

The Relationship Between Subjective Sleep Quality and Aggression in Male Subjects with Antisocial Personality Disorder

Ümit Başar SEMİZ, Ayhan ALGÜL, Cengiz BAŞOĞLU, Mehmet Alpay ATEŞ, Servet EBRİNÇ, Mesut ÇETİN, Cengiz GÜNEŞ, Hüseyin GÜNAY

Abstract

Objective: The aim of this study was to evaluate subjective sleep quality and to determine its relationship to aggression in male subjects diagnosed with antisocial personality disorder (APD).

Methods: The study included 125 male soldiers with APD that consecutively presented to the outpatient psychiatric unit of GATA Haydarpaşa Training Hospital. A control group of 125 normal volunteers with no known medical or psychiatric disorders were selected from among male military personnel. The subjects were evaluated with an assessment battery, which included the Pittsburgh Sleep Quality Index and Aggression Questionnaire, during a semi-structured interview.

Results: The main finding was that more of the APD patients suffered from disturbed sleep quality than did the controls. Compared to the matched controls the APD patients had lower subjective sleep quality, longer sleep latency, shorter duration of sleep, less habitual sleep efficiency, more sleep disturbances, more use of sleeping medication, and a higher level of daytime dysfunction. In the APD group, elevated levels of aggression were also significantly correlated with impaired sleep quality.

Conclusions: The present study provides support for a strong link between subjective sleep quality and aggression in APD. Recognition of sleep disturbances in APD patients is also relevant to the management of APD because effective strategies to improve sleep in this patient group might also lead to vast reductions in their aggressive behaviors.

Key Words: Antisocial personality disorder, aggression, violence, sleep quality, polysomnography

INTRODUCTION

Approximately 80 different sleep disturbances are defined in the literature, which are categorized as primary and secondary disturbances. Sleep disturbances that qualitatively and quantitatively disrupt the normal cycle, duration, and sleep quality influence the clinical outlook and are generally comorbid with psychiatric disorders. Subjective sleep complaints, including reduced sleep duration, increased sleep latency, frequent awakening, and lack of deep sleep, are commonly reported by patients suffering from psychiatric disorders, and are observable in polysomnography (PSG) records (Levy et al, 1988;

Benca et al., 1992; Keshavan et al., 1998; Gann et al, 2001).

A limited number of studies have investigated personality disorders and sleep. To the best of our knowledge no studies focusing on this subject have been conducted in Turkey. In addition, interest in the sleep structure of patients with personality disorders has recently increased. It is observed that studies concentrate mostly on borderline personality disorder (BPD). These studies revealed impaired subjective sleep quality, shorter total sleep duration, REM latency, and non-REM sleep, specifically in the fourth phase, and frequent awakening, which are

Received: 25.04.2007 – Accepted: 04.12.2007

Ayhan Algül MD., e-mail: ansalgul@yahoo.com

confirmed by PSG results (Benson et al., 1990; Battaglia et al., 1993; Asaad et al., 2002). Few studies have evaluated sleep problems in antisocial personality disorder cases (APD). A study by Lindberg et al. (2004) suggested that abnormal sleep structure in APD cases that repeatedly committed violent crime was related to childhood attention-deficit hyperactivity disorder (ADHD). In another study conducted by the same researchers (Lindberg et al., 2006) APD cases that committed murder were compared to healthy controls and it was revealed that severe aggression in women was related to variations in sleep structure, and the relationship between sleep biology and violent impulsive behaviors were observed to be similar in both sexes.

Aggression, which is defined as verbal, physical, or indirect behavior intended to harm oneself or another (Eron, 1982), is a common symptom of many psychiatric disorders (Moeller et al., 2001), including personality disorders (primarily APD) (Eronen et al., 1996; Goodman et al., 2000). Therefore, it is expected that individuals with APD commit crime more often and represent a high percentage of prison inmates (American Psychiatric Association, 1994). Previous research observed that 50%-80% of male inmates have APD (Fazel and Danesh, 2002; Hare, 2003). In addition to causing negative communal and social consequences, aggression is a burden for health services as well (Scott et al., 2001). As pharmacological and behavioral treatments are not entirely effective in treating aggression, the economic and social consequences of this problem increase (Malone et al., 2000).

