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DYNAMICS OF DAILY LIVING ACTIVITIES INDICATORS IN PERSONS WITH SPINAL CORD AND VERTEBRAL COLUMN INJURY UNDER THE INFLUENCE OF ACTIVE REHABILITATION CAMPS

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Abstracts

Topicality. Today, the soldiers who have been injured as a result of hostilities are added to people who receive injuries of the spine and spinal cord in living conditions or in traffic accidents. Invalidation of these persons lies the loss of the ability to move or carry out activities in daily living independently. This article describes the impact of active rehabilitation camps (ARC) on improving self-care in the daily living of persons with spinal cord and vertebral column injuries. **The purpose** of the study is to determine the effectiveness of the ARC program for persons with spinal cord and vertebral column injuries. The effectiveness of the ARC program has been analyzed using the Barthel Activity of the Daily Living (ADL) Index in two stages, in 2004–2009 and 2013–2017. The study covered 204 people, of which 84 persons with cervical spine and spinal cord injuries, 62 with thoracic spine and spinal cord injuries, and 58 persons with lumbar spine and spinal cord injuries. The ARC program has proven a 25% increase in most indicators of everyday life. The best results have been attributed to the movement of one's own body in space, improvement of dressing skills, and overcoming of architectural obstacles. The major difficulties for ARC refer to stair climbing, independent bathing and defecation skills. It has been established that the growth of life activity indicators depends on the severity of injury, which contributed to division of participants of the experiment into groups of similar injuries.

Key words: spinal cord and vertebral column injury, active rehabilitation camps, rehabilitation, Barthel scale, activities of daily living.

Оксана Федорович, Аліна Передерій. Динаміка показників активності повсякденного життя осіб із травмами хребта та спинного мозку під впливом таборів активної реабілітації. **Актуальність.** Нині до осіб, які отримують травми хребта та спинного мозку в побутових умовах чи під час дорожньо-транспортних пригод, додаються й військові, які постраждали внаслідок бойових дій. Інвалідизація таких людей полягає у втраті можливості самостійно пересуватися чи виконувати побутові дії. У цій статті описано вплив таборів активної реабілітації (ТАР) на покращення рівня самообслуговування в повсякденному житті осіб з ураженням хребта й спинного мозку. **Мета дослідження** – визначити ефективність застосування програми ТАР для осіб з ураженням хребта та спинного мозку. Аналіз ефективності застосування програми ТАР здійснено за допомогою індексу активності повсякденного життя Бартела (Barthel Activities of Daily Living (ADL) Index) за два етапи, протягом 2004–2009 і 2013–2017 рр. Дослідження охоплено 204 особи, із яких 84 – з ураженням шийного відділу хребта й спинного мозку, 62 – з ураженням грудного відділу хребта й спинного мозку та 58 – поперекового відділу хребта й спинного мозку. Установлено, що програма ТАР має в більшості показників

повсякденного життя приріст у межах 25 %. Найкращі результати пов'язані з переміщенням власного тіла в просторі, освоєнням навичок одягання, долання архітектурних перепон. Найважче учасникам ТАР було освоїти долання сходових маршів, прийняти ванну й самостійно виконати акт дефекації. Установлено, що приріст показників активності життя залежить від рівня ураження, що зумовило розподіл учасників експерименту на рівноцінні за ураженням групи.

Ключові слова: травма хребта й спинного мозку, табори активної реабілітації, реабілітація, шкала Бартела, повсякденна життєдіяльність.

