



The Relationship between Attention Deficit Hyperactivity Disorder Symptoms and Bedtime Procrastination

Dikkat Eksikliği Hiperaktivite Bozukluğu Belirtileri ve Uyku Vaktini Erteleme Arasındaki İlişki

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Abstract

Aims: We aimed to examine the relationship between attention deficit and hyperactivity disorder (ADHD) symptoms and bedtime procrastination.

Material and Method: Five hundred fifty-three university students participated in our study. All participants answered the sociodemographic data form, The Adult ADHD Self-Report Scale (ASRS v1.1), Bedtime Procrastination Scale (BPS), Brief Self-Control Scale (BSCS), and Insomnia Severity Index (ISI). All participants were divided into two groups, ADHD and non-ADHD, according to the ASRS score. We compared sociodemographic data, sleep routines, and psychometric scales between these two groups. Finally, we analyzed the factors that could predict bedtime procrastination by hierarchical regression analysis.

Results: The mean age of the participants was 20.55 ± 2.17 . Most participants were female and unmarried (69.6% and 98.2%, respectively). BPS, ISI, and ASRS scores were significantly higher in the ADHD group than in the non-ADHD group ($p < 0.01$). BSCS score was significantly lower in the ADHD group than in the non-ADHD group ($p < 0.01$). Sleep duration was significantly lower in the ADHD group than in the non-ADHD group ($p < 0.01$). The correlation coefficients between ASRS and ISI, BPS, and BSCS were 0.461, 0.268, and -0.442, respectively ($p < 0.01$). Self-control and ADHD symptoms separately predicted bedtime procrastination with approximately the same variance (%4 vs. %3.9).

Conclusion: Clinicians should evaluate bedtime procrastination in individuals with adult ADHD by clinical interview or BPS. Individuals with adult ADHD with bedtime procrastination should be assisted with cognitive behavioral therapy-insomnia and sleep hygiene.

Keywords: Attention deficit and hyperactivity disorder, bedtime procrastination, insomnia, self-control.

Öz

Amaç: Dikkat eksikliği ve hiperaktivite bozukluğu (DEHB) semptomları ve uyku vaktini erteleme arasındaki ilişkiyi incelemeyi amaçladık.

Gereç ve Yöntem: Çalışmamıza 553 üniversite öğrencisi katıldı. Tüm katılımcılar sosyodemografik veri formu, Yetişkin DEHB Öz Bildirim Ölçeği (YDEHBÖ), Uyku Vaktini Erteleme Ölçeği (UVEÖ), Kısa Öz Kontrol Ölçeği (KÖKÖ) ve Uykusuzluk Şiddet İndeksi'ni (UŞİ) yanıtladı. Tüm katılımcılar YDEHBÖ puanına göre DEHB'si olan ve olmayan olmak üzere iki gruba ayrıldı. Bu iki grup arasında sosyodemografik verileri, uyku rutinlerini ve psikometrik ölçekleri karşılaştırdık. Son olarak, hiyerarşik regresyon analizi ile uyku vaktini ertelemeyi öngörebilecek faktörleri analiz ettik.

Bulgular: Katılımcıların yaş ortalaması 20.55 ± 2.17 idi. Katılımcıların çoğu kadın ve bekar (sırasıyla %69,6 ve %98,2). UVEÖ, UŞİ ve YDEHBÖ puanları, DEHB grubunda DEHB olmayan gruba göre anlamlı derecede yüksekti ($p < 0.01$). KÖKÖ puanı, DEHB grubunda DEHB olmayan gruba göre anlamlı olarak daha düşüktü ($p < 0.01$). Uyku süresi, DEHB grubunda DEHB olmayan gruba göre anlamlı olarak daha düşüktü ($p < 0.01$). YDEHBÖ ile UŞİ, UVEÖ ve KÖKÖ arasındaki korelasyon katsayıları sırasıyla 0,461, 0,268 ve -0,442 idi ($p < 0.01$). Öz kontrol ve DEHB semptomları uyku vaktini ertelemeyi yaklaşık olarak aynı varyansla (%4'e karşı %3.9) ayrı ayrı yordamıştır.

Sonuç: Klinisyenler, DEHB'li erişkinlerde uyku vaktini ertelemeyi klinik görüşme veya UVEÖ ile değerlendirmelidir. Uyku vaktini erteleyen yetişkin DEHB'li bireylere bilişsel davranışçı terapi-uykusuzluk ve uyku hijyeni ile müdahale edilmelidir.

Anahtar Kelimeler: Dikkat eksikliği ve hiperaktivite bozukluğu, uyku vaktini erteleme, uykusuzluk, öz-kontrol.



