

The 9th International Scientific Conference
EXERCISE FOR HEALTH AND REHABILITATION
The 11th of April, 2024
Kaunas, Lithuania

BOOK OF ABSTRACTS



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Department of Sports Medicine



Lithuanian Federation of Sports Medicine

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INVITED SPEAKERS

ARTIFICIAL INTELLIGENCE APPLICATIONS IN HEALTHCARE

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Introduction. There are various research fields that are related to human daily or working behaviors that involve bio signals, fatigue or stressful situations detection, workability evaluation, anomalies detection and other fields. The most important aspect from the perspective of Artificial intelligence (AI) is what kind of data can be analyzed and how the whole process looks like. The aim of this research is to represent steps of AI analysis-based processes and show some examples of applications.

Research methods and organization. Healthcare applications usually are not focused on specific diagnosis and are more related to monitoring daily life activities. The AI based application implementation process contains four main steps: data collection, data pre-processing, decision making, user interface development. Probably the hardest part is data gathering. The devices for bio-signals recordings need to be selected carefully. Two main aspects need to be considered: devices should be user friendly and wearable (in most of the cases replicable electrodes only are used in laboratory conditions); devices should provide access to the raw data (many devices provide only pre-processed data where some important information might be lost).

In most of the cases, together with bio signal recordings various activities and tests are being performed, such as cognitive abilities evaluations tests or physical exercises. Some other important information is gathered using questionnaires or self-assessment tasks. Furthermore, many additional devices are being used during experiments such as video cameras or virtual reality glasses. All the data and its variety depend on a specific task and further investigation about the most important features is usually required.

Data analysis process steps are listed below:

1. Filtering techniques are applied to reduce high or low frequency noise, interpolate missing data etc.
2. The features extraction is usually related to statistical analysis. Time domain, frequency domain parameters or non-linear parameters can be estimated.
3. Different machine learning or deep learning techniques are applied corresponding to specific tasks. Techniques may be divided into three categories: classification, for example to identify which state is stressful and which one is not; clustering, if we do not have predefined states; regression if we want to make a prognosis for upcoming health conditions.

The final step involves user friendly interface together with data storage platform preparation. Usually, with even more gathered data the more accurate insights in further research can be made.

Project examples. The examples of success stories of AI appliance in data analysis are as follows:

- In the “Careware” project the focus was on smart wearable sport and health solutions. The initial data of ECG signals were recorded using a Cardioscout device. The was to prepare a recommendation system for choosing different intensity levels in training. This application is prepared for professional athletes that want to reach the best results with the highest intensity level minimizing possible damage to heart activity [1].
- “Fatigue” project was more focused on various mental and physical fatigue identification factors. During this research several physical tests were performed to evaluate the physical

state of each participant. The app evaluated workability state and was able to provide recommendations on what parts might be improved [2].

- “Inno4health” project focused on improving cognitive abilities and analysis about its relationship with decision making abilities in professional sports area. The anticipation, concentration, decision-making, attention transfer tests were performed. Gathered data together with heart rate variability was used as initial data. As a result, the individualized training plan was prepared that was based on cluster analysis. The research showed that this platform improved mental abilities of sportsmen [3].
- One of the upcoming projects is AI-based unstable seat prototype for sedentary. The initial data comes from biometric signals from various sensors. The most important features need to be selected in the data analysis part. According to obtained results, the customized instability levels need to be selected to reduce lower back pain while sitting. Another recently started project is focused on stressful situations recognition using only biometric signals and cameras [4].

Conclusions. To summarize, a very important part related to healthcare research is proper data gathering from wearable devices that provide raw data. Only with proper data AI algorithms can help in identifying mental or physical fatigue, evaluate workability state, recognize anomalies and in many other fields.

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BIOSIGNALS OF THE HUMAN BODY

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A biosignal describes a physiological phenomenon, starting from a visual inspection of the patient to signals recorded from the human body using dedicated sensors, e.g., plethysmography. A multitude of biosignals of the human body makes a unique classification of them impossible, so there are at least three different ways how to classify biosignals: (i) existence of biosignals, with the differentiation between permanent biosignals with their source inside the body (e.g., heart sounds) and induced biosignals which are triggered artificially (e.g., electro-plethysmography); (ii) dynamics of biosignals, with (quasi) static biosignals (e.g., core body temperature) versus highly dynamic biosignals (e.g., beat-to-beat heart rate variability); and lastly (iii) origin of biosignals, incl. electric, magnetic, mechanic, optic, acoustic, and other biosignals.

Biosignals are commonplace in research and clinical practice today, which are relevant not only for the pre-screening and diagnosis of maladies but also for their therapy, theranostics (i.e., personalized closed-loop therapy) and follow-up treatment. In the words of Canadian physician William Osler (1849-1919), the father of modern medicine: “Listen to your patient, he is telling you the diagnosis”. For instance, the diagnosis of sleep apnea, i.e., abnormal cessation of respiration during sleep, requires the monitoring of a complete set of sleep and respiratory variables with numerous sensors distributed over the entire body.

The very first diagnoses were made on the patient’s verbal account of his illness with the unaided senses. Even Hippocrates of Cos (around 460 BC - 377 BC), ancient Greek physician, noted that good humour, reported quiet sleep, clear mind, and mobility were descriptive of a favourable prognosis. Then, inspection, palpation, percussion and auscultation followed, as the very first biosignals, with the use of first technical tools as stethoscope (invented by Dr. Rene Theophile Hyacinthe Laennec (1781-1826), the French internist). However, most of the technical accessories faced severe antagonism even by prominent physicians, in line with Arthur Schopenhauer (1788-1860), a German philosopher: “All truth passes through three stages. First, it is ridiculed. Second, it is violently opposed. Third, it is accepted as being self-evident”.

In order to adequately apply biomedical sensors and reasonably interpret the corresponding biosignals, a proper understanding of the physiologic phenomena involved, their influence on the registered biosignals, and the technology behind the sensors is critical. From a strategic point of view, biosignal generation involves the biosignal formation path from the biosignal source at the physiological level (i.e., origin of biosignal), to biosignal propagation within the body (attenuation of biosignal), to biosignal transmission in the sensor (spectral shaping of biosignal) up to its conversion to a, usually electric, signal (recording of biosignal). To give an example, heart sounds, an acoustic biosignal, are created by the closure of heart valves, which constitutes the biosignal source. Sounds when propagating in the thoracic tissue are subjected to attenuation mechanism. Amplification and filtering of the heart sounds in the chestpiece of the stethoscope reflect biosignal transmission within the sensor, with biosignal conversion being performed by a microphone at the output of the chestpiece.

SHORT ORAL SCIENTIFIC PRESENTATION SESSION

USE OF VIRTUAL REALITY TO ASSESS CHANGES OF LOWER LIMB FUNCTION, BALANCE, GAIT AND QUALITY OF LIFE IN PATIENTS AFTER STROKE

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Introduction. Stroke is a medical emergency caused by an interruption of blood flow to the brain, leading to brain cell damage and potentially permanent disability or death (1). Stroke is the second leading cause of death and disability worldwide (2). According to World Stroke Organization there are over 13.7 million new strokes each year. Globally, one in four people over the age of 25 will have a stroke in their lifetime (3). Accordingly, it is important to know the consequences of stroke and treatment options. Which is why our aim of this study to assess changes in lower limb function, balance, gait and quality of life in patients after stroke using virtual reality.

Research methods and organization. Participants in the study were gathered from January until December of 2023 year after getting Bioethics centre approval for the study. All participants had to meet inclusion criteria which were 50-80 years old, diagnose of stroke with hemiparesis, with no severe cognitive function impairment (The Mini-Mental State Examination patient should score at least 11 points) and a consent to participate in the study. Exclusion criteria were unstable health condition, severe dementia or aphasia, significant hearing or visual impairment, pusher syndrome, severe spasticity or tremor. Patients were divided into two groups: virtual reality (VR) and conventional physiotherapy (CP). Each group had 21 patients. VR group patients mean age was 70.6 ± 7.3 , CP group 69 ± 6.8 . VR group sessions consisted of different games for balance, gait and lower limb function in front of the screen projecting the patient, CP group sessions consisted of different balance, resistance and gait exercises. Both groups received 30 minutes sessions 6 times a week for 24 days. Each patient had between 18-21 sessions depending on patient's arrival and well-being on each day. Patients were tested first and the last day of the study. Patients were assessed using these tests: Berg Balance Scale, Timed Up and Go Test, Wisconsin Gait Scale, Fugl-Meyer Assessment Lower Extremity, Stroke Impact Scale. Data analysis was performed using IBM SPSS v29 software. The Mann-Whitney-Wilcoxon criteria was used to compare two independent samples with a sample size of <25 . The Wilcoxon criteria was used to compare two dependent samples with a sample size of <25 . Quantitative data analysed using non-parametric criteria are presented as $X_{me}(X_{min}-X_{max}; \bar{x})$. X_{me} - median, X_{min} - minimum value, X_{max} - maximum value, \bar{x} - arithmetic mean. Differences with $p \leq 0,05$ were considered statistically significant.

Results. Timed up and go test time for the VR group was 13 (9-16; 13.14) seconds, for the CP group was 13 (10-30; 14.61) seconds. At the end of the study, timed up and go test time of the VR group was 11 (8-14; 10.95) seconds, in the CP group 12 (8-19; 11.85) seconds. Timed up and go test results showed a statistically significant difference in the VR group ($Z=-3.536$; $p<0.001$), and in the CP group ($Z=-3.438$; $p<0.001$). Wisconsin gait scale score of the VR group was 17.1 (14.35-21.35; 17.42) points, for the CP group 16.95 (14.35-21.35; 17.75) points. At the end of the study Wisconsin gait scale score of the VR group was 15.96 (14.35-18.35; 15.35) points, in the CP group 16.35 (14.35-18.95; 16.42) points. Wisconsin gait scale results showed a statistically significant difference in the VR group ($Z=-3,205$; $p<0,001$), and in the CP group ($Z=-2,661$; $p=0,007$). Modified Fugl-Meyer assessment score of the VR group was 60 (53-64; 59.42) points, for the CP group 60 (54-65; 59.90) points. At the end of the study, modified Fugl-Meyer score of the VR group was 62 (57-68; 61.09) points, in the CP group 62 (57-68; 61.42) points. Modified Fugl-Meyer test results showed a statistically significant difference in the VR

group ($Z=-3,437$; $p<0,001$). Comparing both groups statistical difference was found after the study ($U=141$; $p=0,044$). Berg balance scale score of the VR group was 48 (31-54; 47.28) points, for the CP group 48 (22-54; 45.19) points. At the end of the study, Berg balance scale score of the VR group was 52 (45-56; 50.71) points, in the CP group 50 (29-56; 48.85) points. Berg balance scale results showed a statistically significant difference in the VR group ($Z=-3,530$; $p<0,001$), and in the CP group ($Z=-3,639$; $p<0,001$). Stroke impact scale results showed a statistically significant difference in the VR group ($Z=-3,520$; $p<0,001$), and in the CP group ($Z=-2,645$; $p=0,006$).