Оксана Федорович, Алина Передерий. Динамика показателей активности повседневной жизни лиц с травмами позвоночника и спинного мозга под влиянием лагерей активной реабилитации. Актуальность. В наше время к лицам, которые получают травмы позвоночника и спинного мозга в бытовых условиях или во время дорожно-транспортных происшествий, добавляются и военные, пострадавшие в результате боевых действий. Инвалидизация этих людей заключается в потере возможности самостоятельно передвигаться и выполнять некоторые бытовые действия. В статье описывается влияние лагерей активной реабилитации (ЛАР) на улучшение уровня самообслуживания в повседневной жизни у лиц с травмой позвоночника и спинного мозга. **Цель исследования** – определить эффективность применения программы ЛАР для лиц с травмой позвоночника и спинного мозга. Анализ эффективности применения программы ЛАР осуществлялся при помощи индекса активности повседневной жизни Бартела (Barthel Activities of Daily Living (ADL) Index) в два этапа в течение 2004–2009 и 2013–2017 гг. Исследованием охватили 204 человека, из которых 84 – с поражением шейного отдела спинного мозга, 62 – с травмой грудного отдела спинного мозга и 58 – поясничного отдела позвоночника и спинного мозга.

Установлено, что программа ЛАР имеет в большинстве показателей повседневной жизни прирост в пределах 25 %. Лучшие результаты достигнуты в выполнении заданий, связанных с перемещением собственного тела в пространстве, освоением навыков одевания, преодоления архитектурных преград. Наиболее сложным для участников ЛАР было освоение лестничных маршей, принятие ванны и самостоятельное выполнение акта дефекации.

Ключевые слова: травма позвоночника и спинного мозга, лагеря активной реабилитации, реабилитация, шкала Бартела, повседневная жизнедеятельность.

Formulation of a research problem and its significance. The spinal cord and vertebral column injury is one of the most traumatic ones, which result in a disablement in 90-95% of all the cases, even in those when the patient was given timely and full aid at the acute stage of injury [5; 6; 11; 12]. The most vulnerable part during the healing of such patients is the restoration of motor functions, which can last for one year after injury and affect the degree of autonomy of such persons in everyday life [7; 8]. Actually, the restoration of motor functions of people with the vertebral column and spinal cord injury is a prerequisite for further socialization, physical adaptation and independence in every day life [1; 4; 12].

Since the rehabilitation process of such individuals is quite long, one of its important factors is the right approach to the restoration of motor functions and well-considered programs of adaptation and socialization of such persons at later stages. One of the important areas of rehabilitation at distant stages is a program of active rehabilitation camps that includes the entire spectrum of theoretical and practical disciplines for a fast, complete and well-balanced assimilation of practices, techniques and methods necessary for a full-fledged life of a person with a vertebral column and spinal cord injury [3; 9; 10]. The ARC program is based on the personal experience of people who suffered the vertebral column and spinal cord injury, which enables to avoid the mistakes that can sometimes be observed when applying classic rehab programs [1; 2; 3].

The goal and the specific tasks of the article. To determine the effectiveness of the active rehabilitation camp program for persons with the vertebral column and spinal cord injury and evaluate its impact on the daily activities of its participants.

Material and methods. In the course of the study, Barthel Activities of Daily Living (ADL) Index was applied to assess the effectiveness of the ARC program, which was worked out using mathematical statistics methods, namely the use of the Pearson's chi-squared test, χ^2 -test, and cluster analysis. The active rehabilitation camps program involves taking part in such types of motor activity as wheelchair riding

techniques, strength exercises, table tennis, swimming and archery. In addition, the ARC program includes self-service classes. Training sessions last for almost the whole day (roughly, from -180h). Each discipline requires from the participant the maximum independent performance of actions concerning moving in a wheelchair, moving the body to different surfaces, dressing up, crossing, etc. An intensive course for the participants allows them to quickly and effectively master certain skills in the field of self-service, which was the subject of scientific research. Therefore, this article gives an overview of the effectiveness of the active rehabilitation camp program, which was carried out by measuring the Barthel's ADL Index, which includes 10 indicators: control of bowel movements, urinary control, personal hygiene, toilet attendance, eating, movement, mobility, dressing up, climbing stairs, bathing. It should be noted that the Barthel Index provides two levels of indicators evaluation 'personal hygiene' and 'bathing': 0 points «dependent» or 5 points «independent». The indicators such as «mobility» and «moving» have a maximum number of evaluation levels (0 points is «fully dependent», 5 points «require significant side assistance», 10 points - «help needed» and 15 points - «completely independent»). The remaining 6 criteria are evaluated at 0, 5 and 10 points, respectively, «dependent», «need support» and «independent» [4; 9].

