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PROBLEMS OF SPATIAL ORIENTATION AND MOBILITY OF STUDENTS WITH VISUAL IMPAIRMENTS

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Abstract

The aim of this paper is to form knowledge and understanding of the existing specific features and difficulties of orientation in the enclosed space of students with visual impairments and to develop correctional-compensatory mechanisms of students with visual impairments. A complex of methods including analysis of the available general and specialized literature on research problems, a pedagogical experiment with interviews, interviews, remedial and practical exercises, and statistical processing was used. It should be noted that 11 students with total visual impairments who entered the Trans-Baikal state university and declared their desire to receive training in the spatial orientation program took part voluntarily in this study. All students are disabled persons of the 1-st group of vision. According to the indicators of loss of vision, all are late-onset blind persons, aged 14 to 24. The work done does not infringe on the rights and does not jeopardize the well-being of student in accordance with the ethical standards of the Committee for the Rights of Experiments of the Helsinki Declaration. It has been established that spatial orientation technologies for late-blind students are of a combined nature. It should be noted that the students with deep visual impairments have positive dynamics of the formation of skills of practical orientation in the surrounding reality during the training period.

Keywords

Students with visual impairments – Spatial orientation – mobility – Educational institution

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Introduction

Under the current requirements of the state and the education system for universities implementing the principle of inclusion, the number of students with a health problem is growing steadily not only in Russia but throughout the world[1].

Integration that affects the development of the educational process for people requiring special conditions is an important prerequisite for providing accessible education for people with disabilities[2].

Nevertheless, Russian authors in their works note that the accessibility of the educational spaces of universities is still quite small[3].

D. Hall and T. Tinklin, in their work on inclusive education in higher education, point out the architectural inaccessibility of classrooms, the lack of special technical equipment for sign language and tiflofacres, the presence of intolerance in social groups, the lack of skills of the academic teaching staff to teach this category of students[4].

According to the website of the Ministry of Education and Science of the Russian Federation 2019, the ratio of applicants with disabilities (HIA) (0.04%) is not comparable with the numbers of applicants with special opportunities in foreign countries. So, in France this figure is 1.17%, in Sweden - 2.4%, in the USA-11% (Bergiren)[5].

Currently, real statistics are such that only every 33rd disabled person under the age of 30 enters Russian universities, while among applicants who do not have health problems, this figure is already every fifth[6].

The problem of organizing appropriate social adaptation in the educational space of young people who have health problems is not unique to Russian universities. Kobi S. and

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[1] E. Sh. Kurbangaleeva y D. N. Veretennikov, “Accessibility of higher professional education to people with disabilities and persons with disabilities”, Psychological Science and Education, Vol: 22 num 1 (2017): 169-180.
S. A. Ivanov, “Trans-Baikal State University - a university developing inclusive education”, Rector of the university, num 12 (2018): 40-43 y L. Lane, “Am I Being Heard?” The 'Voice of' Students with Disability in Higher Education: A Literature Review, 2017

[2] Otkrytoe i distancionnoe obuchenie. Tendenciya, politika i strategii [Open and distance learning. Tendency, policy and strategy]. Division of Higher Education (UNESCO, 2004).

[3] S. I. Zair-Bek; Yu. N. Sergeev y A. A. Belikov, “Accessibility and quality of higher education for people with disabilities: myth or reality? Actual problems of the humanities and natural sciences” (Moscow, 2016) y E. V. Dongauzer y D. V. Mikhaleva, The problem of access to higher education for people with disabilities in Russia: History and Present. Collection of scientific works (Ekaterinburg: Ural State Pedagogical University, 2017).

[4] D. Hall y T. Tinklin, “Students with disabilities and higher education”, Journal of Social Policy Studies, num 1 (2004): 115-127.

[5] F. Corre, “Students with Disabilities in Higher Education (2016). In: I. Kabla-Langlois (ed.) Higher Education and Research in France, Facts and Figures; U. J. Berggren, D. Rowan, E. Bergbäc., B.Blomberg “Disabled Students’ Experiences of Higher Education in Sweden, the Czech Republic, and the United States – a Comparative Institutional Analysis”, Disability & Society, Vol: 31 num 3 (2016): 339–356 y Ministry of Science and Higher Education of the Russian Federation. Avaebal from: https://minobrnauki.gov.ru/

[6] V. I. Yarskaya–Smirnova y D. V. Zaitsev, “Habitus of disability in higher education”, Journal of Social Policy Studies, Vol. 17num 4 (2019): 585-600.

Pärli K., according to their research results at universities in Switzerland, note the mismatch between the spatial capabilities of universities and the needs of students with disabilities. Also, the imperfection of the curriculum designed for these students, including their physical disabilities and the unwillingness of the university administration, to fully provide the necessary support during the study[7].

In accordance with the set of rules of the joint venture, in addition to ensuring the availability of buildings for students with health problems, there are requirements for the accessibility of its individual rooms. Thus, this category of citizens is obliged to receive complete, high-quality and timely information that allows them to navigate in space, use special equipment, receive services and participate in the educational process[8].

A special category of the student youth, entering to a university, are students with visual impairments, for whom it is extremely important to ensure the accessibility of the educational environment and compliance with the necessary requirements in the process of adaptation[9].