Conclusions. Both virtual reality and conventional physiotherapy groups showed positive effects on gait, balance and quality of life for patients after stroke. Comparing both groups better results were found using virtual reality for lower limb function for patients after stroke.

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EFFECT OF FEEDBACK AND TARGETED EXERCISES ON ABDOMINAL MUSCLE THICKNESS, FUNCTION AND LOW BACK PAIN IN SEDENTARY WORKERS

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Introduction. 80% of the population has experienced low back pain in their lifetime. It is more often experienced by women and people aged 40-69. It can be triggered by injuries, bad posture, inflammatory processes and other causes. It can range in intensity from mild to severe (1). One of the risk factors for low back pain is sedentary work (2). The good function of deep muscles of the trunk is essential for low back pain prevention and treatment. It has been shown that appropriate feedback increases exercise results (3). Ultrasound is an excellent way to assess muscle function (4). The study aimed to evaluate the effect of feedback using ultrasound imaging and targeted exercises with individualized commands on the function of deep abdominal muscles.

Research methods and organization. The study included 28 sedentary workers, both male and female, aged between 18 and 50 years, with chronic, non-specific low back pain, randomly divided into two groups. Group 1 ($n=14$) performed stabilization exercises; group 2 ($n=14$) performed targeted exercises, each according to personally selected verbal commands. The exercises were performed daily for a period of 3 weeks. Muscle thickness of the relaxed and contracted external oblique (EO), internal oblique (IO), and transversus abdominis (TA) muscles was measured using ultrasonography (Mindray X7, China). The measurements were performed using verbal commands: relax the abdominal muscles, tighten the abdominal muscles, tighten the pelvic floor muscles and press the lumbar back against the table. Subjects completed the Oswestry Low Back Disability Questionnaire, and pain levels were assessed using a VAS scale. Measurements were taken twice - at the baseline and 3 weeks after the first test. The obtained results were processed with Microsoft Excel 2016 and IBM SPSS Statistics (version 29.0.1.0) programs. Means and standard deviations were calculated. Independent samples were compared by nonparametric data analysis using the Mann-Whitney test. The Wilcoxon test was used to compare dependent samples that did not meet the requirements of a normal distribution. Differences between the same samples, but normally distributed, were assessed by Student's t test. A difference between groups was considered statistically significant when $p<0.05$.

Spearman's correlation was used to determine correlations. Association considered statistically significant at $p < 0.05$.

Results. Stabilization exercises had a positive effect on abdominal muscle thickness. The thickness of the contracted TA muscle increased from 0.53 ± 0.9 cm to 0.55 ± 0.8 cm ($p < 0.05$), the thickness of the TA muscle, after contracting the pelvic floor muscles increased from 0.59 ± 0.10 cm to 0.55 ± 0.11 cm ($p < 0.05$), the thickness of the TA muscle when performing lumbar pressure to the table increased from 0.58 ± 0.08 cm to 0.51 ± 0.12 cm ($p < 0.05$). The thickness of the IO muscle increased from 1.10 ± 0.27 cm to 0.95 ± 0.32 cm ($p < 0.05$). Stabilization exercises effectively reduced pain intensity from 3.14 ± 0.77 to 2.43 ± 0.65 ($p < 0.05$) and disability score from 9.86 ± 2.4 to 8.57 ± 2.4 ($p < 0.05$). Feedback and targeted exercises significantly increased abdominal muscle thickness, reduced pain and disability levels. Thickness of TA muscle after contracting the pelvic floor muscles was greater after targeted exercises, i.e. increased from 0.62 ± 0.09 cm to 0.54 ± 0.09 cm ($p < 0.05$). Thickness of EO muscle when pressing the back against table increased from 0.80 ± 0.24 cm to 0.90 ± 0.21 cm ($p < 0.05$). Pain decreased from 4.07 ± 0.92 to 1.29 ± 0.47 ($p < 0.05$). The level of disability decreased from 10.29 ± 2.3 to 2.8 ± 2.3 ($p < 0.05$). The feedback and targeted exercises had greater impact on disability levels compared to stabilization exercises (2.8 ± 2.3 and 8.57 ± 2.4 respectively, $p < 0.05$). Correlation analysis showed that abdominal muscle function was moderately strongly related to non-specific low back pain, as well as low back disability. A moderate negative correlation was found with IO muscle ($r = -0.621$; $p < 0.05$), EO muscle ($r = -0.614$; $p < 0.05$), and TA muscle ($r = -0.564$; $p < 0.05$).

Conclusions. An increase in abdominal muscle thickness was found in both the targeted exercises group and the stabilization exercises group. The feedback and targeted exercises had greater impact on disability levels compared to stabilization exercises.

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THE EFFECT OF ISOMETRIC EXERCISES ON HIP AND KNEE JOINT FUNCTION AND BALANCE IN PATIENTS AFTER HIP OR KNEE REPLACEMENT

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Introduction. Osteoarthritis remains one of the most common joint degenerative diseases, affecting millions of people worldwide, and the most vulnerable joints being the hip and the knee (1). One of the treatment prospects is a total joint replacement, that helps to reduce symptoms and preserve the function of the joint. Physiotherapy plays the vital role in achieving the best results possible during the rehabilitation, as well as speeding up the recovery. The aim of this research is to determine the effect of isometric exercises on balance and the hip and knee joint function in patients after a total hip or knee replacement.

Research methods and organization. The research was approved by Lithuanian University of Health Sciences Bioethics Center (BEC-SR(M)-103). The study was conducted from February 2023 to August 2023 at organization "Gijos klinikos". It included 60 participants (42 females

and 18 males, 63,68±9,56 years old) after a total hip or knee replacement with no other lower limb pathologies or contraindications for a current treatment program. Participants were randomized in two groups (for each joint) - regular exercises (RE) n=15 and regular + isometric exercises (RIE) n=15, making a total of four groups of 15 patients. All groups had to perform active strength, range of motion and stretching exercises for lower limbs (~30 minutes) once a day for two weeks, while RIE groups also had to perform isometric exercises for hip muscles (up to 10 minutes) 2 times a day for the same period of time. Methods. Outcome measures were assessed at baseline and after 2 weeks, it included KOOS, JR. and HOOS, JR. questionnaires to determine joint function (2), while balance was evaluated via Tinetti test. For joint function two criteria will be presented, that was included in both KOOS, JR. and HOOS, JR. questionnaires and also happen to have the most statistically significant difference from baseline to follow up. Statistical analysis was performed using IBM SPSS Statistics 29. Mann-Whitney U test was used to compare changes in both joint function and balance between RE and RIE groups as well as hip and knee respectable groups after two weeks. The significance level was set to 0,05, joint function results were written as median (Xme), minimum value (Xmin), and maximum value (Xmax) – Xme (Xmin-Xmax) in all groups, while balance results were written as mean (m), minimum value (Xmin), and maximum value (Xmax) – m (Xmin-Xmax) in all groups.

Results. After two weeks of following an exercise program, changes in joint function and balance were found in all 4 groups. Pain going up or down stairs in knee RIE group decreased from 3 (2-5) points at baseline to 2 (1-2) after two weeks ($Z=8.411$; $p<0.001$). Same parameter in knee RE group decreased from 3 (2-5) points at baseline to 2 (1-4) after two weeks ($Z=6.955$; $p<0.001$). Pain going up or down stairs in hip RIE group decreased from 3 (2-5) points at baseline to 2 (1-3) after two weeks ($Z=13.229$; $p<0.001$). Same parameter in hip RE group decreased from 3 (2-3) points at baseline to 2 (1-2) after two weeks ($Z=9.025$; $p<0.001$). Function of bending down to pick up an object in knee RIE group decreased from 3 (2-4) points at baseline to 1 (1-2) after two weeks ($Z=10.693$; $p<0.001$). Same parameter in knee RE group decreased from 2 (1-4) points at baseline to 1 (1-3) after two weeks ($Z=5.245$; $p<0.001$). Function of bending down to pick up an object in hip RIE group decreased from 2 (2-5) points at baseline to 1 (1-3) after two weeks ($Z=8.367$; $p<0.001$). Same parameter in hip RE group decreased from 2 (1-3) points at baseline to 1 (1-2) after two weeks ($Z=9.539$; $p<0.001$). Tinetti score in knee RIE group increased from 12 (7-18) points at baseline to 20.8 (18-24) after two weeks ($Z=10.689$, $p<0.001$). The score in knee RE group increased from 13.33 (8-16) points at baseline to 19.27 (14-22) after two weeks ($Z=6.892$, $p<0.001$). Tinetti score in hip RIE group increased from 12.4 (6-20) points at baseline to 19.07 (15-22) after two weeks ($Z=7.343$, $p<0.001$). The score in hip RE group increased from 14.67 (11-18) points at baseline to 19.6 (15-22) after two weeks ($Z=7.266$, $p<0.001$). Via Tinetti Assessment Tool description, patients who score below 19 are at high risk for falls. At a baseline there was a high risk for falls in all 4 groups, while at the follow up all 4 groups were at an average risk (19-24), and the most improved being knee and hip RIE groups.

Conclusions. Isometric exercise program as well as regular active strength, range of motion and stretching exercises improved joint function and balance in both knee and hip joint groups. At the follow up there were no significant differences between RE and RIE groups as the majority of parameters improved equally, although specific Tinetti test parameters like standing up, standing nudged, indication of gait and trunk control were better in RIE groups at the follow up.

