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# The effectiveness of applying medicine electrophoresis in comprehensive rehabilitation COVID-19

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**Background.** The increased burden on rehabilitation centers caused by the new SARS-CoV-2 coronavirus has shown the need to optimize the rehabilitational process. Physical therapy is one of the safest and most frequently recommended methods of potentiating traditional medical traetment. The aim of our study was to evaluate the effectiveness of electrophoresis with sodium aminodihydrophthalazindione (medication Longidase) in the complex of rehabilitational program of patients with pneumonia caused by a new coronavirus SARS-CoV-2 at the third stage of rehabilitation.

**Methods.** The study has been conducted in the physiotherapy department of the Omsk city. In this study was recruited 54 patients with COVID-19 associated pneumonia. The subjects were divided into two groups. Both groups have received injectable therapy with the drug aminodihydrophthalasindione sodium (Longidase) in a solution for intramuscular injection of 3,000 IU once every 5 days. Group I (main, n = 28) have received intraorgan electrophoresis with galvanic current on Elfor apparatus (Nevoton, St-Petersburg) for 10 min in addition to standard medical therapy according to Russian Health Ministry recommendations.

In the second (control) group (n = 26), therapy was performed according to the Temporary Clinical Recommendations of the Ministry of Health of the Russian Federation for the Prevention, Diagnosis and Treatment of COVID-19 new coronavirus infection (version 10 of 08.02.2021), and the Temporary Clinical Recommendations on Medical Rehabilitation for New Coronavirus Infection (version 2 from 31.07.2020). Performance criteria were: spirometry using MIR spirograph (Italy), Rehabilitation Routing Scale (RRS); assessment of physical activity tolerance according to the Borg scale; assessment of the severity of dyspnea according to the MRC (dyspnea), assessment of anxiety and depression intensity on the Hospital Anxiety and Depression Scale (HADS); assessment of quality of life by the European EQ-5.

**Results.** According to the results of the study there was a 10.7% increase in GEL in the 1st group compared to the 2nd (control) group; an increase in thoracic excursion by 29.8%, a decrease in the severity of dyspnea from moderate to mild in 62.7% of patients, compared with the second (control) group. According to the data of the questionnaire quality of life (EQ-5D), patients in the main group have demonstrated an improvement in overall mobility by 41.6%, daily activity by 28.4%, a decrease in pain/discomfort by 41.8%, and anxiety and depression by 43.5%, compared to the control group (p = 0.001).

**Conclusion.** All patients have undergone a comprehensive study of external respiratory function. According to our results there was statistically significant positive dynamics of breathing function in patients of the main group with use of Longidase treatment. The inclusion of electrophoresis with galvanic current in the complex rehabilitation contributes to regression of respiratory disorders, reduces anxiety and depression, reduces pain and discomfort, thereby improving the patient's quality of life.

**References**

1. Torres-Castro R. et al. Respiratory function in patients post-infection by COVID-19: a systematic review and meta-analysis // Pulmonology. – 2020.
2. Negrini F. et al. Rehabilitation and COVID-19: the Cochrane Rehabilitation 2020 rapid living systematic review. Update as of July 31st, 2020

// Eur J PhysRehabil Med. – 2020. – С. 652-657.

1. Sun T. et al. Rehabilitation of patients with COVID-19 // Expert Review of Respiratory Medicine. – 2020. – Т. 14. – №. 12. – С. 1249-1256.
2. Ita K. Transdermal iontophoretic drug delivery: advances and challenges // Journal of drug targeting. – 2016. – Т. 24. – №. 5. – С. 386-391.
3. Djabri A., Guy R. H., Delgado-Charro M. B. Potential of iontophoresis as a drug delivery method for midazolam in pediatrics //European Journal of Pharmaceutical Sciences. – 2019. – Т. 128. – С. 137-143.

# Remote monitoring of rehabilitation of patients of traumatology and orthopedic profile

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**Introduction.** In the world there is a steady growing number of joint diseases including osteoarthritis (OA) of major appendicular joints [1]. Age, female gender, cardiovascular diseases, obesity, sedentary lifestyle, family history, poverty and injuries are OA risk factors. So, social work for rehabilitation of patients with OA will be increased. About a half of all patients with OA need in-patient rehabilitation and all 100% patients need outpatient rehabilitation [2]. Adequate physical activity is a key point for rehabilitation of patients with OA and belongs to methods being available practically for each patient. For example, a daily walkthrough of 6,000 steps per day can be considered optimal for patients with OA.

Physical rehabilitation including exercise therapy is possible in two variants: in-patient and out-patient. In-patient variant is expensive and it finishes sooner or later that is why it’s important to create simple and effective means for personification and monitoring of rehabilitation within OA. This can be achieved using relatively inexpensive and widespread wireless technologies – portable wireless sensors, Bluetooth and Internet data service [3]. It allows obtaining data on physiological parameters and motion activity of a person and as well as making conclusions about presence and effectiveness of the rehabilitation.

Sensors are used on the smartphone basis or in the form of small devices having dimensions of a wristwatch. Base of both cases is an accelerometer, magnetometer, gyroscope which allows estimating motions both as an extremity segment and gait in general. The last one is an integral index and decrease of the gait variability indicates the positive dynamics of the patient’s rehabilitation. Remote online and offline services allow patients conducting self-diagnostics using current questionnaires for patients – WOMAC, KOOS, Foot & Ankle Disability Index etc. that can give impulse to start treatment and also serve as a

estimating mechanism of the rehabilitation. Another significant advantage of IT-technology usage is a possibility to teach and feedback from patients because it creates additional motivation for them.

So, combination of the portable sensor and smartphone by one application theoretically allows widely carrying out diagnostics and self-diagnostics of OA, planning the rehabilitation, in the presence of feedback – professionally estimating its results and also creating conditions for increase of the patient compliance with OA treatment.

**Purpose** of the present paper has been to develop a system of exercises for a knee-joint in the form of the smartphone application that allows recoding everyday physical activity of the patient and also transmitting obtained data through the Internet for monitoring of the patient’s rehabilitation process.

**Mobile application.** Within the present paper we develop the application for Apple smartphones [4]. The application is still available only for Russian- speaking regions (Russia, Ukraine, Belarus, Kazakhstan etc.). International version is under development. Basic functions of the application:

* rehabilitation exercises for the knee joint. Present release contains 23 exercises for the knee joint and one trial for the elbow. All exercises can be performed at home or at work without special equipment.
* complex of exercises for 1 month. Complex of exercises is prepared for regular activity. Complex has 4 levels of complexity and it is formed according to results of the knee pain test. Application includes a measurement instrument in the form of a modified test Knee Injury and Osteoarthritis Outcome Score (KOOS) consisting of 31 questions for determination of OA symptoms severity. Measurement of OA severity and variation of the load degree during exercise performance.
* video and voice guidance for the exercise performance. Exercise performance is assisted by synchronic videos and voice commands.
* possibility to control the exercise performance by means of smartphone motion sensors [5].

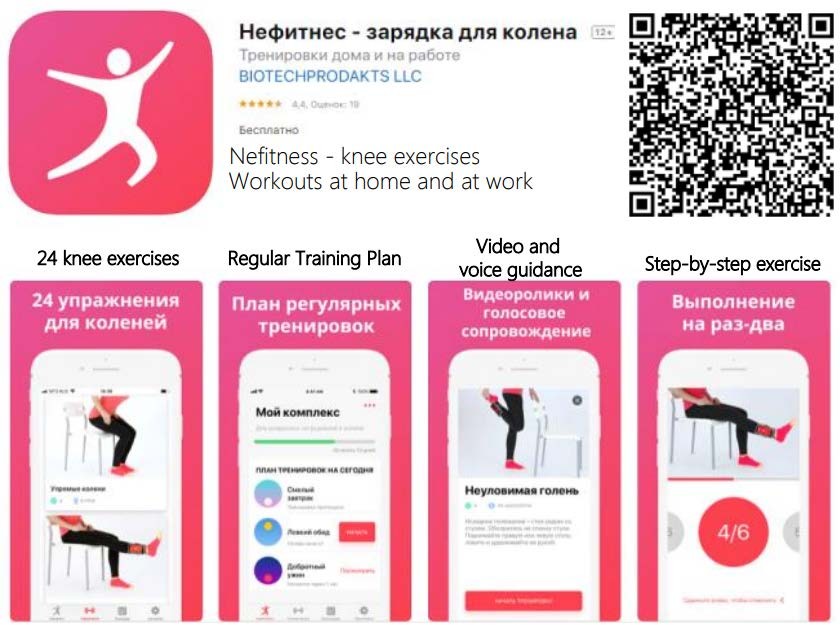


Figure 1 – Apple store front of the application.

The application can be downloaded using the QR-code on the present paper

After termination of the exercise performance, the user receives the final estimation of each cycle of the exercise according to criteria and averaging value of criteria for the whole exercise. Such estimations determine effectiveness of the performed exercise from the point of view of the rehabilitation progress. Estimations motivate the user to improve results. The exercise performance process is accompanied by the virtual assistant’s voice who guides the user’s activity when he does not see the smartphone screen. Also, all exercises are duplicated by videos where the assistant shows how to perform exercises correctly.

**Conclusion**. Wide spread usage of mobile application technologies equipped with feedback through the specialized medical institutions can increase loyalty of patients to physical rehabilitation and in such a way improve the OA flow. The system to estimate the application effectiveness is required for this purpose. They can be parameters to use the application itself, patients’

satisfaction, parameters of economic efficiency. The present possibility to estimate according to the five-score scale within the application can be detailed and represented as a separate congruent questionnaire that allows understanding operation with the application deeply and make amendments if required.

**References**

1. Kun-Hui C., Po-Chao C., Kai-Chun L., Chia-Tai C. “Wearable Sensor- Based Rehabilitation Exercise Assessment for Knee Osteoarthritis,” Sensors, 2015, vol. 15(2), pp. 4193–4211.
2. Yoo T.S., Hong S.K. and other “Gain-Scheduled Complementary Filter Design for a MEMS Based Attitude and Heading Reference System,” Sensors, 2011, vol. 11(4), pp. 3816-3830.
3. Edmond Mitchell, David Monaghan, Noel E. O'Connor, “Classification of Sporting Activities Using Smartphone Accelerometers,” Sensors, 2013, vol. 13(4), pp. 5317-5337.
4. Nefitnes – zaryadka dlya kolena [Elektronnyj resurs] URL: https://clck.ru/FtFMG (data obrashcheniya: 19.09.2021). (in Russia).
5. Ashapkina M.S., Alpatov A.V., Sablina V.A., Kolpakov A.V. “Metric for Exercise Recognition for Telemedicine Systems”, MECO 2019 – Budva, 2019, pp. 668-671.

# Methods of adaptive physical culture for children with congenital skin conditions

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**Introduction.** Congenital ichthyosis and congenital epidermolysis bullosa are two congenital skin diseases.