Based on the study of Boroday I.V.[10] it is possible to establish that the reflection of the properties and signs of objects is reduced with blindness in future professionals. The concept of "color" becomes incomprehensible task, questions arise with the aesthetic perception of the object, it is lowered completeness, speed and integrity of perception. However, the absence of visual impressions cannot distort the general motion of the development of thinking, since safe analyzer systems reflect the basic properties and relation of the moving matter.

Tiflopsychologists have not developed an integral approach to understanding the specific features of the manifestations of visual functions at the stage of professional training. This causes difficulties in typhlopsychological and typhlopedagogical practice, organized by university specialists. According to Zemtsova M.I. and Solntseva L.I.[11], the corrective orientation of education plays a direct role in the development of impaired functions, in particular vision, the elimination of cognitive problems and the study of hidden resources in the formation of the personality of the blind.

The reality of sensory reflection in the blind is significantly reduced. They obtain a lot of data about the outside world indirectly, thanks to the work of thinking. The ability to reflect the properties and essence of objects in their general and essential determinations is the basis of the materialistic understanding of the compensatory function of thinking[12].

[7] S. Kobi y K. Pärli, Bestandesaufnahme hindernisfreie Hochschule (Schweiz: Zürcher Fachhochschule, 2010).

[8] S. G. Terskova, “To the problem of organizing an accessible environment for people with disabilities in the field of higher professional education”, Modern issues of the theory and practice of teaching at a university, Novokuznetsk, num 18 (2015): 111-118.

[9] World Health Organization. Consultation on development of standards for characterization of visual loss and visual functioning (Geneva: WHO, 2003).

[10] I. V. Boroday, How the blind perceive the world (Barnaul, 2017).

[11] M. I. Zemtsova, Ways to compensate for the blindness of cognitive labor activity (Moscow, 1956) y L. I. Solntseva, Children with visual impairment. Special Psychology (Moscow, 2003).

[12] A. G. Litvak, Psychology of the blind and visually impaired: Textbook for students of higher educational institutions (St. Petersburg, 2006).

The functions of thinking are practically unchanged with blindness, in comparison with sighted people, but it is observed the difficulty of the process of perception, or more precisely the formation of an integral image. That is why the blind have to additionally overcome the relative succession, fragmentation and sketchiness of images when they touch. Based on this, it can be assumed that with the help of thinking it is possible to considerably compensate deficiencies in the sensory experience. However, there is a flaw here - such way to overcome disruptions in development carries a certain danger, which can be called "fictitious compensation". It manifests itself in the verbalism of knowledge and the formation of false concepts, the formal selection of signs, which is random in nature and does not reflect significant connections and relationships.

At the same time, interaction of all sensory systems is the significant condition of the effective professionalization of such students. First of all, the interaction of touch with the formation of primary ideas and concepts about the labor functions and possibilities of the educational spaces of the university in the development of professional activities reflected in the Professional Standard. Tiflopsychologists[13] consider touch to be the only modality of perception that gives the blind the real knowledge. It can be compared with vision in its cognitive value. Therefore, when preparing educational resources for students with visual impairments, it is important to take into account the specific biological capabilities of the organism, as well as its individual ability to compensate for the loss of vision function. As a rule, in blind people there is a change in the threshold of analyzers of hearing, touch, smell. They achieve a high degree of differentiability without exceeding the threshold values of standard.

Thus, systemically organized vocational training of students with visual impairments based on the individual capabilities of all sensory systems can help to rely on specific ideas formed in the previous stages of development, images of imagination and concepts already recorded in memory, as well as reliance on the combined capabilities of all sensory systems can help in solving the problem of expanding and deepening the cognitive opportunities of professionalization.

The formation of professional thinking is closely related to the characteristics of the personal development of people with disabilities of this nosological group. Visual deformations complicate the formation of personal qualities, disrupting mental health[14].

Some authors believe that specific representations, images of imagination and concepts that reflect objects which are impossible for direct perception and which are formed in the blind as a result of indirect reflection, help in expanding and deepening cognitive opportunities. It has already been proved that the connection between sensory and logical knowledge, which is inextricable, determines the compensatory role of thinking while reducing the capabilities of the analyzer system[15].

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[13] A. G. Litvak, Psychology of the blind and visually impaired: Textbook for students of higher educational institutions (St. Petersburg, 2006); V. P. Ermakov, G. A. Yakunin, Fundamentals of typhlopedagogy: Development, training and education of children with visual impairments: Textbook (Moscow: Vlados, 2000) y G. V. Nikulina Training for the blind and visually impaired. "The Natural World": a teaching tool: 1 part. (St. Petersburg: Border, 2017).

[14] Yu. E. Krivodonova, “The influence of maladaptive mechanisms of socialization on the professional development of the personality of the blind and visually impaired”, Karelian Scientific Journal num 3 (2014): 29-32

[15] A. G. Litvak, Psychology of the blind and visually impaired: Textbook for students of higher educational institutions (St. Petersburg. 2006) y V. M. Sorokin, Features of the imagination of the

It is difficult to perform analysis and synthesis operations, reflected and being the object of knowledge of various aspects of reality. Being independent cognitive operations, they also directly enter other operations that contribute to the solution of mental tasks. There are also difficulties in the process of performing operations of comparison. At the sensual level the insufficient depth of comparison is reflected in the scientific - theoretical thinking, indeed with the comparison of concepts it is necessary a support to their concrete content.