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ASSESSMENT OF THE ELECTRICAL ACTIVITY OF TRUNK MUSCLES DURING THE EXERCISE WITH DIFFERENT BREATHING TECHNIQUES

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Introduction. As the intensity of physical activity increases, so does the body's demand for oxygen, which is needed to release energy from glucose (1). That's why focusing on breathing during physical activity is important. Breathing exercises, separate from physical or other exercises, can reduce back pain (2), improve trunk stability and fitness (3). Breathing exercises are often combined with movements of the limbs or trunk, such as “Plank”, elbow-leg or postural stability exercises. Combining exercises can have a synergistic effect, as the respiratory muscles are involved in both breathing and postural control (3). The aim of the research was to assess the electrical activity of trunk muscles during the exercise with different breathing techniques.

Research methods and organization. The study was approved by the Lithuanian University of Health Sciences Bioethics center (BEC-SR(M)-107) and took place at the Department of Sports Medicine. The study was carried out from July to October of 2023. Inclusion criteria: age 18-30; physically active (doing physical activity at least 3 times a week), no complaints of musculoskeletal or other pain, no acute lung, respiratory or related diseases. Consent forms were signed before taking part in the study. 20 individuals participated in the study (10 females, 10 males). The average age of participants was 22.25 ± 2.0 and the body mass index - 23.01 ± 2.32 kg/m². Methods used in the study: questionnaire survey, the short form of international physical activity questionnaire (IPAQ-S), electromyography, maximal voluntary muscle contraction testing. The electrical activity of the trunk muscles was recorded with a four-channel electromyograph Noraxon Myotrace 500. Noraxon Ag/AgCl disposable double electrodes were used to record EMG data. Before applying the electrodes, the skin was cleaned with an alcohol-based disinfectant. The study investigated three breathing techniques (ordinary, nasal diaphragmatic and pursed lips breathing) during four exercises (static and dynamic versions of the “Plank” and “Dead bug”). A total of 10 breathing cycles per exercise. Each cycle consisted of a 2-second inhalation and a 4-second exhalation. The electrical activity of four muscles was recorded during the study: musculus rectus abdominis (RA), musculus rector spinae (ES), musculus obliquus abdominis externus (OAE) and musculus obliquus abdominis internus (OAI). The muscle electrical activity was compared between static and dynamic exercise. Statistical analysis was performed with IBM SPSS Statistics 29 and Microsoft Excel software. Due to the small study size, nonparametric statistics were used. The Wilcoxon (Z) criterion was used for dependent samples. The difference was considered statistically significant when $p < 0.05$.

Results. The electrical activity of the ES muscle in the exhalation phase was found to be higher in the dynamic “Plank” exercise than in the static “Plank” exercise when breathing through the pursed lips ($Z = -2.053$; $p = 0.04$). Meanwhile, no statistically significant difference was found while breathing with other breathing techniques during the static and the dynamic exercise “Plank” ($p > 0.05$). The electrical activity of the OAI muscle was found to be higher in the static “Dead bug” exercise than in the dynamic “Dead bug” exercise during both breathing phases of the ordinary breathing: inhalation ($Z = -2.427$; $p = 0.014$) and exhalation ($Z = -2.352$; $p = 0.017$). The results showed that the electrical activity of the RA muscle during expiratory phase of the ordinary breathing was higher in the static than in the dynamic “Dead bug” exercise ($Z = -2.165$; $p = 0.03$). The RA muscle activity was also higher during static “Dead bug” exercise in both breathing phases while breathing through the diaphragm: inhalation ($Z = -2.912$; $p = 0.002$) and exhalation ($Z = -3.136$; $p < 0.001$). Respectively with the electrical activity of the OAE muscle: inhalation ($Z = -2.539$; $p = 0.009$) and exhalation ($Z = -2.427$; $p = 0.014$). Similar results were observed when comparing the electrical activity of the RA muscle during the same exercises but

only breathing through the pursed lips: inhalation ($Z=-3.061$; $p=0.001$) and exhalation ($Z=-3.659$; $p<0.001$).

Conclusions. The study found that ordinary, nasal diaphragmatic and pursed lips breathing showed differences in the electrical activity of the trunk muscles depending on the exercise and breathing phase. The electrical activity of the abdominal muscles was higher during the static "Dead bug" exercise when breathing with different breathing techniques during inhalation and exhalation. Electrical activity in the back muscle was higher during the dynamic "Plank" exercise during exhalation through pursed lips.

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EFFECTS OF OBESITY WITH AND WITHOUT EXERCISE TRAINING ON THE FUNCTIONAL PROPERTIES OF ISOLATED MOUSE HINDLIMB MUSCLES

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Introduction. Obesity causes deterioration in health and function of many tissues through multiple mechanisms including inflammation and fibrosis (1). However, force generation of locomotory muscles may also improve due to increased weight-bearing functional overload (2). The aim of this study was to identify effects of obesity on the contractility of mouse hindlimb muscles and determine whether observed effects are modified with exercise training.

Research methods and organization. All procedures involving mice were approved by the Lithuanian State Food and Veterinary Service (No. G2-255). Adult male C57BL/6J mice were divided into three groups: control (CON), obese (OB) and obese subjected to exercise (OB-EX) ($n=8$ each). Both obese groups were ~70% heavier than CON due to the feeding obesogenic high-fat diet throughout the study. OB-EX also underwent standardized 30 min daily training regimen on treadmill 5 times/week for 6 weeks while CON and OB were left sedentary during that time. After training, mice were sacrificed and slow-twitch soleus (SOL) and fast-twitch extensor digitorum longus (EDL) muscles were isolated for ex vivo contractility assessments (1200A-LR Muscle Test System, Aurora Scientific Inc., Canada). Group means were compared using the one-way ANOVA with Bonferroni post-hoc tests. Statistical significance was considered when $p<0.05$.

Results. Exercise had no effect on body mass of OB-EX compared to OB. Peak tetanic force of SOL and EDL was induced at 80Hz and 100Hz frequency stimulation, respectively, and did not significantly differ between the groups at any point on the force-frequency curve. Force normalized to muscle mass did not differ between groups either. While no differences were observed in contraction and relaxation time of EDL between groups, obesity led to a shortened twitch half-relaxation time in SOL muscles of OB compared to CON (136 ± 30 vs. 218 ± 86 ms, $p<0.05$), and OB-EX was intermediate (170 ± 40 ms, $p>0.05$).

Conclusions. Obesity does not affect the force generation capacity of isolated mouse SOL and EDL muscles. However, it does alter SOL contractility, leading to faster relaxation. Exercise training during obesity does not impact contractility parameters of these muscles.

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THE RELATIONSHIP BETWEEN QUALITY OF FUNCTIONAL MOVEMENTS, LOWER EXTREMITY EXPLOSIVE POWER AND NON-CONTACT INJURIES OF YOUTH FOOTBALL PLAYERS

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Introduction. Puberty-related injuries tied to maturation pace, affecting muscle strength, flexibility, and bone development, heightening specific risks. Movement dysfunction involved abnormal muscle and joint movements (1). Functional movement traits were crucial for injury risk and talent selection in youth football (2). Increased lower limb strength reduced injuries, emphasizing the importance of measuring lower extremity explosive power (3). The aim of this research was to evaluate the relationships between physical parameters such as functional movement screening, lower limb explosive power and non-contact injuries of youth football players during the half of the season.

Research methods and organization. From January to July, 40 male football players, aged 13-15, participated from the Vilnius Football Academy. Parental permissions to participate and Application For Research Approval by Bioethics Centre were obtained. Analysis of Functional Movement Screening (FMS) and lower limb explosive power measuring (Countermovement Jump (CMJ)) was conducted. FMS was according to seven fundamental movement patterns: the deep squat, hurdle step, in-line lunge, shoulder mobility, active straight leg raise, push-up, and rotary stability. Three repetitions of each screen were completed. Whose total score was 21-15 points had a low risk of injury, 8-14 points indicated a moderate risk, and <7-high risk (4). During the CMJ, participants maintained their trunk in an upright posture. Players performed the two measured attempts. Players who did not achieve a 35.1 cm height during the jump were associated with an increased risk factor for injury. Furthermore, injuries were monitored throughout the half of the football season. FMS measurements were conducted at the beginning of the study period, while CMJ – once per every month during the study period. Lower limb injuries were classified into acute and chronic injuries. Statistical data analysis was conducted using IBM SPSS 29.0. Data were presented as median, minimum value, maximum value, and arithmetic mean. The correlation was calculated using the Shapiro-Wilk test to determine the distribution of the data according to the normal distribution. For data that met the normality condition, correlation coefficients between variables were calculated using the Pearson test; for those that did not meet the normality conditions, the Spearman test was applied. The obtained correlation coefficient was considered statistically significant when $p < 0.05$. Correlation was assessed using correlation coefficient (r) values: $r=0$ - no correlation; $r=0 - 0.2$ - very weak; $r=0.21 - 0.5$ - weak; $r=0.51 - 0.7$ - moderate; $r=0.71 - 0.9$ - strong; $r=1$ - very strong.

Results. During the first half of the football season, the team encountered a total of 46 lower-body injuries, consisting of 15 acute non-contact injuries and 31 chronic injuries. Among the acute injuries, ankle sprains were the most prevalent, accounting for 8 cases, followed by muscle strains with 7 cases. Chronic injuries predominantly included Osgood-Schlatter Disease with 15 cases, Sever's Disease with 9 cases, and Anterior Superior/Inferior Iliac Spine Apophysitis with 5 cases, and 2 cases of stress fractures. The Functional Movement Screening test result for the young footballer was 15(8-18;14.4). 22 players scored more than 15 points in total and had a low risk of injury, while 18 players scored 8-14 points in total and had a moderate risk of injury. The lower limb explosive power result during the Countermovement Jump test was 35.75(26.6-39.7;35.65) cm. 7 players did not reach the 35.1 cm threshold and were at risk of injury, while

33 players reached the threshold and did not have an increased risk of injury. After calculating the correlation between the results of the FMS test and the frequency of chronic injuries during the half of season, a statistically significant weak correlation ($r=0.346$; $p<0.05$) was found. Also, statistically significant relationships were identified between lower limb explosive power and the risk of chronic injuries. The correlation between them was weak ($r=0.363$, $p<0.05$). Furthermore, a reliable correlation between CMJ results and acute injuries was found ($r=0.389$, $p<0.05$). No statistically significant correlation was found between FMS and acute injuries.