The current body of research focusing on the relationship between sleep disorders and behavioral problems is growing. Clinical and animal studies reveal that sleep deprivation leads to aggression and impulsivity. In a study conducted with rats, it was observed that sleep deprivation increased aggression and fighting behavior with defensive intention (De Paula and Hoshino, 2002). Similarly, it was shown that animals that were docile at the beginning of the study became more restless and aggressive after they were deprived of sleep (Marks and Wayner, 2005). Schubert (1977) reported that aggression was related to the duration and frequency of sleep periods. It was observed that healthy individuals who were sleep deprived for 1 night exhibited restlessness and emotional fluctuation (Roth et al., 1976), with an increased level of aggression (Cutler and Cohen, 1979). Studies conducted with children and adolescents also observed that aggression was related to sleep deprivation (Chervin et al., 2003) and treating sleep disturbances

contributed to the recovery of behavioral problems (Dahl et al., 1991; Ali et al., 1996).

Despite the considerable quantity of evidence suggesting a strong relationship between sleep and aggressive behavior, studies investigating the relationship between subjective sleep quality and level of aggression in APD cases are limited. In addition, it is observed that valid scales for evaluating subjective complaints are not used effectively in studies that explore sleep disorders. Although PSG is considered the gold standard in sleep studies, it has some disadvantages, such as the cost of equipment and the first-night effect. It has been shown that scales that assess sleep disorders yield similar results as objective measures and that they are very reliable (Harvey et al., 2003). Researchers assert that sleep quality is a subjective measure related to temperamental characteristics and might comprise factors that cannot be measured by PSG (Engdahl et al., 2000). Additionally, although PSG evaluates only the night in which study is conducted, the Pittsburgh Sleep Quality Index (PSQI) indicates the quality of sleep during the month prior to evaluation.

The aims of the present study were to determine subjective sleep quality and level of aggression in APD cases using self-report scales, to compare the APD cases to healthy controls, and to determine the relationship between sleep quality and level of aggression.

METHOD

Subjects

The study included 176 male soldiers diagnosed with APD based on "antisocial symptom checklist" that were referred to the psychiatric unit of GATA Haydarpasa Training Hospital between March 2006 and March 2007 because of maladjustment and criminal behavior (fighting, disrespecting superiors, disregard for disciplinary rules, robbery, etc.), or those that voluntarily presented with complaints, such as self-harm and continuous conflict with others. Two cases were excluded from the study because they could not complete the assessment forms due to education and language problems, and 1 case declined to participate. Subjects that participated in the study were assessed with the Turkish version (Sorias et al., 1990; Coşkunol et al. 1994) of SCID-II (Spitzer et al., 1985). APD diagnoses were confirmed using DSM III-R. Twelve subjects that were diagnosed with Axis II disorders other than APD were excluded from the study. Participants were also administered the Turkish version (Çorapçıoğlu et al., 1999) of SCID-I (First et al., 1997)

Table I. Sociodemographic characteristics of the participants.

Characteristic	APD (n = 125)	Control (n = 125)	Analysis	P
Age (years)	22.0 ± 2.4	21.7 ± 4.1	t = 0.7	0.5
Marital status (n/%)				
Married	44 (35%)	31 (25%)	$\chi^2 = 3.2$	0.7
Single	81 (65%)	94 (75%)		
Education (years)	5.5 ± 2.6	9.1 ± 3.1	t = -9.4	< 0.001
Income level (n/%)				
Low	75 (60%)	51 (41%)	$\chi^2 = 9.2$	0.01
Medium	42 (34%)	62 (50%)		
High	8 (6%)	12 (10%)		
Work status (n/%)				
Working	55 (44%)	117 (94%)	$\chi^2 = 71.6$	< 0.001
Not working	70 (56%)	8 (6%)		

χ^2 : Chi-Square test; t: Student's t-test; APD: antisocial personality disorder.

in order to screen for the presence of Axis I disorders that might negatively affect sleep; 36 cases identified with Axis I disorders (major depression, posttraumatic stress disorder, organic mental disorder, and any kind of psychotic disorder) were excluded from the study. Participants with substance abuse and impulse control disorders were not excluded from the study because these are comorbid disorders commonly seen in APD cases. All the participants had an alcohol and/or substance use history; however, during the course of the study they did not use any kind of substance or psychotropic drug for at least 2 months. Thus, 125 cases met the criteria to participate in the study. The control group was chosen from among military personnel that had just began their military service and were referred to the psychiatric unit of GATA Haydarpaşa Training Hospital for an initial screening. Among them, 125 normal subjects, matched in terms of age and marital status to the APD cases, that did not have a history of somatic, psychiatric, or neurological disorders were admitted into the control group.

