ORIGINAL ARTICLE

Annals of Agricultural and Environmental Medicine
www.aaem.pl

Screen time, preventive visual hygiene behaviours, and digital eye strain symptoms among adults in Poland – a cross-sectional study

Agnieszka Kamińska[1,A-F], Radosław Sierpiński[1,2,A,C-F], Agata Olearczyk[2,A,D-F], Aysel Galbinur[3,D-F], Tural Galbinur[3,D-F], Maciej Kamiński[4,D-F], Mariusz Gujski[5,D-F], Mateusz Jankowski[6,A,D-F], Grzegorz Juszczyk[7,D-F]

[1] *Faculty of Medicine, Collegium Medicum, Cardinal Stefan Wyszynski University, Warsaw, Poland*
[2] *National Centre for Health Policy and Health Inequalities, Cardinal Stefan Wyszynski University, Warsaw, Poland*
[3] *Department of Ophthalmology, Azerbaijan Medical University, Azerbaijan*
[4] *Faculty of Medicine, Łazarski University, Warsaw, Poland*
[5] *VIZJA University, Warsaw, Poland*
[6] *School of Public Health, Centre of Postgraduate Medical Education, Warsaw, Poland*
[7] *Department of Public Health, Faculty of Health Sciences, Medical University, Warsaw, Poland*
A – Research concept and design, B – Collection and/or assembly of data, C – Data analysis and interpretation, D – Writing the article, E – Critical revision of the article, F – Final approval of the article

Kamińska A, Sierpiński R, Olearczyk A, Galbinur A, Galbinur T, Kamiński M, Gujski M, Jankowski M, Juszczyk G. Screen time, preventive visual hygiene behaviors, and digital eye strain symptoms among adults in Poland: a cross-sectional study. Ann Agric Environ Med. doi:10.26444/aaem/226604

Abstract

Introduction and Objective. Digital eye strain (DES) comprises ocular and visual symptoms linked to prolonged use of digital devices. The aim of the study is to assess screen exposure, preventive visual hygiene behaviours, DES-related symptoms, and factors associated with preventive practices among adults in Poland.

Materials and Method. A cross-sectional CAWI survey was conducted in March 2026 among a nationwide quota sample of adults in Poland. Data were collected using the Computer-Assisted Web Interview (CAWI) technique.

Results. A total of 1,090 adults participated. More than half reported at least 3 h of daily screen time on a typical working day, while 27.7% used no preventive visual hygiene behaviours. Regular breaks were reported by 31.9% and proper room lighting by 36.1%. In multivariable logistic regression analysis, higher education (aOR: 1.87; 95%CI: 1.38–2.54; p<0.001), occupational activity (aOR: 1.60; 95%CI: 1.16–2.19; p=0.004), wearing spectacles or contact lenses (aOR: 2.11; 95%CI: 1.54–2.88; p<0.001), diagnosed eye conditions (aOR: 2.08; 95%CI: 1.47–2.93; p<0.001), and longer screen exposure (p<0.05), were independently associated with using at least one preventive behaviour. About one-quarter frequently reported burning or irritated eyes (24.9%), tearing (24.6%), blurred vision (25.3%), and difficulty maintaining visual focus (24.1%). DES-related symptoms differed by gender, age, occupational status, vision correction, diagnosed eye conditions, and screen exposure (p<0.05).

Conclusions. Daily screen exposure and DES-related symptoms were common among adults in Poland, while preventive visual hygiene behaviours were insufficiently implemented. Public health interventions are needed to promote evidence-based visual hygiene and reduce discomfort related to prolonged use of digital devices.

Key words

Poland, adults, digital eye strain, screen exposure, visual hygiene, eye symptoms

INTRODUCTION

The global socio-economic development and rapid expansion of digital technologies has led to increased daily exposure to electronic screens [1, 2]. Computers, smartphones, tablets, and other digital devices, are commonly used for occupational, educational, as well as recreational activities [3]. Remote work and education during the COVID-19 pandemic also led to widespread implementation of screen-based online communication tools by different socio-demographic groups [4, 5]. Modern technology facilitates and supports human functioning across numerous areas of daily life [6]. However, the health consequences associated with prolonged digital device use have become an increasing public health concern [2, 3].

Prolonged digital screen use has been associated with multiple adverse health consequences, including visual disturbances, musculoskeletal disorders, sleep impairment, reduced physical activity, and negative effects on mental health [7]. Digital eye strain (DES), also called computer vision syndrome (CVS) is a group of ocular and visual symptoms associated with the prolonged use of digital devices [8, 9]. DES symptoms commonly include burning or irritated eyes, dryness, blurred vision, eye fatigue, light sensitivity, visual focusing difficulties, and headaches [8–10]. DES is considered a multifactorial condition resulting from prolonged near

✉ Address for correspondence: Radosław Sierpiński, Faculty of Medicine, Collegium Medicum, Cardinal Stefan Wyszynski University, Warsaw, Poland
E-mail: r.sierpinski@uksw.edu.pl

Received: 05.06.2026; accepted: 27.07.2026; first published: 15.09.2026

work, reduced blink rate, increased accommodative and vergence demands, improper viewing distance, poor lighting conditions, screen glare, and inadequate ergonomic practices during digital device use [8–10]. Previous studies indicate that DES symptoms may affect more than half of digital device users worldwide [10].

Preventive visual hygiene behaviours play an important role in reducing the risk of DES and limiting visual discomfort associated with prolonged screen use [7, 8]. Preventive strategies for DES include taking regular breaks during screen use, maintaining appropriate viewing distance and posture, ensuring adequate lighting conditions, optimizing workplace ergonomics, and using lubricating eye drops when needed [11]. However, scientific evidence suggests that public awareness of preventive eye health measures remains limited [10, 12, 13].

