



The health status of the visual analyzer in university students and its correction by means of physical rehabilitation

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Abstract

The aim of the work is to analyze the state of health, in particular the state of problems with the work of the visual analyzer in students; get acquainted with the scientific basis of the method of restoring vision using exercises on Bates theory and conduct its testing with students in a university.

Material and methods. Analysis and synthesis of data from literary sources and our own research on the state of the visual analyzer in school children and students of higher educational institutions. Development of questionnaires and a survey of 142 students. Testing the method of restoring vision according to the method of W. Bates in two randomized groups of students ($n = 15$), which consisted in the daily performance of special exercises for 10–15 minutes for a month. Determination of visual acuity according to the tables of Sivtsev and Golovin and field of view using the Ferster perimeter for white, red, green and blue colors before and after rehabilitation intervention. Methods of mathematical statistics.

Results. It was revealed that problems with the visual analyzer of students are ahead of all pathologies combined and make up about 30%. Moreover, only 4% of students with visual pathologies were congenital, and in the remaining 28% of students - acquired recently. The use of exercises according to the method of W. Bates contributed to the improvement of the performance of the visual analyzer (visual acuity for the right and left eye, $p < 0.05$ and field of view for all colors, $p < 0.05$) among students of the study group.

Conclusions. The study showed that the implementation of exercises according to the method of W. Bates can be the basis for the development of a program of physical therapy, adapted to the conditions of its use by university students.

Keywords: health; vision; disease; prevention; lifestyle; rehabilitation

Анотація

Коритко З. І., Копитко С. Ю., Соколев М. Я. Стан здоров'я зорового аналізатора у студентів вишів і його корекція засобами фізичної реабілітації

Мета роботи – проаналізувати стан здоров'я, зокрема стан проблем із роботою зорового аналізатора у студентів; познайомитися з науковим підґрунтям методики відновлення зору за допомогою вправ за теорією Бейтса та провести її апробацію у студентів в умовах вишу.

Матеріал і методи. Аналіз та узагальнення даних літературних джерел та власних досліджень про стан зорового аналізатора у школярів і студентів закладів вищої освіти. Розробка анкети та опитування 142 студентів. Апробація методики відновлення зору за методикою У. Бейтса у двох рандомізованих групах студентів ($n=15$), яка полягала у щоденному виконанню спеціальних вправ протягом 10–15 хвилин протягом місяця. Визначення гостроти зору за таблицями Сівцева та Головіна і поля зору за допомогою периметра Ферстера для білого червоного, зеленого і синього кольорів до і після реабілітаційного втручання. Методи математичної статистики.

Результати. Виявлено, що проблеми із зоровим аналізатором у студентів випереджують усі патології разом узяті і складають біля 30%. При чому, лише у 4% студентів патології зору були вроджені, а у решти 28% студентів – набуті протягом останнього часу. Використання вправ за методикою У. Бейтса сприяло покращенню показників роботи зорового аналізатора (гостроти зору для правого і лівого ока, $p < 0,05$ і поля зору для усіх кольорів, $p < 0,05$) у студентів групи дослідження.

Висновки. Проведене дослідження довело, що виконання вправ за методикою У. Бейтса може бути основою для розробки програми з фізичної терапії, адаптованої до умов її використання студентами вишів.

Ключові слова: здоров'я; зір; захворювання; профілактика; спосіб життя; реабілітація.

Аннотация

Корытко З. И., Копытко С. Ю., Соколев М. Я. Состояние здоровья зрительного анализатора у студентов вузов и его коррекция средствами физической реабилитации

Цель работы - проанализировать состояние здоровья, в частности состояние проблем с работой зрительного анализатора у студентов; ознакомиться с научным основанием методики восстановления зрения с помощью упражнений по теории Бейтса и провести ее апробацию у студентов в условиях вуза.