Statement regarding the basic material of the research and the justification of the results obtained. In order to get the correct results, the participants in the experiment were divided into three groups according to the possibilities of performing the tasks, namely a group of patients with the cervical spine injury, thoracic spine injury and lumbar spine and spinal cord injury. In addition, these groups were divided according to the stages of the study: 2 groups of patients with the cervical spine and spinal cord injury, 61 persons (2004-2009) and 23 persons (2013-2017); 2 groups with the thoracic spine and spinal cord injury, 29 persons (2004-2009) and 33 persons (2013-2017); and 2 groups with lumbar spine injury, 29 persons (2004-2009) and 29 (2013-2017).

The dynamics of the examined indicators in the group of ARC participants with the cervical spine and spinal cord injury (61 persons) shows that 10 out of 8 indicators have been significantly improved as a result of the ARC program. Thus, with the indicators of «control of defecation» and «control of urination» the changes in the Pearson's chi-squared test are statistically significant. Instead, the z-test shows that these indicators did not show statistically significant changes ($p < 0.05$). Similar results of statistical analysis were obtained for the indicators of «personal hygiene» and «bathing», but in contrast to the previous comparison, the Pearson's chi-squared test has no statistically significant changes, only the z-test shows positive changes. It is assumed that although the changes that took place according to these indicators, are verified by one of the tests as statistically significant, they could still not be substantially expressed in terms of improving functions in such a short period of time. The development and improvement of these indicators («control of defecation», «control of urination», «personal hygiene», «bathing») requires more time.

When processing the initial data of the «personal hygiene» indicator, 28% of the surveyed had «0» score, and, accordingly, 72% had a maximum score of «5». At the final evaluation, after passing the ARC, these figures have changed for the better in the range of 8%, that is, 0 points were received by 20% of camp participants and, accordingly, 80% of the surveyed received an assessment of 5 points.

The best dynamics of the results was demonstrated by the participants of the experiment in such a skill as «toilet attendance», in which at the beginning of the experiment, 64% of participants had 0 points, and at its completion a «0» point was received by 22%, and the number of people who had a «5» score increased from 36% to 78%. Also, some positive results were recorded in the «moving» and «dressing up» indicators, where there were some changes from 80% and 82% of those who had 5 points at the beginning of the ARC, to 64% and 53%, respectively, who got 10 points at the end of the experiment.

It should be emphasized that changes in such indicators as «toilet attendance», «eating», «moving», «dressing up» and «climbing stairs», both for Pearson's chi-squared test and z-test are statistically significant ($p > 0.05$). It is assumed that the collected statistically significant changes in these indicators are due to the application of such disciplines as wheelchair riding techniques, swimming, athletic gymnastics and self-service classes, which involve crossing into different planes, moving the body on different surfaces, dressing

and undressing and overcoming of architectural barriers in a wheelchair with the use of special training techniques that are necessary for people with spinal cord injury at the level of the cervical spine and help improve performance in the short term [4; 6; 9].

The indicator of «mobility» has not undergone any changes, since according to the evaluation procedure people with tetraplegia, who use a wheelchair, get 5 points as soon as they meet the condition of using a wheelchair with a demonstration of the ability to get around the corners and use the door.

A cluster analysis was also carried out to confirm the obtained data. The comparison of the initial data with the final data according to the results of cluster analysis, enables to point out that the significant changes occurred in 7 indicators out of 10. The indicators of «mobility», «bathing» and «control of urination» do not show any positive changes in this category of the surveyed. The indicators of «control of bowel movements» and «personal hygiene» also do not demonstrate any statistically significant shifts to the positive side, which indicates a need in a longer period of training, or in a constant assistance in performing these tasks.