Congenital ichthyosis is a term that combines several hereditary diseases that are similar in their clinical manifestations, and are characterized by a diffuse keratinization disorder of the hyperkeratosis type revealed by formation of skin scales that resemble those of fish. The most severe varieties are: congenital ichthyosis, fetal ichthyosis of the colloidal child type, bullous congenital ichthyosiform erythroderma of Brocq, and bullous ichthyosiform erythroderma [6].

Congenital epidermolysis bullosa (CEB) is a group of hereditary diseases characterized by formation of intradermal or subdermal blisters on skin and mucous membranes in locations of pressure or a minimal trauma, when exposed to heat or erupting spontaneously [1, 4]. The prognosis for people suffering from epidermolysis bullosa varies greatly depending on the form and subtype of the disease, and is also affected by the degree of manifestation of concomitant somatic conditions [5].

Lesions to the musculoskeletal system are frequent and particularly painful for patients with various forms and subtypes of epidermolysis bullosa. Children with borderline and dystrophic epidermolysis bullosa get significantly behind in the ability to get up and walk without support compared to healthy peers, their movements being also less diverse. It should also be noted that with certain types of inheritance and mutations, epidermolysis bullosa can be linked with other serious diseases, such as, for example, cerebral palsy, atrogripposis or muscular dystrophy [2].

**Relevance of the study.** To date, there is no unified system of rehabilitation and habilitation of children with congenital skin disorders due to CEB and ichthyosis, which would coordinate and direct activities of various institutions whose duty it is to cater to medical, professional and social aspects

of their rehabilitation and habilitation. Neither the place nor the role of adaptive physical culture for children with impaired skin function have been determined, nor have any methodological techniques or tools for working with these children been as yet worked out [3].

**Purpose of the study:** to develop and experimentally substantiate a methodology for adaptive physical culture (methods, techniques and means) for children with congenital disorders of skin function due to CEB and ichthyosis, aimed at improving functions of life and vital activity.

**Conclusion.** The study involved 360 children (aged 0 to 18 years) with congenital epidermolysis bullosa (48,61% boys and 51,39% girls) born as of 2018. Of these, 12,50% are dystrophic CEB (autosomal recessive type of inheritance), 26,67% are dystrophic CEB (autosomal dominant type of inheritance), 16,11% are a simple form of CEB, 0,83% are a borderline form of CEB, 0,28% is Kindler syndrome, and 43,61% are unspecified CEB.

The study also included 184 children (aged 0 to 18 years) with ichthyosis 55,85% boys and 47,87% girls), born as of 2018. Of these, 19,15% are lamellar ichthyosis, 18,62% are ichthyosiform erythroderma, 10,11% are Netherton syndrome, 3,72% are x-linked ichthyosis, 1,60% – needle ichthyosis, 0,53% – keratoderma, 0,53% – KID syndrome, and 45,75% – unspecified congenital ichthyosis.

The highest numbers of children with congenital epidermolysis bullosa were registered in the following Federal Districts: Central 21,11%, Volga 20% and North Caucasus 19,17%.

Among children with ichthyosis, Central 22,87%, Volga 21,28%, Siberian 18,09% Federal Districts were also in the lead.

Among children with congenital epidermolysis bullosa, the maximum age group was 8-14 years old 40% and 4-7 years old 31,39%. Among children with ichthyosis – 4-7 years old 33,51%, 0-3 years old 32,45% and 8-14 years old

29,79%.

In our preliminary studies it was observed that adaptive physical education significantly contributes to improvement of functions of life and vital activity, locomotor function (upping of general motor activity, support ability, coordination and orientation in space), as well as indicators of activity and participation in children with congenital skin disorders due to CEB and ichthyosis in day-to-day situations;

As of now, over the period from 2018 to 2020, 1,734 sessions of adaptive physical training have been carried out with children affected by congenital disorders of skin function due to CEB. An experimental basic model of ICF for children with congenital skin disorders has been also developed.

**References**

1. Adaptive physical culture and sports in rehabilitation and habilitation : educational and methodical manual / Evseev S.P., Ponomarenko G.N., Vladimirova O.N., Didur M.D. – Saint-Petersburg, 2018. – 51 с.
2. Epidermolysis bullosa: a guide for practitioners / ed. Murashkina N.N., Namazova-Baranova L S. – M. : Pediatrician, 2019. – 33 p. [in Russian]
3. Evseev S.P. E25 Theory and organization of adaptive physical culture: a textbook / by S.P. Evseev. – Moscow : Sport, 2016. – 32 p. [in Russian]
4. Prodinger K.M., Limer M., Bauer J., Hintner H. The Austrian Center for Epidermolysis bullosa (Epidermolysis bullosa House Austria) as a model for organizing care for a rare condition. Almanac of Clinical Medicine. 2019;47(1):2–11. doi: 10.18786/2072-0505-2019-47- 008.
5. Chan JM, Weisman A, King A, Maksomski S, Shotwell C, Bailie C, Weaver H, Bodan R, Guerrero E, Zmazek M, Khuu P. Occupational therapy for epidermolysis bullosa: clinical practice guidelines. Orphanet J Rare Dis. 2019 Jun 7;14(1):129. doi: 10.1186/s13023-019-1059-8. PMID: 31174559; PMCID: PMC6556021.
6. Limmer AL, Nwannunu CE, Patel RR, Mui UN, Tyring SK. Management of Ichthyosis: A Brief Review. Skin Therapy Lett. 2020 Jan;25(1):5-7. PMID: 32023022.

# Comprehensive rehabilitation after COVID-19 using Threshold IMT breathing machines

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**Introduction.** In March 2020 The World Health Organization has announced a global pandemic of SARS-CoV-2. The most threatening manifestation of the new coronavirus infection was COVID-associated pneumonia. The peculiarity of lung damage in COVID-19 is that the volume of lung tissue damage and the duration of the disease are more significant than in bacterial and viral pneumonia. The search for not only competent treatment protocols, but also affordable ways to restore the respiratory system has become very relevant. Methods of pulmonary rehabilitation have become a mandatory addition to the drug therapy of patients with lung diseases.

Rehabilitation after COVID pneumonia includes training of the respiratory muscles with the help of special simulators. One of the most effective and affordable is Threshold IMT. It is proved that for effective pulmorehabilitation, in addition to breathing exercises, a full-fledged diet of patients enriched with proteins and vitamins is necessary. Koumiss is a fermented milk drink made from mare's milk, obtained as a result of lactic acid and alcoholic fermentation. The healing power of koumiss is an internationally recognized fact. From the point of view of nutrition, mare's milk is a vitamin bomb, so there are a lot of vitamins and minerals in koumiss. Thus, the main task was to assess the impact of complex rehabilitation using the Threshold IMT breathing trainer and kumis therapy on the health indicators of individuals after COVID-associated pneumonia.

**The main part.** Working hypothesis: the combined use of the Threshold IMT breathing simulator and kumysotherapy will have a positive effect on the human body in the process of comprehensive rehabilitation after COVID- associated pneumonia. Practical significance: development of an affordable way to restore health after COVID-associated pneumonia. Scientific novelty: There is currently not enough information on the rehabilitation of patients with COVID-19. We are the first to investigate the effectiveness of complex rehabilitation after COVID-associated pneumonia using the Threshold IMT breathing trainer and kumis therapy.

We examined 58 people who had COVID-associated pneumonia in 2020- 2021. The study included persons who have undergone a new coronavirus infection COVID-19, with persistent health abnormalities, continuing follow-up care at home. Exclusion criteria for the study: acute period of COVID-19 disease and age up to 18 years. The subjects were divided into two equal groups, comparable in terms of the main investigated indicators. The main group (n = 29) daily practiced breathing exercises using Threshold IMT individual breathing trainers and took kumis 200.0 g each 2 r / day for 3 weeks. Classes began with several exercises and sets per day with a gradual increase in the load up to 8-10 repetitions of each exercise. The comparison group (n = 29) took koumiss without using the Threshold IMT breathing trainer. To assess the effectiveness of rehabilitation, all subjects were measured three times (at the start, after 3 and 6 weeks), the respiration rate (RR), SpO2 at rest and during exercise, were assessed by tests and scales (6-minute walk test (TSH), Stange tests and Genchi, MRC dyspnea scale). For the statistical processing of the data, the Excel program was used with the calculation of the error according to the Student's criterion. Results and discussion: Subjects aged 33-59 years (mean age

41.6 ± 7.7 years) are day hospital patients, most of whom are men (63%). Almost all patients underwent a course of treatment in COVID hospitals of the city, and only 24% were treated under the supervision of a local doctor. In terms of social status, employed people slightly prevailed (66%).

At the start of the study, patients complained of cough (97%), shortness of breath (96%), headache (84%) and weakness (67%). Many were found to be overweight (51%), hypertension (66%) and tachycardia (68%). During the evaluation testing, shifts in health indicators were revealed in all subjects. A retrospective analysis of the results after 3 weeks revealed positive changes in

all the studied parameters in the study participants, more pronounced in the main group that used the daily combined effect of the Threshold IMT breathing simulator and taking koumiss.

Final testing (after 6 weeks) showed positive dynamics in the main group. In the comparison group, by the end of the study, the indicators remained at the level of values achieved after 4 weeks. In those who took kumis in combination with the Threshold IMT breathing simulators, complaints completely disappeared by the end of the study, and in the comparison group, they remained only in 7 patients.

**Conclusion.** Our working hypothesis that the combined use of the Threshold IMT breathing simulator and kumysotherapy will have a positive effect on the human body during recovery from COVID-associated pneumonia has been confirmed. Against the background of complex rehabilitation, a significant disappearance of complaints was revealed with a significant improvement in the components of patients health.

**References**

1. Akhmadullin R.V., Gilmutdinova L.T., Zagidullin Sh.Z. Kumyso- lechenie patients with respiratory diseases in a sanatorium. – Ufa, 2004. – 125 p.
2. Gilmutdinova L.T., Gilmutdinov A.R., Faizova E.R., Salakhov E.M., Gilmutdinov B.R. Aspects of physical rehabilitation of patients who have undergone a new coronavirus infection // Medical Bulletin of Bashkortostan. – 2020. – Vol. 15. – No. 6 (90). – Pp. 76-80.
3. Guan VJ, Ni TZU, Hu Wu, etc. Clinical characteristics of the 2019 coronavirus disease in China. N English J Med. 2020 February 28.

# Application of medical rehabilitation in patients with the consequences

**of acute cerebrovascular accident in a day hospital**

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**Introduction.** Acute cerebrovascular accident is currently one of the most important medical and social problems. In Russia, stroke develops annually in more than 450-500 thousand people, of which about 35% die in the acute period of the disease. No more than 10-15% of surviving patients return to work, and 20-25% of patients need outside help until the end of their lives.

