.22±.41	0.048*
Subjective sleep quality	1.47±.14[d]	1.77±.12	1.65±.17	1.93±.08	0.043*
Sleep latency	1.97±.24	2.43±.24	2.15±.30	2.09±.17	0.536
Sleep duration	1.00±.17	1.24±.17	1.32±.24	1.15±.13	0.703
Habitual sleep efficiency	1.00±.19	1.06±.16	.88±.22	.97±.13	0.930
Sleep disturbances	1.58±.13[c,d]	1.90±.10	2.00±.12[a]	2.10±.06[a]	0.002*
Use of sleeping medication	.42±.15	.20±.09	.32±.15	.30±.08	0.621
Daytime disfunction	2.08±.33[c]	1.98±.25[c]	3.37±.37[a,b]	2.66±.22	0.010*
PSQI global score	9.03±.84	10.60±.73	10.57±1.12	11.27±.52	0.189
EPQR-A Neuroticism	2.65±.34[c]	3.40±.30	4.44±.36[a]	3.36±.22	0.011*
EPQR-A Extroversion-introversion	3.4±.33	3.44±.29	3.70±.34	3.10±.21	0.480
EPQR-A psychoticism	1.31±.21	1.10±.14	1.18±.19	1.15±.11	0.815
EPQR-A lie	4.69±.25	4.94±.19	4.85±.27	5.21±.11	0.167
DS-NA	10.69±1.25	10.98±.92	14.59±1.39	11.60±.82	0.125
DS-SI	9.91±1.13	9.79±.70	9.28±1.14	10.46±.59	0.777
DS-14 total	20.91±11.96	20.84±10.77	24.46±11.38	21.90±11.35	0.536

One-Way Anova; Post-Hoc Tukey Test;α:0.05;
[a] Difference with snorer group is statistically significant
[b] Difference with mild group is statistically significant
[c] Difference with moderate group is statistically significant
[d] Difference with severe group is statistically significant

Table 4 Correlation of the Eysenck Subscales with the PSG. sleep and psychological parameters

	EPQR-A neuroticism		**EPQR-A extroversion-introversion**		**EPQR-A psychoticism**		**EPQR-A lie**	
	r	p	r	p	r	p	r	p
Subjective sleep quality	0.240	0.001*	-0.015	0.838	0.046	0.526	0.001	0.988
Sleep latency	0.272	0.001*	-0.045	0.549	-0.004	0.961	-0.166	0.026*
Sleep duration	0.024	0.743	0.033	0.660	-0.100	0.175	0.060	0.418
Habitual sleep efficiency	0.083	0.272	0.036	0.629	-0.013	0.860	0.024	0.750
Sleep disturbances	0.347	0.001*	-0.046	0.530	-0.004	0.955	0.041	0.578
Use of sleeping medication	0.032	0.665	-0.064	0.372	0.122	0.090	0.009	0.900
Daytime disfunction	0.293	0.001*	0.011	0.879	0.111	0.122	-0.107	0.137
PSQI global score	0.293	0.001*	-0.053	0.491	0.064	0.403	-0.078	0.310
ESS	0.108	0.130	-0.056	0.430	-0.012	0.870	0.160	0.024*
AHI	0.049	0.500	-0.015	0.836	0.063	0.377	0.103	0.147
Stage 1	0.160	0.025*	-0.071	0.322	-0.115	0.106	-0.065	0.362
Stage 2	-0.140	0.051	0.077	0.281	0.087	0.221	0.095	0.182
Stage 3	0.017	0.809	-0.040	0.574	0.038	0.590	-0.036	0.611
REM	-0.046	0.525	0.017	0.816	0.014	0.847	-0.016	0.818
Sleep efficiency	-0.036	0.620	0.030	0.673	0.136	0.056	-0.096	0.179
Total sleep time	-0.033	0.646	-0.047	0.514	0.124	0.081	0.005	0.949
DSI	-0.007	0.926	-0.080	0.263	-0.027	0.706	0.094	0.188
HAD-anxiety	0.586	0.001*	0.116	0.106	0.141	0.047	-0.048	0.498
HAD-depression	0.329	0.001*	-0.132	0.065	0.062	0.386	0.065	0.366
DS-NA	0.737	0.001*	-0.063	0.381	0.066	0.358	-0.128	0.073
DS-SI	0.272	0.001*	-0.471	0.001*	0.105	0.147	-0.099	0.171

Pearson Correlation test; α:0.05; *Correlation is statistically significant. PSS: DS:

Table 5. Correlation of the PSQI global scores with the psychological parameters

	PSQI global score	
	r	p
HADS-Anxiety	0.384	p<0.001*
HADS-Depression	0.239	0.002*
EPQR-A Neuroticism	0.293	p<0.001*
EPQR-A Extroversion-introversion	-0.053	0.491
EPQR-A psychoticism	0.064	0.403
EPQR-A lie	-0.078	0.310
DS-NA	0.415	p<0.001*
DS-SI	0.285	p<0.001*

Pearson Correlation test; α:0.05; *Correlation is statistically significant

Table 6. Correlation of the psychological tests and PSG parameters

	HAD-Anxiety		HAD-Depression		DS-NA		DS-SI	
	r	p	r	p	r	p	r	p
ESS	-0.001	0.987	0.188	0.007	0.110	0.122	0.108	0.132
AHİ	-0.050	0.481	0.104	0.140	0.037	0.607	0.079	0.271
Stage 1	-0.026	0.716	0.172	0.014*	0.221	0.002*	0.220	0.002*
Stage 2	-0.007	0.923	-0.065	0.356	-0.193	0.006*	-0.164	0.021*
Stage 3	0.075	0.287	-0.056	0.429	0.026	0.719	0.013	0.858
REM	-0.006	0.933	-0.085	0.226	-0.073	0.307	-0.108	0.133
Sleep efficiency	0.053	0.448	0.011	0.877	-0.100	0.161	-0.105	0.142
Total sleep time	-0.004	0.956	-0.020	0.772	-0.078	0.272	-0.029	0.688
DSİ	-0.073	0.301	0.012	0.869	0.024	0.738	0.113	0.113
Minimum oxygen saturation	0.063	0.368	-0.098	0.165	-0.037	0.603	-0.039	0.590
Mean oxygen saturation	0.037	0.596	-0.095	0.179	-0.038	0.590	-0.007	0.919

Pearson Correlation test; α:0.05; *Correlation is statistically significant

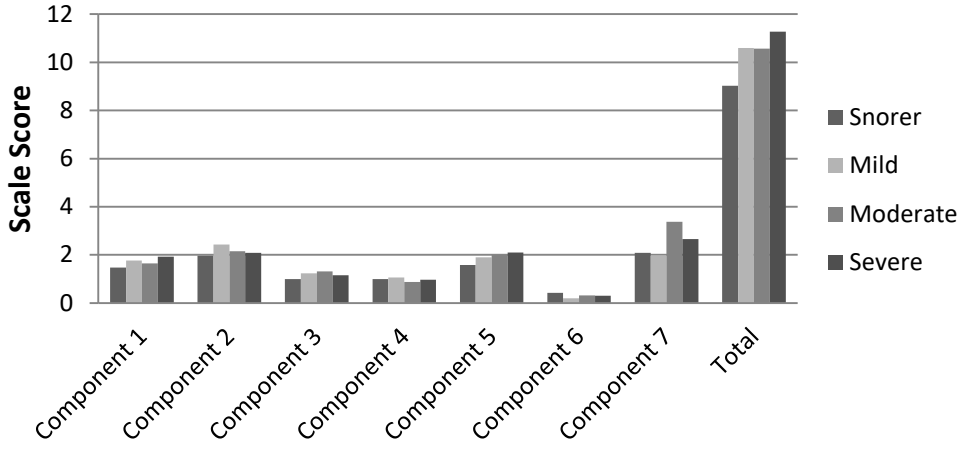

Figure 2. Comparison of the PSQI scores of the groups.

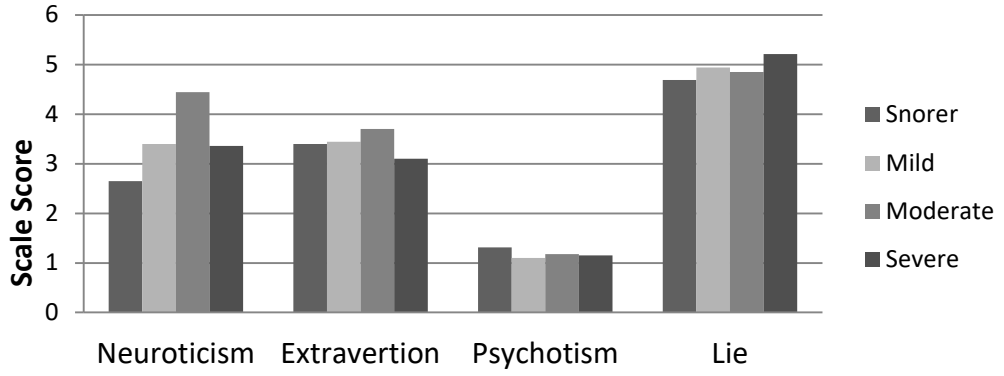

Figure 3. Comparison of the Eysenck scores of the groups.

