

ENHANCEMENT OF PHYSICAL PREPAREDNESS OF ATHLETES WITH VISUAL IMPAIRMENTS BY ADAPTIVE SPORTS

POBOLJŠANJE TJELESNE SPREMNOSTI SPORTISTA OŠTEĆENOG VIDA KROZ ADAPTIVNI SPORT

ABSTRACT

The analyses of existent scientific knowledge of taking into account level of vision loss at the construction of sportsmen's preparation in adaptive sport testifies about lack of information on the extent of adaptive sports training impact on the level of physical preparedness of people of visual impairment. The aim of the research is to determine the influence degree of adaptive sports training on the physical preparedness of people with visual impairments. Theoretical analysis, pedagogical observation, pedagogical experiment, mathematical and statistical methods were applied. 34 people with visual impairments took part in our research. It has been established that the level of vision loss of people with visual impairment affects the indicators of physical preparedness. There were found significant differences in the level of speed development, flexibility and coordination the blind in comparison with indicators of people with severe visual impairment, and people with moderate visual impairment before and after experiment. As a result of the experiment, there was a significant increase in the indicators of all tests for people with visual impairment. It's indicating the positive impact of adaptive sports training on their physical preparedness. The obtained results indicate that there is a relationship between the level of vision loss of people with visual impairment and the impact of adaptive sports training on their physical preparedness.

Key words: *blind, adaptive sports, strength, coordination, endurance, flexibility.*

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INTRODUCTION

In modern society, the search for solutions for problem solving of persons' with disabilities social integration is considered within framework of the new special means of substantiation, methods and technologies of persons' with disabilities adaptation to the external environment (Blauwet & Willick, 2012; Herasymenko, Mukhin, Pityn & Kozibroda, 2016; Rudenko, Hlozhyk, Guzii & Prystupa, 2017). At the same time, one of the most effective socialization means for persons with disabilities has been actively developing - adaptive sports (Dehghansai, Lemez, Wattie & Baker, 2017). It's as unique social phenomena that has no analogues in modern society allows to create conditions for the attraction persons with disabilities to social life by providing the opportunity to realize their own potential in activities that have a social significance (Sahlin & Lexell, 2015; Lastuka & Cottingham, 2015; Jaarsma, Dekker, Geertzen & Dijkstra, 2016; Fagher, Jacobsson, Timpka, Dahlström & Lexell, 2016). For adaptive sports, as a type of social practice that aims at satisfying self-actualization needs of people with disabilities as members of society and realization of their capabilities in competitive activities, the tendency is to focus on achieving sporting results (Weiler, Van Mechelen, Fuller & Verhagen, 2016; Willick, Cushman, Blauwet, Emery, Webborn, Derman et al., 2016; Kozina, Chebanu, Prokopenko, Korobeynikov, Korobeynikova, Korobeinik, et al., 2018). A demonstration a sporting result, improvement of functional capabilities and a sense of "victory" contributes to the formation of a sense of self-realization, personal growth and overcoming social isolation in persons with disabilities (McNamee, 2017). One of the ways for realization of sports potential

in the process of achieving maximum possible result is the conformity of the scientific and methodological level provision of preparation to the needs of sports practice. It is connected the need to account the level of saved motor potential and specific peculiarities motor activity persons with disabilities in the process of adaptive sports training (DePauw & Gavron, 1995; Winnick & Porretta, 2017). In the researches of some authors there was substantiated the necessity of adaptation athlete's preparation provisions, means and methods, volume and intensity of loadings in accordance with the nosological group of athletes with disabilities (Roztorhui, Perederiy, Briskin & Tovstonoh, 2018; Pisapia & D'isanto, 2018). But the nosological group as a combination of diseases, which are united by common features, can't be the main criterion for adapting the methodological guidelines of athletes' preparation in adaptive sports. It is because in one nosological group there can be athletes with different severity of manifestations and symptoms of diseases and concomitant diseases. Thus, the nosological group of athletes with visual impairments include the blind, persons with moderate and severe visual impairments. (Mann & Ravensbergen, 2018). Therefore, it is more correct to take into account the level of saved motor and functional possibilities in the process of constructing the athletes' preparation in adaptive sports.

