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Investigation and analysis of eye discomfort of flight attendant students in a school

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Abstract: *By investigating the current situation of eye discomfort among flight attendant students at the Civil Aviation Flight Academy of China, this study explores the influencing factors of eye discomfort and provides a basis for preventing eye discomfort among flight attendant students. From September to October 2023, a self-designed "Survey Form on Eye Use by Air Attendants" was used to conduct an online survey of air crew students at the Civil Aviation Flight Academy of China through the Wenjuanxing platform. A total of 1409 questionnaires were distributed, 1398 questionnaires were collected, and 1229 valid questionnaires were collected. 225 cases of eye discomfort were detected, with a detection rate of 18.31%; Students with detected myopia have a higher rate of eye discomfort, and the difference between the two is statistically significant (P<0.05); With the prolonged use of electronic products, the proportion of discomfort in the eyes gradually increases, and the difference is statistically significant (P<0.05); The difference between daily exercise time≤0.5h and>1h was statistically significant (P<0.05); With the extension of sleep time, the proportion of discomfort in the eyes showed a decreasing trend, and the difference was statistically significant (P<0.05). Multivariate logistic regression analysis further revealed that myopia and prolonged use of electronic devices are risk factors for eye discomfort, while sleep duration is a protective factor. Therefore, the eye habits of flight attendant students need to be improved. It is necessary to strengthen education on the standardized use of electronic products and enhance eye health awareness to alleviate eye discomfort.*

Keywords: *flight attendant students; Eye discomfort; Electronic product*

1. Introduction

With the rapid development of the information age, the use of electronic products has been inseparable from our daily life. The widespread use of visual display terminals (VDTs) has led to a surge in the occurrence of VDT syndrome. Today's college students, in addition to normal class access to electronic products, electronic readers, online shopping, online games, video, live broadcast, etc. occupy almost part of their extracurricular time. It also inevitably causes a variety of eye discomfort and a series of systemic and even psychological symptoms [1]. In order to investigate the relationship between eye discomfort and the use of electronic products among flight attendant students in our school, this study will explore the possible influencing factors and their internal relationship of the syndrome, and provide reasonable suggestions for the prevention and control of VDTS among flight attendant students in our school. This study adopts the method of cluster sampling for flight attendant students in our school and sends out an electronic questionnaire survey on a class basis. The questionnaire survey is analyzed as follows:

2. Data and methods

2.1 Objects

Students of flight attendants of Civil Aviation Flight College of China were selected to conduct a questionnaire survey. The self-designed questionnaire on Flight Attendant Students' Eye Use was used to conduct an online electronic questionnaire in the form of questionnaire star. Two professionally trained teachers issued the electronic questionnaire.

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2.2 Methods

From September to October 2024, a questionnaire survey was conducted on eye discomfort among flight attendant students of Civil Aviation Flight College of China in the form of questionnaire star. The self-designed questionnaire on Flight Attendant Students' Eye Use was used to conduct an online questionnaire survey. This survey was conducted through a questionnaire distributed to each class. The main contents of the questionnaire included: basic information of flight attendant students (gender, age, grade, myopia, daily eye use (time spent using electronic products, eye discomfort, daily sports time, average daily sleep time) and other related questions. All questionnaires are multiple-choice questions.

2.3 Quality control

The questionnaire survey was conducted by two trained ophthalmologists, and unified explanation was given to the class where the flight attendant students were, and cooperation was obtained to determine the questionnaire survey time, method and answer time. All the flight attendant students under investigation were required to independently complete the questionnaire within the stipulated time. All the investigated flight attendant students were given detailed explanations of the purpose and method of this investigation and obtained verbal consent. The collation of questionnaire data was jointly completed by two ophthalmologists, and all the recovered questionnaires were screened by two ophthalmologists and invalid questionnaires were eliminated. Finally, all the data are entered into the computer, Enter two names for two people, and then cross-checked.