Since joining the European Union in 2004, Poland has experienced substantial socio-economic and digital transformation, accompanied by rapid adoption of digital technologies, widespread Internet access, and growing use of digital public and e-health services [14]. In 2024, approximately 96% of Polish households had Internet access, while smartphones and digital media became integral components of everyday life across all age groups [15]. The increasing use of digital devices has also become an important public health and educational issue, particularly in the context of growing debate regarding smartphone use among school-aged children and adolescents [16].

In Poland, the burden of eye conditions and visual complaints is increasing, raising also concerns regarding the long-term ophthalmic consequences of intensive digital device use [17]. Previously published data on DES are focused on selected occupational groups, students or healthcare professionals [10, 12, 13]. There is a gap in nationwide research on preventive visual practices and DES prevention methods among adults in Poland.

OBJECTIVE

The aim of the study is to assess daily screen exposure, preventive visual hygiene behaviours, and digital eye strain–related symptoms in a nationwide sample of adults in Poland, as well as to identify factors associated with the implementation of at least one preventive visual hygiene behaviour.

MATERIALS AND METHOD

Study design and population. This cross-sectional survey was carried out between 13 – 17 March 2026 among a nationwide sample of adults in Poland. Data were collected using the Computer Assisted Web Interview (CAWI) technique. The data collection process was conducted by a public opinion survey company (Nationwide Research Panel Ariadna), based on a study protocol and methods provided by the authors [18].

Participants were selected from an online research panel of over 100,000 registered and verified individuals [18]. Quota-based sampling was applied, with stratification by gender, age, and place of residence. The sampling structure reflected the demographic distribution of the Polish adult population, based on official demographic data published by Statistics Poland [19]. In Poland, approximately 96% of households have Internet access; therefore, the CAWI technique used in this study allowed for obtaining a nationwide sample of adults in Poland [18].

Invitations to participate in the study were distributed via e-mail and SMS messages [18]. Each respondent received an individualized link to the online questionnaire hosted on a secure platform managed by the Nationwide Research Panel Ariadna [18]. In cases of non-response, participants with matching socio-demographic characteristics were invited to participate in order to maintain the previously predefined quotas. There were no missing answers. Similar methodology was used in previously published nationwide cross-sectional studies from Poland [20, 21].

The study followed the principles expressed in the Declaration of Helsinki. Participation in the study was voluntary and anonymous; informed consent was obtained from all participants. The study protocol was reviewed and approved by the Bioethics Committee at the Centre of Postgraduate Medical Education, Warsaw, Poland (Decision No. 3/2026 of 11 February 2026).

Study questionnaire. The study questionnaire consisted of 16 questions addressing selected aspects of eye health, visual behaviours, and factors related to the use of digital devices. The questionnaire was developed by the authors based on a review of the current literature [7–13].

Daily screen time during a typical working day was assessed using a single-choice question regarding the total time spent using digital devices or screens (e.g., smartphone, computer, tablet, or television).

Visual hygiene practices during screen use were assessed using a multiple-choice question including eight predefined behaviours, such as taking regular breaks, maintaining appropriate screen distance and lighting, using lubricating eye drops, blue-light filters, or computer glasses. Respondents who selected at least one listed behaviour were classified as using visual hygiene practices during screen use.

DES-related symptoms experienced within the past 7 seven days were assessed using nine questions regarding the frequency of ocular and visual symptoms associated with prolonged screen use, including burning eyes, blurred vision, eye pain, headache, light sensitivity, and difficulty maintaining visual focus. Responses were recorded using a five-point Likert scale ranging from ‘never’ to ‘daily’.

A pilot study was conducted among 18 adults who completed the questionnaire twice with a 7-day interval. Based on the pre-test results, four items were revised to improve clarity and consistency. The kappa coefficients for key items ranged from 0.64 – 0.92.

Statistical analysis. Statistical analyses were conducted using IBM SPSS Statistics version 29 (IBM Corp., Armonk, NY, USA). Categorical variables were presented using frequencies and proportions. Cross-tabulations and chi-square tests were used to compare categorical variables. Logistic regression analyses were performed to identify factors associated with the use of at least one visual hygiene practice during screen use. In the first step, bi-variable logistic regression models were applied for each independent variable. Variables selected based on literature review and those statistically significant in bivariable analyses were included in the multivariable

logistic regression model. Results were presented as odds ratios (ORs) with 95% confidence intervals (95%CIs). A statistically significance level was set at $p < 0.05$.

RESULTS

A total of 1,090 adults participated in the study (Tab. 1) – 54.1% were female, 29.6% were aged 60 years or older, and 45.9% had higher education. Most respondents were occupationally active (61.5%), wore spectacles or contact lenses (69.3%), and 35.4% declared an eye condition diagnosed by a doctor. Detailed characteristics of the study population are presented in Table 1.

Table 1. Characteristics of the study population (n=1090)

Variable	n	%
Gender		
female	590	54.1
male	500	45.9
Age [years]		
18–29	139	12.8
30–39	220	20.2
40–49	205	18.8
50–59	203	18.6
60+	323	29.6
Higher education		
yes	500	45.9
no	590	54.1
Currently married		
yes	586	53.8
no	504	46.2
Place of residence		
rural area	432	39.6
city below 20,000 residents	142	13.0
city from 20,000 to 99,999 residents	207	19.0
city from 100,000 to 499,999 residents	171	15.7
city ≥ 500,000 residents	138	12.7
Having children under 18 years		
yes	275	25.2
no	815	74.8
Occupational status		
active	670	61.5
passive	420	38.5
Self-declared financial status		
good	510	46.8
moderate	424	38.9
bad	156	14.3
Wearing spectacles or contact lenses		
yes	755	69.3
no	335	30.7
Eye condition diagnosed by a doctor		
yes	386	35.4
no	704	64.6

Daily screen exposure and preventive visual hygiene practices among adults in Poland. Most respondents reported spending 3–4 h (31.5%) or 5–6 h (20.2%) daily in front of screens during a typical working day (Tab. 2). Regular breaks from screen exposure were reported by 31.9% of respondents, while 36.1% ensured proper room lighting during screen use. Lubricating eye drops were used by 17.3% of participants, and 15.8% reported using computer glasses with blue-light filtering lenses. Notably, more than one-quarter of respondents (27.7%) declared that they did not use any preventive visual hygiene practices (Tab. 2).