The analysis of available scientific knowledge about the athletes' preparation in adaptive sports shows that there is no information about the impact of sports training on the physical preparedness of persons with different levels of vision loss.

The aim of research is to determine the effect of the adaptive sports activities on the quality of life and physical preparedness of athletes with visual impairments.

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METHODS

Entity sample. 34 people with visual impairments took part in our research. Among them: 8 blind (B1), 10 persons with severe visual impairment (B2) and 16 – with moderate visual impairment (B3). The study participants included 16 women and 18 men. The average age of them was $26,44 \pm 6,35$ years old.

Procedures. Athletes with visual impairments were included in the groups of physical and rehabilitation preparation at the regional centers of physical culture and sports for people with disabilities "Invasport". The training program for people with visual impairment provided 3 training sessions per week the duration 120 minutes. The total amount of training sessions was 40 hours. The features of implementation, structure and content of the training program for groups of physical

and rehabilitation preparation people with visual impairment are detailed in our previous researches (Roztorhui, Perederiy, Briskin, Tovstonoh, Khimenes & Melnyk, 2018).

Testing. The level of physical preparedness of athletes with visual impairment was determined. It was done in order to determine the impact of adaptive sports activities on the physical preparedness of persons who were researched before and after implementation of the training program. Exercises were chosen and adapted according to the athletes' nosological characteristics, the requirements of sports metrology and technical simplicity for use in the training process. The list of exercises that have been selected to determine the level of physical preparedness of people with visual impairment is shown in Table 1.

Table 1. Tests to determine the level of physical of preparedness people with visual impairment

No i/o	Name of test	Directivity
1.	Push-ups, number of times	Strength
2.	Running at 30 m, s	Speed-strength abilities
3.	Cooper's 12-minute test on a stationary bike, m	Endurance
4.	V-Sit flexibility test, sm	Flexibility
5.	Keep balance on the right leg, s	Coordination abilities
6.	Keep balance on the left leg, s	Coordination abilities

The level definition of strength development of people with visual impairment was carried out on the results basis in the exercise «push-ups», speed-strength abilities – with the help of running at 30 m, endurance – Cooper's 12-minute test on a stationary bike, flexibility – V-Sit flexibility test and coordination was determined on the basis of the results in the exercise «keep balance on one leg».

Factors that could affect the reliability of tests were taken into account

in the process of determining the level of physical preparedness. In particular, determining the level of physical preparedness before and after the experiment was conducted in one time interval.

Before the beginning of determining the level of physical preparedness of people with visual impairments, a preparatory part was carried out. It included the complex workout of general exercises. For realization of running at 30

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m, V-Sit flexibility test, push-ups and keep balance on one leg the athletes had three attempts. The best result was recorded in the research protocol.

The study was approved by the local research ethics committee, performed in accordance with the ethical standards of the journal, IJSM and conformed to the recommendations of the Declarations of Helsinki. The current study was undertaken in Ukraine after the approval of the Institutional Research Ethics Committee at Lviv State University of Physical Culture. Participation was voluntary; participants received no incentives.

Statistical analysis. The results were analyzed with the statistica for Windows software (version 6.00). Previously, all variables were analyzed for normality with the use of the Shapiro-Wilk test. The Student's test and Mann-Whitney test was applied to assess the value of statistical differences in the physical preparedness results of athletes with different levels of vision loss. The Student's test and Wilcoxon signed-rank test were used for comparison of studied parameters between groups before and after experiment. The values of $p < 0.05$ were considered statistically significant.

RESULTS

The analysis of the results of determining the level of physical preparedness of people with visual impairment before experiment made it possible to detect differences in the indexes for tests «running at 30 m», «V-Sit flexibility test», «keep balance on one leg (right and left)», that depending on the level of their vision loss.

Indexes of physical preparedness of researched persons in group B1 for tests «running at 30 m» and «V-Sit flexibility test» differ from those of groups B2 and B3 at the $p < 0.05$ significance level as described in Table 2. In tests «keep balance on the right leg» and «keep balance on the left leg» of researched persons in group B1 differ from the indexes of the other two groups with a significance level $p < 0.01$.