**The main part.** The aim of the study was to evaluate the effectiveness of kinesiotherapy and transcerebral magnetotherapy in the medical rehabilitation of patients with the consequences of acute ischemic cerebral circulation disorders.

110 patients with the consequences of acute cerebrovascular accident were examined, who were treated in the day hospital of the State Medical Institution of the RVFD of Ufa.

The main neurological syndromes were moderate motor disorders (hemiparesis), sensitivity disorders, bulbar and pseudobulbar disorders, ataxia, postural instability, cognitive, asthenic, anxiety, depressive, speech disorders. According to the ongoing rehabilitation, patients were divided into three groups by simple randomization. The first main group (n = 37) received a course of kinesiotherapy (CT) against the background of standard medical rehabilitation. The second main group (n = 37) received a course of kinesiotherapy in combination with transcerebral magnetic therapy against the background of standard medical rehabilitation. The third group (control group) (n = 37) received a basic rehabilitation complex.

The basic rehabilitation complex was carried out depending on the form of stroke, the severity of symptoms, the severity of the main and concomitant

diseases with the inclusion of physical therapy, therapeutic gymnastics, electrical stimulation, paraffin-ozokerite applications, massage of paretic limbs, dry carbon dioxide baths. Therapeutic gymnastics was carried out in the form of individual classes, depending on the side of the lesion, using reflex methods of physical therapy, using active-passive exercises, exercises in movement in the knee-elbow and knee-wrist positions, exercises for training and mastering stable balance. For stability training, training of the center of gravity control functions, we used the SIGMA balancing platform according to the methodology developed by us.

The course of treatment consisted of 10-15 daily procedures with an assessment of the stability of standing, amplitude, time characteristics of fluctuations in the total center of body mass according to R. Bohannon (1989). Transcerebral magnetic therapy was performed using "rotating" pulsed magnetic fields from the ALIMP device to the head area, cervical sympathetic ganglia with a solenoid installation No. 2, in the configuration of inductors-solenoids "prism", the intensity of magnetic induction-30-100%, frequency-10-100 Hz, for 10-15 minutes according to the method developed by us. The course of treatment consisted of 10 daily procedures. The patient's mobility was analyzed by assessing walking using the Hauser walking index, the severity of motor disorders, the degree of spasticity using the Rivermead mobility index, the five- point MRC scale (1996), Ashworth (1964), and the modified Rankin scale (1988). Assessment of disability-according to the rehabilitation routing scale (SRM). Static processing of the obtained results was carried out using standard statistical computer programs "Statistika 6.0 Windows" with the establishment of the reliability of differences using the Student's criterion (t).

**Conclusion.** After the rehabilitation course, 86.3% of patients of group I, 89.9% of group II, and 44.1% of the control group had an improvement in their clinical condition. In patients of groups I and II, there was a significant decrease in blood pressure (BP): systolic by 18.6%, (p<0.05), diastolic by 14.6%, (p<0.05), pulse – by 20.2% (p<0.05), mean blood pressure – by 18.6% (p<0.05), heart rate – by 12.4% (p<0.05) in comparison with the baseline data. In the control group, significant changes in similar indicators were less significant. Headaches, dizziness, feeling of heaviness and noise in the head decreased in 86.4% of patients of group I, in 89.9% of patients of group II and in 50.1% of the control group. Improvement of memory, mood and attention was noted in

* 1. % of patients of group I, in 88.6% of patients of group II and in 35.2% of the control group. Sleep was normalized in 85.5% of patients of group I, in 89.2% of patients of group II and in 38.2% of the control group, with a decrease in the severity of general weakness in 84.5%, 85.7% and 39.5% of patients, respectively.

In patients of group I, there was a significant decrease in the manifestations of vestibulo-ataxic syndrome by 53.8% (p<0.05), asthenic – by 70.2% (p<0.05) and dysmnestic – by 56.5% (p<0.05), in patients of group II, respectively, by 58.4% (p<0.05), 78.1% (p<0.05) and 62.4% (p<0.05) in comparison with the baseline data. Against the background of kinesiotherapy and transcerebral magnetotherapy, there was a regression of muscle weakness and spasticity in the paretic limbs within 1-3 points. According to the results of the analysis of the Rivermead mobility index, a modified Rankin scale, a "Five- point scale for evaluating muscle strength", after a course of treatment, 80.1% of patients of group I and 85.5% of patients of group II had mild paresis.

According to the five-point MRC scale, paresis was not detected in 20.2% of group II patients by the end of the rehabilitation course, 79.8% had mild hemiparesis. The rehabilitation course with the use of stability training contributed to a significant increase in the speed of movement of the pressure center by 8.4%, a decrease in the maximum amplitude of the center's oscillations along the axes by 4.6% (p<0.05), improved coordination of movements and balance, increased stability of the vertical posture, a decrease in the intensity, duration of dizziness, spasticity and improvement of motor functions (p<0.05).Thus, the use of kinesiotherapy and transcerebral magnetotherapy in the medical rehabilitation of patients with the consequences of ONMC in a day hospital leads to an improvement in the parameters of the clinical and neurological condition, restoration of motor functions, improvement of indicators of systemic hemodynamics, coordination of movements, balance, increased stability of the vertical posture with an increase in the effectiveness of rehabilitation measures in comparison with the control group.

**References**

* + 1. Gilmutdinova L.T. et al. Kinesiotherapy and preformed physical factors in the treatment and prevention of cerebral circulatory disorders. Methodological recommendations. – Ufa, 2007. – 52 p.
    2. Iseeva D.R. The use of magnetotherapy in the complex treatment of patients with dyscirculatory encephalopathy: abstract. dis. ... uch. art. candidate of Medical Sciences. – M., 2012. – 22 p.
    3. Ponomarenko G.N. Physical and rehabilitation medicine. – M., 2016 –

685 p.

# Rehabilitation after coronavirus infection COVID-19 using of dry carbon dioxide baths

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**Introduction.** The appearance of COVID-19 in the end of 2019 in the People's Republic of China and its spread around the world posed a number of tasks for doctors and healthcare professionals, including the rehabilitation of patients who suffered pneumonia associated with the new coronavirus infection COVID-19. Prevention of the consequences of the disease and improvement of the prognosis of life of patients who have suffered pneumonia associated with a new coronavirus infection has become possible thanks to the medical rehabilitation programs being developed, which are actively being implemented in daily practice in the conditions of the day hospital of outpatient hospital and medical rehabilitation departments of health resort.

**The main part.** We conducted a study to evaluate the effectiveness of medical rehabilitation of patients who had pneumonia associated with a new

coronavirus infection COVID-19 with the inclusion of dry carbon dioxide baths in a day hospital of the Republican Medical and Physical Education Dispensary (Ufa). The program of medical rehabilitation in a day hospital was implemented within 14 days. Depending on the revealed clinical and functional changes on the part of the respiratory system, individual programs of medical rehabilitation were developed with the subsequent division of patients into two groups by random sampling.

The main group of patients (n = 30), in addition to the basic complex, received procedures of dry carbon dioxide baths (Reabox, Russia), respiratory gymnastics, dosed walking, chest massage. The control group of patients (n = 30) received a basic complex consisting of a sparing and training regime of motor activity, depending on the severity of functional disorders with the transition to a training regime, therapeutic nutrition, climate therapy (walking in the fresh air), physical therapy and psychotherapy. All patients received standard drug therapy according to the indications.

Before the start of rehabilitation measures, all patients underwent a general therapeutic study with an assessment of physical performance – using the 6-minute walk test (TSW), assessment of the severity of dyspnea on the MRC scale, assessment of the functional state of the respiratory system using the Stange and Genchi tests. The vital capacity of the lungs (VC), the forced expiratory volume in the first second (FEV1), the level of blood oxygen saturation SpO2 at rest and after exercise were determined. Psychological status was assessed according to the hospital scale of anxiety and depression, the level of functional independence of patients from others – according to the Rankin scale. The procedures for dry carbon dioxide baths were carried out in special sitting baths "Reabox" at a flow rate of an air-gas mixture of 10-15 l/min, a temperature of 28-30 С, a procedure lasting up to 10-15 minutes, daily, a course of treatment consisted of 10 procedures. The first test bath was carried out with a reduced flow of carbon dioxide to 75% of the therapeutic method.

Therapeutic exercises were carried out daily, by individual and / or small- group methods during the entire rehabilitation period, and included breathing and general developmental exercises. The effectiveness of the rehabilitation course was assessed by the dynamics of clinical, laboratory and functional parameters. Statistical processing of the material was carried out using the method of variation statistics, the reliability of differences – according to Student's test, at p<0.05.

**Conclusion.** Among the patients of the main group, against the background of the rehabilitation measures carried out with the use of dry carbon dioxide baths, an increase in the distance traveled during the 6-minute walk test is noted by 20.3% (p˂0.05) from the initial value and by 7.3% in the control group, the increase in VC was 15.1% (p˂0.05), with an increase in FEV1 by 22.5% (p˂0.05) in patients of the main group. The rehabilitation course contributed to a decrease in the severity of shortness of breath by 45.5% (p˂0.05) in the main group and by 26.4% (p˂0.05) in the control group. A significant improvement in the results of the Shtange tests (from 32.3 ± 0.04 sec to 34.1 ± 0.02 sec) and Genchi (from 23.6 ± 0.01 sec to 26.4 ± 0.03 sec), blood oxygen saturation parameters SpO2 at rest (from 97.1 ± 0.14% to 98.6 ± 0.12%) and during exercise (from 97.9 ± 0.11% to 98.8 ± 0.15%) in the main group.

The results of psychological testing on admission showed that 28% of patients had increased indices of the neurotic triad, 30% of patients had anxiety, and 35% had depression. After the rehabilitation course, an improvement in the psychological status was noted in most patients of the main group with a decrease in signs of neurotization (by 5.1%), depression (by 7.3%) and anxiety (by 8.5%), as well as an increase in mood. The value of functional independence in everyday life according to the Rankin scale after a course of rehabilitation measures on average decreases from 2.7 ± 0.02 to 1.6 ± 0.01 points, in contrast to patients in the control group.

Thus, the use of dry carbon dioxide baths in the complex medical rehabilitation of patients who have undergone pneumonia associated with the new coronavirus infection COVID-19 in a day hospital has a positive clinical effect with a significant improvement in respiratory function parameters, leads to an increase in exercise tolerance, and contributes to stabilization of psychoemotional status and regression of the severity of depression and anxiety, reduce the functional independence of patients in everyday life.