Normally, abstraction and generalization have their origin at the level of sensory knowledge, and from this we can conclude that in this sphere defects are reflected in all mental operations to one degree or another, negatively affecting the development of thinking of blind people.

Some typhlopsychologists, such as Nikulina G.V., Ermakov V.P.[16] said touch to be the only modality of perception, which gives the blind real knowledge. It can be compared with vision in its cognitive value.

There are different types of response to vision loss: hysterical, anxiety-depressive, phobic, hypochondria. Most often total blindness leads to isolation, the desire to close with one's own world, lack of communication skills, restraint in the formation of an active position, reduced independence, inability to make decisions, unwillingness to take responsibility. As a result, specific personality traits such as egoism, self-centeredness, dependency, lack of a sense of camaraderie and duty, stubbornness, irritability, negativism, callousness, indifference to others are manifested. Not only degree of vision loss, but also the conditions for the development of positive self-esteem play the significant importance in psychological stress tolerance, social adaptation and integration in the blind[17].

The results of studies carried out by Zittel L. et al.[18], must be taken into account with the already existing diversity of views on the development of motor skills, psychosocial and social spheres in the blind. The prospects for the socialization of people with this pathology depend on individual characteristics, including the development of cognitive, mental, behavioral, scientific and social forms[19].

All this leads to the fact that a blind person forms a very unusual and unique psychological system, due to the fact that processes occur at different levels of development because of the impact of a primary defect on it and its correction, based on the creation of new compensatory development paths.

Loss of visual abilities, ultimately, leads to adverse consequences, both at the individual and collective level of development. Total blindness gives rise to psychological,

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blind and visually impaired. In the collection: Education and training of the blind and visually impaired (Leningrad, 1982).

[16] V. P. Ermakov, G. A. Yakunin, Fundamentals of typhlopedagogy: Development, training and education of children with visual impairments: Textbook (Moscow: Vlados, 2000) y G. V. Nikulina. Training for the blind and visually impaired. The Natural World: a teaching tool: Part 1 (St. Petersburg: Border, 2017).

[17] I.A. Korobeinikov. Development disorders and social adaptation (Moscow: PERSE, 2002).

[18] L. Zittel; J. Pyfer y D. Auxter, Principles and Methods of Adapted Physical Education & Recreation. Jones & Bartlett Publishers, 2016.

[19] D. Rahardja Sistem Pengajaran Modul Orientasi dan Mobilitas (Bandung: UPI Press, 2010).

social and economic problems, and also leads to a change in the quality of life. As a result, there is a decrease in self-esteem and personal freedom[20]. However, people who are deprived of vision have the makings for successful learning and a safe life. With the successful development of skills, a blind person will feel that he/she is competitively capable, he/she will consider himself/herself more full-fledged, happy and necessary for the society[21].

The work of the visual analyzer is known to be main one in the labor activity that is why the student experiences the traumatic effects of lack or sudden loss of vision as a “personality crisis”[22].

D. Balla, E. Zigler, and Stahl S. believe that self-esteem occupies a dominant position in the psychology of personality in the blind. From this it follows that the process of personal development must be analyzed taking into account individual self-esteem and age and gender identification. Webster A. in his work notes low social adaptation, self-doubt, passivity in adolescents with anomalous vision, which ultimately inhibits the development of positive self-esteem and “self-concept”. However, the authors R. Martinez and K. Sewell believe that blind adolescents have an objective opportunity to develop their positive "self-concept"[23].

It must be admitted that scientific research on spatial orientation and mobility reflects the aspects and concerns of many authors who study the issues of social rehabilitation only among early-blind children studying in correctional schools. It should be noted that in tiflopedagogical literature there are very few articles dealing with social adaptation of late-blind citizens, the problems they have got, their socialization and mobility.

Everyone knows that for the blind, spatial orientation training is essential because the problem of mobility, inability to move independently leads to a feeling of inferiority, a deterioration in the self-esteem of their capabilities and complete dependence on accompanying persons[24].

The formation of spatial representations, orientation and mobility in the blind is closely related to physical development and the ability to independently analyze their sensations and perceptions. In addition, each modality can reflect and reflects the spatial characteristics of objects[25].

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[20] N. Kara-José, “ER. Temporini. Cirurgia de catarata: o porquê dos excluídos”, Rev Panam Salud Publica. Vol: 6 num 4 (1999): 242–48.

[21] L. A. Kolyvanova, “Practice-oriented activities as a basis for creation of safe living of students with deprivation of view at the medical college”, International Journal of Experimental Education num 12 (2013): 11-13.

[22] A. G. Litvak, Psychology of the blind and visually impaired: Textbook for students of higher educational institutions (St. Petersburg, 2006).

[23] R. Martinez, “Self-concept of adults with visual impairments”, Journ. Of Rehabilitation num 62 (1996): 55-58.

[24] E. Hojan; M. Jakubowski; A. Talukder; H. Wereda; A. Furmann y R. Ewertowski, “A new method of teaching spatial orientation to the blind”, Acta Physica Polonica, num 121 (1-A) (2012): 5-8.

[25] A. V. Kornev; N. V. Karpova y I. N. Bakai, “The development of coordination abilities of children with visual impairment”, Pharmaceutical, Biological and Chemical Sciences Research, Vol: 9 num 6 (2018): 1056-1062.

Loss or profound impairment of the functions of vision primarily affects the decrease in human activity, which is determined by both biological and social factors[26].