All the questionnaires and tests were administered by the same researcher (ÜBS), without indicating the participants' names in order to ensure consistency. After informing the participants about the procedures

and aims of the study, they all provided informed consent.

INSTRUMENTS

After all the subjects completed a sociodemographic data questionnaire, they were administered the other scales used in the study.

Aggression Questionnaire (AQ): This is an updated form of the Buss-Durkee Hostility Inventory (1957). This test, developed by Buss and Warren (2000), assesses anger and aggression. The scale uses a 5-point Likert-type scale and contains 34 items in 5 subscales. The subscales evaluate physical aggression, verbal aggression, anger, hostility, and indirect aggression. The scale doesn't have a cut off point. Level of aggression is determined according to total score (≤ 29 : very low; 30-39: low; 40-44: low-average; 45-55: average; 56-59: average-high; 60-69: high; ≥ 70 : very high). If the total score is high, subscale scores should be evaluated as well. The reliability and validity study of the questionnaire was conducted by Can (2002). The scale's internal consistency is very reliable and the Cronbach's alpha internal consistency coefficient is 0.95. In the test-retest reliability analysis the correlation coefficient value was reported to be $r = 0.482$ -

Table II. PSQI and AQ scores.

SCALES	APD (n = 125)	Control (n = 125)	t	P
Pittsburgh Sleep Quality Index				
Subjective sleep quality	1.8 ± 0.8	1.2 ± 0.8	5.2	< 0.001
Sleep latency	2.4 ± 0.8	1.8 ± 0.8	6.8	< 0.001
Sleep duration	1.9 ± 1.2	1.0 ± 0.9	7.1	< 0.001
Habitual sleep efficiency	1.4 ± 1.2	0.8 ± 0.8	4.4	< 0.001
Sleep disturbances	2.1 ± 0.7	1.3 ± 0.5	9.2	< 0.001
Use of sleeping medication	1.5 ± 1.3	0.0 ± 0.0	13.0	< 0.001
Daytime dysfunction.	1.3 ± 0.9	0.8 ± 0.6	5.6	< 0.001
PSQI global score	12.5 ± 4.5	6.8 ± 2.7	12.0	< 0.001
Aggression Questionnaire				
Physical aggression	22.1 ± 8.9	4.6 ± 4.4	19.4	< 0.001
Verbal aggression	11.5 ± 4.6	6.3 ± 2.6	11.1	< 0.001
Anger	18.2 ± 6.8	6.7 ± 4.4	13.2	< 0.001
Hostility	18.2 ± 6.8	5.6 ± 3.3	18.5	< 0.001
Indirect aggression	9.6 ± 5.4	4.2 ± 2.3	10.3	< 0.001
Global score	78.5 ± 29.3	27.4 ± 11.7	18.1	< 0.001

t: Student's t-test; APD: antisocial personality disorder.

0.760, and the subscale values were as followings: $r = 0.847$ for physical aggression, $r = 0.696$ for verbal aggression, $r = 0.746$ for anger, $r = 0.810$ for hostility, $r = 0.857$ for indirect aggression, and $r = 0.857$ for total aggression.

Pittsburgh Sleep Quality Index (PSQI): The scale was developed by Buysse et al. (1989), and analysis of its reliability and validity was conducted by Ağargün et al. (1996). PSQI is a 19-item self-rating questionnaire, which assesses sleep quality and disturbances during a 1-month time period. Each item is scored from 0 to 3 points. The scale consists of 7 subscales that evaluate subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. The total of the 7 subscale scores yields the global PSQI score, which ranges between 0 and 21. A global PSQI score greater than 5 is indicative of a diagnostic sensitivity of 89.6% and specificity of 86.5%. It also shows that the individual

has poor sleep quality, and that there are at least 2 serious or 3 medium level disturbances in the areas mentioned above.

Data Analysis

Data are presented as percentages or mean ± SD. Differences between group variables were calculated using Student's t-test for continuous variables, and chi-square test for categorical variables. Pearson's correlation analysis was used for correlation analysis. All the analyses were performed using SPSS v.10.0 and statistical significance was considered as $P < 0.05$.

RESULTS

Sociodemographic characteristics of the participants are presented in Table I. Mean age of the APD cases was 22.0 ± 2.4 years (range: 18-30 years), and about two thirds of the cases (65%, $n = 81$) were single. Duration of education of the group was 5.5 ± 2.6 years, 60% (n

Table III. AQ scores of APD cases according to sleep quality.