Table 2. Daily screen exposure and preventive visual hygiene practices among adults in Poland (n=1090)

How much total time do you usually spend in front of all types of screens or displays during a typical working day (e.g., smartphone, computer, tablet, or television)?		
	n	%
Less than 1 hour	32	2.9
1–2 hours	137	12.6
3–4 hours	343	31.5
5–6 hours	220	20.2
7–8 hours	126	11.6
9–10 hours	96	8.8
More than 10 hours	78	7.2
Difficult to say	58	5.3
Which of the following practices do you use while working or studying in front of a screen? Please select all that apply.		
I take regular breaks (e.g., every 30–60 minutes) and look into the distance or rest my eyes from screens	348	31.9
I consciously blink more often or remind myself to blink	145	13.3
I position the screen at an appropriate distance ("arm's length") and height	306	28.1
I ensure proper room lighting and use a lamp when it gets dark	393	36.1
I use lubricating eye drops	189	17.3
I increase font size or screen magnification	193	17.7
I use blue-light filters (e.g., night mode on devices)	145	13.3
I use computer glasses with blue-light filtering lenses	172	15.8
Other (please specify)	4	0.4
I do not use any eye care or vision protection practices	302	27.7

Socio-demographic differences in preventive visual hygiene behaviours among adults in Poland. Preventive visual hygiene behaviours significantly differed according to selected socio-demographic and health-related characteristics (Tab. 3). Respondents with higher education, those wearing spectacles or contact lenses, individuals with diagnosed eye conditions, and participants with longer daily screen exposure, more frequently reported the use of preventive visual hygiene practices ($p<0.05$). Ensuring proper room lighting, taking regular breaks, and maintaining appropriate screen distance were among the most commonly reported behaviours across most subgroups.

Factors associated with the use of preventive visual hygiene behaviours among adults in Poland. In multivariable logistic regression analysis (Tab. 4), higher education (aOR: 1.87; 95%CI: 1.38–2.54; $p<0.001$), occupationally active

Table 3. Socio-demographic differences in preventive visual hygiene behaviors among adults in Poland (n=1090).

	I take regular breaks and look into the distance or rest my eyes from screens		I consciously blink more often or remind myself to blink		I position the screen at an appropriate distance ("arm's length") and height		I ensure proper room lighting and use a lamp when it gets dark		I use lubricating eye drops		I increase font size or screen magnification		I use blue-light filters (e.g., night mode on devices)		I use computer glasses with blue-light filtering lenses	
Variable	%	p	%	p	%	p	%	p	%	p	%	p	%	p	%	p
Gender																
female (n=590)	32.5	0.6	13.4	0.9	28.1	0.9	40.3	**0.001**	20.2	**0.01**	20.8	**0.003**	20.8	**0.003**	17.1	0.2
male (n=500)	31.2		13.2		28.0		31.0		14.0		14.0		14.0		14.2	
Age [years]																
18–29 (n=139)	28.1	0.3	11.5	**0.04**	26.6	0.08	23.7	**<0.001**	17.3	0.7	13.7	**0.002**	13.7	**0.002**	15.8	0.5
30–39 (n=220)	30.9		19.1		26.8		34.5		15.9		12.3		12.3		19.5	
40–49 (n=205)	28.3		13.7		21.5		31.7		16.1		13.7		13.7		15.1	
50–59 (n=203)	33.5		9.4		30.0		38.9		16.3		21.2		21.2		13.3	
60+ (n=323)	35.6		12.4		32.5		43.3		19.8		23.5		23.5		15.2	
Higher education																
yes (n=500)	36.6	**0.002**	15.6	**0.04**	33.4	**<0.001**	46.0	**<0.001**	20.4	**0.01**	20.0	0.07	20.0	0.07	19.4	**0.003**
no (n=590)	28.0		11.4		23.6		27.6		14.7		15.8		15.8		12.7	
Currently married																
yes (n=586)	32.8	0.5	12.1	0.2	27.8	0.8	37.7	0.2	16.6	0.5	16.0	0.1	16.0	0.1	15.5	0.8
no (n=504)	31.0		14.7		28.4		34.1		18.3		19.6		19.6		16.1	
Place of residence																
rural area (n=432)	30.8	0.3	13.2	0.4	24.5	0.1	33.3	**0.04**	14.4	0.1	15.3	0.2	15.3	0.2	15.5	0.9
city below 20,000 residents (n=142)	25.4		16.2		24.6		28.2		14.8		16.9		16.9		13.4	
city from 20,000 to 99,999 residents (n=207)	34.8		13.5		31.4		39.1		19.8		16.9		16.9		16.4	
city from 100,000 to 499,999 residents (n=171)	35.7		14.6		32.7		40.4		21.1		20.5		20.5		15.8	
city ≥ 500,000 residents (n=138)	33.3		8.7		31.9		42.8		21.0		23.9		23.9		18.1	
Having children under 18 years																
yes (n=275)	28.0	0.1	12.4	0.6	24.0	0.08	32.7	0.2	14.9	0.2	14.9	0.2	14.9	0.2	14.9	0.6
no (n=815)	33.3		13.6		29.4		37.2		18.2		18.7		18.7		16.1	
Occupational status																
active (n=670)	32.2	0.8	14.9	**0.04**	28.7	0.6	35.8	0.8	18.4	0.3	16.7	0.3	16.7	0.3	18.7	**<0.001**
passive (n=420)	31.4		10.7		27.1		36.4		15.7		19.3		19.3		11.2	
Self-declared financial status																
good (n=510)	30.0	0.4	12.9	0.8	26.9	0.5	37.3	0.7	16.9	0.5	16.9	0.4	16.9	0.4	14.7	0.5
moderate (n=424)	34.2		13.2		30.0		35.4		18.9		19.6		19.6		17.5	
bad (n=156)	32.1		14.7		26.9		34.0		14.7		15.4		15.4		14.7	
Wearing spectacles or contact lenses																
yes (n=755)	35.1	**<0.001**	13.4	0.9	31.1	**<0.001**	40.4	**<0.001**	20.9	**<0.001**	21.3	**<0.001**	21.3	**<0.001**	21.1	**<0.001**
no (n=335)	24.8		13.1		21.2		26.3		9.3		9.6		9.6		3.9	
Eye condition diagnosed by a doctor																
yes (n=386)	34.7	0.1	15.3	0.2	31.1	0.1	42.2	**0.002**	28.8	**<0.001**	22.8	**0.001**	22.8	**0.001**	21.2	**<0.001**
no (n=704)	30.4		12.2		26.4		32.7		11.1		14.9		14.9		12.8	
Self-reported screentime exposure																