The aim of our study was to identify individual opportunities in spatial orientation and mobility of students with visual impairments in a confined space on the territory of the university when getting training.

We suggested that: - increasing the mobilization readiness of students to master orientation techniques in the educational space of the university will lead to a change in the often lower self-esteem to a realistic level; - relying on the individual interaction capabilities of each student's intact analyzers should accelerate and facilitate the use of technical rehabilitation tools (TRT).

During the lessons, we set the task to form knowledge and understanding of the existing specific features and difficulties of orientation in a confined space and awareness of our right in the development of correctional and compensatory mechanisms that give an objective opportunity to successfully adapt to reality.

Methods

A complex of methods including analysis of the available general and specialized literature on research problems, a pedagogical experiment with interviews, interviews, remedial and practical exercises, and statistical processing was used.

Eleven students with total visual impairments who entered the Trans-Baikal State University in the academic years 2018-2019 and declared their desire to receive training in the spatial orientation program took part voluntarily in the study. There were 9 men and 2 women. All of them are disabled persons of the 1-st group of vision.

The work done does not infringe on the rights and does not jeopardize the well-being of these students in accordance with the ethical standards of the Committee for the Rights of Experiments of the 2008 Helsinki Declaration (WMA Declaration of Helsinki - Ethical Principles for Medical Research Involving Human Subjects). Parental consent to examine the young people (students) was received[27].

According to the temporary indices of the loss of sight, all late blind are at the age from 14 to 24. Average age comprised 25,3 ± 4,9.

From the history of life, it is established the absence in the close relatives of anomalous sight, which proves that the received disturbances of the participants in the experimental group is not a hereditary factor.

It should be noted that 10 students live with parents, 1 student live in the student hostel.

[26] E. I. Gililov y G. V. Nikulina, Training and education of the blind and visually impaired: a retrospective analysis, condition, trends. Textbook (St. Petersburg, 2001).

[27] WMA Declaration of Helsinki - Ethical Principles for Medical Research Involving Human Subjects. 2013. [cited 2019 Jul 12]. Available from: http://www.ub.edu/recerca/Bioetica/doc/Declaracio_Helsinki_2013.pdf

None of the study participants finished a special (correctional) comprehensive school of type III-IV (visual impairment). As a result, they have not finished the training of spatial orientation, within the framework of the program for blind and visually impaired schoolchildren on the course "Orientation in Space".

The acquisition of the habits of orientation makes possible for students with visual impairments to find that level of the social competence, with which they can independently satisfy their needs, not only in the process of studies, but also adequately evaluate themselves and surrounding people and equally interact with them.

It is known that self-assessment is an important regulator of human behavior. It has a significant impact on the choice of orientation in space, on establishing positive relationships with others, on criticism to his / her own. Disturbed self-assessment of students with visual impairments:

- deforms interaction with the material objects of the educational space of the university;
- distances them from sighted classmates, university teachers, education coordinators of
  departments;
- reduces the level of self-demanding, as well as the ability to adequately perceive students with other nosology in the process of comparing themselves with them.

Analysis of the results of the self-assessment study of the personality[28] of students with visual impairments of the 1st year showed that they are more likely to do not adequately assess themselves in the educational space of the university. Two of them tend to overestimate their self-esteem. They underestimate the importance of their disease in spatial orientation. Six students tend to underestimate their self-esteem. These students demonstrate great uncertainty in self-esteem, which proves their great dependence on the social environment.

Inclusive education in higher education involves a rich and intensive daily schedule of attending classes, moving to educational buildings, self-study and other events[29]. To do this it is necessary to have certain skills in orientation and mobility. The administration of the university is not able to provide each blind individual accompanying in the process of study. In this connection, orienteering training is one of the main tasks of successful training of totally blind students.

Every year, at the beginning of academic year, according to the program the specialists from the regional center of inclusive education (RCIE) in the Trans-Baikal state university conduct corrective and practical classes with students who have certain problems in spatial orientation. This program includes tactile and auditory acquaintance with the architectural structure of educational buildings.

[28] S. A. Budassi, About one method of measuring the density of a group. - In the book: On the question of the diagnosis of personality in a group (Moscow, 1973).

[29] D. F. Romanenkova, The organization of inclusive training for people with disabilities and persons with limited possibilities of health in professional educational organizations: textbook (Chelyabinsk: Polygraph-Master, 2013).

The purpose of the classes was to create such conditions for students with visual impairments that they could form an adequate idea of themselves and their abilities which could ensure the blind students' readiness for spatial orientation in the process of studying at the university, due to the interaction and coordination of tactile - kinesthetic - auditory sensory systems.

Classes were held 2 times a week for 1.5 hours for 3 months. The students with visual impairments were divided into 2 groups. In addition to the specialists of RCIE, in the practical exercises on mobile orientation, volunteers of the social-pedagogical team "Oikos", who were trained at the school of inclusive volunteering of Trans-Baikal state university, were also involved.

Before the start of classes, an individual card for each student with total visual impairments was filled with his/her personal data for taking into account the passage of the program and analysis of the results. The health worker checked the state of the preserved sensory organs, and the psychologist, in the process of an individual conversation, found out the personal attitude of each student to learning, diagnosing psychological obstacles that need to be taken into account during the class and which can interfere with practical training.

According to Litvak A.G.[30], the implementation of this work is necessary with the aim of restructuring inter-analytic relationships, including the replacement of the visual component with the motor one.