Aggression Questionnaire	Poor sleepers (n = 102)	Efficient sleepers (n = 23)	t	p
Physical aggression	23.1 ± 8.2	10.4 ± 9.7	4.6	< 0.001
Verbal aggression	11.8 ± 4.3	8.0 ± 6.5	2.6	0.01
Anger	18.1 ± 7.2	7.6 ± 9.7	4.3	< 0.001
Hostility	18.6 ± 6.3	12.8 ± 9.9	2.7	0.01
Indirect aggression	9.8 ± 5.1	7.4 ± 7.7	1.4	0.20
Global score	81.3 ± 26.3	46.2 ± 42.7	18.1	< 0.001

t: Student's t-test.

= 75) had low-level income, and 56% (n = 70) reported that they didn't have a job. There were no differences in terms of age or marital status between the APD and control groups, but level of education, work, and income levels were significantly lower in the APD group when compared to the control group.

When the APD and control groups were compared in terms of subjective sleep complaints, global PSQI scores were significantly higher in the APD cases (12.5 ± 4.5) than in the healthy controls (6.8 ± 2.7). PSQI global scores were > 5 points in 81.6% of the APD group (n = 102) and in 38.4% of the control group (n = 48), indicating poor sleep quality. When the groups were analyzed in terms of PSQI subscales, it was observed that the APD group had lower subjective sleep quality (t = 5.2, P < 0.001), longer sleep latency (t = 6.8, P < 0.001), shorter sleep duration (t = 7.1, P < 0.001), lower habitual sleep efficiency (t = 4.4, P < 0.001), more sleep disturbances (t = 9.2, P < 0.001), more use of sleeping medication (t = 13.0, P < 0.001), and more daytime dysfunction (t = 5.6, P < 0.001), as compared to the control group (Table II).

Table II also presents the AQ mean global and subscale scores. It was observed that the AQ global score was significantly higher in the APD group than in the control group (t = 18.1, P < 0.001). The APD group also had higher scores compared to the control group on 5 AQ subscales: Physical aggression (t = 19.4, P < 0.001), verbal aggression (t = 11.1, P < 0.001), anger (t = 13.2, P < 0.001), hostility (t = 18.5, P < 0.001), and indirect aggression (t = 10.3, P < 0.001).

When the APD cases that reported poor sleep quality (poor sleepers: PS; PSQI global score > 5; n = 102) and those who didn't report a sleeping problem (efficient sleepers: ES; PSQI global score ≤ 5; n = 23) were compared to each other in terms of AQ score, it was observed that AQ global score in the PS group was significantly higher than in the ES group (t = 3.8, P < 0.001). It was determined that the PS group had higher scores on most of the AQ subscales than the ES group did: Physical aggression (t = 4.6, P < 0.001), verbal aggression (t = 2.6, P = 0.01), anger (t = 4.3, P < 0.001), and hostility (t = 2.7, P = 0.01). On the indirect aggression subscale there was no significant difference between the 2 groups (Table III).

Table IV shows the Pearson's correlation coefficients, which demonstrate the relationship between PSQI and AQ in the APD cases. When the global scores of both scales were analyzed a significant positive correlation was observed between subjective sleep complaints and aggression (r = 0.597, P < 0.001). Moreover, a reciprocal positive correlation was observed between all the subscales of both scales.

DISCUSSION

The present study yielded 2 main findings. The first is related to subjective sleep quality and level of aggression in the APD group. Higher levels of aggression in the APD cases, as compared to the healthy control group, was expected; however, that the APD cases reported significantly more subjective sleep complaints than the control group is an important finding of the study. The

Table IV. Pearson's correlation coefficients show the relationship between PSQI and AQ scores in APD cases.

SCALES	Aggression Questionnaire (AQ)					
	Physical aggression	Verbal aggression	Anger	Hostility	Indirect aggression	AQ Global score
Subjective sleep quality	0.381***	0.295***	0.315***	0.247***	0.182**	0.328***
Sleep latency	0.432***	0.323***	0.388***	0.364***	0.268***	0.406***
Sleep duration	0.392***	0.348***	0.383***	0.409***	0.322***	0.419***
Pittsburgh Sleep Quality Index (PSQI)						
Habitual sleep efficiency	0.265***	0.259***	0.245***	0.288***	0.148*	0.274***
Sleep disturbances	0.516***	0.445***	0.452***	0.472***	0.340***	0.501***
Use of sleeping medication	0.590***	0.456***	0.497***	0.575***	0.404***	0.576***
Daytime dysfunction	0.358***	0.314***	0.302***	0.269***	0.232***	0.331***
PSQI Global score	0.615***	0.511***	0.542***	0.558***	0.401***	0.597***

*P < 0.05, **P < 0.005, ***P < 0.001.