	I take regular breaks and look into the distance or rest my eyes from screens		I consciously blink more often or remind myself to blink		I position the screen at an appropriate distance ("arm's length") and height		I ensure proper room lighting and use a lamp when it gets dark		I use lubricating eye drops		I increase font size or screen magnification		I use blue-light filters (e.g., night mode on devices)		I use computer glasses with blue-light filtering lenses	
less than 1 hour (n=32)	9.4	**<0.001**	6.3	**0.01**	6.3	**<0.001**	9.4	**<0.001**	3.1	**<0.001**	0.0	**0.02**	0.0	**0.02**	9.4	**<0.001**
1–2 hours (n=137)	27.0		10.2		15.3		33.6		15.3		16.1		16.1		15.3	
3–4 hours (n=343)	31.8		11.7		30.0		40.2		15.5		20.1		20.1		10.8	
5–6 hours (n=220)	34.1		15.5		32.7		36.8		18.2		17.3		17.3		15.5	
7–8 hours (n=126)	41.3		16.7		32.5		40.5		16.7		21.4		21.4		22.2	
9–10 hours (n=96)	43.8		21.9		37.5		40.6		31.3		17.7		17.7		22.9	
more than 10 hours (n=78)	32.1		15.4		34.6		48.5		28.2		21.8		21.8		29.5	
difficult to say (n=58)	8.6		1.7		6.9		8.6		1.7		5.2		5.2		6.9	

status (aOR: 1.60; 95%CI: 1.16–2.19; p=0.004), wearing spectacles or contact lenses (aOR: 2.11; 95%CI: 1.54–2.88; p<0.001), diagnosed eye conditions (aOR: 2.08; 95%CI: 1.47–2.93; p<0.001), and longer daily screen exposure, were independently associated with the use of at least one preventive visual hygiene behaviour (Tab. 4). Respondents who reported difficulty estimating their daily screen time were significantly less likely to use preventive behaviours (p<0.05).

Frequency of digital eye strain–related symptoms among adults in Poland. Burning or irritated eyes (24.9%), excessive tearing (24.6%), blurred or unclear vision (25.3%), and difficulty maintaining visual focus after prolonged screen use (24.1%) were among the most commonly reported digital eye strain–related symptoms experienced often, very often, or daily during the past 7 seven days. Frequent eye pain was reported by 17.8% of respondents, while 21.3% declared frequent light sensitivity. Detailed frequencies of digital eye strain–related symptoms are presented in Table 5.

Table 4. Factors associated with the use of at least one preventive visual hygiene behaviour among adults in Poland (n=1090).

			Do you usually use sunglasses with UV protection? – yes			
			Bivariable Logistic Regression		Multivariable Logistic Regression	
Variable	n	%	OR (95%CI)	p	aOR (95%CI)	p
Gender						
female (n=590)	73.7	0.3	1.17 (0.90–1.52)	0.3		
male (n=500)	70.6		Reference			
Age [years]						
18–29 (n=139)	72.7	0.7	Reference			
30–39 (n=220)	72.3		0.98 (0.61–1.58)	0.9		
40–49 (n=205)	68.3		0.81 (0.50–1.30)	0.4		
50–59 (n=203)	74.9		1.12 (0.69–1.83)	0.6		
60+ (n=323)	73.1		1.02 (0.65–1.60)	0.9		
Higher education						
yes (n=500)	79.8	**<0.001**	2.04 (1.55–2.69)	**<0.001**	1.87 (1.38–2.54)	**<0.001**
no (n=590)	65.9		Reference		Reference	
Currently married						
yes (n=586)	71.2	0.4	0.89 (0.68–1.16)	0.4		
no (n=504)	73.6		Reference			
Place of residence						
rural area (n=432)	68.8	**0.04**	Reference		Reference	
city below 20,000 residents (n=142)	68.3		0.98 (0.65–1.47)	0.9	0.87 (0.56–1.37)	0.6
city from 20,000 to 99,999 residents (n=207)	73.9		1.29 (0.89–1.87)	0.2	1.08 (0.72–1.62)	0.7
city from 100,000 to 499,999 residents (n=171)	80.1		1.83 (1.20–2.81)	**0.005**	1.32 (0.83–2.09)	0.2
city ≥ 500,000 residents (n=138)	75.4		1.39 (0.90–2.15)	0.1	0.87 (0.54–1.41)	0.6
Having children under 18 years						
yes (n=275)	66.9	**0.02**	Reference	**0.02**	1.43 (1.01–2.01)	**0.04**