2.4 Statistical Analysis

All the data were recorded into the computer and analyzed using SPSS23.0 statistical software. $\chi 2$ test was used for comparison between groups, and $P < 0.05$ was considered to be statistically significant. logistic regression analysis was used for multivariate analysis of eye discomfort.

3. Results

3.1 General Situation

Table 1: General analysis of eye discomfort among flight attendant students (n, %)

Investigation item		Number of detections(%)	Have a symptom(%)	Denial symptom(%)	χ^2	P
sex	female	1137(92.51)	200(17.59)	937(82.41)	0.333	0.668>0.05
	male	92(7.49)	14(15.22)	78(84.78)		
Whether myopia or not	myopia	675(54.92)	140(20.74)	535(79.26)	5.928	0.018<0.05
	non-myopia	554(45.08)	85(15.34)	469(84.66)		
The frequency of Check the eyes	never	51(4.15)	41(80.39)	10(19.61)	1.867	0.601>0.05
	<0.5year	616(50.12)	504(81.82)	112(18.18)		
	0.5~1 year	427(34.74)	354(82.90)	73(17.10)		
	>1 year	135(10.98)	105(77.78)	30(22.22)		
Electronic time	≤1h	38(3.09)	0(0.00)	38(100)	24.303	0.000<0.05
	1~2h	127(10.33)	10(7.87)	115(9.55)		
	2~3h	343(27.91)	47(13.70)	296(86.30)		
	≥3h	726(59.07)	168(23.14)	558(76.86)		
Daily exercise time	≤0.5h	17(1.38)	5(29.41%)	12(70.59%)	0.079	0.011<0.05
	0.5-1h	670(54.52)	104(15.52)	566(84.48)		
	>1h	542(44.10)	59(10.89)	483(89.11)		
Average sleep time	≤6h	23(1.87)	11(47.83)	12(52.17)	18.414	0.000<0.05
	6~8h	757(61.59)	151(19.95)	606(80.05)		
	8~10h	431(35.07)	63(14.62)	368(85.38)		
	≥10h	18(1.46)	0(0.00)	18(100)		

The survey issued a total of 1409 questionnaires, 1398 questionnaires were recovered, the response rate was 99.22%, 1229 effective questionnaires, the effective rate was 87.91%. Among them, 1137 female

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students and 92 male students were detected. The oldest was 22 years old, the youngest was 17 years old, and the average age was (19.17 ± 1.94)years. A total of 225 cases of eye discomfort were detected, the detection rate was 18.31%. The rate of ocular discomfort was higher in myopic students, and the difference between them was statistically significant ($P < 0.05$). The proportion of eye discomfort increased with the use of electronic products for longer time, and the difference was statistically significant ($P < 0.05$). The difference of daily exercise time ≤0.5h and >1h was statistically significant ($P < 0.05$). Eye discomfort accounted for 20.74%; There were 523 patients who denied myopia, of which 14.53% had eye discomfort. There were 31 cases with uncertain myopia (29.03%), the difference was statistically significant ($P < 0.05$). With the extension of sleep time, the rate of eye discomfort showed a decreasing trend, and the difference was statistically significant ($P < 0.05$). (See Table 1 for details)

3.2 Multivariate logistic regression analysis of flight attendant students' eye discomfort

When other variables are fixed, myopia, the time of using electronic products and the length of sleep are important factors affecting eye discomfort, among which myopia and prolonged use of electronic products are risk factors for eye discomfort, and sleep time is a protective factor affecting eye discomfort. (See Table 2 for details)

Table 2: Multivariate logistic regression analysis of eye discomfort of flight attendant students

Influencing factor	β	SE	Waldχ^2	p	OR	95%CI
Whether myopia or not	0.457	0.161	8.118	0.004	1.579	(1.153,2.162)
Electronic time	0.649	1.127	26.285	<0.001	1.913	(1.493,2.451)
Daily exercise time	-0.268	0.153	3.058	0.0803	0.765	(0.567,1.033)
Average sleep time	-0.538	0.148	13.222	0.0003	0.584	(0.437,0.780)