APD cases reported longer sleep latency, shorter sleep duration, poorer habitual sleep efficiency, more sleep disturbances, more use of sleeping medication, and more daytime dysfunction. The results of the current study are consistent with previous studies that report poor levels of both objective and subjective sleep in antisocial individuals (Lindberg et al., 2003a, 2003b). A study that evaluated sleep quality with PSG revealed that APD cases had frequent awakenings in the course of a night, and therefore, had poor habitual sleep efficiency and increased non-REM sleep, specifically in the fourth phase (Lindberg et al., 2003a). In that study, subjective sleep quality, as evaluated by the Basic Nordic Sleep Questionnaire, was disturbed, and antisocial cases reported longer sleep latency, more frequent awakenings, and more complaints about being sleepy in the morning, as compared to the normal controls. Moreover, the duration of the fourth phase, and delta and theta activity were higher in APD cases that had a history of behavior disorders and high levels of testosterone (Lindberg et al., 2003b).

The second and more remarkable finding of the present study is that sleeping problems and level of aggression were significantly related to each other in the APD cases. The severity of sleeping problems was correlated with the level of aggression. It is remarkable that inef-

ficient sleep and direct aggression were related to each other in the APD cases. These findings support previous studies that report a positive relationship between aggression and sleeping disorders (Lindberg et al., 2003a, 2003b; Ireland and Culpin, 2006). In another study that investigated sleeping problems and aggression in individuals that committed crime using subjective tests (Ireland and Culpin 2006), it was shown that sleep duration and quality were related to the level of aggression. In that study the researchers considered a high score on the aggression test, especially on the hostility subscale, as a predictor of poor sleep quality and decreased sleep duration. In Ireland and Culpin's study (2006), the participants consisted of young adolescents that were not administered a diagnostic personality evaluation, although the crimes that they committed were indicated in the study. In Lindberg et al.'s study (2003b), sleep structure of the APD cases that displayed aggressive behaviors were evaluated by PSG and actigraphy; however, their aggression levels were not indicated. The current study is different from previous studies as all the participants were diagnosed with APD, and the level of aggression in all the participants was evaluated.

Studies that investigated the biological roots of anti-social and aggressive behavior suggest that there are many

common mechanisms that regulate aggressive behavior and sleep (Lewis, 1991; Gatzke-Kopp et al., 2001). Lindberg et al. (2005) worked with APD cases that committed murder and reported decreased alpha activity in their EEG records, and increased delta and theta activity in their occipital lobes. The researchers proposed that difficulty with daytime wakefulness might be related to problems during the non-REM period. Many agents in the central nervous system have a role in the sleep/wake cycle, but the serotonergic system is proposed to be the most important neurotransmitter (Portas et al., 2000; Adrien, 2002). Ağargün et al. (1997) proposed that there was a relationship between suicidal behavior and deterioration of sleep quality in depression, and that serotonin plays a key role in this relationship. It has been suggested that the prefrontal cortex (PFC) plays a crucial role in both regulating anger and violent behavior (Halasz et al., 2006), as well as maintaining wakefulness (Dahl, 1997). In addition, a relationship between structural and functional abnormalities in the PFC, and APD has been indicated (Halasz et al., 2006).

The relationship that that was observed between level of aggression and sleep disturbances in the present study might have been related to a common brain dysfunction in the APD cases, and sleep disturbances might contribute to aggressive behavior together with other social and psychological factors (Lindberg et al., 2003b). In the light of these findings, it might be suggested that aggressive behavior may improve in response to the treatment of sleep disturbances (Haynes et al., 2006). Additionally, it is not possible to state that there is direct relationship between sleep and aggression based on the current literature. More research is needed to elucidate this relationship.