		Do you usually use sunglasses with UV protection? – yes				
		Bivariable Logistic Regression		Multivariable Logistic Regression		
no (n=815)	74.1		1.42 (1.05–1.90)		Reference	
Occupational status						
active (n=670)	75.1	**0.01**	1.43 (1.09–1.87)	**0.01**	1.60 (1.16–2.19)	**0.004**
passive (n=420)	67.9		Reference		Reference	
Self-declared financial status						
good (n=510)	72.2	0.7	1.12 (0.75–1.66)	0.6		
moderate (n=424)	73.3		1.19 (0.79–1.78)	0.4		
bad (n=156)	69.9		Reference			
Wearing spectacles or contact lenses						
yes (n=755)	78.9	**<0.001**	2.79 (2.11–3.69)	**<0.001**	2.11 (1.54–2.88)	**<0.001**
no (n=335)	57.3		Reference		Reference	
Eye condition diagnosed by a doctor						
yes (n=386)	82.6	**<0.001**	2.39 (1.76–3.24)	**<0.001**	2.08 (1.47–2.93)	**<0.001**
no (n=704)	66.6		Reference		Reference	
Self-reported screentime exposure						
up to 2 hours (n=169)	63.9	**<0.001**	Reference		Reference	
3–4 hours (n=343)	75.8		1.77 (1.19–2.64)	**0.005**	1.89 (1.23–2.88)	**0.003**
5–6 hours (n=220)	73.6		1.58 (1.02–2.44)	**0.04**	1.46 (0.92–2.32)	0.1
≥ 7 hours (n=300)	81.3		2.46 (1.61–3.77)	**<0.001**	1.95 (1.22–3.10)	**0.005**
difficult to say (n=58)	24.1		0.18 (0.09–0.35)	**<0.001**	0.20 (0.10–0.42)	**<0.001**

Table 5. Frequency of digital eye strain–related symptoms reported during the past 7 days among adults in Poland (n=1090).

During the past 7 days, how often have you experienced the following symptoms associated with digital screen use? Please select one response for each symptom.					
	never	rarely	often	very often	daily
	n (%)	n (%)	n (%)	n (%)	n (%)
Burning or irritated eyes	444 (40.7)	375 (34.4)	197 (18.1)	57 (5.2)	17 (1.6)
Foreign body sensation in the eye	499 (45.8)	368 (33.8)	155 (14.2)	53 (4.9)	15 (1.4)
Excessive tearing	388 (35.6)	434 (39.8)	202 (18.5)	50 (4.6)	16 (1.5)
Eye redness	522 (47.9)	357 (32.8)	162 (14.9)	37 (3.4)	12 (1.1)
Blurred or unclear vision	430 (39.4)	384 (35.2)	196 (18.0)	59 (5.4)	21 (1.9)
Eye pain	573 (52.6)	330 (30.3)	126 (11.6)	48 (4.4)	13 (1.2)
Headache	436 (40.0)	421 (38.6)	164 (15.0)	53 (4.9)	16 (1.5)
Light sensitivity	515 (47.2)	342 (31.4)	158 (14.5)	57 (5.2)	18 (1.7)
Difficulty maintaining visual focus after prolonged screen use	468 (42.9)	359 (32.9)	193 (17.7)	49 (4.5)	21 (1.9)

Socio-demographic differences in digital eye strain–related symptoms among adults in Poland. The frequency of digital eye strain–related symptoms significantly differed ($p<0.05$) by gender, age, occupational status, use of spectacles or contact lenses, diagnosed eye conditions, and daily screen exposure (Tab. 6). Frequent symptoms were more commonly reported by women, younger respondents, individuals with diagnosed eye conditions, and participants wearing spectacles or contact lenses. Higher prevalence of symptoms was also observed among respondents reporting longer daily screen exposure and among those who reported using at least one preventive visual hygiene behaviour.

DISCUSSION

This cross-sectional study provides nationwide data on daily screen exposure, preventive visual hygiene behaviours, and DES-related symptoms among adults in Poland. A significant proportion of adults reported frequent DES-related symptoms. Significant socio-demographic differences in DES-related symptoms were observed, with women, younger adults, individuals with diagnosed eye conditions, respondents wearing spectacles or contact lenses, and participants with longer daily screen exposure more frequently reporting DES-related symptoms. The implementation of preventive visual hygiene behaviours remained insufficient despite the widespread daily screen exposure. In this study, respondents with higher education, occupationally active individuals,

Table 6. Socio-demographic differences in frequent digital eye strain–related symptoms among adults in Poland (n=1090).

During the past 7 days, how often have you experienced the following symptoms associated with digital screen use? – combined responses "often", "very often" and "daily"