Correctional and practical classes were given, focusing on the methodology of V.S. Sverlova[31], as modified by M.N. Naumov[32] in the direction: orientation in a confined space with the movement of the body.

Psycho-correctional work was carried out using various art-therapeutic methods involving the psychological service of the university. The purpose of the proposed classes was to form the tactile - kinesthetic - auditory foundations of the sensory groups of the organism, which are necessary for the spatial orientation of students with visual impairments in the process of learning at the university using the technical rehabilitation means (TRM).

Spatial orientation is represented as a blind person's ability at every moment to be aware of the spatial relationship of the surrounding spaces and his/her place relative to each of them. At the beginning of the class, students were interviewed in order to identify personal problems that impede social adaptation and orientation in the learning process. The results of the study were final to statistical processing with the calculation of the arithmetic mean value, standard deviation, arithmetic mean error, student t-test, error probability according to the table of this coefficient[33].

[30] A. G. Litvak, Psychology of the blind and visually impaired: The textbook (St. Petersburg: Publishing House of the Russian State Pedagogical University, 1998).

[31] V. S. Sverlov, The methodology of teaching the blind orientation in space. A manual for teachers and educators of schools for the blind (Moscow: Uchpedgiz, 1969).

[32] M. N. Naumov, Teaching the blind spatial orientation: textbook (Moscow: All-Russian Society of the Blind, 1982), 123

[33] A. M. Grjibovski, "Social variations in fetal growth in Northwest Russia: an analysis of medical records", Annals of Epidemiology, num 9 (2003): 599–605.

Training exercises were carried out for developing self-confidence and self-love, correcting communication skills, listening skills, expressing his/her point of view, and reaching a compromise solution.

After the practical classes were completed, the results were summed up in the course of improving their skills and capabilities.

Results and discussion

Stressful effects adversely affect the state of the psyche of the late-onset blind persons, as a result of which there is a change in the personality of this person.(34) The conscious acquisition of skills, which are essential for the implementation of the elements of social adaptation, is the main task for the further self-determination of a person with profound visual impairment in the learning process. Lack of vision should be compensated by learning and acquiring certain skills that contribute to solving their own problems of spatial orientation and mobility. When asked whether they went through social rehabilitation, 76% of students answered “no”, and 24% of them answered “yes”.

Thus, the main problems identified in students with visual impairments during interviews before and after classes were summarized in the table (Table 1):

Name	Before classes	After classes
Fear and phobic states of being late for classes	46%	12%
Get lost inside the educational building	68%	6%
Hesitation to seek help from unfamiliar students in orientation and location	74%	17%
Internal discomfort from a large number of nearby students	49%	9%
Uncertainty about your location capabilities	51%	11%

Percent (%) - valid percent

Table 1

Psychological problems identified in students before and after classes

A significant reduction in psychological problems is associated with the solution of problems in the complex of measures of social, psychological and pedagogical adaptation, including the personal interest of these students and building trusting relationships within the group. We gave classes in a confined space. In the first area of study, training began with the acquaintance of students with visual impairments with an entrance group equipped with a bell of tiflo-call, Braille signs that help the blind with orientation at the entrance to the educational building.

Photo 1 (Author: Sergey Kokhan). The entrance group of the academic building of Trans-Baikal state university. May 2018. Author: Sergey Kokhan

To facilitate the spatial orientation and mobility of the blind on the ground floor of the academic building, where classes are held, the installation of floor tactile tiles was made.

Photo 2 (Author: Sergey Kokhan). Tactile marking of the first floor of Trans-Baikal state university academic building. May 2018. Author: Sergey Kokhan.

The main attention was paid to the study of the location of office premises on the 1st floor, applied on the floor tactile information mnemonic diagram.