INTRODUCTION

Attention-deficit hyperactivity disorder (ADHD) is one of the most frequent childhood neurodevelopmental disorders. Persistent symptoms of inattention and hyperactivity-impulsivity are the main symptoms of ADHD (1). It also has been shown to have a high prevalence in adults. The prevalence of adult ADHD is estimated to be between 2.5% and 8.9% (2,3).

Procrastination and ADHD

Procrastination is the irrational tendency to postpone any task until after the deadline (4). There are different types of procrastination (i) Academic procrastination is delaying studying for an exam or writing an essay shortly before the deadline. (ii) Daily procrastination is difficulty organizing daily activities and performing to deadlines (for example, inability to pay bills on time). (iii) Decision procrastination describes those with chronic problems making timely decisions (5). All three types of procrastination can be highly associated with ADHD (6). Parents and teachers of children with ADHD provide anecdotal evidence, and a limited number of studies suggest an association between ADHD and procrastination. Procrastination is also involved in identifying problems associated with ADHD. Children with ADHD may likely avoid and procrastinate from complex, unpleasant, demanding, and uninteresting choices, tasks, daily activities, and decisions. They also show organizational problems with school-related activities, such as forgetting homework, difficulty completing long chores, studying for exams, and keeping materials organized. These problems are closely related to procrastination (6). Adults with ADHD present clinically with procrastination, planning difficulties, and missing deadlines (7). In addition, individuals with ADHD are prone to develop negative beliefs about themselves, low self-esteem, and low self-efficacy because they often experience these problems (8). Typical maladaptive beliefs point to feelings of imperfection, failure, and insufficient self-control. When these individuals face negative or stressful situations, they are likely to develop maladaptive coping strategies such as procrastination and avoidance, reinforcing their negative beliefs and creating a vicious circle (9). Therefore, avoidance/procrastination is a compensatory strategy for adolescents and adults with ADHD and it causes them to stop tackling an unpleasant and challenging task beyond their capacity (8).

Bedtime Procrastination, Self control, ADHD

In 2014, Kroose et al. described bedtime procrastination. Bedtime procrastination is defined as not being able to go to bed at the desired time even though no external conditions prevent it (10). Bedtime procrastination is now a very common phenomenon after the use of technological devices (11). It impairs sleep quality and predicts insomnia in university students (12). Another important finding is that bedtime procrastination is predictive of depression and anxiety (13). Self-Control can be defined as the ability to change, adapt, or break undesirable behavior patterns to achieve effortful

goal-directed action. It has been shown to be particularly associated with health-related behaviors (14). For example, self-control is negatively associated with health-promoting behaviors. Additionally, studies show a negative link between self-control and procrastination. Unsurprisingly, bedtime procrastination reflects a failure of self-control, similar to procrastination in general and health-related behaviors (15).

The present study

Low self-control and procrastination are ordinary among individuals with ADHD (6). Therefore, bedtime procrastination in adults with ADHD may be a significant clinical problem. As far as we know, there is no study examining the relationship between ADHD and bedtime procrastination. We aimed to investigate the relationship between ADHD and bedtime procrastination among university students. Our hypotheses are: First, individuals with ADHD are more likely to have bedtime procrastination and insomnia than those without ADHD. Second, self-control is lower in individuals with ADHD than in those without ADHD. Third, there is a significant correlation between ADHD symptoms, self-control, bedtime procrastination, and insomnia severity. Finally, ADHD symptoms and self-control are independent risk factors for bedtime procrastination.

MATERIALS AND METHODS

Study Population and Procedure

In our study, we included students from the various faculties of Gaziantep University. The researchers explained the definition and aims of the study to all participants in a quiet classroom environment. Afterward, participants who volunteered to participate in the study completed the sociodemographic data form, The Adult ADHD Self-Report Scale (ASRS v1.1), Bedtime Procrastination Scale (BPS), Brief Self-Control Scale (BSCS), and Insomnia Severity Index (ISI), respectively. We removed 163 participants from the study since 75 participants with incomplete responses to ASRS v1.1, BPS, BSCS, and ISI, and 88 gave unreliable answers to the scales as 1111111 or 123123123. Finally, we completed the study with 553 participants. The Clinical Research Ethics Committee of Gaziantep University approved this study (Date: 21.12.2022, decision no:2022/468). We conducted our study between 1 January 2023 and 15 January 2023 in accordance with ethical rules and the principles of the Declaration of Helsinki (16).