	Burning or irritated eyes		Foreign body sensation in the eye		Excessive tearing		Eye redness		Blurred or unclear vision		Eye pain		Light sensitivity		Difficulty maintaining visual focus after prolonged screen use	
Variable	%	p	%	p	%	p	%	p	%	p	%	p	%	p	%	p
Gender																
female (n=590)	29.0	**<0.001**	23.6	**0.01**	26.8	0.07	19.7	0.8	26.9	0.2	19.7	**0.02**	23.4	0.08	26.1	0.1
male (n=500)	20.0		16.8		22.0		19.0		23.4		14.2		19.0		21.8	
Age [years]																
18–29 (n=139)	36.0	**0.01**	29.5	**0.02**	35.3	**0.003**	29.5	**0.001**	33.1	**0.04**	32.4	**<0.001**	36.0	**<0.001**	31.7	**0.02**
30–39 (n=220)	25.9		21.8		24.1		23.2		25.5		24.5		25.0		25.5	
40–49 (n=205)	24.9		22.0		25.4		17.1		27.3		18.5		23.4		27.3	
50–59 (n=203)	22.2		17.7		27.1		19.2		26.1		11.8		19.2		24.1	
60+ (n=323)	21.1		16.4		18.3		13.9		20.1		8.0		12.7		18.0	
Higher education																
yes (n=500)	23.4	0.3	20.2	0.8	21.8	**0.04**	18.6	0.6	25.8	0.7	16.6	0.7	21.0	0.8	24.0	0.9
no (n=590)	26.1		20.7		26.9		20.0		24.9		17.6		21.7		24.2	
Currently married																
yes (n=586)	27.0	0.08	20.1	0.8	25.3	0.6	19.3	0.9	27.3	0.1	17.2	0.9	22.4	0.4	24.6	0.7
no (n=504)	22.4		20.8		23.8		19.4		23.0		17.1		20.2		23.6	
Place of residence																
rural area (n=432)	23.4	0.8	19.9	0.6	21.8	0.3	18.8	0.5	25.2	0.6	15.5	0.7	19.0	0.6	22.9	0.4
city below 20,000 residents (n=142)	27.5		24.6		28.2		23.9		30.3		17.6		23.9		29.6	
city from 20,000 to 99,999 residents (n=207)	25.6		21.3		26.1		20.3		25.6		17.9		23.7		25.6	
city from 100,000 to 499,999 residents (n=171)	26.9		20.5		28.7		19.3		24.0		20.5		21.1		20.5	
city ≥ 500,000 residents (n=138)	23.2		16.7		22.5		15.2		21.7		16.7		23.2		24.6	
Having children under 18 years																
yes (n=275)	28.4	0.1	20.7	0.9	26.9	0.3	21.1	0.4	29.8	**0.04**	22.2	**0.01**	28.4	**0.001**	28.7	**0.04**
no (n=815)	23.7		20.4		23.8		18.8		23.8		15.5		19.0		22.6	
Occupational status																
active (n=670)	26.3	0.2	22.7	**0.02**	27.0	**0.02**	21.9	**0.01**	27.6	**0.03**	21.8	**<0.001**	24.6	**<0.001**	27.2	**0.003**
passive (n=420)	22.6		16.9		20.7		15.2		21.7		9.8		16.2		19.3	
Self-declared financial status																
good (n=510)	24.9	0.9	20.8	0.8	24.3	0.9	19.6	0.9	26.5	0.7	19.4	0.1	20.0	0.5	25.7	0.2
moderate (n=424)	25.2		20.8		24.8		18.9		24.3		16.0		22.2		24.3	
bad (n=156)	23.7		18.6		25.0		19.9		24.4		12.8		23.7		18.6	
Wearing spectacles or contact lenses																
yes (n=755)	30.6	**<0.001**	25.2	**<0.001**	28.3	**<0.001**	23.3	**<0.001**	29.9	**<0.001**	20.4	**<0.001**	24.4	**<0.001**	29.3	**<0.001**
no (n=335)	11.9		9.9		16.1		10.4		14.9		9.9		14.6		12.5	
Eye condition diagnosed by a doctor																
yes (n=386)	42.5	**<0.001**	34.7	**<0.001**	37.0	**<0.001**	31.1	**<0.001**	39.4	**<0.001**	29.3	**<0.001**	37.6	**<0.001**	39.1	**<0.001**
no (n=704)	15.2		12.6		17.8		12.9		17.6		10.5		12.5		15.9	
Self-reported screentime exposure																

During the past 7 days, how often have you experienced the following symptoms associated with digital screen use? – combined responses "often", "very often" and "daily"

	Burning or irritated eyes		Foreign body sensation in the eye		Excessive tearing		Eye redness		Blurred or unclear vision		Eye pain		Light sensitivity		Difficulty maintaining visual focus after prolonged screen use	
less than 1 hour (n=32)	15.6	0.2	21.9	0.8	25.0	0.6	18.8	0.7	15.6	0.3	6.3	0.3	12.5	0.07	18.8	0.2
1–2 hours (n=137)	20.4		16.8		19.0		16.8		21.2		13.9		19.0		18.2	
3–4 hours (n=343)	21.9		19.5		23.0		17.5		24.2		14.6		19.5		21.0	
5–6 hours (n=220)	25.5		19.5		27.7		23.2		28.6		19.1		21.8		29.5	
7–8 hours (n=126)	31.7		23.0		28.6		20.6		23.0		20.6		32.5		24.6	
9–10 hours (n=96)	30.2		21.9		27.1		16.7		25.0		20.8		19.8		29.2	
more than 10 hours (n=78)	28.2		23.1		21.8		21.8		33.3		20.5		17.9		26.9	
difficult to say (n=58)	27.6		25.9		25.9		20.7		29.3		20.7		24.1		25.9	
At least one preventive visual hygiene behaviour																
yes (n=788)	28.8	**<0.001**	24.7	**<0.001**	27.8	**<0.001**	22.8	**<0.001**	29.7	**<0.001**	20.3	**<0.001**	25.6	**<0.001**	27.7	**<0.001**
no (n=302)	14.6		9.3		16.2		10.3		13.9		8.9		10.3		14.9	

those wearing spectacles or contact lenses, individuals with diagnosed eye conditions, and participants with longer daily screen exposure, were more likely to report the use of preventive visual hygiene behaviours.

In this study, more than half of adults in Poland reported spending at least 3 h daily in front of digital screens during a typical working day, with more than one-fifth declaring screen exposure of 5–6 h per day. This observation confirms high prevalence of prolonged screen exposure in the adult population [11, 12]. Similar patterns of prolonged screen exposure in adults were reported in other European countries and the United States [9, 10]. Prolonged screen exposure is considered as one of the most important lifestyle-related factors affecting eye health and associated with DES-related symptoms [8, 10]. Prolonged screen time exposure may result from increased digitalization of occupational, educational, and reactional activities [2, 3].