**References**

1. Aspects of physical rehabilitation of patients who have undergone a new coronavirus infection / Gilmutdinova L.T., Gilmutdinov A.R., Faizova E.R., Salakhov E.M., Gilmutdinov B.R. // Medical Bulletin of Bashkortostan. – 2020. – № 6. – С. 87-91.
2. Interim guidelines “Prevention, diagnosis and treatment of new coronavirus infection (COVID-19). Version 6 (04/28/2020)” (approved by the Ministry of Health of Russia).
3. Medical rehabilitation of patients with pneumonia associated with the new coronavirus infection COVID-19 / Razumov A.N., Ponomarenko G.N., Badtieva V.A. – URL: <http://rusnka.ru/med-reabilitatsiya-patsientov-s-> pnevmoniyami-covid-19.

# Cognitive impairments in patients

**with chronic cerebral ischemia who have undergone СOVID-19**

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**The aim of the study** was to evaluate the dynamics of cognitive functions on the basis of clinical and neurological examination of patients with 1-st, 2-nd stages of chronic cerebral ischemia (CCI) who had undergone СOVID-19.

**Materials and methods of research.** The study included 60 patients with 1-st, 2-nd stages of CCI. The main group consisted of 60 patients with CCI who had undergone COVID-19, the comparison group consisted of 50 patients with stages of CCI (without COVID-19 in history). The state of the cognitive sphere was studied using a short test for assessing the mental sphere – Mini Mental State Examination (MMSE), the state of the psycho-emotional sphere was determined using the Hamilton Depression Scale (HDG).

**Results of our own research.** Analysis of focal neurological symptoms showed: central paresis of the 7th pair of cranial nerves was detected in 90% and 80%, central paresis of the 12th pair of cranial nerves occurred in 50% and 30% of the examined, respectively. Reflexes of oral automatism were found in 30% and 20%, respectively, anisoreflexia was diagnosed in 67% and 62% of patients,

unsteadiness in the Romberg position in 67% and 57%, and an intention when performing a finger test in 32% and 20%, respectively, in patients with CCI after cоronavirus disease and CCI.

During the follow-up, the general MMSE score in the patients of the main group was 21.7 ± 0.02, while in the comparison group it was 23.8 ± 0.04, which confirms the negative effect of COVID-19 on the cognitive sphere.

At the time of inclusion in the study, all patients had disorders in the emotional sphere. The study of the psycho-emotional state using clinical scales of depression showed that depressive syndrome is characteristic in the group of patients with CCI, but prevails in the main group. The results according to the Hamilton Depression Scale (HDG) averaged 10.3 ± 2.1 points in the comparison group, which corresponds to mild depression (8-16 points), while in the main group of patients with CCI who had undergone СOVID-19 it was 7.8 ± 1.2 points.

**Conclusions.** In CCI, an increasing of neurological symptoms is combined with a deepening of cognitive and depressive disorders. The formation of cognitive and depressive disorders is associated with more extensive focal brain damage and more pronounced vascular disorders due to СOVID-19.

**References**

1. Chukanova E.I., Chukanova A.S. The efficacy and safety of Mexidol FORTE 250 in sequential therapy in patients with chronic cerebral ischemia / Korsakov Journal of Neurology and Psychiatry 2019, vol. 119, no. 9.
2. Chukanova E.I., Chukanova A.S. Separate mechanisms of the pathogenesis of mitigation of cerebral circulation insufficiency. Pharmateca (cardiology / neurology). 2014; 13 (286): 14-20.
3. Levin O.S. Diagnosis and treatment of discirculatory encephalopathy. Toolkit. M. 2010. 4. Yakhno N.N. Cognitive disorders in a neurological clinic // Neurological journal 2006, 11 (Appendix 1); with. 4-12.
4. Yakhno N.N. Cognitive disorders in a neurological clinic // Neurological journal 2006, 11 (Appendix 1); with. 4-12.
5. Zakharov V.V. et al. Chronic insufficiency of cerebral circulation: a description of a clinical case // Therapeutic archive, No. 4, 2016, pp. 93-98.
6. Madzhidova Y.N., Azimova N.M., Narzieva G.N., Bakhramov M.S., Tadzhiev T.R. The effectiveness of therapy for cognitive impairments and depressive disorders in chronic cerebral ischemia // Neurology, № 1, 2020.
7. Rumyantseva S.A. et al. Problems and prospects for the correction of intermediate metabolism in patients with vascular comorbidity // Journal of Neuronews No. 1-2 2014.

# Cognitive disorders in patients with the new coronavirus infection COVID-19 in the period of clinical manifestations

**(peak phase of the disease)**

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**Topicality.** The pandemic of the new coronavirus infection COVID-19 caused by the SARS-CoV-2 virus, which began in December 2019, continues to spread throughout the world today. This disease is characterized by the most frequent lesions to the respiratory system in the form of pneumonia, which in some cases is accompanied by the development of acute respiratory distress syndrome [1, 3]. There is an increasing amount of data indicating that the SARS-CoV-2 virus, apart from the lungs, affects other organs and tissues, in particular the nervous system [2].

**Purpose of the study.** Identification of cognitive impairments in patients with COVID-19 in the period of clinical manifestations (the peak phase of the disease).

**Research methods.** A screening examination of 28 patients with COVID-19 in the period of clinical manifestations (10 men and 18 women) was

carried out at the State Healthcare Institution of the Central City Clinical Hospital of the city of Ulyanovsk. The degree of cognitive disorders was assessed using the Montreal Cognitive Scale (MoCA – test). In pairwise comparison of patient groups, the nonparametric Mann-Whitney test (U-test) was used. The results are presented as a median, 25th and 75th percentiles (M (25; 75)) and as arithmetic mean and standard deviation (M ± s). Differences were considered significant at the achieved level of significance p<0.05.

**Results.** The mean age of the examined patients was 61.48 ± 11.91 years. In the course of data analysis, reliable results were obtained, indicating that 89.29% of patients (21 examined) had cognitive impairments. The most significant disorders were identified in the following cognitive areas: impaired optical-constructive skills were detected in 82.14% of patients (23 examined), impaired calculation operations – in 35.71% of patients (10 examined), impaired repetition of phrasal phrases – in 42.86% of patients (12 examined), impaired fluency of speech – in 60.71% of patients (17 examined), impaired long-term memory in 75.00% of patients (21 examined).

**Conclusions.** This study showed that in the overwhelming number of patients with new Coronavirus infection COVID-19 in the period of clinical manifestations, pronounced impairments of cognitive functions are observed, affecting mainly the optical-constructive sphere, spheres responsible for speech functions and calculation operations, and long-term memory.

**References**

1. Furman E.G., Repetskaya M.N., Koryukin I.P. The lesion of the lower respiratory tract and lungs during coronavirus infection COVID-19 in children and adults: similarities and differences (literature review) // Perm Medical Journal. – 2020 – volume XXXVII, No. 2. – Pp. 5-14.
2. Sharifian-Dorche M., Huot Ph., Osherov M., Wen D., Saveriano A., Giacomini P.S., Antel J.P., Mowla A. Neurological complications of coronavirus infection; a comparativerewiew and lessons learned during the COVID-19 pandemic // Journal of the Neurological Sciences 417 (2020).
3. Bhaskar S., Bradley S., Israeli-Korn S. et al. Chronic Neurology in COVID-19 Era: Clinical Considerations and Recommendations From the REPROGRAM Consortium. // Fronters in Neurology (2020), Volume 11, Article 664.

# A pilot study research effectiveness of rehabilitation patients after stroke with virtual reality

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**Introduction.** The problem of rehabilitation of acute and subacute cerebrovascular disorders does not lose its relevance at all stages of the disease. The use of modern understanding of neuroplasticity expands rehabilitation opportunities, making them available at different periods of stroke and other neurological disease (Khan et al., 2016; Alia et al., 2017). A comprehensive rehabilitation approach requires rehabilitation from the earliest time of the disease in order to achieve a meaningful recovery of lost functions in the future.

**The Main Body.** The purpose of the study was to test the effect of a new method of supplementary motor rehabilitation including VR + robotics therapy on the restoration of the affected walking function in the acute and early recovery periods of ischemic stroke with supratentorial localization.

The study included rehabilitation of stroke patients using the ReviVR walk simulator. The ReviVR walk simulator is a proprietary product developed in Samara State Medical University and is protected by Russian and international patents (priority date 29.12.2016; RU2655200C1, WO2018124940A1). The simulator provides immersion in a life-like VR environment and walking imitation with visual and tactile biofeedback based on physical impact-alternate pressing to the soles, synchronized with the “steps” of the avatar in the VR environment. The patient was wearing a VR headset and two orthoses equipped with four-chamber pneumatic cuffs each fixed on both feet. The chambers in the cuffs were inflated sequentially when a virtual avatar was making a “step.” Such sequential inflation of the four chambers imitated the contact of the sole with the surface during a real walk. The operation of the pressure valves in the chambers (pumping and venting) was synchronized to provide pace of the “walking” to 26 taps per minute on each sole (equivalent to

0.43 “step” per second or one “step” every 2.3 s). The maximal pressure of the chambers on the soles was 0.5 kg/cm2 of the plantar surface of the foot.

Stimulation of the soles with pneumatic cuffs occurred for both a paralyzed and a healthy limb. The patients saw the virtual environment and their avatar from the “first-person view” in a walking position. By turning a head, the patient could observe the movement of the limbs of the virtual avatar.

In our study, we tested a combination of virtual reality (VR) and robotics in the original adjuvant method of post-stroke lower limb walk restoration in acute phase using a simulation with visual and tactile biofeedback based on VR immersion and physical impact to the soles of patients. The duration of adjuvant therapy was 10 daily sessions of 15 min each.

It should be noted that patients in both the Control and Experimental groups showed positive rehabilitation dynamics that was observed when assessing the motor function of the lower extremities when performing isolated motor tasks by an affected extremity and during synergistic movements of both lower extremities. To assess the effectiveness of rehabilitation in the compared groups, we evaluated the progress points (the difference in scores after and before rehabilitation). The progress points were checked for normality of the distribution with the Shapiro-Wilk test. All data showed a non-normal distribution (p < 0.02). Assessment of progress in groups was carried out using the two-tailed Mann-Whitney U test. The following are the significant rehabilitation progress points in Control and Experimental groups, respectively:

−1.26 ± 0.62 and −2.83 ± 0.32 points by the NIHSS scale (p = 0.0003);

1.56 ± 0.29 and 2.51 ± 0.31 points by the Rivermead Mobility Index (p = 0.0286); 2.15 ± 0.84 and 6.29 ± 1.20 points by the Fugl-Meyer Assessment Lower Extremities scale (p = 0.0127); and 6.19 ± 1.36 and 13.49 ± 2.26 points by the Berg Balance scale (p = 0.0163). A higher decrease is better for the NIHSS scale; a higher increase is better for the RMI, FMA-LE, and BBS scales.