Conclusions. The study found that the quality of functional movements assessed by Functional Movement Screen tests was associated with non-contact chronic injuries among youth football players during the half of the season. Countermovement Jump results were related to non-contact chronic and acute injuries among youth football players during the half of the season.

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THE EFFECT OF DIFFERENT PHYSIOTHERAPY PROGRAMS ON CHRONIC NON-SPECIFIC LOWER BACK PAIN, FUNCTION AND QUALITY OF LIFE IN SEDENTARY WORKERS

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Introduction. One in ten people experiences lower back pain (LBP) at any given point in time worldwide, with a lifetime prevalence of 80-85%, affecting people of all ages from children to adults [1]. It is a major issue which causes work productivity loss, disability and clinical challenges [2]. Manual therapy, core stabilization and myofascial release techniques are proven to be effective methods used by physiotherapists to treat chronic lower back pain [3]. However, it is unknown which methods are the most effective in treating LBP.

Research methods and organization. All participants ($n=60$) were randomly separated to 2 groups: experimental (EG) and control group (CG). The subject age ranged from 18-64 years. All of the participants were sedentary workers. Duration of the intervention was 4 weeks, 5 times a week, total of 20 sessions. First group was the joint mobilization and core stabilization group (EG, $n=30$), second group was the myofascial release and core stabilization group (CG, $n=30$). Subjects pain perception was measured using a visual analog scale (VAS), quality of life was measured by the SF-36 survey, back muscle endurance was tested using ITO test while abdominal muscle endurance was tested by Kraus-Webber test, lumbar spine mobility was examined using Schober test and functional disability was assessed using the Oswestry questionnaire. Statistical data analysis was performed using IBM SPSS 22.0. Wilcoxon test was used to analyze dependent samples, while Mann-Whitney-Wilcoxon test was used to compare independent samples. Significance was set at $p<0.05$.

Results. After the intervention all mean values were calculated, pain values in EG decreased by 3.48 ($p<0.05$) and CG 3.28 ($p<0.05$) points, pain values decreased by 0.2 points more in EG than in CG ($p>0.05$); disability scores in EG decreased by 43% ($p<0.05$) and 36% in CG ($p<0.05$), disability values decreased 7% more in the EG than in CG ($p>0.05$); quality of life increased by 19.1 points in EG ($p<0.05$) and 16.1 in CG ($p<0.05$), quality of life values increased 3 points more in EG than in CG ($p>0.05$); back muscle endurance increased in EG by 16.6 s ($p<0.05$) and

in CG 13.1 s ($p < 0.05$), endurance increase in EG was 3.5s longer than in CG ($p > 0.05$); abdominal muscle endurance increased in EG by 12.8s ($p < 0.05$) and 10.5 s ($p < 0.05$) in CG, endurance increase in EG was 2.3s longer than in CG ($p > 0.05$); spine mobility increased by 1.7cm ($p < 0.05$) in EG and 1.4cm ($p < 0.05$) in CG, mobility increase in EG was 0.3s longer than in CG ($p > 0.05$).

Conclusions. Both physiotherapy programs showed positive effect on LBP, function and quality of life.

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PARENTS' VIEWS ON USING VIDEO MODELING TO FOSTER INDEPENDENCE IN CHILDREN WITH AUTISM

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Introduction. In recent decades, there has been an increasing number of children with autism cases recorded in Lithuania, Europe, and worldwide [1]. The aim of this qualitative research was to explore parents' views on the use of video modeling to cultivate independence skills in children with autism. Limited independence skills in autistic children create a heavier caregiver burden, posing a significant challenge [2]. Identifying methods to enhance independence in individuals with autism is vital, as it relieves caregiver burden and enables resources to be redirected to other critical needs. Video modeling emerges as a promising technique in teaching essential skills to individuals with autism [3].

Research methods and organization. Authorization for the research was granted by the LSMU Bioethics Center under reference number 2023-BEC2-099. The study utilized purposive sampling. At the start of the research period, efforts were made to contact families receiving occupational therapy services at the institution, as well as to reach out to families who had previously received services to share their experiences. Simultaneously, an analysis was conducted to ensure that all families met the selection criteria. Participants had to meet specific criteria: 1. The child has been diagnosed with autism; 2. Parental consent to participate in the study; 3. The use of video modelling during occupational therapy to develop independence skills. The study took place from June to October 2023 at the "Augu pozityviai" nonprofit organization in Vilnius. A qualitative descriptive research method was employed, utilizing semi-structured interviews with pre-planned open-ended questions. Nine mothers raising children with autism participated in the study ($n=9$). Age of mothers participating in the study is undefined. After studying the literature and defining the selection criteria, we set interview questions. The survey collected information from respondents on the socio-demographics of the families participating in the study. The average age of children with autism was 3.5 years, and the diagnosis was made within a two-year period. The specific research questions guiding this study were: What challenges related to independence skills does your child encounter? Can you share the benefits and drawbacks your family experienced using video modeling? How did your child respond to viewing and adapting to the visual materials? Would your family find this method of teaching independence skills agreeable? Interviews were recorded using a mobile phone and subsequently transcribed into a Word

document for analysis. To ensure the confidentiality of the participants, responses were anonymized using a coding system (T1, T2, T3).

Results. Through the analysis of parental feedback, four principal themes emerged: "Independence Skills," "Pros and Cons of Video Modeling," "Adapting Visual Materials," and "Family Acceptance of Teaching Methods." Parents identified several challenges in independence skills, including difficulties with hygiene, choosing tasks, sustaining attention during daily activities, preparation, and sensory perception issues in their children with autism. They recognized that video modeling's primary benefit lies in its visual nature, which enables children to more rapidly understand and plan actions. Nonetheless, a significant drawback is the difference between the environments depicted in the videos and their homes, which hampers children's ability to transfer learned skills due to a lack of generalization. Sensory sensitivities were also highlighted, with certain video sounds causing discomfort for one children. Regarding the adaptation of visual materials, responses varied, with a smaller proportion of children showing minimal interest in watching the videos at home, and a larger proportion showing more engagement. The acceptance of video modeling as a method for teaching independence skills elicited mixed reactions. While four parents appreciated it for aligning with their child's visual learning preferences and assisting parents who might lack teaching expertise, one parent was skeptical due to issues such as language comprehension. Among the participants, four embraced this method for its potential to foster engagement and support parental guidance. In contrast, one parent did not find it applicable due to their child's adept comprehension skills, and another cited their child's struggle with language understanding as a hindrance.

Conclusions. Children with autism encounter independence challenges in hygiene, task selectivity and sensory perception. Visual modeling enhances children's understanding of the material being presented but presents challenges in applying skills across environments. Disadvantages include lack of interest and language comprehension issues. Despite its benefits for children's visual skills and parental assistance, some consider video modeling ineffective due to comprehension challenges.

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EFFECTS OF DIFFERENT EXERCISE PROGRAMS ON PAIN INTENSITY, DISABILITY AND FUNCTIONAL STATUS IN SUBJECTS WITH LOW BACK PAIN

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Introduction. Exercise training for low back pain has collectively been shown to be effective in reducing pain [1]. Core stabilization exercises, based on the motor learning approach, emphasize the co-activation of the transversus abdominis and lumbar multifidus muscles. These deep stabilization muscles attach to the thoracolumbar fascia, create a stiffening effect in the lumbar spine by increasing intra-abdominal pressure, and provide segmental stability to the spine [2]. Hamstring shortening may cause reduction in muscle strength, quadriceps muscle dysfunction and posture derangement leading to hyper-lordosis [3]. Research aim to evaluate the effects of spine stabilization and stretching exercises on low back pain, disability and functional status.

Research methods and organization. A total of 60 patients with chronic low back pain participated in the study. The subjects ranged in age from 18 to 55 years. The duration of the intervention was 4 weeks, 5 times a week, total of 20 physiotherapy sessions. The subjects were randomly divided into two groups: experimental (EG) (n=30) and control (CG) (n=30). The experimental group performed static stretching exercises and lower back stabilization exercises. The control group only performed lower back stabilization exercises. The following tests were administered at the beginning of the study and after 4 weeks. The subjects' back muscle endurance was assessed with the ITO test, abdominal muscle endurance tested with the Kraus-Webber test, lumbar spine mobility examined with the Schober test, pain intensity was tested with the numerical analogy scale (VAS), functional disability was assessed by the Oswestry Questionnaire, self-reported questionnaire that quantifies fear of movement was tested by Tampa Scale of Kinesiophobia and quality of life was measured by SF-36 survey. Statistical data analysis was performed using IBM SPSS 22.0. Due to the variables' non-normality, the Mann-Whitney-Wilcoxon test was used to compare independent samples, and the Wilcoxon test analyzed dependent ones. Significance was set at $p < 0.05$.

Results. After the intervention, pain decreased by 4 points in the EG ($p < 0.05$) and 3.4 points in the CG ($p < 0.05$), pain decreased by 0.6 points in the EG more than the CG ($p > 0.05$); disability decreased by 70% in the EG ($p < 0.05$) and 50% in the CG ($p < 0.05$), disability decreased by 20% in the EG more than the CG ($p < 0.05$); fear of movement decreased by 13.4 points in the EG ($p > 0.05$) and 10.9 points in the CG ($p > 0.05$), fear of movement decreased by 2.5 points in the EG more than the CG ($p > 0.05$); spinal mobility increased by 2.04 cm in the EG ($p < 0.05$) and 0.62 cm in the CG ($p < 0.05$), spinal mobility increased by 1.42 cm in the EG more than the CG ($p < 0.05$); back muscle endurance increased by 29.1 s in the EG ($p > 0.05$) and 29 s in the CG ($p > 0.05$), back muscle endurance increased by 0.1 s in the EG more than the CG ($p > 0.05$); abdominal muscle endurance increased by 33 s in the EG ($p > 0.05$) and 30 s in the CG ($p > 0.05$), abdominal muscle endurance increased by 3 s in the EG more than the CG ($p > 0.05$); quality of life improved by 16.8 points in the EG ($p < 0.05$) and 10.6 points in the CG ($p < 0.05$), quality of life improved by 6.2 points in the EG more than the CG ($p < 0.05$).