According to the results of tests «push-ups» and «Cooper's 12-minute test on a stationary bike», the indexes of three groups researched persons do not differ statistically. There were not found significant differences among the researched persons of B2 and B3 groups in the indexes for all tests that determine physical preparedness before the beginning of adaptive sports training.

Table 2. *Physical preparedness indexes of people with visual impairment before experiment*

Name of test	Group B1	Group B2	Group B3	Differences B1-B2	Differences B2-B3	Differences B1-B3
	(n=8) $\bar{x} \pm SD$	(n=10) $\bar{x} \pm SD$	(n=16) $\bar{x} \pm SD$			
Push-ups, number of times	4.47±0.94	9.40±5.50	12.94±6.63	U=37.5	t=1.4	U=41.5
Running at 30 m, s	8.11±0.73	7.37±0.68	7.28±0.61	U=18**	t=0.4	U=27.5**
Cooper's 12-minute test on a stationary bike, m	3466.13±1000.74	4014.80±965.34	4007.56±1474.34	U=27	U=78	U=51
V-Sit flexibility test, sm	3.13±0.94	4.49±1.03	4.26±1.97	U=15**	t=0.3	U=42.5
Keep balance on the right leg, s	10.94±3.40	18.80±2.89	19.61±2.48	U=4*	t=0.8	U=3*
Keep balance on the left leg, s	10.28±3.30	17.37±2.46	18.78±3.10	U=3*	U=60.5	U=0*

*Statistically significant results (p<0.01); ** Statistically significant results (p<0.05); \bar{x} – mean; *SD* – standard deviation; *U* – Mann-Whitney test; *t* – Student's test.

Indexes for re-determining the physical preparedness level of persons with visual impairment after experiment are presented in Table 3. It has been established that significant differences among people with different levels of vision loss after experiment are available exclusively among

researched persons of B1 group in the same tests as before experiment, namely «running at 30 m», «V-Sit flexibility test», «keep balance on one leg (right and left)». There were not found differences in the test indexes in other groups.

Table 3. *Physical preparedness indexes of people with visual impairment after experiment*

Name of test	Group B1	Group B2	Group B3	Differences B1-B2	Differences B2-B3	Differences B1-B3
	(n=8) $\bar{x} \pm SD$	(n=10) $\bar{x} \pm SD$	(n=16) $\bar{x} \pm SD$			
Push-ups, number of times	12.38±4.72	12.20±5.92	15.13±6.47	U=36	U=50.5	U=44.5
Running at 30 m, s	7.47±0.51	6.83±0.44	6.82±0.44	U=22	U=77.5	U=31**
Cooper's 12-minute test on a stationary bike, m	4031.50±1069.65	4400.20±823.76	4358.75±1275.37	U=29	t=0.1	U=55
V-Sit flexibility test, sm	3.84±0.41	5.57±0.98	5.26±1.58	U=3,5*	t=0.6	U=29.5**
Keep balance on the right leg, s	12.32±3.73	20.97±3.20	22.02±2.59	U=2*	t=0.9	U=2*
Keep balance on the left leg, s	11.69±3.77	19.50±2.98	21.27±3.40	U=4*	U=58	U=0*

*Statistically significant results (p<0.01); ** Statistically significant results (p<0.05); \bar{x} – mean; *SD* – standard deviation; *U* – Mann-Whitney test; *t* – Student's test.

As a result of the experiment, there was found a significant increase in the physical preparedness indexes at a $p < 0.01$ level of significance in all researched persons in six tests (Table 4). The most essential increase in the indexes of physical preparedness in all tests was found at researched persons of group B1.

Among six tests, the most significant changes in physical preparedness indexes at all researched people were found in the tests «V-Sit flexibility test» and «push-ups». The lowest growth of physical preparedness indexes were found in the results of running at 30 m and Cooper's 12-minute test on a stationary bike.