We compared our research with the most similar studies performed in the last 6 years for VR- and robotics-based lower limb rehabilitation (Lee et al., 2014; Xiang et al., 2014; Givon et al., 2015; Ko et al., 2015; Song and Park, 2015; Gibbons et al., 2016; Lo et al., 2017; Darbois et al., 2018; Clark et al., 2019). These studies used the same clinical scales to measure the rehabilitation progress of lower limb function and/or were performed in the acute period of ischemic stroke. Authors also noted an increase in the effectiveness of rehabilitation when using adjuvant therapy. Evaluating the results of similar studies and our own results, we believe that this influence is due to the impact

on motor and premotor areas of neuroplasticity caused by visual, sensory, and cognitive evoked intercortical interactions. The patient's involvement in the virtual environment and the use of the game-like component during the rehabilitation of the lower extremities greatly improve the motor function. Our results are consistent with the findings that patients assimilated the virtual lower limbs as if they were their own legs (Shokur et al., 2016), and we assume that, in our case, there was a similar mechanism of identification (agency) that had a positive effect on neuroplasticity and motor recovery.

**Conclusion.** We consider the main finding of this study that the application of rehabilitation with implicit interaction with VR environment produced by the robotics action has measurable significant influence on the restoration of the affected motor function of the lower limbs compared with standard rehabilitation therapy. Our study shows that an adjuvant post-stroke VR + robotics therapy of the lower extremities in acute phase using interaction via realistic proprioceptive and implicit tactile impacts significantly improves the performance of standard rehabilitation. The simple and intuitive mechanism of rehabilitation, including through the use of sensory and semantic components, allows the therapy of a patient with diaschisis and afferent and motor aphasia. Safety of use allows one to apply the proposed method of therapy at the earliest stage of a stroke. We suggest that the use of explicit interaction within walking synergy may show better clinical effects of rehabilitation. We will clarify this hypothesis in our further work.

**References**

1. Clark W.E., Sivan M.J., O'Connor R., undefined (2019). Evaluating the use of robotic and virtual reality rehabilitation technologies to improve function in stroke survivors: a narrative review. *J. Rehabil. Assist. Technol. Eng.* 6:205566831986355. 10.1177/2055668319863557.
2. Darbois N., Guillaud A., Pinsault N. (2018). Do robotics and virtual reality add real progress to mirror therapy rehabilitation? A scoping review. *Rehabil. Res. Pract.* 2018, 1–15. 10.1155/2018/6412318.
3. Gibbons E.M., Thomson A.N., Noronha M.D., Joseph S. (2016). Are virtual reality technologies effective in improving lower limb outcomes for patients following stroke–a systematic review with meta-analysis. *Top. Stroke Rehabil.* 23, 440–457. 10.1080/10749357.2016.1183349.
4. Khan F., Amatya B., Galea M.P., Gonzenbach R., Kesselring J. (2016). Neurorehabilitation: applied neuroplasticity. *J. Neurol.* 264, 603–615. 10.1007/s00415-016-8307-9.
5. Lee C.-H., Kim Y., Lee B.-H. (2014). Augmented reality-based postural control training improves gait function in patients with stroke: randomized controlled trial. *Hong Kong Physiother. J.* 32, 51–57. 10.1016/j.hkpj.2014.04.002.
6. Shokur S., Gallo S., Moioli R.C., Donati A.R.C., Morya E., Bleuler H., et al. (2016). Assimilation of virtual legs and perception of floor texture by complete paraplegic patients receiving artificial tactile feedback. *Sci. Rep.* 6:32293. 10.1038/srep32293.

# The generalized joint hypermobility assessment method and a rehabilitation treatment method for the children with generalized joint hypermobility

**using the Alfa stabilometric platform**

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**Introduction.** The main objectives of the present study were to describe the method of assessment of generalized joint hypermobility and to investigate the possibility of using the Alfa stabilometric platform as a rehabilitation treatment method for the children with generalized joint hypermobility.

**Method.** In order to assess the strength of the relationship between hypermobility (HM) and stability parameters in the vertical position, we conducted a correlation analysis between the data of the Beighton scale (BESS), the total number of errors according to the BESS scale, the average value

between the maximum and minimum position of the center of gravity (CH) in the frontal plane. The results of this assessment are shown in Figure 1.

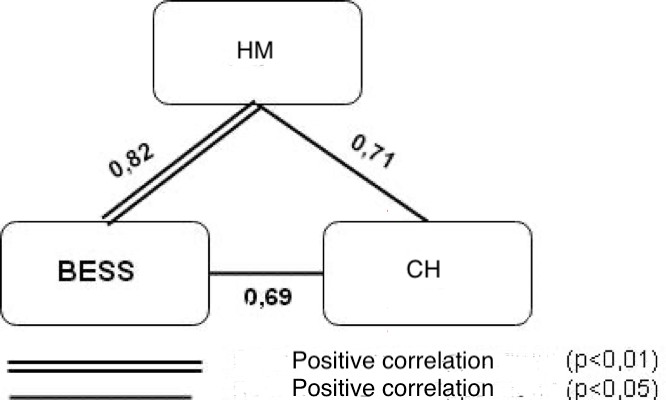


Figure 1

As we see in the figure below, there is a positive correlation between the amount of hypermobility and the total number of errors according to the BESS scale (r = 0.82; p = 0.0047) – the higher the hypermobility, the greater the number of errors the subject makes in the clinical assessment of body balance. At the same time, the hypermobility value also demonstrates a positive correlation with the average value of the amplitude of the center of gravity oscillations in the frontal plane (r = 0.71; p = 0.038). Thus, children with generalized hypermobility of the joints show a decrease in stability in the vertical position when performing tests according to clinical and stabilometric assessment.

The ALFA stabilometric platform is a modern device that allows both the balance assessment and training in neurological and orthopedic patients. Training on the platform aims at stimulation of musculoskeletal and nervous systems elements responsible among others for controlling balance.

Active rehabilitation training on the platform with biological visual feedback for patients with various disorders of the musculoskeletal system and vestibular apparatus contributes to the development of a sense of balance, proprioreceptive and coordination abilities.

The study involved two groups (experimental and control) of thirty five children aged 7 to 17 years with an established diagnosis: generalized joint hypermobility. The study was conducted from 10.05.2021 to 11.08.2021.

**Results.** According to the study, children who have active training on the ALFA stabilometric platform have a significant positive dynamics in terms of stability in the vertical pose and the correct motor stereotype. While the control group of observation demonstrated the absence of statistically significant changes in relation to these parameters during the study period – 3 months.

The developed body balance training complex for children with generalized joint hypermobility demonstrated its effectiveness in 96 % of the experimental group participants in improving the stability parameters in the vertical position by 3.4 times according to the BESS clinical assessment scale, and by 4.3 times according to indirect stabilometry.

**Conclusion.** We can use the ALFA stabilometric platform not only for the assessment of generalized joint hypermobility but also for active rehabilitation training for children with generalized joint hypermobility.

**References**

1. Gross N.A. Physical rehabilitation of children with disorders of the musculoskeletal system / N.A. Gross. – M. : Soviet sport, 2000.
2. Savelyev M.Yu. Physiological substantiation in the assessment of the stability and equilibrium stability in children of primary school age with the norm in the physical and motor function of the body : abstract of the dissertation of the Candidate of Medical Sciences: 03.00.13, 14.00.51 // M.Yu. Savelyev. – Arkhangelsk, 2005.
3. Khramtsov P.I. Functional stability in children depending on the arch of the feet of the vertical posture / P.I. Khramtsov, A.M. Kurgansky // Vestn. Ross. akad. med. nauk. – 2009. – Ez 5.
4. Aydın E. Orokortu elkarrekin laxity dituzten emakumeen kontrol orekapostura / E. Aydın // Turkish Journal Medikuntza Fisikoa eta Errehabilitazioa. – 2017. – Vol. 63, I 3.
5. Bulbena A. Joint Hypermobility da arrisku-factory bat Sindromea ezaugarri antsietate nahasteak: 15 urteko jarraipen-kohorte-azterketa

/ A. Bulbena, J. Gago, G. Pailhez [et al.] // Gen Psykiatria Stand. – 2011. – Vol. 33, I 4.

# Wind tunnel as an innovative means of complex rehabilitation of children with disabilities

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The value of an integrated approach to the treatment of disorders in children with disabilities using a wind tunnel is the combination of traditional technologies used by diverse specialists and innovative technology implemented by flight instructors using a specially developed Adaptive Flying Fitness Therapy (hereinafter – AFF-T).

The AFFT technique is an author's, proven and justified system of special exercises in a wind tunnel from the point of view of physiology and neuropsychology (Rudnev A.A., Lemeshenok M.A.). The purpose of the exercises is a deep, positive impact on the cognitive, physical and psycho- emotional spheres of the child through physical and neurodynamic stimulation in the conditions of an air flow. In our opinion, this is of great importance for the effective correction and compensation of impaired functions in the presence of a complex symptom complex in children with disorders in the cognitive and motor spheres of development.

The program of complex correction of disorders with the use of classes in a wind tunnel was built by us on the basis of neuropsychological (Zh.M. Glozman, T.V. Akhutina, etc.), complex and personalized (T.V. Tumanova, T.B. Filicheva, etc.) campaigns for the correction of impaired functions in children; on the basis of ideas about the structural and functional blocks of the brain (A.R. Luria), the level organization of movements (N.A. Bernstein), about the consistent regular development of higher mental functions in ontogenesis, about the plasticity of the brain (E. Konorsky et al.) and the role of the cerebellum in solving cognitive problems and the mechanisms of the effect of cerebellar stimulation on the child's brain (Yu.V. Zueva, A.L. Sirotyuk, etc.).

We see the developing potential of classes in a wind tunnel according to a specially developed method in the fact that they are the "trigger" of the algorithm for compensating for impaired functions in the motor, cognitive and psycho-emotional spheres; they help the child to get the energy necessary for learning, increase productive efficiency; they have a holistic, balanced physical

and neurodynamic effect on the child's body; they have a deep massage effect; they effectively destroy incorrectly formed muscle stereotypes; they create a high emotional background during classes; they have a powerful effect on the deep structures of the brain with a prolonged developmental effect.

The AFF-T project was implemented on the basis of the GoodSky aerodynamic complex in Gudermes, the Republic of Chechnya. The study was conducted during two intensive rehabilitation courses for children with motor and cognitive disabilities (autism, cerebral palsy, speech disorders of various origins and severity). The project involved 20 children aged 5 to 12 years and their parents; 5 specialized specialists (AFC coach, cerebellar stimulation specialist, speech therapist, speech pathologist, psychologist); highly qualified flight instructors.

The program included flights in an air tube using the AFF-T method, taking into account the age, nature and degree of impaired development (6 minutes daily); daily classes with an APC trainer, a specialist in cerebellar stimulation, a speech therapist, a speech pathologist on an individual correctional and developmental route based on diagnostic results; group classes with a psychologist on the development of communication and social skills; as well as outdoor recreation in order to restore physical strength, expand horizons, consolidate communication skills in communicating with peers and adults.