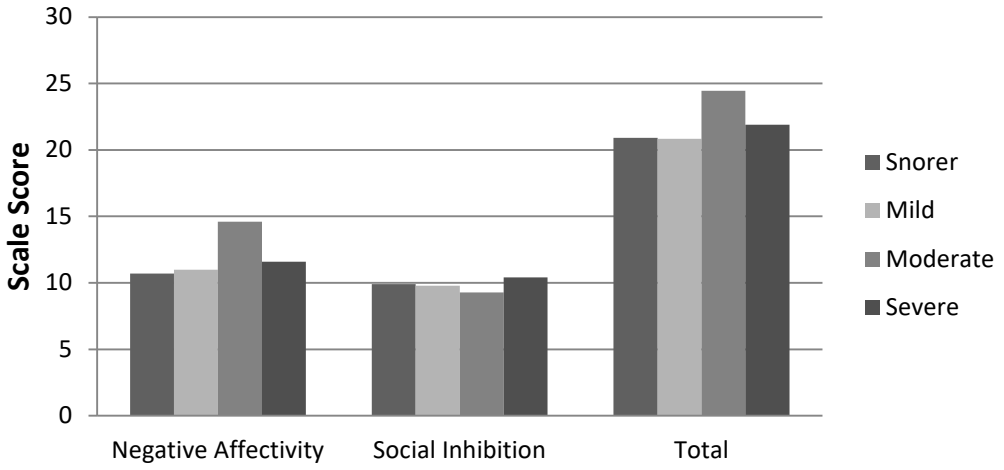

Figure 4. Comparison of the DS-14 scores of the groups .

DISCUSSION

To compare the personality characteristics and psychological symptomatology of the mild-to-severe OSA groups with those of the snorer group, we analyzed PSG parameters, sleep quality, and the HADS, EPQR-A, and HDS-14 scores. Moderate OSA patients had higher neuroticism scores than the snorer group, which is the most important sole predictor of common psychiatric conditions. Neuroticism or emotionality is characterized by high levels of negative affect, such as depression and anxiety. According to Eysenck's theory, neurotic people—who have low activation thresholds, are unable to inhibit or control their emotional reactions, and experience negative affect (fight-or-flight) in the face of very minor —are easily nervous or upset[31]. Moreover, it also plays an important role in patients with other diagnoses that have a strong association with psychological distresses, such as low subjective well-being and physical health problems[32]. The personality patterns of sleep apnea patients were consistently those of a somatic-neurotic type, similar to typical patterns for medical outpatients. The high level of psychologic distress demonstrated was clearly a consequence rather than a cause of the disorder[33]. Different from our study, Pierobon et al. had reported that as for the personality characteristics, patients reported with higher frequency a tendency toward extroversion[34].

This trait is commonly associated with sociability, liveliness, activeness, assertiveness, hypersensitivity, and dominance[35]. Therefore, they hypothesize that obese OSA patients emphasize sociability and some interpersonal characteristics to facilitate societal acceptance and minimize behavioral limitations[34].

Previous studies on the relationship between MMPI profiles and OSA have exhibited a large variety of psychiatric symptoms, personality features, and psychological difficulties. In the study by Aikens and Mendelson (1999), compared to patients with primary snoring, OSA patients had significantly higher absolute scores and approximately twice the rate of clinical elevation on both depression and hypochondriasis. They concluded that OSA patients have relatively more inactivity, anergia, guilt, pessimism, and low self-esteem accompanied by prominent somatic concerns[36]. OSA symptoms and their consequences have an impact on the biological, social, and psychological domains of the patient. All these personality traits potentially contribute to higher rates of noncompliance.

Another important aspect of our study is that our results indicated a significant correlation between subjective sleep quality, sleep latency, sleep disturbances PSQI global score, and neuroticism. Additionally, there was a positive correlation between PSG stage 1 and neuroticism scores. The disturbance of sleep quality and continuity that is associated with many sleep disorders predisposes individuals to the development or exacerbation of psychological distress and mental illness[2].