The changes in the index of daily living activity indicators in the second group of the surveyed with a similar level of the spinal cord injury are similar to the changes recorded in persons from the first group. 6 indicators out of 10 had some significant improvements according to the Barthel ADL index. These indicators are «control of bowel movements», «toilet attendance», «eating», «movement», «climbing stairs» and «bathing».

It should be noted that in comparison to the first group, there is a significant number of people (78 %) with spinal cord injury at the level of C6-C7 in the second group, indicating that this group is potentially stronger physically than the previous one. It is assumed that the absence of statistically significant changes in the indicators of personal hygiene, dressing, mobility, and urinary control is associated with the high enough scores at the beginning of the study, which would not be able to improve significantly in these indicators.

In order to compare the initial data to final data, a cluster analysis also was applied, which enabled to confirm that the participants of the survey achieved the best results in the «eating», «moving» and «dressing up».

This analysis suggests that «climbing stairs» and «bathing» did not reveal any positive changes in this category of the surveyed. Also, «control of bowel movements», «control of urination» and «personal hygiene» have changed positively only among 14 people, which makes up about 60 %, while 40 % of participants had minor changes with this indicators.

The final analysis of the total points according to this test shows quite high-quality changes of the indicators among the participants. If the patient gains 0-20 points, it is a full dependence, 21-60 points is a great dependence, 61-90 is a moderate dependence, 91-99 is a slight dependence, 100 is complete independence (Table.1).

The dynamics of these indicators in the group of ARC participants with the thoracic spine and spinal cord injury (29 people) shows that there has been a significant improvement of 6 indicators out of 10 as a result of the ARC program's progress. This is evidenced by the results of the statistical analysis using the Pearson's chi-squared test and z-test criteria. Thus, the indicators of «control of bowel movements», «toilet attendance», «movement», «mobility», «dressing up» and «climbing stairs» have statistically significant changes according to the Pearson's chi-squared test and z-test criteria with a level of significance equal 0.05. Also, in the analysis of the «control of urination», the Pearson's chi-squared test criterion shows statistically significant changes that are not confirmed by the z-test criterion. The initial results for this indicator were: 13.8% of camp participants had a '0' point, 68.96% of people were rated «5» and 17.24% had «10» points.

At the end of the camp program, the indicators changed to the following: 0 points were not received by any camp participant, 58.62% received «5» points and «10» points were received by 41, 38%. The data of cluster analysis also confirms the fact that the indicators have changed in the direction of a significant improvement.

It can be asserted that most indicators have changed for the better. As for indicators of «personal hygiene» and «bathing», statistically significant changes are also not observed. The «eating» indicator has minor changes towards improving.

Table 1

**The final analysis of the total score
of the Barthel ADL index indicators of ARC participants
with a cervical spine injury during (n = 84)**

Groups	Levels of total score	at the beginning of ARC	%	At the end of ARC	%
2007-2010 n = 61	Full dependence	15	24.6%	3	4.9%
	Great dependence	46	75.4%	54	88.5%
	Moderate dependence	0	0	5	6.6%
	Slight dependence	0	0	0	0
	Independence	0	0	0	0
2014-2017 n = 23	Full dependence	6	26%	1	4.35%
	Great dependence	17	74%	21	91.3%
	Moderate dependence	0		1	4.35%
	Slight dependence	0		0	0
	Independence	0		0	0

This group can be identified as the one that shows good results in the «control of urination» and «toilet attendance», which was directly in consequence of the persistent work of instructors, that involved daily monitoring of the participants for the performance of certain self-service tasks.

In the second group, people with the thoracic spine and spinal cord injury (33) (2013-2017), the change of indicators during the ARC shows that 10 out of 8 indicators have been significantly improved as a result of the ARC program's progress, which is evidenced by the results of the statistical analysis. Thus, these changes are statistically significant both in the Pearson's chi-squared test and in the z-test with the significance level of 0.05 in the indicators of «toilet attendance», «movement», «mobility», «climbing stairs» and «bathing».

