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Investigation of the Effect of Multi-screen Addiction on Adult Individuals Diagnosed with Dry Eye

Göz Kuruluğu Tanısı Konulan Yetişkin Bireylerde Çoklu Ekran Bağımlılığının Etkisinin Araştırılması

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Abstract

Objective: Dry eye is an ocular surface disease characterized by the loss of the tear film layer. Alongside the increasing use of digital screen devices, the prevalence of dry eye has also risen. This study aims to investigate the effect of multi-screen addiction on dry eye in adults.

Method: This cross-sectional study was conducted between 01.05.2023 and 01.11.2023 with adults who presented to the Family Medicine and Ophthalmology Outpatient Clinics of a University of Health Sciences Turkey, Gaziosmanpaşa Training and Research Hospital with symptoms of dry eye and met the inclusion criteria. All participants were evaluated for dry eye using the Schirmer test. According to the tear film and ocular surface society dry eye workshop II criteria, 210 individuals were classified as having dry eye, while 210 individuals were classified as not having dry eye. Data were collected using a demographic information form and the multi-screen addiction scale (MSAS). A p-value of <0.05 was considered statistically significant.

Results: A total of 420 individuals with a mean age of 37.35±13.58 years (range: 18-79) were included in the study. The mean total score on the MSAS for all participants was 36.16±11.94 (range: 15-67). According to the MSAS, 41.4% (n=174) of all participants exhibited multi-screen addiction, with rates of 50.0% (n=105) in the dry eye group and 32.9% (n=69) in the non-dry eye group. The prevalence of multi-screen addiction was statistically significantly higher among individuals with dry eye compared to those without dry eye (p<0.001).

Öz

Amaç: Göz kuruluğu, gözyaşı film tabakasının kaybı ile karakterize bir oküler yüzey hastalığıdır. Dijital ekranlı cihazların kullanımının artmasına paralel olarak göz kuruluğu görülme sıklığı da artmaktadır. Bu çalışmada; yetişkinlerde çoklu ekran bağımlılığının göz kuruluğuna etkisinin araştırılması amaçlanmıştır.

Yöntem: Bu kesitsel çalışma; 01.05.2023-01.11.2023 tarihleri arasında Sağlık Bilimleri Üniversitesi, Gaziosmanpaşa Eğitim ve Araştırma Hastanesi, Aile Hekimliği ve Göz Hastalıkları Poliklinikleri'ne göz kuruluğu semptomlarıyla başvuran ve çalışmaya dahil edilme kriterlerini karşılayan yetişkinler ile gerçekleştirildi. Tüm katılımcılar Schirmer testi ile göz kuruluğu açısından değerlendirildi. Gözyaşı filmi ve oküler yüzey topluluğu kuru göz atölyesi kriterlerine göre 210 katılımcı göz kuruluğu olan olarak sınıflandırılırken, 210 katılımcı göz kuruluğu olmayan olarak sınıflandırıldı. Verileri elde etmede tanıtıcı bilgi formu ve çoklu ekran bağımlılığı ölçeği (ÇEBÖ) kullanıldı. P<0,05 istatistiksel olarak anlamlı kabul edildi.

Bulgular: Çalışmaya yaş ortalaması 37,35±13,58 (min: 18-maks: 79) yıl olan toplam 420 kişi dahil edildi. Tüm katılımcıların ÇEBÖ'den aldıkları toplam puan ortalama 36,16±11,94 (min: 15-maks: 67) idi. ÇEBÖ'ye göre tüm katılımcıların %41,4'ünde (n=174) çoklu ekran bağımlılığı saptandı; bu oran göz kuruluğu olan grupta %50,0 (n=105), göz kuruluğu olmayan grupta ise %32,9 (n=69) idi. Çoklu ekran bağımlılığı olma oranı göz kuruluğu olanlarda göz kuruluğu olmayanlara göre istatistiksel olarak anlamlı şekilde daha yüksekti (p<0,001).

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Abstract

Conclusion: In this study, multi-screen addiction was identified in 41.4% of participants. The prevalence of multi-screen addiction was statistically significantly higher among individuals with dry eye (50.0%) compared to those without dry eye (32.9%). These findings suggest that behavioral factors related to screen use may be associated with ocular surface health. Therefore, monitoring screen time and promoting preventive eye health measures, particularly among individuals with intensive digital screen use, are considered important.