The most significant limitation of the present study is the subjective evaluation of sleep disturbance, because participants might have had difficulty remembering sleep problems in the past; therefore, they may have provided inaccurate information, which might have affected the results. Different results might be obtained using objective methods, such as actigraphy and PSG. For instance, subjective sleep quality measurements like PSQI measure problems such as decreased sleep duration and efficiency, poor sleep quality, decreased relaxing effect of sleep, fatigue at night, and emotional depression in BPD cases without depression, whereas electrophysiological measurements measure only abnormalities similar to depression during REM sleep (Philipsen et al., 2005). There are some studies in which subjective tests yielded results similar to objective test results (Harvey et al., 2003). As a matter of fact, Lindberg et al. (2003a) reported that APD

cases had poorer subjective sleep quality, especially longer sleep latency and frequent awakenings during the night, and felt sleepier during the day compared to the control group. In the same study, actigraphic sleep analysis showed that although sleep duration in the APD and the control groups was the same, sleep latency in the APD cases was about 40 minutes longer. Their PSG results also revealed that APD cases had more frequent awakenings during the night; accordingly, they had decreased sleep efficiency and significantly increased slow-wave sleep (deep sleep) in phase 2 and phase 4, which is known as the deepest sleep phase, compared to the controls. Asaad et al. (2002) also indicated disturbed sleep quality in BPD cases, as compared to controls, according to both PSG records and subjective measurements.

Despite the intention to exclude APD cases with Axis I comorbid disorders that might have negatively influenced sleep, it was not possible because of the extended use of alcohol and substances among the APD cases (Robins, 1998). It was reported that individuals diagnosed with substance dependency had longer sleep latency, difficulty in maintaining sleep, increased phase 1 sleep, decreased deep sleep, and abnormalities in REM sleep (Williams and Rundell, 1981; Gillin et al., 1990; Gann et al., 2001). Mossberg et al. (1985) reported that sleep disturbance recovered 4-8 weeks after individuals stopped using alcohol. In another study individuals that were diagnosed with alcohol dependency had partially normal sleep records, although with decreased phase 4 sleep, 1-2 years after they stopped using alcohol (Adamson and Burdick, 1973). In the current study all the participants had an alcohol or substance use history; however, as they performing military service they did not use alcohol or substances for at least 2 months during the course of the study. Nevertheless, subjective sleep complaints might have been influenced by the ongoing effects of alcohol and substance use. The fact that this study was a cross-sectional study is an important limitation. A longitudinal study might yield important results that could help determine more accurately the relationship between sleep and aggression.

Finally, the present study contributes to the data compiled by previous studies that have attempted to clarify the relationship between sleep disturbance and aggression in individuals diagnosed with APD. More extensive research using objective measurements is needed. Understanding the causes of aggression in APD cases, who account for an important percentage of individuals that exhibit aggressive behaviors, might ensure the development of more effective treatment approaches.