Regarding the psychological comorbidity in patients diagnosed with OSA, previous studies focused mainly on depressive and secondarily on anxiety symptoms. Our results are consistent with those of previous studies. We found significant differences between the depression and anxiety scores of the OSA and snorer groups. We also identified a correlation between PSQI global scores and HADS depression scores. However, we did not find any association between HADS scores and the AHI and the other PSG parameters in our study, except a positive correlation between stage 1 and HADS-depression. Likewise, the HADS-depression scores of 44 Swiss OSA patients and 16 snorers were not correlated with their AHI scores[37]. Millman also observed no relationship between the severity of the disease and the depression scores [38]. Unlike these results, Aikens and Mendelson (1999) reported that, the depression score was greater when the frequency of sleep-disordered breathing was higher and the nocturnal hypoxemia more severe[36]. Most studies on OSA patients have found positive relationships between AHI scores and the severity of depressive symptoms. Andrews et al. considered that factors other than hypopnea and apnea, shared by depressive and OSA patients, explained the connection between OSA and depressive symptoms evident in many clinical studies[9]. Such variations in findings may be attributable to the use of different methodologies, especially the tools employed to identify depressive symptoms. Furthermore, cut-off scores varied and different factors were assessed. The development of depressive symptoms is complex and multifactorial[14]. Further research is needed to determine the relationship between depressive symptoms and AHI scores.

In our study, the HADS-anxiety scores of the moderate OSA group were significantly different from the mild and severe OSA groups. Although we found a correlation between the HADS anxiety scores and PSQI global scores, we could not identify any correlation with PSG parameters. Reports of anxiety in the context of OSA are less common than depression, and it seems that this relationship is still poorly understood[39]. OSA patients also have high values of anxiety (16.7% in an American survey of 4060 subjects)[40], defined as tension and irritability, as a direct consequence of sleep impairment [41]. Similar to our results, Leeet al. (2015) reported that apnea severity measured by the AHI and the respiratory distress index was not found to be related to anxiety[42]. Additionally, Şahbaz et al. (2008) found no difference between groups according to the severity of OSA in respect to the existence of anxiety and depression[43].

There was no difference detected between the DS-14 scores of the four groups in our study. Additionally, there was no correlation between DS-14 scores and PSG parameters, except stages 1 and 2. However, there was a correlation between PSQI global scores and DS-NA and DS-SI scores. Broström et al. (2007) found no differences between Type D and non-Type D regarding the severity of OSA, as reflected by the AHI[44]. The Type D (distressed) personality is defined as a combination of negative affectivity (NA; i.e., a tendency to experience negative emotions) and social inhibition (SI; i.e., a tendency to inhibit the expression of emotions with others because of insecurity and tension) [45,46]. NA has been correlated with

subjective health and low quality of life[47], and such individuals are prone to experience increased levels of anxiety[48] and depression[49]. Studies showed that higher levels of anxiety and depression negatively affect sleep quality[50]. However, the impact of personality traits on perceived sleep evaluation in OSA patients still needs further research.

The limitations of our study were as follows: The study subjects were patients who visited a state hospital sleep center for sleep-related symptoms, which may limit the generalizability of the study's findings. The control group comprised subjects with OSA symptoms/snoring but an AHI <5, as indicated by PSG rather than healthy subjects without any complaint. Additionally, the EPQR-A results may not only reflect the premorbid personality, but may also be affected by current psychiatric symptoms. However, the EPQR-A was devised to evaluate the genetically based temperament. Finally, the fact that structured interviews for personality were not conducted is another limitation[51]. We think that an examination should be conducted on a larger patient population and subjects re-examined with the psychological survey post-treatment to better understand how OSA affects patients' psychologial profile.

It is difficult to identify and generalize various personality characteristics through a single personality questionnaire. However, we used the EPQR-A for our evaluation because it has a self-rating scale, is a valid psychometric test that is relatively easy to complete in the outpatient clinic, and may be more reliable and specific in evaluating personality traits than other similar tests, such as the MMPI. Further research with other psychological assessment techniques is now needed to confirm these results[52].

In this study, we demonstrate that mild-to-severe OSA groups differed from the snorer group in the patients' personality characteristics. Both common psychiatric conditions and the "neurotic" personality trait occur with considerably high rates in patients with OSA. Another important aspect of our study is that our results indicated a significant correlation between the sleep quality components and neuroticism. The strengths of this study include its relatively large sample size and that the evaluations took place at one sleep center. Moreover, this is the first in-depth study to investigate the personality characteristics of mild-to-severe OSA groups. However, the question remains as to whether a neurotic personality is a result of being sleep deprived (i.e., caused by OSA) and having a chronic condition, or existing prior to developing OSA. Such a study might be difficult to design, but a prospective long-term study of CPAP-treated patients with OSA could increase our understanding.

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