Материал и методы. Анализ и обобщение данных литературных источников и собственных исследований о состоянии зрительного анализатора у школьников и студентов высших учебных заведений. Разработка анкеты и опросы 142 студентов. Апробация методики восстановления зрения по методике В. Бейтса в двух рандомизированных группах студентов ($n = 15$), которая заключалась в ежедневном выполнении специальных упражнений в течение 10–15 минут в течение месяца. Определение остроты зрения по таблицам Сивцева и Головина и поля зрения с помощью периметра Ферстера для белого красного, зеленого и синего цветов до и после реабилитационного вмешательства. Методы математической статистики.

Результаты. Выявлено, что проблемы со зрительным анализатором студентов опережают все патологии вместе взятые и составляют около 30%. Причем, только у 4% студентов патологии зрения были врожденные, а в остальных 28% студентов - приобретенные в последнее время. Использование упражнений по методике В. Бейтса способствовало улучшению показателей работы зрительного анализатора (остроты зрения для правого и левого глаза, $p < 0,05$ и поля зрения для всех цветов, $p < 0,05$) у студентов группы исследования.

Выводы. Проведенное исследование показало, что выполнение упражнений по методике В. Бейтса может быть основой для разработки программы по физической терапии, адаптированной к условиям ее использования студентами вузов.

Ключевые слова: здоровье; зрение; заболевания; профилактика; образ жизни; реабилитация



Introduction

The visual analyzer is one of the most important in the human body, because thanks to vision, people receive about 95% of all information about changes in the environment. Recently, the load on the visual apparatus has increased significantly due to the total computerization, constant use of smartphones and other gadgets, especially in student youth [1]. Students are constantly increasing the volume of study programs, the fulfillment of various tasks, where there is a need for a long time to work with computers, the Internet, literature, which requires constant tension of the accommodation unit to consider small objects and leads to a decrease in adaptive mechanisms of the eye [2–4]. Impairment of the visual analyzer impairs performance and causes a whole complex of movement disorders [5–7] and a number of psychological deviations [8].

Literary evidence indicates that the number of short-sighted children in school is increasing every year. Thus, only 8% of children with visual impairments were detected in the lower grades per 1000 surveyed students. In the middle school age, 14% of children have problems with the work of the visual analyzer, and in the upper classes - 20 - 30% [1, 9].

Problems with the work of the visual analyzer are also noted by foreign researchers. Thus, in a survey of young school children in Guangdong, 37% of children of 13 years of age were short-sighted [10]. Another study conducted in urban Guangdong showed that almost 50% of children aged 15 years had refractive disorders [11, 12]. Among 17-year-old Chinese, this figure rose to 54%. [10].

In Ukraine, children and young people's eye disease has progressed sharply recently, as 10 years ago the percentage of such pathologies was much lower. Thus, in 2008, 15% of boys and girls diagnosed with impaired vision were found among first year students of the Faculty of Economics of Sumy State Higher Educational Institution "Ukrainian Banking Academy of the National Bank of Ukraine" [13].

Among economics students enrolled in the first year, 46% of children with different pathologies were identified, with 33% of them being various somatic diseases: 11% therapeutic problems, 9% dermatological, 7% gynecological, 4% neurological diseases and 2% ENT pathology bodies. At the same time, visual analyzer disorders account for the largest proportion of all diseases (13%) [8].

Most of the scientific literature is devoted to the study of myopia, myopia, myopia and astigmatism, which are caused by birth defects in students and students [1]. There is very little research

on the problems with the visual analyzer. However, the literature indicates that recently the percentage of students with acquired defects has increased significantly [3, 14].

The relevance of the topic is due to the significant increase in the number of young people with vision disorders, which are mainly associated with long-term visual work. Therefore, the search for techniques and methods that contribute to the preservation and restoration of the visual analyzer is relevant.

To date, the accepted theory, visual acuity and its disorders is the theory of the German scientist G. Heilmholtz, according to which the optical system of the eye consists of the cornea, lens and vitreous body. The change in the curvature of the lens, that is, the change in its optical power, focuses the rays on the retina. Therefore, today, all pathologies of the eye: changes in the shape of the cornea, the refractive power of the lens and the length of the eyeball are compensated, according to existing theory and approaches to vision correction, the selection of glasses and lenses. Surgical or medical treatment is also being carried out, and recommendations are made regarding the observance of vision hygiene, rest, and work [15–17].