Keywords: Dry eye, family medicine, Schirmer test, screen addiction

Öz

Sonuç: Bu çalışmada; katılımcıların %41,4'ünde çoklu ekran bağımlılığı saptandı. Çoklu ekran bağımlılığı prevalansı, göz kuruluğu olan bireylerde (%50,0) göz kuruluğu olmayanlara (%32,9) kıyasla istatistiksel olarak anlamlı derecede daha yüksekti. Bu bulgular, ekran kullanımına ilişkin davranışsal faktörlerin oküler yüzey sağlığı ile ilişkili olabileceğini düşündürmektedir. Dolayısıyla, özellikle yoğun dijital ekran kullanımı olan bireylerde ekran süresinin izlenmesi ve koruyucu göz sağlığı önlemlerinin teşvik edilmesi önem taşımaktadır.

Anahtar kelimeler: Aile hekimliği, ekran bağımlılığı, göz kuruluğu, Schirmer testi

Introduction

According to the tear film and ocular surface society dry eye workshop II (TFOS DEWS II) reports, dry eye is defined as a multifactorial disease characterized by a loss of homeostasis of the tear film, accompanied by ocular symptoms. In the etiopathogenesis of dry eye, tear film instability and hyperosmolarity, ocular surface inflammation and damage, as well as neurosensory abnormalities, play significant roles (1-3). Dry eye may cause symptoms such as burning, itching, redness, and ocular fatigue. Blurred vision and photophobia are also common, particularly during visually demanding tasks. If the condition persists over an extended period, it can interfere with daily activities and may lead to permanent ocular damage (4). The global prevalence of dry eye is estimated to range between 5% and 50%, varying based on the demographic and clinical characteristics of the studied populations (5). Epidemiological studies have reported that the prevalence of dry eye increases with age and is more common among women (6,7). Moreover, office workers, students, and individuals with prolonged exposure to digital screens are considered high-risk groups (8,9).

In recent years, the widespread use of digital screen devices—such as computers, televisions, tablets, and smartphones—has made dry eye an increasingly important public health concern. Prolonged screen time can disrupt the tear film and reduce the blink rate, thereby contributing to the development of dry eye. Increased exposure to screens accelerates tear evaporation, particularly promoting the onset of evaporative dry eye (10).

Excessive use of digital screen devices has also been associated with various health issues, including screen addiction. Screen addiction comprises several subtypes, such as internet addiction, digital gaming addiction, media addiction, and technological device addiction (11,12). Although multi-screen use offers certain advantages in daily life—such as rapid access to information and multifaceted interaction—its excessive use may lead to addiction and a range of adverse health outcomes, including sleep disturbances, physical inactivity, overeating, weight gain, and obesity (13-18).

Current research on health problems associated with screen addiction primarily focuses on systemic effects. However, the relationship between multi-screen addiction and dry eye has not been adequately explored in the literature. Therefore, this study aims to evaluate the impact of multi-screen addiction on dry eye.

Materials and Methods

Study Design and Participants

This study was designed as a cross-sectional study. It was conducted between May 1, 2023, and November 1, 2023, among individuals presenting with symptoms suggestive of dry eye at the Family Medicine and Ophthalmology Outpatient Clinics of a University of Health Sciences Turkey, Gaziosmanpaşa Training and Research Hospital.

Sample size calculation was performed using G*Power software. With a statistical power of 95%, a significance level of 5%, and an effect size of 0.26, the minimum required sample size was calculated as 194 participants in each group (dry eye and non-dry eye). A total of 420 participants were ultimately enrolled in the study.

Eligibility Criteria

Inclusion Criteria

- Age ≥18 years,
- Presentation with at least one symptom suggestive of dry eye (burning, itching, redness, ocular fatigue, blurred vision, photophobia),
- Ability to provide informed consent,
- Completion of Schirmer test and study questionnaires.

Exclusion Criteria

- Presence of an acute illness at the time of evaluation,
- Systemic diseases strongly associated with dry eye (e.g., Sjögren's syndrome),
- Use of medications affecting sleep or alertness (e.g., benzodiazepines, antipsychotics, H1 antihistamines),
- Hearing, speech, cognitive, or cooperation limitations impairing communication,
- Pregnancy.