A comparative analysis of the diagnostic results before and after the intensive courses showed positive results in the development of deficient functions in children with an average indicator of the dynamics of development of 25%. As a result of control diagnostics, observation and a survey of parents, it was recorded that neurodynamic stimulation helped children to get the energy necessary for learning; increased productive performance; improved neurodynamic indicators of the course of mental processes, including indicators of the speed of stimulus reaction, concentration of attention, arbitrariness of activity; manifestations of aggression decreased in children; coordination of movements improved.

The obtained data allow us to state that the complexity and reasonable intensity of the correction process using a wind tunnel ensures a high percentage of achieving the planned results and obtaining positive dynamics of children's development in a shorter period of time.

The existing experience of implementing a comprehensive correction program using a wind tunnel and monitoring the results makes it possible to assert that the system of exercises in a wind tunnel has a complex effect on the physical sphere of child development and on the mechanisms of organization of higher mental activity, thereby launching an algorithm for compensating for impaired functions in the motor, cognitive and psycho-emotional spheres of children. In this regard, in our opinion, the wind tunnel can be considered as one of the effective innovative means of comprehensive rehabilitation of children with disabilities.

**References**

1. Glozman Zh.M. Forms and methods of mediation in neuropsychological rehabilitation and correction. journal. Vol. 30, 2009. No. 4. pp. 87-91.
2. Bernstein N.A. On the construction of movements / N.A. Bernstein. –

M. : Book on Demand, 2012. – 253 p.

1. Volkovskaya T.N. Neuropsychological approach to the study of developmental deficiencies in children with early organic damage to the central nervous system. / T.N. Volkovskaya // Special psychology. – No. 3-4. – 2010. – pp. 32-38.
2. Sirotyuk A.L. The role of cerebellar stimulation in the mental development of preschool children / A.L. Sirotyuk. [electronic resource]. – Access mode: <http://sensint.ru/sites/default/files/rol_mozzhechkovoy_> stimulyacii\_v\_psihicheskom.pdf (10.03.2019).
3. Sandakov D.V., Sandakova N.V., Shamshurin M.V. Aerotube as a means of therapeutic physical culture // Pedagogical-psychological and medico- biological problems of physical culture and sport. – 2020. – No. 4. – URL: https://cyberleninka.ru/article/n/aerotruba-kak-sredstvo-lechebnoy-fizicheskoy- kultury (accessed: 21.03.2021).
4. Zueva Yu.V. The role of the cerebellum in cognitive processes

/ Yu.V. Zueva, N.K. Korsakova, L.A. Kalashnikova. [electronic resource]. – Access mode: [http://virtualcoglab.cs.msu.su/html/Zueva.](http://virtualcoglab.cs.msu.su/html/Zueva) (10.02.2019).

# Student-led volunteer project «Mirror, mirror!!!», expanding the use of mirror therapy in neurorehabilitation

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**Introduction:** Mirror therapy (MT) is a therapeutic approach that uses a mirror box to regenerate neural networks that control limbs and other parts of the body [1]. Developed by Vilayanur S. Ramachandran at University of California San Diego to address phantom limb pain, a mirror box utilizes mirrors to give the impression to the user’s brain that they are moving an affected limb. In mirror therapy, a patient performs exercises with an unaffected limb but because of the reflective surfaces inside the box, it appears as though the affected limb is being exercised [2, 3]. By this setup, different brain regions for movement, sensation, and pain are stimulated. Modern data confirm the efficacy of Mirror Box therapy for post-stroke paralysis, complex regional pain syndrome type I and type II; and half-body neglect syndrome (level Ib+ of evidence). The size effect of the MT is small. A Cochrane Review 2018 summarized the effectiveness of mirror therapy for improving motor function, activities of daily living, pain and visuospatial neglect in patients after stroke. At the end of treatment, mirror therapy improved movement of the affected limb and the ability to carry out daily activities, it reduced pain after stroke, and the beneficial effects on movement were maintained for six months, but not in all study groups. Thus mirror therapy is effective at least as an adjunct to conventional rehabilitation for people after stroke.

Mirror therapy offers clinicians an easy-to-use and low-cost adjuvant therapeutic technique. However, its effectiveness as a stand-alone modality largely arises from low-quality evidence. Instead, there is a greater weight of evidence in favor of its use as a combined or sequential therapy.

Mirror therapy is rarely used in the clinics of the city of Ufa and the Republic of Bashkortostan.

**The goal** of our project is wider introduction of mirror therapy into the clinical practice in rehabilitation of neurological patients.

**Our tasks** are to inform doctors, physical therapy instructors and patients about the methodology of mirror therapy and its effectiveness; to teach students mirror therapy and the technique of making a mirror box; to provide specialized departments with mirrors and mirror boxes.

**The project's target audience, geography and coverage:** Patients with paresis after stroke, traumatic brain injuries, exacerbations of multiple sclerosis, injuries of peripheral nerves of the extremities at hospital departments of neurology, neurorehabilitation and out-patient clinics.

**Implementation stages:** 1. Recruitment of student volunteers participating in the project. Informing them about the goals and objectives of the project, the method of mirror therapy, the mechanisms of the effect, the method of conducting, the technology of making mirror boxes. 2. Preparatory stage: selection of mirrors, making mirror boxes, making written instructions for their use. 3. The main stage: the work of volunteer students with patients together with physical therapy instructors and rehabilitation doctors/ independent mirror therapy in hospitals. 4. The final stage: the introduction and persistent use of mirror therapy in supervised organizations.



The project is at the stage of implementing the idea. Mirror therapy was introduced into the clinical practice of the Republican Clinical Hospital n.a.

G.G. Kuvatov in Ufa.

**Conclusion.** A mirror box cannot be purchased at the shop of medical eqiupment or a pharmacy, but it is easy to make it with your own hands. Often, doctors do not have time to demonstrate/recommend mirror therapy for the patient, especially for making a box. Medical students engaged in this volunteer

project can improve their knowledge of medical rehabilitation, improve their communication skills with patients and colleagues, develop empathy and a compassionate attitude to sick people.

**References**

* 1. Ezendam D., Bongers R.M., Jannink M.J.A. Systematic review of the effectiveness of mirror therapy in upper extremity function. *Disabil. Rehabil.* 2009;31:2135–2149. doi: 10.3109/09638280902887768.
  2. Rothgangel A.S., Braun S.M., Beurskens A.J.H.M., Seitz R.J., Wade D.T. The clinical aspects of mirror therapy in rehabilitation. *Int. J. Rehabil. Res.* . 2011;34:1–13. doi: 10.1097/MRR.0b013e3283441e98.
  3. Thieme H., Morkisch N., Mehrholz J., Pohl M., Behrens J., Borgetto B., Dohle C. Mirror therapy for improving motor function after stroke. *Cochrane Database Syst. Rev.* . 2018;2018:CD008449. doi: 10.1002/14651858.CD008449.pub3.

# History of language impairment: developmental language disorder in Russia

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The first specialized schools for atypical populations of children have been established in early 19th century under the guidance of the Empress consort Maria Feodorovna, who has been appointed the chief inspector of public orphanages in 1797. These first public educational institutions were the school for deaf and mute children opened in 1806, and the school for blind children – in

1807. Since then, the number of charity institutions and public organizations has been steadily increasing, reaching the total of 6.5 thousand institutions providing social support of disadvantaged children, including those with disabilities and developmental impairments, by the end of the 19thcentury.

Systematic research of speech and language problems and remediation practices has started developing from late 1820’s (Bezlyudova, 1993) [3]. However, except for a few original and innovative works, like Laguzen’s early investigation on stuttering (1838), the great proportion of speech and language pathology (SLP) literature have been translations from other languages until early 1900’s. Things have started to change dramatically for the field during the Soviet times, when the researchers have begun approaching the problem of typical and atypical development and functioning from cross-disciplinary perspective, thus bridging the fields of psychology, linguistics and neurophysiology. Since that time, the field has remained a multi-disciplinary branch of science, focussing on the interconnections between language acquisition/functioning and other higher cognitive processes, as well as the ability to ‘think in a language’, i.e., using inner speech (Vygotsky, 1934; Luria, 1962, 1966b) [5].

The terms ‘language impairment’ (LI) and ‘developmental language disorder’ generally accepted in the European literature are not widely used in the Russian tradition of SLP. The LI research in Russia has been developing as two distinct approaches. The first one is known as the ‘clinical approach’, which stemmed from clinical studies, where LI is considered as a pathological condition with its characteristic symptoms, etiology and pathogenesis (Belova- David, 1969; Kirichenko, 1977; Kovalev&Kirichenko, 1970; Mnukhin, 1948; Traugott, 1940; Traugott&Kajdanova, 1975; see also for review Kornev, 2005). Similarly to early research of patients with aphasia (Luria, 1962, 1966a), this approach puts much stress on the brain dysfunctions, which are believed to underlie LI in children. Therefore, the clinical framework recognizes two main types of LI, known as ‘alalia’ (the terms ‘developmental dysphasia’ and ‘early child aphasia’ are also occasionally used). These types of alalia are identified, depending on whether the underdevelopment of cortical structures is believed to be around Broca’s area (‘motor alalia’) or Wernicke’s area (‘sensory alalia’) (Kovshikov, 1983; Seliverstov, 1997; Sobotovich, 1985). In the Word Health classification of diseases ICD-10 (World Health Organization, 1992) these two

subtypes of alalia are most closely associated with the receptive language disorder (F80.1) and expressive language disorder (F80.2) [6].

The significance of neuroanatomy is apparent even in the definition of the term alalia, which is a systematic underdevelopment of speech, the impairment of the speech and language functional system resulting from the dysfunction of the speech motor and auditory analysers/centres (Lalaeva&Shakhovskaya, 2011). However, the vast majority of clinical cases reporting on children with general LI could not fit into the two categories of motor and sensory alalia. Although some attempts have been made to further develop the terminology for different subtypes of alalia (Orfinskaya, 1963), they have not been widely accepted, and at present the classification remains close to its original form. This is probably partly due to lack of behavioural and neurophysiological empirical data. Specifically, the absence of standardized language assessments with sufficient specificity and sensitivity complicates the process of identifying of different language profiles among children with ‘alalia’ using behavioural methods. At the same time, the primary neurophysiological abnormalities which are believed to underlie these children’s language deficits, cannot be reliably identified on a brain scan or in a recording of the brain electrical activity, except in most severe clinical cases. In addition, since the majority of speech therapists are certified specialized *educators* (i.e., not medical doctors), they are not officially qualified to diagnose children with alalia, which is a medical term.