However, the experimental work of Bates et.al. [18] and their findings that glasses are harmful to humans [18] are ignored. American scientists have argued that the refractive apparatus of the eye is not limited to the cornea, lens, and vitreous body, according to G. Heilmholtz's theory. Bates et.al. [18] have shown that in this process all the muscles of the eye, which change the shape of the eyeball and thereby help to focus the rays on the retina, are also actively involved.

Scientists have experimentally proved that training of 7 eye muscles (middle straight, upper straight, upper oblique, lower straight, lateral straight, lower oblique, ciliary) and stimulation of blood movement directly in the vessels of the eyeball and circulation of the internal eye fluid stops the processes vision loss and even completely restores vision.

The aim of the work is to analyze the state of health, in particular the state of problems with the work of the visual analyzer in students; get acquainted with the scientific basis of the method of restoring vision using exercises on Bates theory and conduct its testing with students in a university.

Material and methods

Participants

Anonymous questionnaire was conducted among 142 students of I and II courses of Ivan Bobersky State University of Physical Education (LSUFG). The students who study in non-sports



specialties (1st year - hotel and restaurant business, n = 70, and 2nd year - rehabilitation, n = 72) were interviewed with the possibility of correct comparison of the results of our studies with the literature data.

Procedure

Students answered 22 questions related to their health status and, in particular, the condition of the visual analyzer, lifestyle, working conditions, as well as the level of awareness of vision hygiene and prevention of eye diseases.

In addition, in two randomized groups of students (n = 15) of the same course who had recently acquired visual impairment, in two stages the study of visual acuity according to the tables of Sivtsev and Golovin and determination of the field of vision for different colors (white, blue, red and green) using Fourster's perimeter in four directions (bottom, top, temple, and nose). The experimental group

performed specially selected exercises for 10-15 minutes daily for a month. The control group served as the control. Students in both groups adhered to their daily routine. In the first stage, the initial performance of the visual analyzer was determined, and in the second stage, the same indicators were studied after the use of physical rehabilitation a month later.

Computerized processing of the research results was performed using MS Excel 2007 and the statistical program SPSS 11.5.

Results

Questionnaire among LSUFK students found that only 42% of students without health problems were enrolled in the first year of the Faculty of Tourism with a specialty of hotel and restaurant, and 58% of students had deviations in health status, with various somatic diseases being 26%, and problems with the visual analyzer were 32% (Fig. 1).

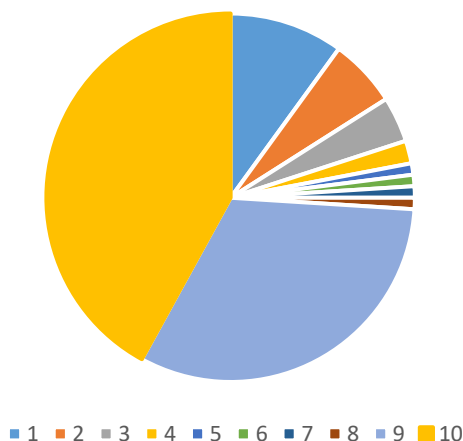


Fig. 1. Frequency of pathology detection among university students

- 1 - enrolled in the first year (%):Ear, throat, nose
- 2 - The digestive system
- 3 - Cardiovascular system
- 4 - Dialysis system
- 5 - Endocrine system
- 6 - Musculoskeletal system
- 7 - Urinary
- 8 - Skin
- 9 - Rheumatism
- 10 - Vision problems
- 11 - Absence of diseases

The same pattern of distribution of identified health problems was also observed among rehabilitation students. 27.8% of students had a

variety of somatic diseases and 27.4% of students had visual impairment (Fig. 2).