Data Collection

Schirmer Test Procedure

During the initial assessment, all participants were evaluated for dry eye by an ophthalmologist using the Schirmer test. The Schirmer test was performed as Schirmer I without anesthesia, by placing standardized Schirmer strips on the outer one-third of the lower conjunctival fornix of both eyes for 5 minutes to measure basal and reflex tear production. Based on the TFOS DEWS II criteria, participants with tear production <10 mm/5 min were classified as having dry eye and included in the dry eye group, whereas those with tear production >10 mm/5 min were assigned to the non-dry eye group (3).

Descriptive Information Form

The form developed by us included questions regarding the participants' socio-demographic characteristics (age, gender, education level), presence of chronic diseases and use of eyeglasses.

Multiple Screen Addiction Scale (MSAS)

The MSAS, developed by Sarıtepeci (19) in 2021, is a 15-item, 5-point Likert-type scale used to assess multi-screen addiction. The scale comprises three subdimensions: Excessive screen time (4 items), compulsive behavior [(CB) 8 items], and loss of control [(LC) 3 items]. The MSAS defines addiction according to the monothetic criterion as scoring 3 or above on all items, and according to the polythetic criterion as scoring 3 or above on at least 8 items. The Cronbach's alpha coefficients for the total scale and its subdimensions range between 0.71 and 0.92, indicating good internal consistency (19).

In the present study, the polythetic criterion (≥3 on at least 8 items) was applied to classify participants as having multi-screen addiction. Participants meeting this threshold were categorized as having addiction (yes/no), and this categorical variable was used in group comparisons. Total and subscale scores were additionally analyzed as continuous variables.

Ethical Considerations

The study was conducted with the approval of the Clinical Research Ethics Committee of University of Health Sciences Turkey, Gaziosmanpaşa Training and Research Hospital (date: 12.04.2023, approval number: 53). All procedures were carried out in accordance with the Declaration of Helsinki. Verbal and written informed consent were obtained from all participants.

Statistical Analyses

Statistical analyses of the data obtained in the study were performed using IBM SPSS Statistics for Windows, Version 25.0 (Statistical Package for the Social Sciences, IBM Corp., Armonk, NY, USA). Descriptive statistics were presented as frequency (n) and percentage (%) for categorical variables, and mean ± standard deviation for continuous variables. Normality assumptions were assessed using the Kolmogorov-Smirnov test, with p-values >0.05 indicating normal distribution. Independent samples t-test was used to compare various clinical parameters between groups. Pearson's chi-square test was employed for comparisons of categorical variables. A p-value of less than 0.05 was considered statistically significant.

Results

This study was conducted with a total of 420 participants, including 210 individuals with dry eye and 210 without dry eye. The mean age of all participants was 37.35±13.58 years (range: 18-79). The mean age of the dry eye group was 36.51±13.45 years (range: 18-75), and the non-dry eye group had a mean age of 38.17±13.69 years (range: 18-79). The frequency distributions of the socio-demographic and medical characteristics of the two groups are presented in Table 1.

Descriptive statistics of the MSAS scores and the distribution of multi-screen addiction according to dry eye status are presented in Table 2. The mean total MSAS score of all participants was 36.16±11.94 (range: 15-67). Participants with dry eye demonstrated higher total MSAS scores (37.83±12.47) compared to those without dry eye (34.49±11.18). Similarly, subscale scores for Excessive Screen Time, excessive screen time, CB, and LC were higher in the dry eye group.

According to the polythetic classification criterion, 41.4% (n=174) of the total sample met the criteria for multi-screen

Table 1. Socio-demographic and medical characteristics of the dry eye and non-dry eye groups

	Total (n=420)	Dry eye (-) (n=210)	Dry eye (+) (n=210)
Age (mean ± SD)	37.35±13.58	38.17±13.69	36.51±13.45
	n (%)	n (%)	n (%)
Gender			
Male	146 (34.8)	74 (35.2)	72 (34.3)
Female	274 (65.2)	136 (64.8)	138 (65.7)
Education level			
Primary and middle school	66 (15.7)	32 (15.2)	34 (16.2)
High school	115 (27.4)	66 (31.4)	49 (23.3)
Associate degree	48 (11.4)	13 (6.2)	35 (16.7)
University	191 (45.5)	99 (47.1)	92 (43.8)
Chronic disease			
No	312 (74.3)	150 (71.4)	162 (77.1)
Yes	108 (25.7)	60 (28.6)	48 (22.9)
Use of eyeglasses			
No	221 (52.6)	98 (46.7)	123 (58.6)
Yes	199 (47.4)	112 (53.3)	87 (41.4)