Conclusions. Lower back stabilization and static stretching exercises have reduced disability, improved spinal mobility and quality of life.

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ASSOCIATIONS OF LOW BACK PAIN AND FUNCTIONAL INDICATORS WITH CHANGES IN THE LONGITUDINAL ARCH OF THE FOOT IN YOUNG PERSONS

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Introduction. Introduction. Low back pain (LBP) is a more common musculoskeletal disorder. (1) Biomechanical disturbances are widely believed to be the likely cause of LBP due to changes in the soft tissue structure around the spine. (2) Structural changes in the longitudinal arch of the foot result in changes in loading along the midfoot and plantar arch, resulting in altered biomechanics of the ankle, knee, hip, and spine. Compensatory movements in the lower

structures put too much stress on the lumbar and pelvic region, which leads to the development of LBP (3) The aim. To assess the correlations between low back pain and functional indicators of young people with changes in the longitudinal arch of the foot.

Research methods and organization. Research methods and organization. There were 64 subjects in the study, of which 37 (57.8%) were men and 27 (42.2%) were women. The age of the subjects was 30 (18-38; 29) years. The study was conducted at Kaunas city polyclinic, Šilainiai branch, FMR department. The total duration of the study is 14 months. Selection criteria: persons with and without foot arch changes; persons experiencing back pain. (more than 3 months); persons without pathological changes in the lower part of the spine (scoliosis, disc herniation); the absence of the main disease (rheumatoid arthritis, malignant tumor) or other CNS diseases that may affect back pain; participating persons who voluntarily agreed to be included in the study after the purpose and methods of the study were explained to them and they agreed to participate in the study in writing. The Mathiass test was used to assess the stability of the spine, the Schober test was used to assess the mobility of the spine, the McGill test was used to assess the static endurance of the trunk muscles, the visual analogue pain scale (VAS), the plantogram was used to assess the longitudinal arch of the foot, and the Oswestry functional disabilities were used to assess the condition of the functional index. The research results were evaluated using the IBM SPSS program. The Shapiro-Wilk test was used to test the normality assumption of the quantitative data. The Mann-Whitney test was applied to two independent samples, and the Kruskal-Wallis test to three independent samples. Qualitative data are presented as relative frequencies (n) and percentages (%). The Chi-squared (χ^2) criterion was used to determine the equality of proportions. Spearman's test was used for correlation analysis. Significance level $\alpha=0.05$.

Results. Of all the participants in the study, 32 (50%) had changes in the inner longitudinal arch of the foot, of which 6 (18.8) had a convex foot and 26 (81.2%) had flat feet, while 32 (50%) had no changes. . When assessing the relationship between lumbar mobility, trunk muscle endurance and low back pain, a statistically significant direct weak correlation was found between Schober and McGill test (abdominal/back) results ($r=0.33$; $p=0.008$). Subjects with better mobility showed better abdominal-back muscle endurance. A statistically significant inverse relationship of moderate strength was found between the results of the Shoher test and pain in the lower back ($r=-0.445$; $p<0.001$) - the greater the pain of the subjects, the lower the mobility of the lower back and vice versa. No significant correlations were found between the ratings of the inner longitudinal arch of the foot and other indicators. In subjects without arch changes, there was a statistically significant inverse correlation of moderate strength between Shoher and McGill test (lateral) results ($r=-0.405$; $p=0.022$). In subjects without foot arch changes, the results of the McGill abdominal/back test were correlated with the results of the McGill lateral trunk muscle test and with pain - a statistically significant inverse relationship of moderate strength ($r=-0.478$, $p=0.006$), and between the results of the McGill abdominal/back test and pain - statistically significant inverse weak relationship ($r=-0.376$, $p=0.034$). Lower back pain was significantly related to McGill test results of the lateral trunk muscles ($r=0.408$; $p=0.021$). When assessing the relationship between lumbar mobility, trunk muscle endurance and low back pain in subjects with foot arch changes, a statistically significant inverse moderate correlation was found between Schober test results and low back pain ($r=-0.575$; $p=0.001$). No more statistically significant associations were found in the exploratory test results for those with foot arch changes.

Conclusions. The results of this review show that in individuals complaining of low back pain, trunk functional indicators are not statistically significantly related to foot condition and pain. However, changes in the internal longitudinal arch can affect the mobility of the lower back and decrease the endurance of the abdominal-back muscles. Further investigation and refinement of the findings of this study is recommended before firm clinical associations can be established.

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THE EFFECT OF AEROBIC EXERCISE ON THE QUALITY OF LIFE IN TYPE 2 DIABETES MELLITUS

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Introduction. Diabetes mellitus is a chronic metabolic disease clinically manifested by chronic hyperglycemia, and other symptoms commonly associated with abnormal effects of pancreatic β -cell biology on insulin action [1,2]. The most common type is type 2 diabetes (T2DM), which accounts for 90% of all cases of diabetes. Research indicates that the quality of life (QoL) of a person with T2DM is lower due to diabetes-related complications, premature mortality, neglect of risk factors, especially low physical activity [3,4]. Engagement in physical activity is effective in improving QoL and healthy life expectancy in the management and treatment of T2DM [5]. The aim of this study was to assess the effect of aerobic exercise on the QoL of patients with T2DM.

Research methods and organization. The study was conducted between March 2023 and November 2023 at UAB “SG Klinika“ in Klaipėda. Approval for the study was obtained from the Lithuanian University of Health Sciences Bioethics Center (BEC-SR(M)-131). The recruitment was done by informing patients visiting the institution. Inclusion criteria were as follows: has T2DM ≥ 5 years; age between 18-65 years; no co-morbidities. Participants (n=80) were divided into two exposure groups: intervention group (n=40; 28 women, 12 men, with an average age of 52.03(\pm 10.1) years) and no-exercise control group (n=40; 26 women, 14 men, with an average age of 52.05(\pm 8.69) years). Allocation was performed using a clinical trial randomization tool. All of the participants were given the World Health Organization QoL Brief Form (WHOQOL-BREF) to assess their QoL at the beginning and end of the study. The intervention group had to follow a standardized physiotherapy program for 12 weeks, which included moderate intensity aerobic exercises: exercise for the first 4 weeks 3 times/week during 45 minutes/session; then for 4 weeks exercise 4 times/week during 45 minutes/session; for the last 4 weeks exercise 3 times/week during 60 minutes/session. Participants had the option to perform exercises either in-person or remote via “Zoom” with the supervision of a physiotherapist. Moderate intensity exercises level (50-70% of maximum heart rate) was monitored using the Karvonen formula. Statistical analysis was performed using IBM SPSS 29 Statistics. The Shapiro-Wilk test was used for assumption of normality (n<50). The quantitative data that satisfied the assumption of normality are presented as the arithmetic mean (m) and standard deviation (SD) - m(\pm SD). The Wilcoxon test was calculated to compare two dependent samples, Mann-Whitney U test to compare two independent samples. χ^2 criteria was applied to qualitative data analysis. Correlation was estimated using Spearman's correlation coefficient (r). The significance was set at p<0.05.

Results. The average duration of T2DM in the intervention group was 6.2(\pm 1.51) years, and in the no-exercise control group was 6.33(\pm 1.47) years. When evaluating the domains of the WHOQOL-BREF questionnaire of the intervention group, statistically significant improvements were found in all of them: improved physical health (Z=4.8; p<0.001), psychological health (Z=4.271; p<0.001), social relationships (Z=4.002; p<0.001), environment (Z=3.656; p<0.001).

No statistically significant improvements in QoL domains were observed in the no-exercise control group: physical health ($Z=0.396$; $p=0.692$), psychological health ($Z=0$; $p=1.0$), social relationships ($Z=0.317$; $p=0.752$), environment ($Z=1.084$; $p=0.279$). When comparing the results of the no-exercise control group at the beginning and at the end of the study in overall QoL, no statistically significant difference was observed. A statistically significant, direct, moderate relationship between physical and psychological health was established ($r=0.601$; $p<0.001$). A statistically significant, direct, low relationship was established between physical health and social relationships ($r=0.343$; $p=0.002$). A statistically significant, direct, low relationship was established between psychological health and social relationships ($r=0.385$; $p<0.001$). No relationship was established between psychological health and the environment ($r=0.223$; $p=0.47$). No relationship was established between social relations and the environment ($r=0.276$; $p=0.13$).

Conclusions. Our study results confirmed the hypothesis that 12 weeks of aerobic exercise program significantly improves the overall quality of life, including physical and psychological health, in patients with type 2 diabetes mellitus. According to that, we can say that moderate intensity aerobic exercise can be recommended to improve the quality of life of individuals with type 2 diabetes mellitus.

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THE EFFECT OF DYNAMIC NEUROMUSCULAR STABILIZATION ON THE FUNCTIONAL STATUS OF THORACIC AND TRUNK MUSCLES IN WOMEN AFTER PREGNANCY WITH DIASTASIS OF RECTUS ABDOMINIS MUSCLES

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Introduction. One of the main problems after pregnancy is diastasis of the rectus abdominis muscles (DRA) (1). DRA can lead to changes in abdominal muscle function, pelvic floor muscle dysfunctions such as incontinence and pelvic organ prolapse, and lower back pain (2). These days, a neuromuscular technique widely used by physiotherapists is Dynamic Neuromuscular Stabilisation (DNS) (3). DNS helps to restore ideal muscle coordination of the integrated stabilisation system by promoting a whole-body, global, motor pattern necessary to maintain posture and control spinal stability (4). Aim: To assess the effect of DNS on the functional status of the thoracic and trunk muscles in women after pregnancy with diastasis of rectus abdominis muscles.