The best dynamics of the results have been demonstrated by participants in this experiment for tasks such as «moving», «mobility» and «bathing». A comparison of the data at the beginning of the experiment to the data at the end of the experiment captures the changes within 50 %. For example, when evaluating the indicator of «moving» at the beginning of the experiment 69.7% of the participants had «10» points, and 30.3% of the people had «15» points, respectively, then at the end of the experiment, 68% of persons got «15», and 32% got «5».

It can be assumed that the obtained statistically significant changes in most indicators is also due to the appliance of such disciplines as «wheelchair ride techniques», «swimming», «athletic gymnastics» and «self-service classes» in the ARC program. It should also be noted that such activities as «table tennis» and «archery» have a positive influence on the training of balance in the wheelchair, which is very useful for the people with the thoracic spine and spinal cord injury [3; 9].

The analysis of the indicators of the two groups the thoracic spine and spinal cord injury, carried out at different times, allows to record positive changes in the representatives of both groups after undergoing the active rehabilitation camps. The data from the tables of the summary results (Table 2) shows that the groups

that got into the camps before 2009 and after the end of 2014 differ from each other in both the initial indicators and the final ones. It can be assumed that these differences are determined by the higher level of capabilities of the second group people. This, in turn, can also indicate a better situation with the rehabilitation process at the acute stage of injury.

Table 2

The final analysis of the total score of the indicators of the Index for Activities of Daily Living (ADL) of ARC participants the thoracic spine injury during (n = 62)

Groups	Levels of total score	at the beginning of ARC	%	at the end of ARC	%
2007-2010 n = 29	Full dependence	0	0	0	0
	Great dependence	28	96.5%	7	24.1%
	Moderate dependence	1	0.5%	22	75.9%
	Slight dependence	0	0	0	0
	Independence	0	0	0	0
2014-2017 n = 33	Full dependence	0	0	0	0
	Great dependence	8	24.25%	0	0
	Moderate dependence	25	75.75%	25	75.75%
	Slight dependence	0	0	4	12,125%
	Independence	0	0	4	12,125%

In the group of people with the lumbar spine and spinal cord injuries (29 people), the dynamics of indicators shows that 10 indicators out of 5 (toilet attendance, movement, mobility, climbing the stairs and bathing) have been significantly improved as a result of the ARC program's progress, which is evidenced by the statistical results analysis applying the Pearson's chi-squared test and the z-test. The indicators of «eating» and «personal hygiene» were estimated at the beginning of the camp program and, respectively, did not show any changes at the end of the program. The indicators of «control of bowel movements» and «control of urination» changed among a small number of people, which did not affect the overall result, but these indicators showed a tendency for improvement.

In return, the changes in «toilet attendance», «mobility» and «bathing» are statistically significant both for the Pearson's chi-squared test and the z-test with a level of significance equal 0.05. Similar results were obtained when applying a cluster analysis.

The analysis of the dynamics of the «movement» and «climbing the stairs» indicators according to Pearson's chi-squared test shows that the calculated coefficients are greater than the critical ones, which was not revealed by the z-test. Therefore, in order to confirm statistically significant changes, a cluster analysis was also applied, the results of which indicate the presence of changes in the indicator of «movement» and can be considered statistically significant. As a result of undergoing the ARC program for 12 people, which is 41,4%, the «movement» indicator changed from «10» to «15», while «climbing stairs» indicator has changed slightly, an improvement from the «5 « to the «10» was received only by 4 people, representing 13.8% of the surveyed.

It should be noted that according to the analysis, the best results in this group of the surveyed were achieved in the «bathing» indicator, where changes in the improvement of this ability during the ARC

occurred in 44.8% of the surveyed. The ability to «climb stairs» had the least amount of changes, where many people remained at the level of «need for significant assistance» and even two people who were completely dependent on assistance. It can be assumed that this skill requires considerable effort and time to master certain techniques. A significant number of people using a wheelchair do not master this ability towards a complete independence.