Data Collection Tools

Sociodemographic Data Form:

ASRS v1. 1

ASRS is an 18-item self-report scale used to assess ADHD symptoms in adults (17). Each item has responses ranging from 0 (never) to 4 (very often). The total score is obtained by summing up all the items. The first nine items (part A) consist of questions about attention deficit, while the last nine are

about hyperactivity-impulsivity (part B). A score above 24 on Part A or Part B indicates a diagnosis of ADHD (18). ASRS has a high internal consistency coefficient. In our study, ASRS's internal consistency coefficient was excellent (Cronbach's $\alpha = 0.90$).

BPS

BPS is a 9-item self-report scale that evaluates bedtime procrastination (10). We chose this scale in our study because it is the only scale to assess bedtime procrastination in Turkish (19). Items 2, 3, 7, and 9 are reverse-scored, and a higher score indicates more bedtime procrastination. We found the internal consistency coefficient of the scale 0.76.

BSCS

The BSCS is a 13-item self-report scale that evaluates self-control (20). Each item receives scores ranging from 1 (not at all true of me) to 5 (totally true of me). A high score indicates high self-control (20). We used this scale to analyze the predictive role of self-control in our study. The internal consistency coefficient of the scale was 0.70 in our study.

ISI

We used ISI to determine participants' insomnia severity as it is the most widely used tool for determining insomnia severity (21). It consists of 7 items and evaluates insomnia severity in the last two weeks (22). The total score ranges from 0 to 28, and a high score indicates severe insomnia. We found the internal consistency coefficient of ISI 0.82 in this study.

Statistical Analyses

We used IBM SPSS Statistics Version 23.0 for descriptive statistics, group comparisons, correlation, and regression analyses. We analyzed skewness-kurtosis values to determine whether the data was normal distribution and accepted skewness-kurtosis between -2 and +2 as a normal distribution. We divided all the participants into two groups ADHD with a score of 24 or higher from part A or Part B of ASRS and the non-ADHD group with a lower score. We compared sleep variables and scale scores between these two groups. We used the Student's t-test and chi-square test for these comparisons. Pearson correlation coefficient measured the associations between demographics, BPS, ASRS, ISI, and BSCS. Hierarchical regression analyses investigated the independent effects of self-control and ADHD symptoms on bedtime procrastination. A p-value < 0.05 was considered statistically significant.

RESULTS

Characteristics of all the participants

Table 1 presents the sociodemographic variables and scale mean scores of all participants. The mean age of the participants was 20.55 (SD: 2.17), and the age range was between 16-43. Most participants were female (69.6%), and

almost all were unmarried (98.2%). The mean of ASRS, BPS, ISI, and BSCS was 32.77, 27.73, 11.89, and 40.71, respectively.

Comparison of sociodemographic data, sleep variables, and scales between ADHD (+) and ADHD (-) groups

Table 1. Sociodemographic and clinical variables of all the participants

Variables	Mean (SD)
Age (years)	20.55 (2.17)
BMI (kg/m ²)	22.44 (10.00)
	n (%)
Sex	
Male	168 (30.4)
Female	385 (69.6)
Marital status	
Not married	543 (98.2)
Married	10 (1.8)
Living	
Alone	80 (14.5)
With family	327 (59.1)
With friend	146 (26.4)
Smoking	
Yes	90 (16.3)
No	463 (83.7)
Alcohol use	
Yes	38 (6.9)
No	515 (93.1)
Psychometric Instruments	Mean (SD)
ISI	11.89 (5.18)
BPS	27.73 (5.50)
BSCS	40.71 (6.06)
ASRS	32.77 (11.06)
ASRS inattention	16.62 (6.18)
ASRS hyperactivity-impulsivity	16.14 (5.79)

SD; Standard Deviation, BMI; Body Mass Index, ISI; Insomnia severity Index, BPS; Bedtime Procrastination Scale, BSCS; Brief Self Control Scale, ASRS; The Adult ADHD Self-Report Scale-v1.1.

We divided all participants into two groups, ADHD and non-ADHD, according to the ASRS score. When we compared the two groups, we found no significant difference in terms of age ($p = 0.10$), gender ($p = 0.64$), and BMI ($p = 0.54$). BPS, ISI, and ASRS scores were significantly higher in the ADHD group than in the non-ADHD group ($p < 0.01$). BSCS score was significantly lower in the ADHD group than in the non-ADHD group ($p < 0.01$). Sleep duration was significantly lower in the ADHD group than in the non-ADHD group ($p < 0.01$). Bedtime after 2 am on weekdays was statistically significantly higher in the ADHD group ($p = 0.02$). On the other hand, bedtime after 2 am on the weekend was more, but not statistically significant ($p = 0.17$). In addition, this group's wake-up time on weekdays and weekends was also late, statistically significant than the non-ADHD group. **Table 2** shows the detail of the comparison of the two groups.