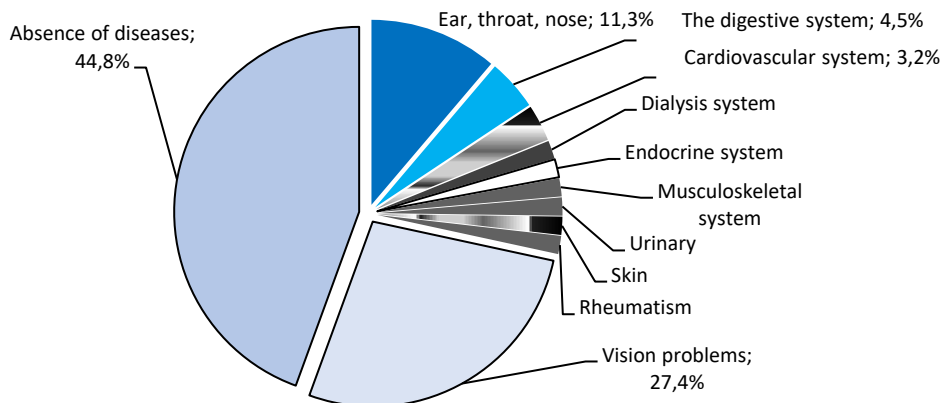


Fig. 2. Frequency of pathology detection among university students 2 course

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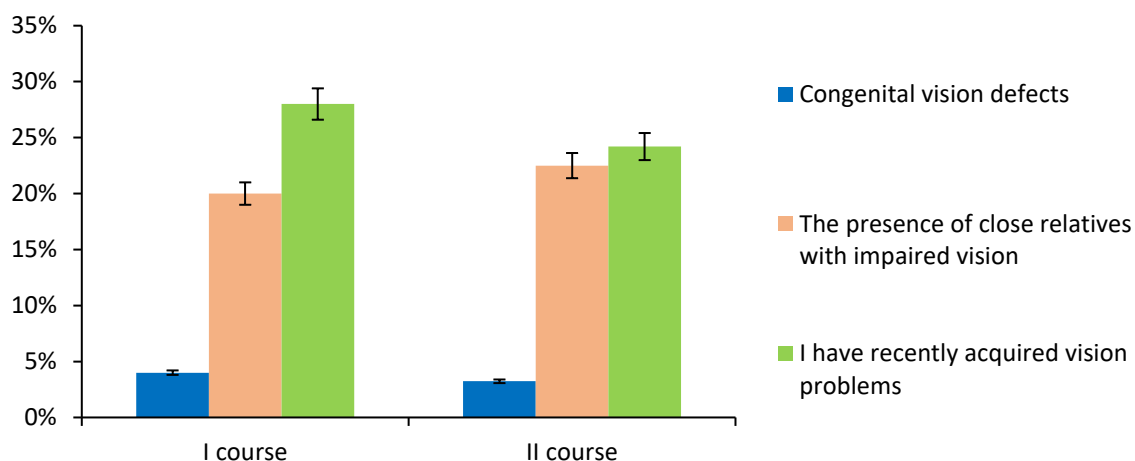


Fig. 3. Etiology of diseases of the visual analyzer in students of I and II course

Similar to the second-year students, only 3.23% had congenital vision defects among 27.4% of students. Instilling of students of the first and second year did not reveal the reasons for the deterioration of the work of the visual analyzer in the way of life of students. According to the survey, students lead a

healthy lifestyle. They are more than two hours in the air. To restore their ability to work, students use active recreation and almost all regularly engage in physical culture (Fig. 4). However, the state of the visual analyzer is obviously not given enough attention.