In the next group, the change in the indicators during the ARC with lumbar spine and spinal cord injuries (29 people, 2013-2017) shows that 5 indicators out of 10, have also been significantly improved as a result of the ARC program, which is evidenced by the results of the statistical analysis. As for the «eating» and «personal hygiene» indicators that have not shown any changes, it can be assumed that they will not be higher because they are highly evaluated at the beginning of the camp.

The «control of bowel movements» and «urinary control» indicators showed changes among a small number of people that did not affect the overall result, and showed only tendencies for change, as well as in the previous group.

The obvious changes occurred in the «toilet attendance», «mobility» and «bathing» indicators, and these changes are statistically significant both by the Pearson's chi-squared test and by the z-test with a level of significance equal 0.05. The same results are confirmed by the cluster analysis.

Analyzing such indicators as «movement» and «climbing stairs», according to the Pearson's chi-squared test, the calculation coefficients are higher than the critical ones, but the z-test does not show such changes. Therefore, a cluster analysis also was applied to confirm statistically significant changes, and its data shows the change in the indicator of «movement» from «10» points to «15» points; «climbing stairs» indicator also changed and the improvement from «5» to «10» points took place in 20,7% of the surveyed, which is 6 people, and from «0» points to «5» - in 10,35% of the surveyed, which is 3 persons, but in general changes have taken place in 31,05% of the surveyed.

It should be noted that, as in the previous group, according to the analysis, the best results in this group of surveyed were achieved in the «bathing» indicator, where changes occurred in 51.7% of the surveyed. The indicator of «dressing up» was changed the least. The analysis of the summary indicators of the two groups (Table 3), which was surveyed at different times, showed positive changes in both groups after undergoing the active rehabilitation camps. The groups of individuals with an injury at the level of the lumbar spine are equivalent. In both groups, the participants substantially improved their skills in the short run of the ARC program.

Table 3

The final analysis of the total score of the indicators of the Index for Activities of Daily Living (ADL) of ARC participants with the thoracic spine injury during (n = 58)

Groups	Levels of total score	at the beginning of ARC	%	at the end of ARC	%
1	2	3	4	5	6
2007-2010 n = 29	Full dependence	0	0	0	0
	Great dependence	4	13.8%	0	0
	Moderate dependence	24	82.75%	21	72.4%
	Slight dependence	1	3.45%	4	13.8%
	Independence	0	0	4	13.8%

End of the Table 3

1	2	3	4	5	6
2014-2017 n = 29	Full dependence	0	0	0	0
	Great dependence	4	13.8%	0	0
	Moderate dependence	24	82.75%	22	75.86%
	Slight dependence	1	3.45%	4	13.8%
	Independence	0	0	3	10.34%

Conclusions and prospects for further research. The program of the active rehabilitation camp involves intensive physical activity, which significantly positively affects the dynamics of self-service levels of people with the vertebral column and spinal cord injuries. In general, it can be stated that in all the groups of the examined people, regardless of the level of the injury, the indicators that was improved the most were those that improved the possession of ones own body in space that is, all types of transitions, movements and displacements.

The level of intensity of the exercises on the ARC and their construction is such that it is possible in the shortest possible time to master the necessary techniques in everyday life and develop the necessary skills, learning from a personal example of instructors who use wheelchairs themselves. The improvement of self-service indicators will allow people with the cervical spine, thoracic spine, lumbar spine and spinal cord injury to be more independent. This program will allow people with the vertebral column and spinal cord injuries to gain significant practical experience for the further improvement of their abilities at home. The obtained results enables to confirm the efficiency and effectiveness of programs of active rehabilitation camps. We believe that the program of active rehabilitation camps should be an integral part of the complex rehabilitation process for patients with the vertebral column and spinal cord injuries in Ukraine.