REFERENCES

- Adamson J, Burdick JA (1973) Sleep of dry alcoholics. *Arch Gen Psychiatry*, 28:146-149.
- Adrien J (2002) Neurobiological bases for the relation between sleep and depression. *Sleep Med Rev*, 6:341-351.
- Ağargün MY, Kara H, Solmaz M (1997) Subjective sleep quality and suicidality in patients with major depression. *J Psychiatr Res*, 31:377-381.
- Ağargün MY, Kara H, Anlar O (1996) Pittsburgh Uyku Kalitesi İndeksi'nin Geçerliliği ve Güvenilirliği. *Türk Psikiyatri Derg*, 7:107-111.
- Ali NJ, Pitson D, Stradling JR (1996) Sleep disordered breathing effects of adenotonsillectomy on behaviour and psychological functioning. *Eur J Pediatr*, 155: 56-62.
- American Psychiatric Association (1994) DSM-IV - Diagnostic and Statistical Manual of Mental Disorders – 4th Ed. American Psychiatric Association, Washington DC. Amerikan Psikiyatri Birliği, Washington DC, 1994'ten, çeviri editörü Koroğlu E, Hekimler Yayın Birliği, Ankara, 1998.
- Asaad T, Okasha T, Okasha A (2002) Sleep EEG findings in ICD-10 borderline personality disorder in Egypt. *J Affect Disord*, 71: 11-18.
- Balkin TJ, Braun AR, Wesensten NJ et al. (2002) The process of awakening: a PET study of regional brain activity patterns mediating the reestablishment of alertness and consciousness. *Brain*, 125: 2308-2319.
- Battaglia M, Ferini-Strambi L, Smirne S et al. (1993) Ambulatory polysomnography of never-depressed borderline subjects: a high-risk approach to rapid eye movement latency. *Biol Psychiatry*, 33: 326-334.
- Benca RM, Obermeyer WH, Thisted RA et al. (1992) Sleep and psychiatric disorders. A meta-analysis. *Arch Gen Psychiatry*, 49:651-668.
- Benson KL, King R, Gordon D et al. (1990) Sleep patterns in borderline personality disorder. *J Affect Disord*, 18: 267-273.
- Buss AH, Durkee A (1957) An inventory for assessing different kinds of hostility. *J Consult Psychol*, 21:343-9.
- Buss AH, Warren WL (2000) Aggression Questionnaire-Manuel. Western Psychological Services,1-53.
- Byusse DJ, Reynolds CF, Monk TH et al. (1989) The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatry Res*, 28:193-213.
- Can S. "Aggression Questionnaire" Adlı Ölçeğin Türk Popülasyonunda Geçerlilik ve Güvenilirlik Çalışması. Yayınlanmamış Uzmanlık Tezi, İstanbul 2002.
- Chervin RD, Dillon JE, Archbold KH et al. (2003) Conduct problems and symptoms of sleep disorders in children. *J Am Acad Child Adolesc Psychiatry*, 42: 201-208.
- Coccaro EF, Kavoussi RJ, Trestnan RL et al. (1997) Serotonin function in human subjects: intercorrelations among central 5HT indices and aggressiveness. *Psychiatry Res*, 73: 1-14.
- Çorapçıoğlu A, Aydemir Ö, Yıldız M. (1999) DSM-IV Eksen I Bozuklukları (SCID-I) için Yapılandırılmış Klinik Görüşme, Klinik Versiyon. Hekimler Yayın Birliği, Ankara.
- Coşkunol H, Bağdiken İ, Sorias S et al. (1994) SCID-II (Türkçe versiyonu) görüşmesinin kişilik bozukluklarındaki güvenilirliği. *Türk Psikoloji Dergisi*, 9: 26-29.
- Cutler N, Cohen H (1979) The effect of one night's sleep loss on mood and memory in normal subjects. *Compr Psychiatry*, 20: 61-66.
- Dahl RE, Pelham WE, Wierson M (1991) The role of sleep disturbances in attention deficit disorder symptoms a case study. *J Pediatr Psychol*, 16: 229-239.
- Dahl RE (1997) The regulation of sleep and arousal: Development and psychopathology. *Dev Psychopathol*, 8: 3-27.
- De Paula HM, Hoshino K (2002) Correlation between the fighting rates of REM sleep-deprived rats and susceptibility to the 'wild running' of audiogenic seizures. *Brain Res*, 926: 80-85.
- Engdahl BE, Eberly RE, Hurwitz TD et al. (2000) Sleep in a community sample of elderly war veterans with and without posttraumatic stress disorder. *Biol Psychiatry*, 47: 520-525.
- Eron LD (1982) Parent-child interaction, television violence, and aggression of children. *Am Psychol*, 37:197-211.
- Eronen M, Hakola P, Tiihonen J (1996) Mental disorders and homicidal behavior in Finland. *Arch Gen Psychiatry*, 53: 497-501.
- Fazel S, Danesh J (2002) Serious mental disorders is 23 000 prisoners: a systematic review of 62 surveys. *Lancet*, 359: 545-550.
- First MB, Spitzer RL, Gibbon M, Williams JBW (1997). Structured Clinical Interview for DSM-IV Clinical Version (SCID-I/CV). Washington DC: American Psychiatric Press.
- Gann H, Feige B, Hohagen F et al. (2001) Sleep and the cholinergic rapid eye movement sleep induction test in patients with primary alcohol dependence. *Biol Psychiatry*, 50:383-390.
- Gatzke-Kopp LM, Raine A, Buchsbaum M et al. (2001) Temporal lobe deficits in murderers. *J Neuropsychiatry Clin Neurosci*, 13: 486-491.
- Gillin JC, Smith TL, Irwin M et al. (1990) Short REM latency in primary alcoholic patients with secondary depression. *Am J Psychiatry*, 147:106-109.
- Goodman M, New A (2000) Impulsive aggression in borderline personality disorder. *Curr Psychiatry Rep*, 2: 56-61.
- Halasz J, Toth M, Kallo I et al. (2006) The activation of prefrontal cortical neurons in aggression-A double labeling study. *Behav Brain Res*, 175:-166-75.
- Hare RD (2003) Manual for the hare psychopathy checklist, 2nd edn, revised. Toronto, ON: Multi-Health Systems.
- Harvey AG, Jones C, Schmidt DA (2003) Sleep and posttraumatic stress disorder: a review. *Clin Psychol Rev*, 23:377-407.
- Haynes PL, Bootzin RR (2006) Sleep and aggression in substance abusing adolescents results from an integrative, behavioral sleep treatment pilot program. *Sleep*, 29: 512-520.
- Ireland JL, Culpin V (2006) The relationship between sleeping problems and aggression, anger, and impulsivity in a population of juvenile and young offenders. *J Adolesc Health*, 38:649-655.
- Keshavan MS, Reynolds CF, Miewald JM et al. (1998) Delta sleep deficits in schizophrenia: Evidence from automated analyses of sleep data. *Arch Gen Psychiatry*, 55:443-448.
- Levy AB, Dixon KN, Schmidt H (1998) Sleep architecture in anorexia nervosa and bulimia. *Biol Psychiatry*, 23:99-101.
- Lewis CE (1991) Neurochemical mechanisms of chronic antisocial behavior (psychopathy). A literature review. *J Nerv Ment Dis*, 179:720-7.
- Lindberg N, Tani P, Appelberg B et al. (2003a) Sleep among habitually violent offenders with antisocial personality disorder. *Neuropsychobiology*, 47:198-205.
- Lindberg N, Tani P, Appelberg B et al. (2003b) Human impulsive aggression: a sleep research perspective. *J Psychiatr Res*, 37:313-324.
- Lindberg N, Tani P, Porkka-Heiskanen T et al. (2004) ADHD and sleep in homicidal men with antisocial personality disorder. *Neuropsychobiology*, 50:41-7.
- Lindberg N, Tani P, Sailas E et al. (2006) Sleep architecture in homicidal women with antisocial personality disorder--apreliminary study. *Psychiatry Res*, 145:67-73.
- Lindberg N, Tani P, Virkkunen M et al. (2005) Quantitative electroencephalographic measures in homicidal men with antisocial personality disorder. *Psychiatry Res*, 136: 7-15.
- Malone RP, Delaney MA, Luebbert JF et al. (2000) A double-blind placebo-controlled study of lithium in hospitalized aggressive children and adolescents with conduct disorder. *Arch Gen Psychiatry*, 57: 649-654.
- Marks CA, Wayner MJ (2005) Effects of sleep disruption on rat dentate granule cell LTP in vivo. *Brain Res Bull*, 66:114-119.
- Moeller FG, Barratt ES, Dougherty DM et al.(2001) Psychiatric aspects of impulsivity. *Am J Psychiatry*, 158: 1783-1793.