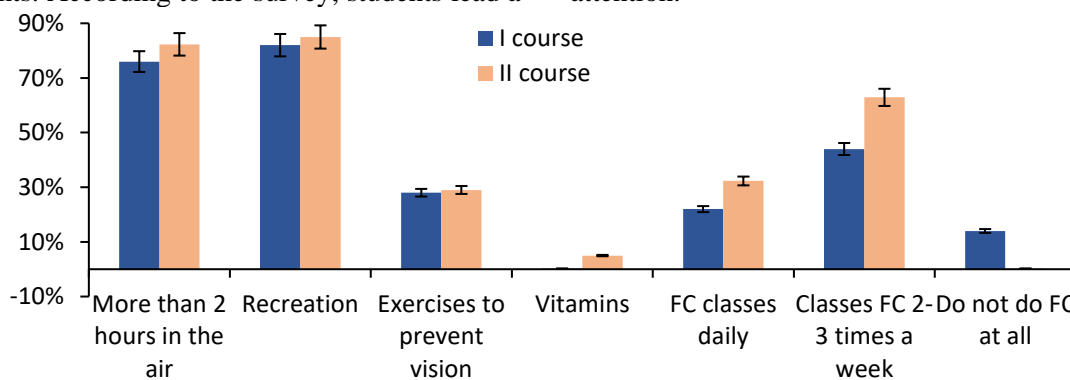


Fig. 4. Results of questionnaire of students of I and II year of LUDUF for their lifestyle and its maintenance (%)



Comparing the literature data and the results of a survey conducted by LSUFK students about their somatic health status, and in particular the visual analyzer, we conclude that most visual impairments in students are due to the high loadings on the visual analyzer in higher education institutions as they have been acquired recently. In such a case, such recently acquired visual impairments should be corrected by means of physical rehabilitation, in particular by exercises that change the length of the optic axis of the eyeball (by W. Bates method), and not only affect

the refractive apparatus of the eye, as other techniques. Exercises according to the method of U. Bates were also chosen for the sake of simplicity of their implementation, which does not associate the student with a specific time of completion, or with special conditions or specialists.

Before performing the complex of physical exercises according to the Bates method (at the 1st stage of the survey), the studied groups did not differ in terms of visual acuity of the right and left eyes ($p > 0.05$) (Table 1).

Table 1

Visual acuity of students of experimental and control groups at the first stage of research

Eye	Groups	Statistical indicators				
		\bar{x}	S	m	t	p
Right	Experimental, n =15	0,84	0,04	0,02	0,354	p = 0,725
	Control, n =15	0,83	0,04	0,02		
Left	Experimental, n =15	0,79	0,08	0,03	0,555	p = 0,581
	Control, n =15	0,81	0,04	0,02		

In the second stage of the study (one month) in the CG students, the visual acuity indicators of the right and left eyes did not change ($p > 0.05$). At the same time, after the completion of the rehabilitation

program, which consisted of Bates eye exercises (the second stage of the research), the students of OG improved the visual acuity of both eyes ($p < 0.05$) (Table 2).

Table 2

Visual acuity in students of experimental and control groups at the first and second stage of research

Eye	Sages	Statistical indicators				
		\bar{x}	S	m	t	p
Control group, n =15						
right	I stage	0,83	0,04	0,02	0,555	p = 0,581
	II stage	0,85	0,08	0,03		
left	I stage	0,79	0,08	0,03	0,277	p = 0,782
	II stage	0,80	0,02	0,01		
Experimental group, n =15						
right	I stage	0,84	0,04	0,02	2,683	p = 0,009
	II stage	0,90	0,02	0,01		
left	I stage	0,81	0,04	0,02	3,051	p = 0,003
	II stage	0,92	0,08	0,03		

The students of both groups at the first stage of the study almost did not differ also in terms of peripheral vision. From a separate field of view of the right eye for white to the nose and to the bottom was greater in the control group than in the experimental group ($p < 0.05$) (Fig. 5), but its indicators did not go beyond the reference values for healthy people.

Under the influence of Bates' exercise, the right eye's field of view for white color increased ($p < 0.05$) (Fig. 5). The tendency to change the field of view under the influence of exercises according to the method of W. Bates was observed for the left eye, as well as increased the field of view of both eyes for other colors (red, blue and green).