In this study, regular breaks during screen exposure (31.9%) and maintaining proper room lighting (36.1%) were the most commonly reported preventive visual hygiene behaviours among adults in Poland. However, more advanced preventive measures, such as the use of lubricating eye drops (17.3%) or computer glasses with blue-light filtering lenses (15.8%), were implemented less frequently. Notably, more than one-quarter of respondents declared that they did not use any preventive visual hygiene behaviours. This observation suggest relatively low public awareness of preventive visual hygiene behaviours among adults in Poland [10, 22]. Similar gaps in the implementation of preventive visual hygiene behaviours have also been reported in studies conducted in different countries. A study among university students in Jamaica demonstrated that preventive ergonomic and visual hygiene practices were inconsistently applied despite the high prevalence of computer vision syndrome symptoms [22]. Similarly, a study conducted in Saudi Arabia during the COVID-19 pandemic reported prolonged screen exposure accompanied by suboptimal preventive behaviours and high prevalence of DES-related symptoms among digital device users [23].

Significant differences in preventive visual hygiene behaviours were observed across socio-demographic and health-related groups. Respondents with higher education, those who were economically active, people wearing spectacles or contact lenses, participants with diagnosed eye conditions, and those reporting longer daily screen exposure had higher odds to report at least one preventive behaviour. This may indicate that individuals with greater visual demands, prior eye-related problems, or higher health literacy levels are more likely to implement preventive visual hygiene behaviours [4, 7, 8, 10]. In contrast, respondents who had difficulty estimating their daily screen time were less likely to implement preventive visual hygiene behaviours, which may reflect lower awareness of screen-related health risks and less self-monitoring of digital device use in this group.

In this study, a substantial proportion of adults in Poland self-reported the presence of frequent DES-related symptoms during the past 7 seven days. Burning or irritated eyes, excessive tearing, blurred or unclear vision, and difficulty maintaining visual focus after prolonged screen exposure were among the most commonly reported symptoms. Frequent light sensitivity and eye pain were also commonly declared by the respondents. A similar prevalence of ocular complaints associated with prolonged digital device use has been reported recently in studies conducted in Spain and Italy [10, 24]. In the above-mentioned studies, DES-related symptoms were associated with prolonged screen exposure, intensive online activities, and inadequate ergonomic practices [10, 24].

Socio-demographic differences in self-reported DES-related symptoms were observed in the current study. Women more frequently reported DES-related symptoms which is in line with previously published data on higher susceptibility of dry eye symptoms among females [25]. High frequency of DES-related symptoms was also observed among young adults, which may reflect greater screen-time exposure in youngest age groups [13]. Respondents

diagnosed with eye conditions and those wearing spectacles or contact lenses were more likely to report DES-related symptoms. This observation may result from pre-existing eye conditions, increased visual sensitivity or higher level of knowledge on eye health and eye-related symptoms [10, 23]. Higher prevalence of DES-related symptoms was also observed among those with longer daily screen exposure that may result from the fact that prolonged screen time exposure led to ocular fatigue and visual discomfort [8–10]. As respondents implementing preventive visual hygiene behaviours more often reported DES-related symptoms, it can be hypothesized that these preventive measures were implemented in response to existing symptoms rather than as preventive practice.

No significant urban–rural differences in the prevalence of DES-related symptoms were observed. However, selected preventive visual hygiene behaviours were more frequently reported by residents of urban areas, especially those living in medium-sized and large cities. This observation may result from differences in health awareness, occupational screen exposure, and access to eye care information and ergonomic practices between urban and rural populations [3].

Practical implications. There are several practical implications resulting from this study. A substantial proportion of adults in Poland reported frequent DES-related symptoms, while the implementation of preventive visual hygiene behaviours remained insufficient. Public health interventions are needed to increase awareness of evidence-based preventive measures related to screen use and eye health. Educational campaigns should promote regular breaks during screen exposure, proper lighting conditions, appropriate viewing distance, and ergonomic workplace practices. Occupationally active individuals and those with prolonged daily screen exposure should be considered priority groups for preventive interventions. Moreover, workplace health policies and educational programmes should incorporate visual hygiene recommendations as part of broader digital health promotion strategies. Healthcare professionals should also provide patients with practical guidance regarding safe screen use and prevention of DES-related symptoms.

Limitations of the study. This cross-sectional study is based on self-reported measures, therefore, recall bias and subjective interpretation of symptoms may occur. There was no clinical ophthalmologic assessment of DES symptoms and signs; respondents were only asked about selected DES symptoms. Validated clinical instruments for DES assessment were not used. Some patients may experience symptoms related to other health conditions, rather than DES. CAWI technique was used so those without Internet access were excluded from this study.

CONCLUSIONS

Daily screen exposure and DES-related symptoms were common among adults in Poland, while a substantial proportion of respondents did not report using visual hygiene practices during screen use. The use of preventive visual behaviours was more frequently observed among individuals with higher screen exposure, diagnosed eye conditions, and those wearing spectacles or contact lenses. These findings highlight the need for public health activities aimed at promoting evidence-based visual hygiene practices and increasing awareness of behaviours that may reduce visual discomfort associated with prolonged use of digital devices.