Research methods and organization. The study was performed during the period of 01/11/2023 to 28/02/2024 at Healthy Movement Studio "Motus" in Kaunas. The study was approved by the Lithuanian University of Health Sciences Bioethics Center (No. BEC-SR(M)-112). There were

30 subjects (women after pregnancy). Inclusion criteria: age 30-50 years; body mass index no greater than 30; women no more than two months postpartum; women up to a year/two years post-pregnancy; and written informed consent to participate. Age of subjects was 31(28,75-33,25; 31,2) years. DNS method has been applied to women after pregnancy personally in this study. The test is carried out over 4 weeks. DNS functional positions were applied three times a week. Duration of one session – 30 min. Subjects were evaluated on the first day before applying the functional positions of DNS and on the last day after the application of these functional positions. Functional indicators have been evaluated: chest excursion measurement (centimeters at 2-3, 7-8, 9-12 ribs); McGill's (2007) static endurance assessment of back and abdominal muscles (results are expressed in seconds); Assessment of the rectus abdominis muscles diastasis (measured by the number of fingers (cm) that sink into the rectus abdominis muscle gap). Statistical analysis was performed using the IBM SPSS Statistics 29.0 software package. Statistical methods have been used in research: 1. Wilcoxon criteria. The data are presented as median (xme), minimum (xmin), maximum (xmax) value, and mean (\bar{x}) – xme (xmin - xmax; \bar{x}). The quantitative data that satisfied the assumption of normality are presented as the arithmetic mean (m) and the standard deviation (SD) – m(SD). The difference has been considered statistically significant when $p < 0,05$.

Results. Before treatment, chest excursion at the 2-3 ribs max inspiration was 86(81,25-91,25; 85,96)cm, after DNS 91,5(86,75-96; 90,96)cm, improved by 5,5cm, max exhalation was 80(74,5-85,25; 79,90)cm, after DNS 80(74,5-85,25; 79,90)cm, improved by 0 cm. Chest excursion at the 2-3 ribs statistically significantly changed ($Z = -4,797$; $p < 0,001$). Chest excursion at the 7-8 ribs max inspiration was 81(75,75-84; 80,50)cm, after DNS 86(79-89; 84,3)cm, improved by 5 cm, max exhalation was 75(72,5-79,25; 75,43)cm, after DNS 79,5(74,75-82; 78,46)cm, improved by 4,5 cm. Chest excursion at the 7-8 ribs statistically significantly changed (at the $Z = -4,795$; $p < 0,001$). Chest excursion at the 11-12 ribs max inspiration was 79(73,75-1,25; 77,86)cm, after DNS 80(74,75-84,25; 79,56)cm, improved by 1cm, max exhalation was 75(69,75-77; 74)cm, after DNS 76(72-80; 75,5)cm, improved by 1 cm. Chest excursion at the 11-12 ribs statistically significantly changed (at the $Z = -4,795$; $p < 0,001$). Before DNS, abdominal static endurance was 68,5(54-79,25; 70) seconds, after DNS was 91(69,75-99; 92,59) seconds. Abdominal static endurance statistically significantly changed (at the $Z = -4,079$; $p < 0,001$). Before DNS, back static endurance was 52,5(33-69,5; 56,4) seconds, after DNS was 74(63-91; 81,2) seconds. Abdominal static endurance statistically significantly changed (at the $Z = -4,784$; $p < 0,001$). Before DNS, assessment of TPR above the umbilicus was 2(1,5-3; 2,25)cm, after DNS was 1,25(1-2; 1,38)cm. Results statistically significantly changed ($Z = -4,671$; $p < 0,001$). Before DNS, assessment of TPR at the umbilicus was 2(1,5-3; 2,06)cm, after DNS was 1(1-1,62; 1,16). Assessment statistically significantly changed ($Z = -4,021$; $p < 0,001$). Before DNS, assessment of TPR after the umbilical was 2(1,5-2,5; 2,01)cm, after DNS was 1(1-1,62; 1,16). Results statistically significantly changed ($Z = -4,435$; $p < 0,001$).

Conclusions. The study showed that DNS functional positions applied during dynamic neuromuscular stabilization is useful and has a positive effect: improved the upper, middle and lower chest excursion, Static endurance of back and abdominal muscles improves and reduces the diastasis of rectus abdominis muscles diastasis.

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SELF-EFFICACY OF PEDIATRIC REHABILITATION SPECIALISTS ON PRIORITIES OF REHABILITATION PROGRAMS

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Introduction. Family-centred service (FCS) is widely recommended as best practice. The approach is based on: mutual partnership and cooperation, recognition of parents as the best experts for their child, information sharing among all involved and active participation of the child (1). To be effective, the FCS requires a structured evaluation of service provision using valid and reliable assessment tools (2). Self-efficacy is an important provider characteristic and influences clinical behaviour in order to identify challenges, modify methodologies and ensure the effective delivery of rehabilitation programmes for better outcomes (3). The aim was to investigate the self - efficacy of child rehabilitation professionals in family-centred therapy.

Research methods and organization. This study was approved by the Bioethics Centre of the Lithuanian University of Health Sciences on 28 June 2023 (No BEC2-172). The study was carried out in Lithuania from 9 September 2023 to 2 February 2024 using a quantitative approach, using a one-off, online anonymous survey. The survey questionnaire was sent to children's rehabilitation facilities and to the emails and personal social accounts of children's therapists working in the private sector. After completing the questionnaire on the @survey website, the service provider sends the completed answers to the researcher electronically. A total of 87 questionnaires were collected, including 33 from the public sector and 54 from the private sector, from physiotherapists, occupational therapists, speech therapists, psychologists and social workers in the cities of Vilnius, Kaunas, Marijampole, Šiauliai, Tauragė, Alytus, Klaipėda and Palanga. The MPOC-SP (Measure of Processes of Care for Service Providers) questionnaire (4), translated into Lithuanian by the "CanChild" Children's Disability Research Centre, was used. This tool consists of 27 items on four scales, each reflecting an aspect of family-centred service: Interpersonal Sensitivity Indication (SIS) with a maximum score of 70 on this scale, Respectful Treatment of People (TPR) with a maximum score of 63 on this scale, Communication of Specific Information (CSI) with a maximum score of 21 on this scale, and Provision of General Information (PGI) with a maximum score of 35 on this scale. Responses from service providers were requested on a 7-point scale ranging from "7 - very often" to "1 - not at all", with a score of "0" indicating "not applicable". Statistical analysis was carried out using IBM SPSS Statistics 29.01. The scores for each scale were determined and presented by calculating the mean (\bar{x}) and 95% confidence interval (CI) of the item scores.

Results. It was found that the mean of SIS estimate was 35.74 (95% CI: 33.6-37.9) points, the results reflected significant differences in the provision of family-centred services, with a high proportion indicating that insufficient consideration was given to the unique needs and lifestyles of each family. It was found that the mean of TPR estimate 33.38 (95% CI: 30.8-35.7) points. Evidence shows that respectful treatment of families needs to be improved. It was found that the mean of CSI estimate 11.78 (95% CI: 10.7-12.6) points, for this sub-area, indicating that there is inconsistency in the transmission of information to families about assessment, status, progress or treatment. It was found that the mean of PGI 23.86 (95% CI: 22.5-25.2) points, is relatively strong, indicating that this is an area where service providers have the best qualities.

Conclusions. Service providers need to encourage greater participation in family-oriented services. Mutual cooperation would contribute to more effective and respectful service delivery. In the overall context, efforts should be made to improve practice in all areas to ensure a uniformly high standard of family-oriented services. There are clear indications that efforts are

needed to improve family-oriented services in all areas. This is an essential route to optimising family-oriented services.

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RESEARCH OF PARENTS' KNOWLEDGE TOWARDS THE DEVELOPMENT OF PRESCHOOLERS' INDEPENDENCE SKILLS

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Introduction. Education is a crucial tool for shaping the primary personalities of children. Early education and self-care are the foundation for later success in areas like education, well-being, employment, and social integration, according to various sources (1,2). A study conducted in 2022 found that children's independence was influenced by their parents' culture, place of residence, and habits. In their study, authors P. Witt, K. Toit, and D. Franzsen argued that parents' or caregivers' understanding and knowledge of children's developmental stages influenced their readiness for school (3). The purpose of the study is to investigate the knowledge of parents towards the development of preschoolers' independence skills.

Research methods and organization. The study was approved by the Lithuanian University of Health Sciences Bioethics Center (Nr. 2023-BEC2-185). It was conducted in seven educational institutions in Kaunas where children aged 5-6 years old attend. Participants were parents of preschool children. The respondents who filled in the questionnaires lived not only in Kaunas city but also in Kaunas district. The study took place from September 20th, 2023, to December 30th, 2023, and was divided into three stages. Stage 1 - contact was made with the educational institution where children attend. The topic of the study was presented and written consent from the institution was obtained. Stage 2 - respondents were introduced to the questionnaires, and a time and place were agreed upon for filling them out. Stage 3 - the questionnaires were filled out. The questionnaires were based on the Ages and Stages questionnaire. Parental knowledge was evaluated according to the Likert scale. Participants in the questionnaire were: 180 parents. To the respondents, one questionnaire was distributed, consisting of three main parts. The first part was designed to evaluate the demographic and social factors of the parents. The second part was designed to evaluate the parents' attitude towards the development of independent skills in 5-6-year-old children. The third part was designed to evaluate the parents' knowledge of developing independent skills in preschoolers. Statistical data analysis was performed using IBM SPSS Statistics 29.0. Qualitative variables were presented by descriptive statistics and percentage expressions.

Results. 29 fathers and 151 mothers participated in the survey. 91.1% of children grew up in a complete family. Most of the parents were aged between 31-40 years. The majority of the surveyed fathers and mothers were both employed. 47.5% of parents stated that the income of one family member per month is more than 800 euros. Only 3.4% of all respondents had an

income of up to 200 euros per month for one family member. 165 respondents live in Kaunas city and 15 in Kaunas district. 84.4% of mothers indicated that they have higher education, and 72.8% of fathers have higher education. Parental knowledge was evaluated according to the Likert scale. 86.7% of parents agree or fully agree that children start showing an interest in tableware at the age of 2-4 years, and 97.2% say that children of this age should know how to use a spoon, fork, and knife. 20% of parents do not know if a 5-6-year-old child should already have a dominant hand. Parents agree or strongly agree that preschool-aged children should know how to wash their face correctly and thoroughly. They also agree or strongly agree that 5-6-year-old children should know that it is recommended to wash their hands before eating and drinking, after using the bathroom. 7.3% of parents disagree that children should be able to brush their teeth by themselves, and 11.1% are unsure if children should learn to do so. 21.1% are unsure if children should learn to comb their hair. The vast majority of parents agree or strongly agree that 3-year-old children should be able to put on shoes without laces and that 5-6-year-old children should be able to dress themselves independently. 7.8% disagree that 5-6-year-old children should be able to tie their shoelaces, and even 40.6% marked in the survey that they didn't know. 9.4% of parents don't know that around 2 years old, children can independently take off their pants and sit on a potty, and by the age of 4-5, they should be able to go to the toilet by themselves.