4. Discussion

Asthenopia is a group of syndroms caused by excessive use of the eyes, which can cause a series of symptoms such as abnormal visual function, eye discomfort, and systemic symptoms, affecting normal visual function[2]. In general, computer vision syndrome is not a serious eye disease, but if not taken seriously, it can have a certain impact on daily life. With the development of digital technology, more and more college students are exposed to various electronic screen devices. The prolonged use of these devices can cause college students to experience various symptoms of computer vision syndrome, such as dry eyes, fatigue, itching, pain, blurred vision, headache, etc. [3]. These digital computer vision syndrome not only affects the visual health of college students, but also may affect their sleep quality [4]. Foreign scholars have confirmed in vitro experiments on the ciliary body of rabbits[5] that when the load of eye movement increases, if you do not rest and relax in time, it can cause fatigue of the external eye muscles, especially the ciliary muscles.

Previous studies have shown that the age group of people with visual fatigue mainly focuses on 25-50 years old, which is the golden stage of learning and work, and tends to overuse the eyes, which is prone to symptoms of back-eye fatigue from close eye use [6]. Cao Wenting reported that more than 50 percent of young students between the ages of 14 and 20 had visual fatigue [7]. Fan Mengnan [8] found that 73.6% of college students in Xi'an City suffer from VDTS, with more than half of them experiencing different types of eye symptoms. Guo Yirong's survey of low-year-level college students in Lanzhou found that 86.68% of the students experienced eye discomfort after using VDT [9]. The detection rate of eye discomfort among college students in this survey was 18.31%, which was lower than that of Cao Wenting, Fan Mengannan and Kuo Yiqiong, which may be caused by different group selection. Civil aviation flight attendants underwent strict physical and visual selection before entering school. Although the results of different studies cannot be directly compared, on the whole, VDTS has a high incidence in the population and is on the rise [10].

Studies have shown that reading e-books can cause more evaporation of tears, leading to more noticeable eye fatigue symptoms than reading printed books [11]. In the context of the information age, the proportion of college students' online learning time has increased significantly. Recent surveys on the current situation of VDTS among college students show that VDTS is becoming younger and has become an important public health issue [12-13].Teenagers and students use mobile phones or computers in close proximity for a long time. The difference between the electronic display and the book is that the electronic display will emit blue light with a wavelength of 400 ~ 500 nm, which can penetrate the lens of the eye and reach the retina, thus causing retinal damage [14]. This long-term cumulative damage can cause eye fatigue, blurred vision and even headaches and other symptoms, in addition to the screen light intensity,

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flicker, poor clarity, uneven brightness, glare effect, etc., can interfere with the ciliary muscle regulation, stimulate the visual nerve, produce discomfort, cause visual fatigue [15].

Many literatures at home and abroad have shown that the prevalence of visual fatigue in female students is higher than that in male students[16-17], which may be related to female students' preference for online shopping, watching Douyin videos, and applying makeup. It may also be due to subtle differences in daily habits or physiological cycles between men and women and the fact that women are more sensitive than men [18]. In this study, the detection rate of eye discomfort of female passenger students was slightly higher than that of male passenger students, but the difference between them was not statistically significant, which may be due to the different selection of objects and the incongruity of the ratio of male to female students in our school.