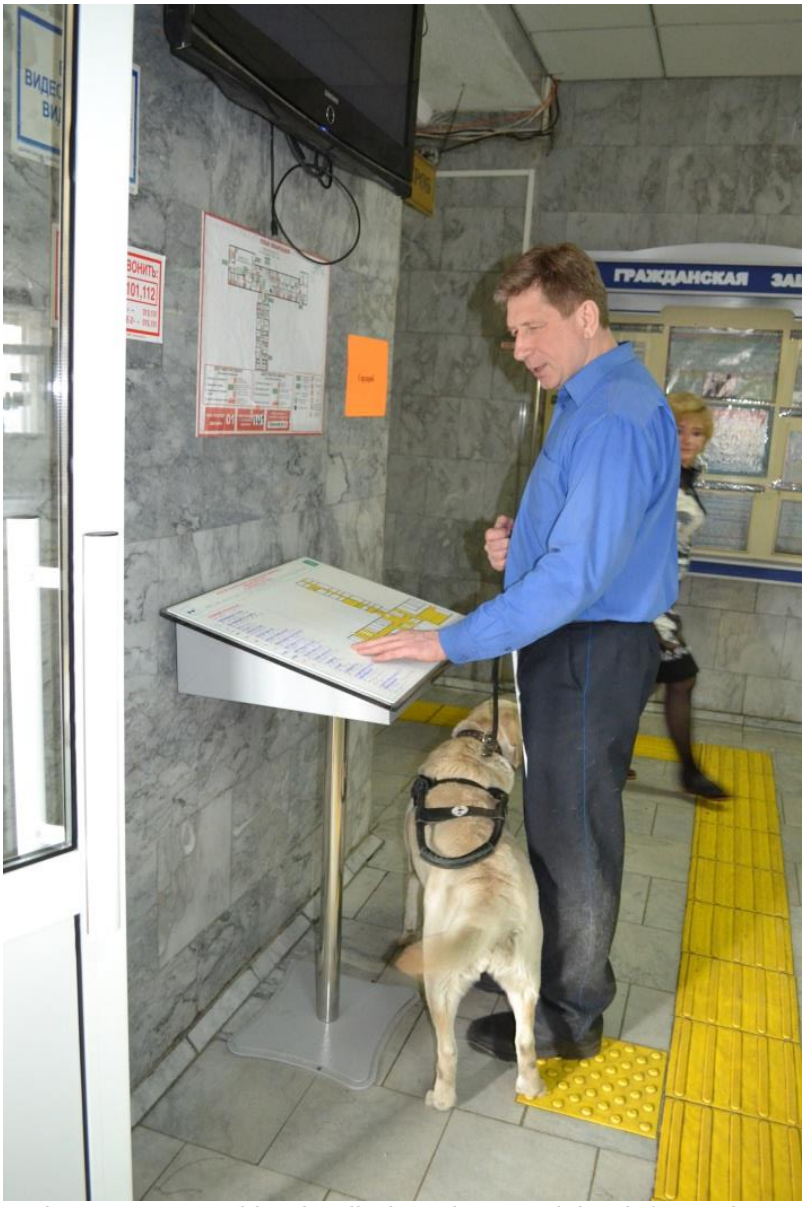

Photo 3 (Author: Sergey Kokhan). Blind student studying information on the floor mnemonic diagram for spatial orientation during training on the 1st floor in Trans-Baikal state university. September, 2018 (The work done does not infringe on the rights and does not jeopardize the well-being of students in accordance with the ethical standards of the Committee for the Rights of Experiments of the 2008 Helsinki Declaration[34]

The subsequent classes were intended to introduce and consolidate the skills of routing to the necessary classrooms and office premises, with a focus on obstacles. Tactile tiles are applied throughout the route and signs are available in Braille with the name of the classroom.

[34] WMA Declaration of Helsinki - Ethical Principles for Medical Research Involving Human Subjects

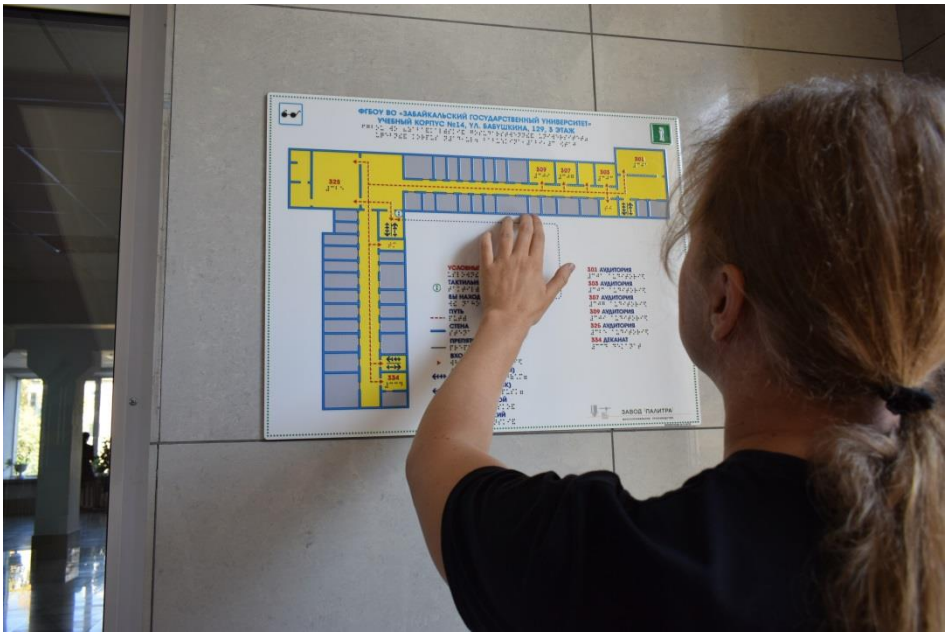

Photo 4 (Author: Sergey Kokhan). Studying wall-mounted textual information for orienting blind students. September, 2018. Author: Sergey Kokhan.

The consolidation of spatial orientation skills in the building and classrooms of the faculty, as well as entering into dialogue with surrounding students and university teachers to change the ineffective orientation stereotype and “reconstruction” of relationship skills was the second direction of the correctional classes. According to the results of the work mentioned above, during the final interview the following results were obtained. The quality of social adaptation of spatial orientation was assessed by the presence of formed skills, which included 4 levels: excellent, good, satisfactory, unsatisfactory. Before the start of classes only 2 students could relatively (satisfactorily) navigate inside the academic building. As for 9 students, they needed to be accompanied. After a course in orientation and architectural accessibility of the university, out of eleven participants in the experiment four students had a good result, they oriented well, additionally using a special cane, the help of a guide dog, studying mnemonic diagrams and tactile marking. Five students had a satisfactory result, which is generally acceptable for adult blind people for a given period of study. Two students had an unsatisfactory result, since they had certain difficulties in perceiving speech prompts to determine their location and needed to be accompanied because of phobias and insecurity in their abilities.