Table 4. *Percentage indexes of physical preparedness indexes growth of people with visual impairment*

Name of test	Group B1 (n=8)		Group B2 (n=10)		Group B3 (n=16)	
	%	Statistical test	%	Statistical test	%	Statistical test
Push-ups, number of times	47.76	$T=0.01^*$	29.79	$T=0.01^*$	16.91	$T=0.00^*$
Running at 30 m, s	7.86	$T=0.01^*$	7.33	$t=6.8^*$	6.31	$T=0.00^*$
Cooper's 12-minute test on a stationary bike, m	16.31	$T=0.01^*$	9.60	$t=5^*$	8.76	$T=0.00^*$
V-Sit flexibility test, sm	26.00	$T=0.01^*$	24.05	$t=12^*$	23.64	$t=6.7^*$
Keep balance on the right leg, s	12.65	$T=0.01^*$	11.54	$t=13.6^*$	12.30	$t=30.2^*$
Keep balance on the left leg, s	13.70	$T=0.01^*$	12.29	$t=12.6^*$	13.22	$T=0.00^*$

% – percentage of increase; *Statistically significant results ($p < 0.01$); t – Student's test; T – Wilcoxon signed-rank test.

The obtained results testify about significant influence of adaptive sports on the physical preparedness indexes of persons with visual impairment. In this case, the magnitude of the effect depends on the level of vision loss and the orientation of adaptive sports training.

DISCUSSION

As a result of the research, it has been found the level of vision loss has a significant effect on the level of preparedness people with visual impairment. Physical preparedness indexes the blind in four of the six tests are lower than with moderate or severe visual impairment. Despite the significant impact of adaptive sports on the physical preparedness level of athletes in group B1, after the experiment, the indexes of speed,

flexibility and coordination qualities in the blind are the lowest among the researched persons. The greatest differences in the level of preparedness are observed in the indexes by the results of keep balance on the right leg and keep balance on the left leg. The indexes of keep balance on the right leg after the experiment in the researched persons of group B1 are only 55.94% from the same index in group B3. This indicates that the level of vision loss directly affects the development level of coordination capabilities of people with visual impairment. This assertion was confirmed by the researches of Joseph Winnick, David Porretta (2017) and Roman Tolmachev (2004), who studied the peculiarities of studying exercise techniques for athletes with visual impairment. In comparison with people with moderate or severe visual impairment

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the blind spend much more time studying techniques of new exercises. This requires a narrow individualization of the training process people with visual impairment during studying sports techniques and especially this is important in the complex coordination sports.

One of the most significant research results is the confirmation of the positive influence of adaptive sports activities on the physical preparedness of people with visual impairment. Reliable indexes of physical preparedness increase in six tests at all researched persons as a result of the experiment that allowed us to conclude that, with the help of the adaptive sports means, adaptive and compensatory mechanisms can be created in the bodies of persons with disabilities. It allows to increase motor activity level to restore muscular strength and joints mobility, to expand the arsenal of motor skills. The results of our research are confirmed by certain number of scientific works, that are devoted to the rehabilitation orientation of adaptive sports as a means of strengthening health, restoring lost functions, adapting to external conditions, physical development and preparedness improvement (DePauw & Gavron, 1995; Houwen, Visscher, Hartman & Lemmink, 2007; Blauwet & Willick, 2012; Lastuka & Cottingham, 2015; Dehghansai, Lemez, Wattie & Baker, 2017).

The obtained results analysis allows us to conclude that there is a correlation between the increase of physical preparedness indexes after experiment and the level of vision loss. The highest indexes of physical preparedness growth after experiment among the researched persons for all tests are observed in group B1. For example, indexes growth in the test «push-ups» in the B1 group was 47.76% and in groups B2 and B3 – 29.79%

and 16.91% respectively. A high level of vision loss greatly affects the possibility of people with visual impairment to move independently and engage in sports.

Therefore physical preparedness indexes of B1 group are significantly lower than in the researched persons of group B2 and B3. The highest indexes of physical preparedness increase that were found in the blind could be caused by a low initial physical preparedness level of researched persons.

CONCLUSIONS

It has been established that there is a correlation between physical preparedness level of people with visual impairment and the level of their vision loss. The blind have significantly lower indexes of speed, flexibility and coordination development, than persons with moderate or severe visual impairment before and after the experiment.