Mossberg D, Liljeberg P, Borg S (1985) Clinical conditions in alcoholic during long-term abstinence: A descriptive longitudinal treatment study. *Alcohol*, 2: 551-553.

Philipsen A, Feige B, Al-Shajlawi A et al. (2005) Increased delta power and discrepancies in objective and subjective sleep measurements in borderline personality disorder. *J Psychiatr Res*, 39: 489-498.

Portas CM, Bjorvatn B, Ursin R (2000) Serotonin and the sleep/wake cycle: special emphasis on microdialysis studies. *Prog Neurobiol*, 60:13-35.

Robins LN (1998) The intimate connection between antisocial personality and substance use. *Soc Psychiatry Psychiatr Epidemiol*, 33: 393-399.

Roth T, Kramer M, Lutz T (1976) The effects of sleep deprivation on mood. *Psychiatr J Univ Ott* 1: 136-139.

Schubert FC (1977) Personality traits and polygraphic sleep parameters. *Waking Sleeping*, 1:165-170.

Scott S, Knapp M, Henderson J et al. (2001) Financial cost of social exclusion: follow-up study of antisocial children into adulthood. *BMJ*, 323: 191-196.

Sorias S, Saygılı R, Elbi H (1990) DSM-III-R yapılandırılmış klinik görüşmesi. Türkçe versiyonu. SCID-II kişilik bozuklukları formu. Bornova, Ege Üniversitesi Basımevi.

Spitzer RL, Williams J (1985) Structured clinical interview for DSM-III-R personality disorders (SCID II). New York Biometrics Research Department, New York State Psychiatric Institute.

Virkkunen M, Eggert M, Rawlings R et al. (1996) A prospective follow-up study of alcoholic violent offenders and fire setters. *Arch Gen Psychiatry*, 53: 523-529.

Williams HL, Rundell OH (1981) Altered sleep physiology in chronic alcoholics: Reversal with abstinence. *Alcohol Clin Exp Res*, 5:318-325.