Discussion

It is known that with poor eyesight the information about the surrounding images, objects and phenomena is a complex process. There is a problem of highlighting the component parts of the object, spatial location and other significant features. Since eye contact is absent or minimal, a person with pathology of vision perceives the reality surrounding him/her only when the intact analyzers (such as hearing, smell, taste and tactile sensations) are activated[35].

[35] W. H. Jacobson, The Art and Science of Teaching Orientation and Mobility to Persons with Visual Impairments. American Foundation for the Blind (New York, 1993).

According to the observation, out of 11 participants in spatial orientation training at the university using the technical rehabilitation means (TRM) and intact analyzers, the percentage of their integrated use was (Table 2).

Name	Percent (%)	Rank place
Hearing + TRM	47 %	2
Tactile + TRM	85%	1
Hearing + tactile + TRM	30%	3

Percent (%) - valid percent.

Table 2

Use of intact analyzers and technical rehabilitation means (TRM)

Analyzing the results, the 1st rank place in the use of intact analyzers and TRM was taken by the use of a tactile analyzer together with rehabilitation equipment - 85%.

Hearing + TRM took the 2nd rank place. When traveling, respondents noted extraneous noise, student voices distracting from routing.

The third mode of movement took the lowest rank (30%).

E. Dunlea notes that blind children can use tactile and auditory information, excluding visual, but emphasizes that the lack of visual information is not fully compensated[36]. She also comes to the conclusion that the impossibility of blind children to control the social situation in which communication occurs is reflected in speech development. Speech is intact for most blind people, but the sphere of active communication is reduced. Compared with the sighted, the blind often have a richer vocabulary, but verbalism is often observed. It means that they use of many words in speech, but they often do not know their meaning.

The specifics of speech development are also manifested in the small use of non-language means of communication - facial expressions, pantomimes because visual impairments make it difficult to perceive expressive movements and make it inaccessible to imitate actions and expressive means used by sighted[37].

The greatest difficulties in the formation of communication tools arise when creating images related to the expression and understanding of his/her attitude to the subject and object of communication by non-verbal means. The absence or deep visual impairment leads to the loss of information about non-speech means of communication. This makes feedback with partner difficult[38].

The hand of the blind is an indispensable "tool" in the perception and processing of information received in everyday life.

[36] A. Dunlea, Vision and thenemergence of meaning (Cambridge: Cambridge University Press; 1989).

[37] A. G. Litvak, Psychology of the blind and visually impaired: The textbook (St. Petersburg: Publishing House of the Russian State Pedagogical University, 1998).

[38] A. E. Mills, The development of phonology in the blind child. Edit by B. Dodd & B. Campbell (Eds.), Hearning by eye: The psychology of lip reading (Hillsdale, NJ: Lawrence Eribaum Associates Inc., 1987).

Hearing is the dominant analyzer for orientation in space, although the significance of other means is also undeniable (Deniskina V.Z., 2004). For healthy people, the lowest acceptable frequency for hearing that is safe is 60 dB, but blind people can hear with a frequency of 32 dB, it means that they can hear the weakest whisper sounds[39]. The distant perception of sounds is invaluable in connection with the ability of a blind person to use sound, speech, as signals of interaction of objects of the external world. The direct spatial orientation in society depends on the degree of perception of sound signals and communication in the representation of the blind with objects and their actions[40].

The student's success in the educational process directly depends on the level of development of visual - figurative representations, spatial orientation and thinking. The auditory perception of the learning material, independent training and the assistance provided in the use of special technical means (assistive) is in many respects the key to mastering the material and to freely express your knowledge in practical classes[41].

It should be noted that for the blind, any movement is a kind of test, which they overcome with a help of technical rehabilitation means. The priority tasks of tiflotechnics related to spatial orientation are:

- the possibility of reducing restrictions in the orientation of the blind, associated with partial or total loss of vision.
- adaptive orientation in everyday life, providing opportunities for the rational organization of the educational process, sociocultural and physical rehabilitation.

By the end of the correctional classes, the students realized and accepted the attitude that the movement with the help of technical rehabilitation means significantly reduces the risks of injuries and allows them to more harmoniously and holistically navigate in space. They had a steady desire to master new types of typhlotechnics.

Table 3 shows the distribution of students by the most used types of typhlotechnics at the beginning of classes and by the most desirable types at the end of classes.

Name	Before classes, % (N)	After classes, % (N)
A special cane	36% (4)	63% (7)
Help of an accompanying person	36% (4)	9% (1)
Special cane and a guide dog	18% (2)	18% (2)
Electronic devices with tactile and audible alarms and a special cane	9% (1)	9% (1)

Table 3
Use of rehabilitation means in movement
N is the number of respondents (frequency); Percent (%) - valid percent

[39] R. S. Heffner & H. E. Heffner, "Hearing and sound localization in blind mole rats (Spalax ehrenbergi)", Hearing research, Vol: 62 num 2 (1992): 206-216.

40 V. P. Ermakov y G. A. Yakunin, Fundamentals of typhlopedagogy: Development, training and education of children with visual impairments: Textbook (Moscow: Vlados, 2000).

[41] S. T. Kokhan, "A study of some aspects of inclusive education of students with disabilities in the Trans-Baikal Territory. Problems of modern pedagogical education", Jour. Yalta. RIO GPA, Vol: 54 num 6 (2017): 100-105.