Experimental testing of adaptive sports activities impact on physical preparedness of people with visual impairment has confirmed the effectiveness of using adaptive sports as a means for the improvement of the level of physical qualities development. In all researched persons, there were found positive dynamics of physical preparedness indexes for the tests «push-ups», «running at 30 m», «Cooper's 12-minute test on a stationary bike», «V-Sit flexibility test» and «keep balance on one leg». The highest indexes of growth in the level of physical qualities development by the tests results after experiment were found in the blind. This indicates that it is possible to create adaptive and compensatory mechanisms in people with a high level of vision loss by adaptive sports means.

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SAŽETAK

Analize postojećih naučnih saznanja, kada se uzima u obzir nivo gubitka vida pri izgradnji pripreme sportista u adaptivnom sportu, svjedoče o nedostatku podataka o stepenu uticaja adaptivnog sportskog treninga na nivo tjelesne spremnosti osoba s oštećenjem vida. Cilj istraživanja je utvrditi stepen uticaja adaptivnog sportskog treninga na tjelesnu spremnost osoba sa oštećenjem vida. Primijenjene su teorijska analiza, pedagoško promatranje, pedagoški eksperiment, matematičke i statističke metode. U istraživanju je učestvovalo 34 osobe sa oštećenjem vida. Utvrđeno je da nivo gubitka vida kod osoba sa oštećenjem vida utiče na pokazatelje tjelesne spremnosti. Otkrivene su značajne razlike u stepenu razvoja brzine, fleksibilnosti i koordinaciji slijepih u poređenju s pokazateljima osoba s teškim oštećenjem vida i ljudi s umjerenim oštećenjem vida prije i nakon eksperimenta. Kao rezultat eksperimenta, došlo je do značajnog porasta pokazatelja svih testova za osobe sa oštećenjem vida. To ukazuje na pozitivan uticaj adaptivnog sportskog treninga na njihovu fizičku spremnost. Dobijeni rezultati pokazuju da postoji povezanost između nivoa gubitka vida kod osoba sa oštećenjem vida i uticaja adaptivnog sportskog treninga na njihovu fizičku spremnost.

Ključne riječi: *slijepo osobe, adaptivni sportovi, snaga, koordinacija, izdržljivost, fleksibilnost.*

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РЕЗЮМЕ

ПОВЫШЕНИЕ ФИЗИЧЕСКОЙ ПОДГОТОВЛЕННОСТИ СПОРТСМЕНОВ С НАРУШЕНИЯМИ ЗРЕНИЯ С ПОМОЩЬЮ АДАПТИВНОГО СПОРТА

Анализ имеющегося научного знания по учету уровня сохраненного зрения в построении подготовки спортсменов в адаптивном спорте свидетельствует об отсутствии информации о степени влияния занятий адаптивным спортом на уровень физической подготовленности у лиц с нарушениями зрения, что снижает эффективность реализации их спортивного потенциала. Целью исследования является выявление влияния занятий адаптивным спортом на физическую подготовленность спортсменов с нарушениями зрения. Для реализации поставленной цели были использованы следующие методы: теоретический анализ, педагогическое наблюдение, педагогический эксперимент, математические и статистические методы. В исследовании приняло участие 34 спортсмена, среди которых 8 с тотальной слепотой, 10 человек с легкими нарушениями зрения и 16 с тяжелыми нарушениями зрения. С целью определения уровня физической подготовленности у лиц с нарушениями зрения были использованы тесты на сгибание и разгибание рук в упоре лежа, бег на 30 м, 12-ти минутный тест Купера на велотренажере, наклон туловища вперед из положения сидя и удержание равновесия на одной ноге. Установлено, что уровень сохраненного зрения значительно влияет на показатели физической подготовленности. Выявлены достоверные различия в уровне развития быстроты, гибкости и координационных качеств у лиц с тотальной слепотой по сравнению с показателями лиц с легкими и тяжелыми нарушениями зрения до и после эксперимента. В результате эксперимента произошло достоверное повышение показателей по всем тестам у лиц с нарушениями зрения, что свидетельствует о положительном влиянии занятий адаптивным спортом на их физическую подготовленность. Полученные результаты свидетельствуют о наличии зависимости между уровнем сохраненного зрения и влиянием занятий адаптивным спортом на физическую подготовленность у лиц с нарушениями зрения.

Ключевые слова: *слепота, адаптивный спорт, сила, координация, выносливость, гибкость.*

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