Conclusions. The results underscore the importance of supporting parents with comprehensive information on child development milestones, especially in areas where there is significant uncertainty. The survey found that the biggest knowledge gaps relate to children's toileting and dressing skills, while parents have the best knowledge of their child's development of personal hygiene and eating skills.

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EFFECTS OF REWARD ON BALANCE AND ATTENTION IN CHILDREN WITH ATTENTION - DEFICIT/HYPERACTIVITY DISORDER

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Introduction. Attention-deficit/hyperactivity disorder (ADHD) is one of the most common neurological disorders in the world, typically affecting 5 to 10 % of the population school-age children [1]. ADHD can manifest as inattention, hyperactivity and impulsivity, can affect various stages of a child's development, social and academic relationships, so it is often difficult for physiotherapist to engage them, as long-term activities often cause them boredom [2,3]. The aim of research was to determine the effect of reward on balance and the cognitive function (attention) in children with attention-deficit/hyperactivity disorder.

Research methods and organization. The study was approved by the Lithuanian Sport University Bioethics Center (MNL-KIN (M)-2023-571). The study was conducted from 2023.06.01 to 2023.08.31 at Gijos clinics in Kaunas at the Consultation, Diagnostic and Therapy

Center. All subjects were selected by purposive sampling and randomly divided into two groups: a Reward Group (RG; n=30) and a Conventional Physiotherapy group (CPT; n=30). Inclusion criteria: ADHD diagnosed by a neurologist, male gender, age 8-10 years, no others neurological disorders, any kind of treatment for ADHD at last 6 months. Participants in RG performed exercises for balance and coordination 3 times per week for 45 minutes and at the end of each session received game-like interactive tasks using virtual reality glasses as a reward. Participants in CPT group performed only physical exercises for balance and coordination 3 times per week for 45 minutes without interactive tasks with virtual reality glasses. Duration of both interventions was 6 weeks. Subjects were assessed at baseline, after 3 weeks, and at the end of the study. Methods used in the study: Abili Balance Analyzer for static balance assessment and RehaCom computer program for assessment of cognitive function. Data was analyzed using IBM SPSS 26.0 and Microsoft Excel 2016 programs. Since the data obtained during the study did not correspond to the conditions of the normal distribution, non-parametric tests were chosen: the Wilcoxon criteria (Z) was used for dependent variables, and the Mann-Whitney criteria (U) for independent variables. Quantitative data are presented as mean with standard deviation (m±SD). A statistically significant difference between samples was considered at p<0.05.

Results. There was no significant difference between groups at baseline in the right(U=27.9; p=0.813) and left(U=29.2; p=0.905) leg stability index as well as in cognitive function checking correct answers scores(U=28.7; p=0.922) and measuring working speed(U=24.2; p=0.857). The right leg stability index improved from 1.87±0.76 at baseline to 1.43±0.55 after 3 weeks(Z=-2.627; p=0.002), and 1.26±0.61 after 6 weeks(Z=-2.471; p=0.012) in RG. The right leg stability index in CPT improved from 1.93±0.42 at baseline to 1.58±0.38 after 3 weeks(Z=-2.273; p=0.008) and 1.25±0.24 after 6 weeks(Z=-2.417; p=0.017). RG had better right leg stability index after 3 weeks (U=7.4; p=0.001) compared to CPT. The left leg stability index improved from 1.98±0.69 at baseline to 1.39±0.45 after 3 weeks(Z=-2.624; p=0.007) and 1.21±0.60 after 6 weeks(Z=-2.127; p=0.022). The left leg stability index in CPT group improved from 2.07±0.24 at baseline to 1.68±0.83 after 3 weeks(Z=-2.548; p=0.005) and 1.23±0.37 after 6 weeks(Z=-2.521; p=0.009). RG achieved higher left leg stability index after 3 weeks(U=7.7; p=0.012) compared to CPT. There was no difference between groups after 6 weeks. The score of correct answers evaluating cognitive function improved from 2.90 ± 1.91 at baseline to 5.43±1.47 after 3 weeks(Z=-2.501; p=0.001) and 4.26±1.55 after 6 weeks(Z=-2.444; p=0.011) in RG. CPT group results changed from 2.83±1.84 at baseline to 3.93±1.37 after 3 weeks(Z=-2.373; p=0.004) and 4.76±1.19 after 6 weeks(Z=-2.327; p=0.016). RG achieved better correct answers score after 3 weeks(U=6.8; p=0.001) compared to CPT. Working speed improved from 35.23±2.71 at baseline to 39.26±3.64 after 3 weeks(Z=-2.624; p=0.007) and 35.26±3.94 after 6 weeks(Z=-2.127; p=0.022) in RG. In CPT group it changed from 34.26±3.13 at baseline to 31.13±4.51 after 3 weeks(Z=-2.551; p=0.001) and 29.40±3.98 after 6 weeks(Z=-2.164; p=0.0013). RG achieved higher working speed after 3 and 6 weeks compared to CPT(U=7.4; p=0.001; U=6.9; p=0.007).

Conclusions. The study revealed that balance and coordination training with a reward for children with ADHD had a more pronounced effect on balance and attention during the first three weeks of interventions compared to CPT. However, after six weeks of interventions there was no significant difference in balance and attention between both groups.

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CHANGES IN LOW BACK PAIN, RANGE OF MOTION AND FUNCTIONAL CONDITION OF YOUNG AGE MOTORCYCLISTS AFTER APPLYING EXERCISE PROGRAM

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Introduction. These days motorcycles are becoming more and more popular type of vehicle. Driving fatigue can be related to maintaining a specific body posture, absorbing the impact of the road, and generating the necessary forces to control the motorcycle [1]. Olorunfemi with co-authors concluded that low back pain prevalence is high among commercial riders [2]. Based on this research stretching exercises and taking rest breaks for professional motorbike riders have a significant progressive outcome from low back pain [3]. This study aims to evaluate the change in low back pain intensity, trunk range of motion, and functional condition of young motorcyclists after exercise program.

Research methods and organization. The study was approved by the Lithuanian University of Health Sciences Bioethics Centre. The study was carried out in a family medicine centre. All participants signed informed consent forms. Inclusion criteria: male, young age (18-44 years), driving a motorcycle, and having active driving experience for more than 5 years. In total 35 participants were involved. The average age of participants was 26 ± 0.6 (21-35) years. Participants were examined twice, before and after the exercise program. A Numerical Analogy Scale and body diagram were used to find out the intensity and location of pain. The active range of trunk motion (flexion, extension, and lateral flexion) was assessed using an inclinometer. Functional condition was evaluated with Roland Morris questionnaire which is designed to assess self-rated physical disability caused by low back pain. The exercise program lasted 8 weeks, 3 days a week, up to 30 minutes. The program consisted of stretching, strengthening, relaxing, and spine-stabilizing exercises. Data statistical analysis was performed with IBM SPSS Statistics 29.0.1.0. Dependent samples were compared using Wilcoxon tests. Quantitative data are presented as median (xme), minimum value (xmin), maximum value (xmax), and mean (\bar{x}) - $xme(xmin-xmax; \bar{x})$. Differences were considered statistically significant if $p < 0.05$.

Results. Pain intensity at the beginning was 5(2-9; 5.08) points and after exercise program - 1(0-5; 1.62) point. Pain intensity significantly decreased after exercise program ($Z = -5.181$; $p < 0.001$). The most affected area based on the body diagram was low back (32.4%), neck (24.3%) and shoulders (13.5%). Functional condition before exercise program was 3(0-9; 3.38) points and after - 1(0-4; 1.08) points. It significantly improved ($Z = -4.393$; $p < 0.001$). Trunk active flexion before exercise program was 83(58-95; 81) degrees, after - 86(73-98; 85.32) degrees. Range of motion significantly increased $Z = -5.178$, $p < 0.001$. Trunk extension before was 18(13-29; 18.97) degrees, after 20(15-29; 20.7) degrees. Range of motion significantly increased $Z = -4.780$, $p < 0.001$. Trunk right lateral flexion before was 23(14-31; 23.08) degrees, after 25(16-31; 24.22) degrees. Range of motion significantly increased $Z = -3.961$, $p < 0.001$. Trunk left lateral flexion before was 23(15-31; 23.41) degrees, after 25(18-32; 25.08) degrees. Range of motion significantly increased $Z = -5.205$, $p < 0.001$.

Conclusions. The study showed that exercise program could be useful for helping young age motorcyclists to decrease low back pain intensity, to increase trunk active range of motion, and to improve back functional condition.

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THE EFFECT OF REMOTE RELAXATION EXERCISES AND SELF-MASSAGE ON PAIN, DURATION, AND FREQUENCY OF MIGRAINE ATTACKS

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Introduction. Migraine affects approximately 11 to 20% of the female population, with the duration of migraine attacks in women being nearly three times longer than in men (1,2). The application of relaxation exercises has been observed to ease migraine-related disorders, decrease the frequency, severity, and duration of migraine attacks, improve migraine-related disability and, enhance quality of life (3,4). Trigger point manual treatment also helps to reduce pain intensity and decrease the frequency and duration of migraine attacks (5). Objective: to evaluate and compare changes in pain, duration, and frequency of migraine attacks by applying remote relaxation exercises and self-massage for women suffering from migraine.