Data are presented as n (%) and mean ± SD values. SD: Standard deviation

Table 2. Descriptive statistics of MSAS scores and distribution of multi-screen addiction according to dry eye status

	Min-max	Mean ± SD
Dry eye (+)		
Total screen addiction score	15.00-67.00	37.83±12.47
Excessive screen time	4.00-20.00	11.08±3.69
Compulsive behavior	8.00-40.00	20.58±7.42
Loss of control	2.00-14.00	6.17±2.99
Dry eye (-)		
Total screen addiction score	18.00-66.00	34.49±11.18
Excessive screen time	4.00-20.00	9.72±4.17
Compulsive behavior	9.00-37.00	18.90±6.68
Loss of control	3.00-14.00	5.88±2.19
Screen addiction according to MSAS (polythetic criterion)		
	No	**Yes**
	n (%)	**n (%)**
Dry eye (-)	141 (67.1)	69 (32.9)
Dry eye (+)	105 (50.0)	105 (50.0)
Total	246 (58.6)	174 (41.4)

Data are presented as n (%), min-max and mean ± SD values. SD: Standard deviation, MSAS: Multi-screen addiction scale

addiction. The prevalence of multi-screen addiction was 50.0% among individuals with dry eye and 32.9% among those without dry eye.

As shown in Table 3, there was a statistically significant difference between the dry eye and non-dry eye groups regarding multi-screen addiction status (p<0.001). The proportion of participants classified as having multi-screen addiction was significantly higher in the dry eye group compared to the non-dry eye group.

In addition, dry eye status was significantly associated with eyeglass use (p=0.015) and education level (p=0.005). No statistically significant differences were observed between groups with respect to age, gender, marital status, or presence of chronic disease (p>0.05).

Discussion

This study examined the relationship between multi-screen addiction and dry eye by comparing individuals with and without dry eye. Multi-screen addiction was identified in 41.4% of participants overall. The prevalence of multi-screen addiction was significantly higher in the dry eye

Table 3. Comparison of socio-demographic and clinical characteristics according to dry eye status

	Dry eye (-) (n=210)	Dry eye (+) (n=210)	p
Age (mean ± SD)	38.18±13.70	36.52±13.45	0.212[a]
Gender	**n (%)**	**n (%)**	
Male	74 (35.2)	72 (34.3)	0.838[b]
Female	136 (64.8)	138 (65.7)	
Marital status			
Married	112 (53.3)	123 (58.6)	0.280[b]
Single	98 (46.7)	87 (41.4)	
Use of eyeglasses			
No	98 (46.7)	123 (58.6)	0.015[b]
Yes	112 (53.3)	87 (41.4)	
Education level			
Primary and middle school	32 (15.2)	34 (16.2)	0.005[b]
High school	66 (31.4)	49 (23.3)	
Associate degree	13 (6.2)	35 (16.7)	
University	99 (47.1)	92 (43.8)	
Chronic disease			
No	150 (71.4)	162 (77.1)	0.180[b]
Yes	60 (28.8)	48 (22.9)	
Screen addiction according to MSAS			
Yes	69 (32.9)	105 (50.0)	<0.001[b]

SD: Standard deviation, MSAS: Multi-screen addiction scale, [a]: Independent t-test, [b]: Pearson chi-square test, p<0.05 is statistically significant

group (50.0%) compared to the non-dry eye group (32.9%).