REFERENCES

1. Akinjide A, Adejumo A, Akinola O, et al. Knowledge, awareness and preventive practices against computer vision syndrome among digital device users. World J Adv Res Rev. 2023;20(3):1523–1531. doi:10.30574/wjarr.2023.20.3.2541
2. AlNamlah L, Konswa AA, Alakeel R, Taieb H. The impact of advanced technology and social media platforms on lifestyle medicine: a narrative review. Discover Public Health. 2026;23:227. doi:10.1186/s12982-026-01479-z
3. Uslu O. Understanding digital wellbeing: impacts, strategies, and the path to healthier technology practices. Discov Soc Sci Health. 2025;5:145. doi:10.1007/s44155-025-00259-5
4. Elisabetta C, Paola R, Acquadro Maran D, et al. Remote workers' life quality and stress during COVID-19: a systematic review. Eur J Public Health. 2025 Feb 1;35(1):141–152. doi: 10.1093/eurpub/ckae167. Erratum in: Eur J Public Health. 2025;35(6):1326. doi:10.1093/eurpub/ckaf169
5. McPhail R, Chan XW, May R, Wilkinson A. Post-COVID remote working and its impact on people, productivity, and the planet: an exploratory scoping review. Int J Hum Resour Manag. 2024;35(1):154–182. doi:10.1080/09585192.2023.2221385
6. de Barros EC. Understanding the influence of digital technology on human cognitive functions: A narrative review. IBRO Neurosci Rep. 2024;17:415–422. doi:10.1016/j.ibneur.2024.11.006
7. Ellis Sandoval N, Peña Martinez MI, Fernandez Cea AB, Hernandez Rincon EH. Effects on Prolonged Screen Time on Postural Health and Visual Health in Children and Adolescents: A Scoping Review. Orthop Res Rev. 2025;17:553–562. doi:10.2147/ORR.S519541
8. Pucker AD, Kerr AM, Sanderson J, Lievens C. Digital Eye Strain: Updated Perspectives. Clin Optom (Auckl). 2024;16:233–246. doi:10.2147/OPTO.S412382
9. Sheppard AL, Wolffsohn JS. Digital eye strain: prevalence, measurement and amelioration. BMJ Open Ophthalmol. 2018;3(1):e000146. doi:10.1136/bmjophth-2018-000146
10. Kaur K, Gurnani B, Nayak S, et al. Digital Eye Strain- A Comprehensive Review. Ophthalmol Ther. 2022;11(5):1655–1680. doi:10.1007/s40123-022-00540-9
11. Lema AK, Anbesu EW. Computer vision syndrome and its determinants: A systematic review and meta-analysis. SAGE Open Med. 2022;10:20503121221142402. doi:10.1177/20503121221142402
12. Alqurashi A, Almaghrabi H, Alahmadi M, et al. The severity of dry eye symptoms and risk factors among university students in Saudi Arabia: a cross-sectional study. Sci Rep. 2024;14(1):15149. doi:10.1038/s41598-024-65297-6
13. Mataftsi A, Seliniotaki AK, Moutzouri S, et al. Digital eye strain in young screen users: A systematic review. Prev Med. 2023;170:107493. doi:10.1016/j.ypmed.2023.107493
14. OECD. Poland economic snapshot. Organisation for Economic Co-operation and Development; 2025. Available from: https://www.oecd.org/en/topics/sub-issues/economic-surveys/poland-economic-snapshot.html (Accessed: 27 May 2026).
15. Statistics Poland. Information society in Poland in 2024. Warsaw: Statistics Poland; 2024. Available from: https://stat.gov.pl/en/topics/science-and-technology/information-society/information-society-in-poland-in-2024,2,14.html (Accessed: 27 May 2026).
16. Lewandowska A, Jankowski M, Gujski M, et al. Rural-urban differences in the perception of cooperation between schools and the psychiatric care system for children and adolescents, and attitudes towards the ban on using phones at school – a cross-sectional study. Ann Agric Environ Med. 2026;33(1):75–81. doi:10.26444/aaem/207723
17. GBD 2019 Blindness and Vision Impairment Collaborators; Vision Loss Expert Group of the Global Burden of Disease Study. Causes of blindness and vision impairment in 2020 and trends over 30 years, and prevalence of avoidable blindness in relation to VISION 2020: the Right to Sight: an analysis for the Global Burden of Disease Study. Lancet Glob Health. 2021;9(2):e144-e160. doi:10.1016/S2214-109X(20)30489-7
18. Nationwide Research Panel Ariadna. About us. Available from: https://panelariadna.com/ (Accessed: 27 May 2026).

19. Statistics Poland. Demographic Yearbook of Poland 2025. Available from: https://stat.gov.pl/en/topics/statistical-yearbooks/statistical-yearbooks/demographic-yearbook-of-poland-2025,3,19.html (Accessed: 27 May 2026).
20. Olearczyk A, Sękowski K, Jankowski M, et al. Prevalence and drivers of missed healthcare appointments in Poland: insights from a 2025 survey. Med Sci Monit. (2026) 32:e951944. doi:10.12659/MSM.951944
21. Olearczyk A, Sękowski K, Jankowski M, et al. Employee expectations towards employer-provided workplace health promotion and mental health support: a 2025 cross-sectional survey. Front Public Health. (2026) 14:1806781. doi:10.3389/fpubh.2026.1806781
22. Mowatt L, Gordon C, Santosh ABR, Jones T. Computer vision syndrome and ergonomic practices among undergraduate university students. Int J Clin Pract. 2018;72(1). doi:10.1111/ijcp.13035
23. Alabdulkader B. Effect of digital device use during COVID-19 on digital eye strain. Clin Exp Optom. 2021;104(6):698–704. doi:10.1080/08164622.2021.1878843
24. Cantó-Sancho N, Sánchez-Zuriaga D, García-Medina JJ. Prevalence and risk factors of computer vision syndrome. PeerJ. 2023;11:e14937. doi:10.7717/peerj.14937
25. Matossian C, McDonald M, Donaldson KE, et al. Dry Eye Disease: Consideration for Women's Health. J Womens Health (Larchmt). 2019;28(4):502–514. doi:10.1089/jwh.2018.7041