Correlations Between Psychometric Instruments

There was a statistically significant correlation between all data collection tools. The correlation coefficients between ASRS and ISI, BPS, and BSCS were 0.461, 0.268, and -0.442, respectively ($p < 0.01$). The correlation coefficient of the ASRS inattention subscale with the BPS was higher than the ASRS hyperactivity-impulsivity subscale correlation coefficient (0.308 vs. 0.264) ($p < 0.01$). **Table 3** displays details of the correlations between psychometric instruments.

Table 2. Comparison between ADHD group and Non ADHD group

Variables	ADHD group (%15, n= 83)	Non ADHD group (%85, n= 470)	p value
Sex (male)	19 (%22.9)	149 (%31.7)	0.10
Age	20.45 (1.95)	20.57 (2.21)	0.64
BMI	21.82 (4.32)	22.55 (10.69)	0.54
ISI	15.83 (6.02)	11.19 (4.70)	< 0.01
BPS	30.87 (6.70)	27.18 (5.07)	< 0.01
BSCS	37.44 (6.38)	41.29 (5.82)	< 0.01
ASRS	49.77 (9.51)	29.77 (8.24)	< 0.01
ASRS inattention	25.95 (5.52)	14.98 (4.64)	< 0.01
ASRS hyperactivity-impulsivity	23.81 (6.49)	14.78 (4.45)	< 0.01
Sleep duration (< 5 hours)	23 (%27.7)	65 (%13.8)	< 0.01
Bedtime on a weekdays (After 02.00 a.m.)	24 (%28.9)	72 (%15.3)	0.02
Bedtime on weekends (After 02.00 a.m.)	31 (%37.3)	122 (%26)	0.17
Wake-up time on weekdays (After 12.00 p.m.)	11 (%13.3)	18 (%3.8)	< 0.01
Wake-up time on weekends (After 12.00 p.m.)	15 (%18.1)	37 (%7.9)	0.02

ISI; Insomnia severity Index, BPS; Bedtime Procrastination Scale, BSCS; Brief Self Control Scale, ASRS; The Adult ADHD Self-Report Scale-v1.1.

Table 3. Correlations between scales

	1	2	3	4	5	6
ISI	-					
BPS	347**	-				
BSCS	-168**	-207**	-			
ASRS	461**	268**	-442**	-		
ASRS inattention	447**	308**	-445**	928**	-	
ASRS hyperactivity-impulsivity	403**	264**	-401**	918**	705**	-

**; p < 0.01. ISI; Insomnia severity Index, BPS; Bedtime Procrastination Scale, BSCS; Brief Self Control Scale, The Adult ADHD Self-Report Scale-v1.1; ASRS

Hierarchical Regression Analysis of Predictors of Bedtime Procrastination

We conducted a hierarchical multiple regression analysis to examine the independent influence of age, sex, self-control, and ADHD symptoms on bedtime procrastination. Most research papers consider a VIF (Variance Inflation Factor) > 10 indicators of multicollinearity, but some choose a more conservative threshold of 5 or even 2.5. As a result of the analysis, the VIF of the final model was 1.26, which did not exceed 2.5, confirming that the multicollinearity problem did not occur (23).

In the first step, we included age and gender in the model and did not detect any predictive effects of age and gender on bedtime procrastination. In the second step, we added self-control to the model. The predictive effect of self-control on bedtime procrastination ($\beta = -0.20, t = -4.91, p = 0.000$). All variables (age, gender, self-control) explain 4% of the variance in bedtime procrastination. Finally, in the third step, we added ADHD symptoms to the model. All variables (age, gender, self-control, ADHD symptoms) explain 8% of the variance in bedtime procrastination. When age, gender, and self-control are controlled, ADHD symptoms

significantly present 3.9% of bedtime procrastination ($R^2 = 0.082, R^2 \text{ change} = 0.039, p = 0.000$). Self-control and ADHD symptoms separately predicted bedtime procrastination with approximately the same variance (%4 vs. %3.9).

Table 4 displays hierarchical regression analysis of bedtime procrastination.

Table 4. Hierarchical regression analysis of bedtime procrastination (N = 553)

Predictors	Part-cor	t	p	β (standart)	R	R2	R2 change	F
Step 1			0.84		0.025	0.001	0.001	0.175
Age	-0.21	-0.49	0.621	-0.02				
Sex	-0.17	-0.39	0.691	-0.01				
Step 2			0.000		0.207	0.043	0.042	8.182
Age	-0.00	0.60	0.543	0.02				
Sex	0.00	0.69	0.485	0.03				
Self-control	-0.20	-4.91	0.000	-0.20				
Step 3			0.000		0.286	0.082	0.039	12.21
Age	-0.01	-0.30	0.757	-0.01				
Sex	-0.02	-0.48	0.625	-0.02				
Self-control	-0.09	-2.30	0.022	-0.10				
ADHD symptoms	0.20	4.82	0.000	0.22				

ADHD; Attention-deficit hyperactivity disorder.