Dry eye is a multifactorial ocular surface disorder characterized by tear film instability. With the widespread and prolonged use of digital devices in occupational, educational, and recreational settings, the frequency of dry eye-related symptoms has increased markedly (20). Several studies have demonstrated an association between prolonged screen use and dry eye (21,22). Portello et al. (23) showed that extended exposure to computers and other screen-based devices reduces blink rate, increasing tear evaporation and contributing to dry eye development. Evidence also indicates a strong correlation between longer screen use and the prevalence and severity of symptoms (24). Tallens-Estarelles et al. (25) similarly reported increased dry eye signs among screen users, highlighting reduced tear volume, impaired stability, and altered tear film composition as key mechanisms. Muntz et al. (26) found that individuals with excessive weekly screen time frequently exhibited dry eye symptoms, with 90% being symptomatic according to the SANDE questionnaire, and demonstrated a positive correlation between prolonged screen exposure, compensatory blink changes, and reduced tear film stability.

In our study, dry eye was assessed using the Schirmer I test without anesthesia, and no subtype classification was performed. Multi-screen addiction was significantly more frequent among those with dry eye (50.0%). These finding reinforce the association between screen-related behaviors and ocular surface complaints, emphasizing the role of behavioral factors in the increasing clinical burden of dry eye. Understanding the etiological contribution of multi-screen addiction is therefore essential, as reducing excessive screen exposure may help mitigate both the prevalence and severity of dry eye symptoms.

Chronic systemic diseases such as diabetes, autoimmune disorders, and thyroid dysfunction are recognized contributors to ocular surface instability. However, in our study, the prevalence of chronic disease did not differ significantly between groups. TFOS DEWS II reports note that systemic comorbidities can disrupt tear film homeostasis (1), yet the distribution of chronic conditions in our sample largely involved disorders not strongly associated with tear film abnormalities. This may explain the absence of a significant relationship, suggesting that behavioral factors—particularly prolonged screen exposure—may have played a more prominent role in dry eye prevalence in this population.

In addition to these findings, dry eye was more common among participants who did not use eyeglasses. Although eyeglasses are not a treatment modality, TFOS DEWS II reports indicate that reduced ocular surface protection and environmental exposure can increase tear film instability and evaporation (1). By providing partial shielding, eyeglasses may help reduce evaporative stress, and individuals who do not use them may experience greater ocular surface exposure during prolonged screen viewing (25). Although our study assessed general eyeglass use rather than sunglasses specifically, prior evidence suggests that various forms of optical or protective eyewear, including sunglasses, can reduce airflow exposure and tear evaporation, which may partially explain our findings.

Another noteworthy finding was the higher prevalence of dry eye among participants with higher educational attainment. This group is more likely to engage in prolonged digital device use, a recognized risk factor for dry eye (21). Prior studies show that intensive screen exposure reduces blink rate and destabilizes the tear film (10,23), which may explain the increased dry eye prevalence observed in this subgroup.

Study Limitations

This study has several limitations. Firstly, dry eye was assessed using the Schirmer I test without anesthesia, without further subtype classification, which limited the analysis of subtype-specific relationships with multi-screen addiction. Secondly, the cross-sectional design prevents establishing a causal relationship between multi-screen addiction and dry eye. Future studies should include detailed classification of dry eye subtypes and further explore their associations with multi-screen addiction. Longitudinal studies are also needed to clarify the long-term effects of screen use on ocular health.

Conclusion

The present study highlights the potential impact of the increasing multi-screen use on eye health. Multi-screen addiction was common among participants (41.4%) and significantly higher in those with dry eye (50.0%). The findings suggest that lifestyle and individual factors contribute to dry eye development, with increased screen time causing adverse changes to the ocular surface. Therefore, it is essential for individuals to monitor and manage their screen time and follow preventive measures to protect their eyes.

Ethics

Ethics Committee Approval: The study was conducted with the approval of the Clinical Research Ethics Committee of University of Health Sciences Turkey, Gaziosmanpaşa Training and Research Hospital (date: 12.04.2023, approval number: 53). All procedures were carried out in accordance with the Declaration of Helsinki.

Informed Consent: Verbal and written informed consent were obtained from all participants.

Footnotes

Authorship Contributions

Surgical and Medical Practices: G.Y., U.Ş., Concept: G.Y., U.Ş., O.B., Design: G.Y., S.T.K., U.Ş., O.B., Data Collection or Processing: G.Y., S.T.K., U.Ş., Analysis or Interpretation: G.Y., S.T.K., U.Ş., O.B., Literature Search: G.Y., S.T.K., Writing: G.Y., S.T.K., O.B.

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