References

1. Divanoglou, A., Tasiemski, T., Augutis, M., Trok, K. (2017). Active Rehabilitation – a community peer-based approach for persons with spinal cord injury: international utilization of key elements. *Spinal Cord* 2017, 1-8. Advance online publication, 4 April 2017; doi:10.1038/s2017.28.
2. Zielińska-Więczkowska, H., Czerwińska, A. (2016). Influence of participation in Active Rehabilitation camps on improvement of the functional status of patients with spinal cord injury. *Med Rodz* ; no. 19(4), 175-179.
3. https://en.wikipedia.org/wiki/Foundation_for_Active_Rehabilitation [Elektronnyi Resurs].
4. Furmaniuk, L., Cywinska-Wasylewska G. (2012). Ocena wpływu obozow Aktywnej Rehabilitacji na sprawność funkcjonalną osób z tetraplegią. *Postepy rehabilitacji* (2), 51–56.
5. Jones, M., Harness, E, Denison, P, Tefertiller, C., Evans N., Larson, C. (2012). Activity-based Therapies in Spinal Cord Injury: Clinical Focus and Empirical Evidence in Three Independent Programs. *Top Spinal Cord Inj Rehabil*; no. 18(1): 34–42.
6. Gómara-Toldrà, N., Sliwinski, M., Dijkers, M. (2014). Physical therapy after spinal cord injury: A systematic review of treatments focused on participation. *J Spinal Cord Med*. July, no. 37(4), 371–379.
7. Józefowski, P., Bolach, E. (2011). The influence of the Active Rehabilitation Programme on the predicted life satisfaction of people with quadriplegia. *Fizjoterapia*, no.19 (3), 28–39
8. Dietrich, W. D. (2015). Protection and Repair After Spinal Cord Injury: Accomplishments and Future Directions. *Top Spinal Cord Inj Rehabil*, Spring; no. 21(2), 174–187.
9. Fedorovych, O. (2012). Zastosuvannia indeksu Bartela dlia otsinky vplyvu taboriv aktyvnoi reabilitatsii na povsiakdennu aktyvnist osob z travmoiu khrebtu i spynnoho mozku [Application of the Barthel index to assess the impact of active rehabilitation camps on the daily activity of persons with spinal cord injury]. *Moloda sportyvnna nauka Ukrainy: zb. nauk. pr. z haluzi fiz. vykhovannia, sportu i zdorovia liudyny / za zah. red. Yevhena Prystupy. L., Vyp. 16, T. 3, 248–252.*

10. Fedorovych, O. (2011). Polipshennia samoobsluhovuvannia v protsesi taboru aktyvnoi reabilitatsii osib z urazhenniam shyinoho viddilu khrebta [Improvement of self-service in the process of active rehabilitation camp for patients with lesion of the cervical spine]. *Moloda sportyvna nauka Ukrainy* : zb. nauk. pr. z haluzi fiz. vykhovannia, sportu i zdorovia liudyny / za zah. red. Yevhena Prystupy. L., Vyp.15, T. 3, 306–310.
11. Fedorovych, O. Perederii, A. (2017). Suchasnyi stan reabilitatsii osib z travmamy khrebta ta spynnoho mozku v Ukraini [The current state of rehabilitation of persons with spinal and spinal cord trauma in Ukraine]. *Sportyvna nauka Ukrainy*, no. 3(79), 40–46.
12. Chebotarova, L. L., Tretiakova, A. I., Yaminskyi, Yu. Ia. (2012). Dynamika neirofiziologichnykh pokaznykiv u khvorykh z naslidkamy ushkodzhennia shyinoho viddilu spynnoho mozku pid vplyvom epiduralnoi elektrostymuliatsii [Dynamics of neurophysiological parameters in patients with the consequences of damage to the cervical spinal cord under the influence of epidural electrostimulation]. *Ukraynskyi neurokhyrurhycheskyi zhurnal*, no. 4, 11–14.

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