A Korean study[19] showed that when Korean teenagers used smartphones for more than two hours a day, their eye discomfort and visual symptoms more than tripled. One hour of tablet or smartphone use can increase eye strain and blurry in young people by as much as five times[20]. A survey conducted by Husug[21] on college students showed that the use of electronic products for a long time and at a close distance caused damage to the stability of tear film, ciliary muscle spasm, and visual fatigue symptoms such as dry eyes, headache and blurred vision. With the extension of the use of electronic products[22-23], symptoms such as eye fatigue, eye distension, and dry eyes increase, and 75% of people who work in front of electronic products for more than 6h a day will have visual symptoms. Most of the findings are consistent with the results of this study. Therefore, prolonged use of electronic products is a risk factor for eye discomfort. Outdoor activities have a wide field of vision, which can relieve eye muscle fatigue and prevent the occurrence of eye fatigue. Our school has high requirements on the physical fitness of flight attendant students. Although there are various compulsory examination of aviation sports subjects, which encourages flight attendant students to insist on outdoor sports, there are still some flight attendant students who cannot adhere to it well and need to be further urged and strengthened. Qiu Yapping et al[24] reported on the behavior of college students staying up late, which was related to the use of their eyes on terminal screens such as watching TV dramas on mobile phones and computer games. Excessive use of their eyes at night would lead to dry eyes and eventually cause visual fatigue[25]. In this study, flight attendant students who slept less than 6 hours had an increased rate of eye discomfort. College students' bad habit of staying up late was a risk factor for eye discomfort. Studies have claimed that insufficient sleep time can promote the occurrence and development of myopia, which is the main influencing factor for poor eye health of middle school students[26-27]. This study suggests that long sleep duration may be a protective factor for eye discomfort, which is consistent with previous studies.

Myopic refractive error is the common cause of visual fatigue, good binocular vision function is an important part of vision, but also an important guarantee of clear and lasting vision. Binocular vision abnormalities can lead to a series of visual dysfunction, which is closely related to visual fatigue [28].A number of studies have shown that myopia is a risk factor for ocular discomfort [29]. Patients with refractive errors or binocular muscle imbalance are prone to adjustment and assembly dysfunction, resulting in adverse visual symptoms such as impaired vision, blurred vision and double vision [30], which is consistent with the results of this study. In patients with refractive errors, both eyes are more likely to have adjustment and aggregation dysfunction [31]. Previous studies have found that patients with refractive errors, especially incomplete correction of refractive errors, inaccurate degree of astigmatism, and deviation of astigmatism axis, are the main factors of near visual fatigue in adolescents [32]. Mild ametropia or optometry deviation, due to continuous efforts to the best of their ability, the eye strain caused by visual fatigue. In particular, visual fatigue is more likely to occur when the eye tries to adjust in order to correct this defect due to poor retinal imaging due to refractive errors [33-35].

In order to prevent the symptoms of eye fatigue such as eye discomfort, college students should be encouraged to use electronic devices correctly, shorten the daily screen time, and pay attention to increasing the number of breaks during use; Encourage college students to spend enough time outdoors, enhance their own quality, and develop good habits of study and life; People with refractive errors should be corrected correctly; Establish good electronic product use habits, appropriate eye care. In addition, it is necessary to improve college students' cognition of eye use behavior and raise the awareness of prevention rather than treatment. Visual fatigue can seriously affect college students' study and life. Therefore, college students should avoid the behavioral factors affecting visual fatigue and improve their awareness of eye health care. We should put forward personalized preventive measures according to this situation.

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5. Conclusion

The article investigates and analyzes the current situation of eye discomfort among flight attendant students at the Civil Aviation Flight Academy of China, revealing the main influencing factors of eye discomfort among this group. Research has found that the detection rate of eye discomfort is 18.31%, with myopic students having a higher rate of eye discomfort, which is significantly different from non myopic students. In addition, the prolonged use of electronic products significantly increases the incidence of eye discomfort, while moderate exercise time and sufficient sleep time have a relieving effect on eye discomfort. Multivariate logistic regression analysis further confirmed that myopia and prolonged use of electronic devices are risk factors for eye discomfort, while adequate sleep time is a protective factor.

In summary, the eye health of flight attendant students needs to be highly concerned. Given that prolonged use of electronic products has become an important factor exacerbating eye discomfort, it is recommended that schools strengthen education on the standardized use of electronic products for students, advocate for scientific eye use, and arrange study and rest time reasonably. At the same time, to enhance the eye health awareness of flight attendant students, measures such as improving the learning environment and increasing outdoor activity time can be taken to prevent and alleviate eye discomfort.

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