Regarding specific methods, for some time there has been a notable development in tools and techniques used during intervention. Thus, the classical methods developed back in the Soviet times (Filicheva et al., 1989; Levina, 1951; also see for review Lalaeva&Shakhovskaya, 2011) are now enriched by IT and computer-based technologies (Bardalim, Miklyaeva, Suslova, Fedorova, &Chudesnikova, 2018; Shipilova, 2007) as well as by new approaches to treatment of underlying deficits. For example, these include the development of rhythm sense and fine motor control skills (Mukhina, 2010), or integrating multimodal sensory information (e.g., tactile, visual and auditory perception) for language learning (Novikova-Ivancova, 2015) [1].

In addition, specialized speech pathology centres in Moscow, Saint Petersburg and a few other major cities often offer ‘composite’ therapy programs. Thus, along with the standard speech and language intervention sessions, such program includes sessions with a neuropsychologist for treating

general motor and sensory deficits (Kisling, 2017; Minenkova, 2007; Semenovich, 2018), which are believed to underlie these children’s language learning problems.

At present, much effort is put into delivering services to children with diagnosed speech and language problems. However, the best outcomes are observed for children who had received early intervention. Public outreach appears to be critical for this initiative, including informing the parents about the developmental milestones in their child’s language and cognitive development, and the steps to take if they notice signs of atypical development in their child. At present, a great proportion of parents remain ignorant about the dangers of leaving the problem untreated: they postpone their visit to a doctor, believing that their child would grow out of his/her problems naturally ‘like all normal children do’ not aware of the statistics on the outcomes and of the benefits of early intervention.

**References**

1. Bardalim V.V., Miklyaeva N.V., Suslova E.A., Fedorova L.I. & Chudesnikova T.A. (2018). *Internet-tehnologii kak resurs dejatel’nosti uchitelya-defectologa [Internet technologies as a professional resource for a defectologist]*. ARKTI.
2. Belova-David R.A. (1969). K voprosu sistematizacii rechevyh rasstrojstv u detej [Towards systematization of speech impairments in children]. *Narushenije Rechi u Doshkol’nikov*, 11–47.
3. Bezlyudova A.V. (1993). *Stanovlenije i razvitije otechestvennoj logopedii kak nauki v period so vtoroj chetverti XIX veka po pervuju chetvert’ XX [The establishment and development of the national speech and language pathology as a science from the second quarter of the 19*.
4. Filicheva T.B., Cheveleva N.A. & Chirkina G.A. (1989). *Osnovy logopedii [Foundations of speech and language pathology]*. Moscow.
5. Vygotsky L.S. (1934). *Myshlenije i rech’ [Thought and language]*. Moscow-Leningrad: Sotsekgiz.
6. World Health Organization. (1992). *The ICD-10 classification of mental and behavioural disorders : clinical descriptions and diagnostic guidelines*. Geneva: World Health Organization. Retrieved from [http://www.who.int/iris/handle/10665/37958.](http://www.who.int/iris/handle/10665/37958)

# Pantomime recognition in patients with transcortical motor aphasia

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According to the ORBI found, 450 thousand primary strokes happen every year worldwide. The most important complications following the stroke are motion disorders and speech disorders like aphasia. The majority of rehab programs are based on a principal of brain plasticity focusing on healthy tissue compensation of the lost functions. Some rehabilitation psychologists suggest rehab programs where the patients with speech disorders are taught to use non- verbal communication including gestured and pantomimes. This allows to facilitate the recovery of speech loss through on the recruitment of motions and paralinguistic reserves. Some rehabilitation therapists also teach sign language as a communication instrument for aphasia [2]. Rehabilitation after aphasia includes the process of learning the expression of thoughts through gestures, therefore, the issue of disorders of pantomime in aphasia is considered from confirming the effectiveness of rehabilitation [3].

However, the efficiency of this type of rehabilitation is a matter of dispute, because the number of works indicate that non-verbal communication is often affected along with aphasia. Moreover, gestural communication is connected to praxis leading to mistake in pantomime recognition and production. Such general and systematic loss of communication is commonly associated with the loss of symbolic function or «asymbolia» [1].

**The aim** of our study was to identify the disorders of non-verbal communication in patients with transcortical motor aphasia by pantomime recognition testing.

Our **hypothesis** was that the patients with transcortical motor aphasia would have the disorder of pantomime recognition.

**Practical significance of the study:** develop rehabilitation programs based on the recovery of symbolic praxis in aphasia. Additionally, we adopted and applied the methodical approach for the diagnosis of non-verbal communication disorders in aphasia.

**Methods of researching** include methods of Luria’s comprehensive neuropsychological diagnostic and the pantomime recognition test (R.J. Duffy, 1975).

The study was conducted on **patients** with poststroke transcortical motor aphasia aged 18 to 65 years (17 patients). The control group consisted of people without organic brain pathology (16 people).

**Results.** In the statistical analysis of the results of the naming test, reliable differences between the control and experimental groups. This results also can be due to structure of disorder in patients with transcortical motor aphasia, in particular difficulties in sentences programming, the presence of a predicative deficit with the safety of repeated speech. Difficulties on naming partly might be conditioned by significant differences (p = 0, 027) between levels of education among participants in experimental (mean = 0, 529) and control (mean = 0, 938) groups.

In the statistical analysis of the result of the pantomime recognition test, reliable between the control and experimental groups. This result can also be due to pantomime recognition difficult in patients with transcortical motor aphasia, and this fact matches with hypotheses of study.

When analyzing the data obtained when performing tests for speech function, we revealed significant correlations between recognition of pantomime and speech neuropsychological tests, auditory-verbal memory function and pantomime naming test, which confirmed the hypothesis about the disorders of the non-verbal communication in aphasia. Also, significant correlations were found between the ability to recognize pantomime and the presence of transcortical motor (rs = 0.554, at p≤0.01) and Broca’s aphasia (rs = 0.392, at p≤0.05) in neuropsychological status. These relationships can also confirm the concept of Finkelnburg and the hypothesis of Duffy et al. about the existence of a general symbolic deficit, presented as a combined violation of the verbal and non-verbal aspects of communication.

The revealed disorders of the recognition of pantomime in transcortical motor aphasia indicate that in the process of rehabilitation it is necessary to recovery not only the verbal, but also the non-verbal side of communication.

**Conclusions:**

1. The contradiction between the difficulties of non-verbal communication in patients with aphasia can be resolved by turning to the symbolic approach.
2. Patients with transcortical motor aphasia have disorders in the recognition of pantomime.
3. Were founded correlations between the ability to soft tests for the recognition of pantomime and neuropsychological tests, evaluating:
   1. Oral speech;
   2. Written speech;
   3. Speech comprehension.
4. The pantomime recognition test (Duffy, 1975) can serve as a diagnostic test for pantomime recognition diagnosis.

**References**

1. Duffy R.J., Duffy J.R. and Karen Leiter Pearson Pantomime Recognition in Aphasics/ Journal of Speech and Hearing 1975.
2. Rose M., Mok Z., Sekine K. Communicative effectiveness of pantomime gesture in people with aphasia // International journal of language & communication disorders 2017.
3. Yang Z.H., Zhao X.Q., Wang C.X. et al. Neuroanatomic correlation of the post-stroke aphasias studied with imaging // Neurol. Res. 2008. Vol. 30.

№ 4. P. 356–360.

# Medical rehabilitation

**of cancer patients as an integrated approach to treatment**

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Medical rehabilitation takes a special place in the recovery of patients of various types.

Rehabilitation of cancer patients is an integrated system of state, social, economic, medical, professional, pedagogical, psychological activities aimed at adapting to the new conditions of vital functions of the body caused by illnesses and treatment of malignant tumors.

The theoretical basis of rehabilitation is the three-dimensional concept of health violations – International Classification of Functioning, Disability and Health (ICF; International Classification of Functioning – ICF, 2001). This classification is based on the premise that it is not the disease that creates restrictions on life, but the environmental conditions. The ICF defines three levels of medical biological and psychosocial consequences of illness (injury) and considers the human condition from the standpoint of three components of health – disorders of the structure and function of the body, the activity of the body and the social participation of the patient [1].

Over the past decades, undoubted progress has been achieved in oncology, creating the preconditions for the early cure and rehabilitation of patients with malignant diseases through modern, multimodal and high-tech methods of diagnosis and treatment [2].

It should be emphasized that in modern clinical oncology, the concept of treatment and rehabilitation are inseparable, which ensures the continuity and consistency of the stages of general treatment. The therapeutic component is fundamental, determining both the result of treatment and rehabilitation [3].

Carrying out rehabilitation procedures with cancer patients has its own features:

* The process is phased,
* The earliest possible start of treatment,
* Continuity, if possible, compatibility with the treatment stage,
* Integrity and individuality of the approach [3].

At the premises of the Federal State Budgetary Institution “Federal Scientific Clinical Center for Medical Radiology and Oncology of the FMBA of Russia (FSBI FSCCRO of FMBA of Russia, Dimitrovgrad), a study was carried out dedicated to changes in the nervous system and assessment of the state according to the International Classification of Functioning in patients with malignant neoplasms in the process of anticancer treatment in order to further determine the tactics of using rehabilitation actions. The patients' age ranged from 25 years and older. The total number of examined patients was 99.

The results of objective and neurological examinations showed that patients of this type, receiving radiation therapy, mainly have the following changes in the nervous system: headaches (43%), dizziness (25%), weakness in the limbs (17%), paresthesia of the upper and lower limbs (8%), and

unsteadiness when walking (7%). The main manifestations according to the International Classification of Functioning, regardless of the main clinical diagnosis, included the following ICF categories: b 280 – pain sensation; b 235 – vestibular functions; b 710 – functions of joint mobility; b 730 – muscle strength functions; b 840 – sensations associated with the skin.

Among the main patients` complaints during and after antitumor drug therapy were paresthesia of the upper and lower extremities, mainly with a distal localization of the process (94%). The main manifestations, according to the International Classification of Functioning, were the following ICF-categories: b 710 – joint mobility functions; b 730 – muscle strength functions; d 445 – use of hand and arm; b 840 – sensations associated with the skin.

Among the patients of the surgical department, the main complaints are: a decrease in the volume of movements performed (45%), weakness in the extremities (25%), pain syndrome (12%), paresthesia of the distal upper and lower extremities (8%), dizziness (5%) , dysfunction of the pelvic organs (5%). These patients are characterized by the corresponding ICF categories: b 280 – pain sensation; b 710 – functions of joint mobility; b 730 – muscle strength functions; b 840 – sensations associated with the skin.

The goal of rehabilitation was to improve the quality of life and psychological state of patients; achievement of social and professional full value condition.

We have developed methodological guidelines "Basic Methodological Procedures of Oncological Rehabilitation at the FSBI FSCCRO of FMBA of Russia", covering the main issues of medical rehabilitation, in particular, the rehabilitation of cancer patients.

Thus, the use of up-to-date technologies, high-tech equipment and the latest techniques can help to better control various components of the treatment and recovery process. To achieve the goals of rehabilitation and correction of the state of cancer patients, rehabilitation programs are used, including nutritional support, physiotherapy treatment, a complex of exercise therapy, correction of psychological state, which together undoubtedly prove the effectiveness of rehabilitation treatment after the first procedures and expect a favorable prognosis.