DISCUSSION

Our study aimed to examine the relationship between ADHD symptoms and bedtime procrastination. To the best of our knowledge, our research is the first study to explore the relationship between ADHD and bedtime procrastination. We found that those with ADHD bedtime procrastinate more, have lower levels of self-control, and experience more insomnia. We also found that ADHD symptoms or self-control independently predicted bedtime procrastination.

While only 20% of adults describe themselves as chronic procrastinators, 33-50% of college students are chronic procrastinators (24). Understanding procrastination is especially important for college students. As in general procrastination, university students are at risk for bedtime procrastination. Therefore, there are many studies on university students about bedtime procrastination (25). That's why we chose our sample group from university students. Previous studies have found negative correlations between bedtime procrastination and self-control and impulsivity (11,15,26). Both self-control and impulsivity are problematic areas in individuals with ADHD (27). Therefore, it is crucial to investigate bedtime procrastination in individuals with ADHD. However, to date, no research has examined the relationship between bedtime procrastination and ADHD.

One of the main findings of our study was that bedtime procrastination was higher in individuals with ADHD than those without ADHD. Adult ADHD patients often exhibit procrastination in their daily lives (6). Descriptive research

on bedtime procrastination was found to be associated with three themes (28). These are deliberate procrastination, mindless procrastination, and strategic delay. Deliberate procrastination, individuals reported that they voluntarily delayed their sleep hours because they thought they deserved some time. On the other hand, mindless procrastination was individuals did not realize how time had passed due to their immersion in evening activities. The strategic delay was defined as those who delay sleep time to fall asleep faster (28). Among these, mindless procrastination may be primarily associated with individuals with ADHD. Adults with ADHD have problems with attention, time planning, organization, and executive functions (29,30). In addition, they may prefer seducers instead of long-range goals and become immersed in evening activities because they have lower self-control (30). Therefore, they may show more bedtime procrastination than individuals without ADHD. Individuals with insomnia can develop some strategies to sleep better, such as going to bed later to fall asleep faster. Insomnia is common in individuals with ADHD, and the prevalence of insomnia has been reported to range from 43% to 80% in adult ADHD. In our study, individuals with ADHD had more severe insomnia and went to bed later than those without ADHD. There may be a role of above mentioned strategic delay in the relationship between ADHD and bedtime procrastination (31).

The other main finding of our study was that ADHD symptoms and self-control predicted bedtime procrastination. In previous studies, academic procrastination, general procrastination, evening chronotype, self-control, negative affect, electronic media use, and smartphone addiction were associated with bedtime procrastination (32-35). One of our study's strongest aspects is examining the relationship between ADHD symptoms and bedtime procrastination. To date, this relationship has never been explored. Inattention may lead to needing to understand how time passes, and impulsivity may lead to engaging in activities, such as using social media, which may lead to preferring not to sleep on time.

Limitations and Future Recommendations

Our study has some limitations. First, we diagnosed ADHD with self-psychometric scales, not clinical interviews. Secondly, the results cannot be generalized to the general population since the sample consists of university students. However, since university students are a risky population in terms of both general and bedtime procrastination, our study is valuable. Third, most of the participants were female, creating gender bias. Despite all these limitations, our study is the first to examine the relationship between ADHD symptoms and bedtime procrastination. Future research should explore bedtime procrastination in individuals diagnosed with ADHD through a clinical interview. What mediates the researchers should investigate the relationship between ADHD and bedtime procrastination. In addition, the relationship between

bedtime procrastination and other psychiatric diseases should be examined, especially its effect on insomnia in these patients.

CONCLUSION

People with ADHD symptoms are more likely to delay bedtime. Inattention, impulsivity, and lack of self-control in these individuals may have caused them to delay their bedtime more than others. Psychiatrists should evaluate bedtime procrastination in individuals with ADHD by clinical interview or BPS. Individuals with ADHD with bedtime procrastination should be assisted with cognitive behavioral therapy-insomnia and sleep hygiene.

ETHICAL DECLARATIONS

Ethics Committee Approval: We obtained ethical approval from the Clinical Research Ethics Committee of Gaziantep University (Date: 21.12.2022, decision no:2022/468).

Informed Consent: All participants signed the free and informed consent form.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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