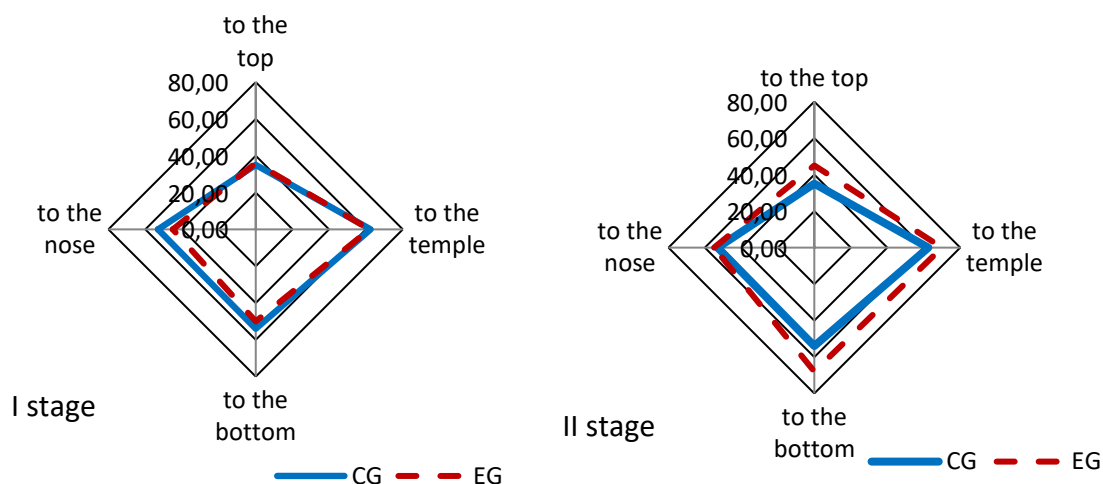


Fig. 5. Right eye field for white in control and experimental groups I and II in the research stage (degrees):
CG – the control group; EG – the experimental group

Discussion

Positive changes in the work of the visual analyzer under the influence of exercises in the Bates method, which remove, first of all, spasm of accommodation, confirm our research that the visual impairment in students appeared recently and is associated mainly with a huge load on the visual analyzer in student youth.

This point of view is confirmed by the scientific literature, which shows that among students of economic profile who study in the first year found 46% of children with different pathologies, with 33% of them being different somatic diseases, and the largest share are disorders of the visual analyzer (13%) [13], and according to our data and according to other authors, the number of students with visual impairments in the 1st year courses reaches more than 30% [3, 14].

Such a difference between our literary studies indicates that problems with the work of the visual analyzer in students have been rapidly worsening, as more than 10 years have passed between literature studies and ours. During this time, young people began to use smartphones and various gadgets to a greater extent. In addition, the preparation for independent testing is done by students and students using computers. Students also have new forms of control related to the introduction of a module rating system, which also require a greater load on the visual analyzer.

In favor of this, the fact that the number of economics students with different somatic pathologies was even higher [13] than in our studies (33% - for economists and 26-27% - for students of LSUFK), and the number of students with vision

problems increased significantly (13% - in economics students and 28-32% - in LSUFK students, $p < 0.05$). Such data are obviously related to the fact that young people have recently been paying more attention to healthy lifestyles [2, 19, 20], so the number of common somatic pathologies has a tendency to decline.

Therefore, comparing the literature data and the results of the questionnaire received from LSUFK students about their somatic health, in particular the visual analyzer, as well as the students' attitude towards eye diseases, and having tested W. Bates' methodology, we can draw the following conclusions.

Conclusions

1. The health of university students is steadily declining and the number of students without chronic illness is decreasing. According to the scientific literature, healthy first-year students make up 54%, and in our studies - only 42%. The most common pathology is impaired visual analyzer (up to 32%), which is mainly acquired, since congenital vision pathology is only about 4% percent.

2. Impaired vision is obviously a consequence of high loadings on the visual analyzer in higher education institutions, as about one third of all students say that their vision has worsened recently (24.1% of 1st year students and 27.4% of 2nd year students).

3. Validation of a complex of exercises according to the method of V. Bates contributed to the positive changes in the work of the visual analyzer, which clearly shows the need to improve the methods of prevention of disorders of the work of



the visual analyzer and the development of a program of physical therapy adapted to the conditions of its use by students of higher education. W. Bates.

Prospects for further research in this direction. In view of the rapid growth of cases of

visual analyzer disorders in student youth, in comparison with other pathologies, methods of prevention should be improved and a program of physical therapy adapted to the conditions of its use by students of higher education should be developed, based on exercises by the method of U. Bates [18].

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