Analyzing the results, it was found that a special cane dominates - 81%, which, according to the blind, is indispensable in the process of life. The special cane also allows strangers to pay attention to the blind and provide them all possible assistance in orienting their whereabouts. Before classes 36% of blind students used only the services of an accompanying person.

During the interview they said that the established habits in family relationships, when, even without their appeals, relatives and friends offered their help in orienting in a closed and open space even without their appeals. It should be noted that it did not contribute to the formation of orientation skills and mobility, the formation of self-esteem, socialization and personal development.

Thus, the blind did not think about the need for the development of the technical rehabilitation means. In the process of study at the university, these students with visual impairments had an urgent need for mobility and orientation without accompanying people, as accompanying persons are not allowed to attend classes. According to the results of classes from four students with visual impairments, three people initially mastered the rules of movement with a special cane, continuing the classes. The totally blind felt quite confidently - 18%, who used the services of a guide dog in addition to the cane. Electronic devices with tactile and audible alarms were used by one blind person.

The students with visual impairments say that the lack of skills in owning a cane leads to low efficiency in the use of electronic data. In their opinion, the development of analyzer systems suffers, as the blind start to hope for electronic devices, practically without training their own "locators", which affects their mobility. High cost of these systems is the second factor.

We assume that with further training in the following years there will not be the blind using only the services of an accompanying person. Since, an individual approach to routing and practical orientation, first with an instructor, and then independently, will make them feel much more confident and it will contribute to independence and efficiency in the educational process. The experimental implementation of the spatial orientation model of late-blind students based on group and individual forms of work showed its effectiveness. The final study of the level of self-esteem has proved it. The results showed that low self-esteem changed to a realistic level in 5 students.

It should be noted that late blind students have a certain experience of social orientation, since by this age they have already formed certain images and ideas about the world that help them navigate in shapes, volumes, size and distance. The above values are extremely necessary for self-orientation in everyday life for people with impaired vision, which is confirmed by researches[42]. At the same time, there are a number of psychological problems associated with the instability regarding an adequate perception of existing reality in everyday life issue[43].

[42] V. P. Miller, Teaching the blind for spatial orientation: a training manual for tifloinstructors and social workers (Biysk, 2010) y S. S. Belov; M. G. Chukhrova; T. G. Orlova y A. S. Shamikaeva, “Orientation and mobility of persons with visual impairment as the basis of their socio-psychological adaptation”, World of Science, Culture and Education num 24 (2010), 193-195.

[43] G. Cousin, Threshold concepts, troublesome knowledge and emotional capital: an exploration into learning about others in Meyer, J. H. F. and Land, R. (eds.) Overcoming barriers to student understanding: Threshold concepts and troublesome knowledge (Oxford: RoutledgeFalmer, 2006).

Late blind people have special experiences that are significantly different from those experienced blindly born or who have lost their eyesight at an early age. Obstacles that form in the restriction of communication, deformation of social status, inevitably lead to psycho-emotional disorders and depressive states.

Therefore, it is fundamentally important to comprehensively solve the existing problems of social adaptation, which includes the provision of psychological and pedagogical support and self-orientation training, communication skills that positively affect the formation of socially adaptive skills. In this case, it is important to draw on the standards of European education approaches[44]

Conclusion

We conclude that at present, there is no clear understanding of spatial orientation technologies for the late blind. According to Solntseva L. I.[45], a successful orientation depends on the possibility of active movement in it. The realities are such that the more practice-oriented long-term classes in a closed and free space, the more confident and independent a student with visual impairments moves.

We found that spatial orientation technologies for late-blind students are of a combined nature. The initial link of such technologies is associated with the formation of an adequate self-esteem, which ensures a decrease in the manifestations of anxiety, fear, oppression, feelings, psychological changes. Only an adequate self-assessment of their own abilities in spatial orientation ensures the success of independent active movement in the educational space of the university and the mastery of its resources.

According to the results of the final interview, 9 totally blind students who completed the course of study registered: the absence of fear and various phobic conditions. According to the results of the final interview, 9 totally blind students who completed the course of study registered the absence of fear and various phobic conditions. They began to more confidently navigate and move in the confined space of classrooms and office space.

The positive dynamics of the formation of students with deep visual impairment of skills of practical orientation in the surrounding reality during the training period is noted. The use of a comprehensive orientation program affecting the accessibility of higher education is possible with the timely formation of knowledge, skills, acquired experience of social adaptation and active life in various spheres of public life.

It is obvious that classes positively affect the social adaptation and psychological stability of blind students, as well as the acquisition of skills and the possibility of independent movement during the period of study at the university.

Nevertheless, it is important for the instrumental spatial orientation of the blind to possess of a special cane, and the desire to use high-tech tools is recommended as auxiliary.

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[44] J. Biggs, Teaching for quality learning at university. 2 ed. (Buckingham: SRHE & Open University Press; 2003)

[45] L. I. Solntseva, Children with visual impairment. Special Psychology (Moscow, 2003).

Due to the growth of those who want to get higher education of late-blind students, research on teaching spatial orientation and mobility is extremely insufficient. It is advisable to continue research with this category of students.

It has been confirmed that the most important tool for spatial orientation of the blind is a special cane and the help of a guide dog. At the same time, students are aware of the fact that high-tech orientation tools will not replace the capabilities of their own sensor systems.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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