**References**

1. Ponomorenko G.N. Medical rehabilitation, textbook; Chapter 1 Fundamentals of Medical Rehabilitation, Moscow, publishing group "GEOTAR–Media", 2014.
2. Semiglazova T.Yu., Kluge V.A., Kasparov B.S., Kondratyev K.O., Krutov A.A., Zernova M.A., Chulkova V.A., Semiglazov V.V. International Model of Rehabilitation of Cancer Patients, Medical Council No. 10, 2018, 10.21518/2079-701X-2018-10-108-116.
3. Solopova A.G., Tabakman Yu.Yu., Idrisova L.E., Sdvizhkov A.M. Rehabilitation of oncogynecological patients. A look at the problem. Obstetrics, gynecology and reproduction. 2015; 4: 46-54.
4. Order of the Ministry of Health of the Russian Federation of July 31, 2020. No. 788n "On approval of the Procedure for organizing medical rehabilitation of adults (https://[www.garant.ru/products/ipo/prime/doc/](http://www.garant.ru/products/ipo/prime/doc/) 74581688/#20444).
5. Association of Oncologists of Russia (https://old.oncology- association.ru/).

# The relationship of MDB specialists in the implementation of an integrated approach of patients with a violation of VPF in a rehabilitation center

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**Introduction.** Every year, the number of people in the world who have certain health restrictions leading to disability increases. According to WHO data, 1,100,5193 people with disabilities for 2020. About 6 million strokes are diagnosed, in Russia – 470 thousand cases. One of the most common causes of disabling patients is TBI, CVD (ONMC), brain tumors, leading to gross

violations of the VPF and speech. 91% of the total number of patients hospitalized in neurosurgical departments were with traumatic brain injury in the Russian Federation in 2020; 3% with a tumor, CVD (ONMC) 6%.

The complexity of speech disorders in aphasia, dysarthria depends on the localization of the lesion, the size of the lesion, the time and age of the lesion, the characteristics of residual and functionally preserved elements of speech activity.

The term “rehabilitation" means (re – repeated, renewable action, opposite action, counteraction, habilis – convenient, adapted). According to the WHO definition, rehabilitation is a combined and coordinated application of social, medical, pedagogical and professional measures for the purpose of training and retraining an individual to achieve optimal working capacity.

In Russia, the definition is used, which was put forward at the meeting of Ministers of Health in Prague in 1967. Rehabilitation is a system of state, socio- economic, medical, professional, pedagogical, psychological and other measures aimed at preventing the development of pathological processes leading to temporary or permanent disability, and at the effective and early return of patients with disabilities and disabled people (children and adults) to society and socially useful work.

**The main part.** Comprehensive rehabilitation in the conditions of the rehabilitation center includes the help of specialists included in the multidisciplinary team, namely a neurologist, speech therapist (aphasiologist, dysphagologist), exercise therapy doctor, physiotherapist, physical therapist, psychologist, neuropsychologist, medical psychologist, occupational therapist, nurse, social worker. The coordinator of the rehabilitation process is a neurologist/rehabilitologist. All specialists provide assistance in treatment and neurorehabilitation, actions should be coordinated.

Comprehensive rehabilitation of patients of different age groups was carried out on the basis of the Three Sisters RC, in whose anamnesis there were such neurological diagnoses as: ischemic stroke / hemorrhagic stroke, traumatic brain injury (TBI), brain tumors. ONMC (children from 6 to 15 years old) – 27.3%; (from 30 to 70) – 72.7%. TBI (from 30 to 70) – 33.3% (children from 3

to 15) – 66.7%. Brain tumors (from 30 to 70) – 55.5% (children from 2 to 15) –

44.5%.

Thus, the medical care program contains methods of drug therapy, physiotherapy, physical therapy, nutrition, rehabilitation of foci of chronic

infection, surgical correction of pathological changes; the program of psychological and pedagogical rehabilitation includes measures for the prevention and treatment of mental disorders, as well as the conscious inclusion of patients in the rehabilitation process, as well as educational measures aimed at correcting behavior, intellectual activity, emotional state, development of psychological confidence in their own usefulness; the program of speech therapy rehabilitation includes measures to restore vital functions (swallowing, chewing), disinhibition of the communicative function of speech, correction of medium and light pronunciation disorders, normalization of vocal and respiratory function; the program of occupational rehabilitation includes – restoration or compensation of lost abilities to engage in productive activities (includes the restoration of professional skills) and spend their leisure time, independence; the program of physical rehabilitation includes the restoration of physical capabilities by performing various exercises and loads.

**Conclusion.** The effectiveness of the multidisciplinary approach is due to the fact that each specialist works in his own segment of solving the patient's problems, while solving a common task, having information about the approaches, views and methods of solving the problem of other team members.

A program of further routing and recommendations from all MDB specialists for relatives of patients or their surrogates was developed to continue the patient recovery program.

**References**

1. Wiesel T.G. Fundamentals of neuropsychology. – Moscow : Astastrel : Transitkniga, 2005. – 247 p.
2. Wiesel T.G. Acquisition and disintegration of speech : monograph. – Barnaul : AltGPU, 2016. – 289 p.
3. Vilensky B.S. Ischemic stroke : handbook / B.S. Vilensky,

N.N. Yakhno. – St. Petersburg : Folio, 2007. – 75 p.

1. Maslova V.A. Introduction to cognitive linguistics. – Moscow : Flint, Nauka, 2014. – 296 p.
2. Gusev E.I. The problem of stroke in Russia // Journal of Neurology and Psychiatry named after S.S. Korsakov. – 2003. – No. 9. – pp. 3-7.
3. Bein E.S. Aphasia and ways to overcome it. – URL: [http://www.detskiysad.ru/bolezni/afaziya04.html.](http://www.detskiysad.ru/bolezni/afaziya04.html)
4. Luria A.R. Fundamentals of neuropsychology. – URL: [http://onlineknigi.com/page/225405.](http://onlineknigi.com/page/225405)
5. Order of the Ministry of Health of the Russian Federation No. 383 dated 12/28/1998 "On specialized care for patients with speech disorders and other higher mental functions". – URL: https://legalacts.ru/doc/ prikazminzdrava-rf-ot-28121998-n-383.

# Pilot scientific and clinical report on the effectiveness of the use of the COVID REHAB telemedicine platform after SARS-CoV-2

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**Introduction.** In patients after the COVID-19 disease, the tolerance to physical activity and the quality of life decreases. [1-3] In the Federal State Budgetary Institution "National Medical Research Center for Rehabilitation and Balneology" of the Ministry of Health of the Russian Federation, the telemedicine platform COVID REHAB was developed in order to reduce the recovery period after COVID-19, rapid social and labor adaptation [4, 5], as well as to provide access to rehabilitation for patients who are unable to undergo full-time medical rehabilitation [6, 7].

**The main part.** Patients received telerehabilitation on the COVID REHAB platform in the online mode, group physical therapy classes with an instructor (respiratory gymnastics and aerobic exercises, strength training of different intensity); training in drainage breathing techniques; neuropsychological support, and Health Schools were held for patients on nutrition, restoration of intestinal microflora, deficiency fillingand non- pharmocological recovery methods of after COVID-19.

The study involved 343 patients aged 17 to 88 years (the average age of 48 years – for both men and women). Of these, 74% (254 people) are women and 26% (89 people) are men.

When filling out the questionnaires, patients indicated hypertension (21.6% (74 people)), heart rhythm disorders (16.6% (57 people)), respiratory

failure (16.4% (56 people)) and type II diabetes mellitus (5.3% (18 people)) as concomitant diseases.

As a result, 343 patients filled out the final questionnaire, which allowed to evaluate the effectiveness of the applied rehabilitation.

After completing the rehabilitation course, the number of patients who stopped feeling weakness increased by 36% (122 people); the number of patients who do not have breathing difficulties increased by 22% (76 people); the number of patients who do not have shortness of breath increased by 19% (65 people); the number of patients who do not have muscle loss increased by 19% (65 people); the number of patients who have a rapid pulse decreased by 17% (58 people); the number of patients who do not feel a lack of oxygen increased by 16% (56 people).

**Conclusions.** Telerehabilitation is development of medicine. The need for its development is caused by the large country territory and the uneven distribution of the population, in particular, a large number of localities remote from district centers with qualified specialists. The analysis of the obtained data demonstrateshigh efficiency of physical therapy complexes developed and used in the FSBI NMITS of Rehabilitation and Balneology of the Ministry of Health of the Russian Federation, taking into account the peculiarities of telerehabilitation.

**References**

1. Fesyun A.D., Lobanov A.A., Rachin A.P., Yakovlev M.Y., Andronov S.V., Konchugova T.V., Gilmutdinova I.R., Barashkov G.N., Mitroshkina E.E., Bogdanova E.N., Lebedev Y.O., Nikitina A.M. Challenges and approaches to medical rehabilitation of patients with COVID-19 complications. Bulletin of Rehabilitation Medicine, 2020. – № 3. – Р. 3-13.
2. Winters J., Lathan C., Sukthankar S. et al. Human Performance and Rehabilitation Technologies / Biomechanics and Neural Control of Movement, ed. by Winters J., Crago P. – New York: Springer-Verlag, 2000. – P. 493-551.
3. Yang LL, Yang T. Pulmonary Rehabilitation for Patients with Coronavirus Disease 2019 (COVID-19). Version 2. Chronic Dis Transl Med. 2020 May 14;6(2):79-86. doi: 10.1016/j.cdtm.2020.05.002. Online ahead of print.
4. Rassouli F., Boutellier D., Duss J., Huber S., Brutsche M.H. Digitalizing multidisciplinary pulmonary rehabilitation in COPD with a smartphone application: an international observational pilot study. Int J Chronic ObstrPulm Dis. 2018;13:3831–3836.
5. Bourne S., DeVos R., North M. Online versus face-to-face pulmonary rehabilitation for patients with chronic obstructive pulmonary disease: randomised controlled trial. BMJ Open. 2017.
6. Vladzimirsky A.V. Telemedicine / A.V. Vladzimirsky, G.S. Lebedev. – Moscow : GEOTAR-Media, 2018. – 576 p. (Series "Library of a specialist doctor") – ISBN 978-5-9704-4195-4. – Text: electronic // URL: https://[www.rosmedlib.ru/book/ISBN9785970441954.html](http://www.rosmedlib.ru/book/ISBN9785970441954.html) (accessed: 25.07.2021). – Authors A.V. Vladzimirsky, G.S. Lebedev.
7. Chaturvedi S.K., Jayarajan D. E-rehabilitation: new reality or virtual need? J PsychosocRehabilMent Health 2017;4:1-3.

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