Research methods and organization. The research was approved by the Vilnius Regional Biomedical Research Ethics Committee (Nr.2023/9-1525-1000). Participants (n=41) were divided in two exposure groups: RE group (relaxation exercises) (n=21), and SM group (n=20). Age of participants was 25(18-54; 31,18) years. Inclusion criteria: migraine attacks lasting 4 to 72 hours, pain intensity ranging from 4 to 10 scores, low or moderate level of physical activity, migraine diagnosis with no other neurological, cardiovascular, respiratory, oncological, or other diseases identified, women, aged 18 to 65 years. The study was conducted from 27/11/2023 to 18/02/2024. Participants were examined before and after the relaxation exercise program and self-massage. Functional indicators have been evaluated: pain intensity (Numeric Pain Intensity Scale), frequency of migraine attacks, and duration of migraine attacks. The RE group performed relaxation exercises remotely three times a week for 12 weeks, each session lasting 30 minutes, the SM group did self-massage independently three times a week for 12 weeks, each session lasting 10 minutes. Statistical analysis was performed with IBM SPSS Statistics 29. Quantitative data from test results were described using median (xme), quartiles (x25 - x75), mean (\bar{x}) - xme(x25,- x75; \bar{x}). The Wilcoxon signed-rank test was calculated to compare two dependent samples and the Mann-Whitney U test to compare two independent samples. Data is considered statistically significant at $p < 0.05$.

Results. The pain intensity before the study was 7(6-7,5; 6,71) scores, and after, it was 6(5-6; 5,61) scores in the RE group. The intensity of pain has statistically significant decreased ($Z = -3,714$; $p < 0,001$). The pain intensity in the SM group before the study was 7(6-8; 6,85) scores, and after, it was 5(4-7; 5,68) scores. The intensity of pain decreased statistically significant ($Z = -2,889$; $p = 0,003$). The difference in pain intensity between groups is similar ($U = 169,5$; $p = 0,754$). The frequency of migraine before the study was 4(3-4; 3,62) times/month, and after, it was 3(2-4; 2,84) times/month in the RE group. The frequency of migraine attacks was reduced statistically significant in the RE group ($Z = -2,708$; $p = 0,004$). The frequency of migraine attacks before the study was 4(3-4,75; 3,95) times/month, and after, it was 3(2-3; 3) times/month in the SM group. The frequency of migraine attacks was reduced statistically significant in the SM group ($Z = -2,315$; $p = 0,021$). The difference in frequency of migraine attacks between groups is similar ($U = 177$; $p = 0,918$). The duration of the migraine attacks before the study was 8(5-12; 8,93) hours, and after, it was 6(5-8; 10,34) hours in the RE group. The duration of the migraine attacks did not decrease statistically significant in the RE group ($Z = -1,505$; $p = 0,139$). The duration of the migraine attacks before the study was 8(7,25-12; 9) hours, and after, it was 5(4-8; 5,82) hours in the SM group. The duration of the migraine attacks decreased statistically significant in the SM group ($Z = -3,544$; $p < 0,001$). The difference in the duration does not differ between groups ($U = 123,5$; $p = 0,096$).

Conclusions. Relaxation exercises and self-massage decreased the pain, and frequency of migraine attacks. Self-massage decreased the duration of the migraine attacks. The difference in

pain intensity, frequency of migraine attacks, and duration of migraine attacks did not differ between the groups.

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RAPID ADAPTATION CHARACTERISTICS OF THE CARDIOVASCULAR SYSTEM DURING REPEATED PHYSICAL LOADS FOR DEVELOPING ENDURANCE IN LEG AND BACK MUSCLES

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Introduction. Insufficient physical activity is associated with various health problems, such as diabetes, overweight, and various cardiovascular system (CVS) diseases (1-2). Scientific studies help us understand how physical activity can affect the health and well-being of our bodies in the long term. The characteristics of long-term adaptations to physical loads are determined by the totality of changes caused by exercise so the study of the body's reactions to physical loads has important practical applied significance. Understanding the importance of long-term adaptation helps to avoid injuries, fatigue, and maintain continuous and sustainable physical activity (1).

Research methods and organization. Ethical approval was obtained for the study Nr. BEC-SR(M)-169. The study involved 24 healthy men attending health improvement physical exercise sessions at various sports clubs, who had a sports doctor's permission to exercise (age – 24.31 ± 4.12 years). The subjects performed a graded exercise test, increasing the load each minute by pedaling a veloergometer until they could no longer continue the task. Based on the duration (and power, 50 W, 100W, 150W, 200W) of the load performed, they were divided into two subgroups of 12 persons each, i.e., a subgroup of lower (A subgroup) and higher (B subgroup) physical fitness. The main study was performed no earlier than after a three-day break. All subjects performed three repetitive loads for the back muscles - trunk extension task using a special training machine. The movement, performing trunk extension – 10 seconds, and returning to the starting position (trunk bending movement) – 15 seconds. Rest intervals between loads were 2 minutes, with the subject standing. ECG was recorded before performing the exercise, in the starting position, and after completing the exercise for 5 minutes, while blood pressure was recorded before the exercise, immediately after completing it, and every 1 minute during recovery after the load. During the leg muscle strength endurance study, subjects performed a calf extension movement for 15 repetitions for three times. For the assessment of the cardiovascular system's functional condition, a computerized ECG analysis system "Kaunas-Load", developed at LSMU Cardiology Institute, was used to record ECG (12 leads) and blood pressure measurements. Statistical data analysis was performed using SPSS 28.0 for Windows

and Microsoft Excel 2016 computer programs. Quantitative data are presented as median, minimum, and maximum value – Xme (Xmin; Xmax). Mann-Whitney criteria for independent samples. Data are considered statistically significant when $p < 0.05$.

Results. Results confirmed that repeating loads due to developing fatigue observed the change in heart rate (HR), which indicates the effect of load summation. If the subjects' HR increased to an average of 105 (88;118) bpm during the first load (statistically significant difference $U=211$; $p=0.008$), then by the third load, the average HR for all subjects was already 106 (96;130) bpm, indicating a trend of summation. The changes in systolic blood pressure (BP) also had a "cumulative" trend. During the first and second load while performing the calf extension movement, the systolic BP values increased to 130 (120;150), but during the third load, the increase in systolic BP values was insignificant 136 (120;154) mm Hg in the subgroup with lower physical fitness. Same patterns were observed when evaluating changes in systolic and diastolic BP, between the subgroups with lower and higher physical fitness, but the smallest fluctuation was in the subgroup with lower physical fitness 48 (40;70) (statistically significant difference between subgroups $U=54$; $p=0.014$). During localized physical exercises, i.e., when one muscle group or less than 1/3 of the body's muscles is activated, their blood circulation intensity is a very important factor determining work capacity (3-4). Based on the data of the study, it is not possible to unequivocally confirm the hypothesis that the magnitude of CVS reactions to physical loads depends most on the amount of active muscles. The data of this study indicate that there are other very significant factors that influence CVS reactions to physical loads. Position of the body or active muscles in relation to the heart level is a very important factor. Although more (up to 2/3) body muscles are activated during the exercise for back muscle training (regional physical load) than during localized physical loads (exercise for leg muscle training), the change in HR was significantly lower (statistically significant difference $U=29$; $p=0.013$).

Conclusions. Exercises for back muscle strength, do not cause a significant cardiovascular system response (both in BP and HR increase), therefore they can be recommended for individuals in health-enhancing exercise programs. Our findings confirms that the assessment of HR and BP responses is important for ensuring the effectiveness and safety of exercises for health-enhancing exercise programs for individuals with lower and higher physical fitness levels.

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EFFECTIVENESS OF PHYSIOTHERAPY IN REDUCING SENSORY MODULATION DISORDERS IN PRESCHOOL CHILDREN WITH AUTISM

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Introduction. Sensory processing problems are prevalent among individuals with autism spectrum disorder (ASD), with over 96% of parents noting sensitivity fluctuations in their children (1, 2). Additionally, up to 95% report observing sensory-related atypical behaviours (3).

Sensory processing disorders are pervasive across all age groups within ASD, adversely impacting both daily functioning and academic achievement (4). When devising interventions in preschool settings, it's crucial to consider not just the sensory elements of the environment but also the individual's unique sensory processing traits (5). The study aimed to evaluate the impact of physiotherapy interventions on vestibular and proprioceptive processing in preschool-aged children with ASD.

Research methods and organization. The study was approved by the Lithuanian University of Health Sciences Bioethics Center (No. BEC-SR(M)-129). The study was carried out using a retrospective method, analyzing the medical records of the Hospital of Lithuanian University of Health Sciences, Kaunas Clinics, Children Rehabilitation clinics "Lopšelis" from June to November 2023. This study analyzed the "Sensory Profile-2" questionnaires completed by 24 parents of preschool children who met certain criteria: diagnosed with autism, aged 3 to 6 years, sensory modulation impairment according to the "Sensory Profile-2" assessment, undergoing physiotherapy, and having completed rehabilitation treatment. The "Sensory Profile-2" in the study reveals a child's vestibular and proprioceptive processing in daily situations, guiding diagnostic and intervention planning by assessing sensory system impact on functional performance. (6). Participants (n=24, age 3,8±0,7 years) were randomly divided into two groups by the systematic selection method: the control group (n=12, 4,0±0,6 years) who received physiotherapy without intervention and the intervention group (n=12, 3,6±0,7 years) who received physiotherapy combined with sensory exercises. All subjects had physiotherapy for two weeks, 5 times a week, 30 minutes a day. The control group received standard physiotherapy treatment throughout the rehabilitation period. The intervention group followed a regular physiotherapy program, with the addition of sensory exercises during the treatment sessions. The questionnaire was administered twice, on the first and last day of rehabilitation. Data analysis was performed using the IBM SPSS Statistics 29 software package. Data are presented as median (Md) and first and third quartiles (Q1-Q3) – Md(Q1-Q3). The Wilcoxon (Z) criterion was used to compare the two dependent samples. The nonparametric Mann-Whitney Wilcoxon (U) was applied to the two independent samples. A statistically significant difference was considered when $p < 0.05$.

Results. The vestibular information processing of the control group was 33.50(23.00-36.00) scores before therapy and 30.00(19.50-32.25) scores after therapy. In the control group, the vestibular information processing score changed statically significantly ($Z = -2.692$; $p = 0.007$). In the intervention group, the processing of vestibular information before therapy was 32.50(26.00-34.75) scores, and after therapy 23.00(17.25-28.75) scores. In the intervention group, the vestibular information processing score changed statically significantly ($Z = -3.063$; $p = 0.002$). There were no statistically significant differences in vestibular information processing scores between the groups before therapy ($U = 65.5$; $p = 0.713$) or after therapy ($U = 52$; $p = 0.266$). The proprioceptive information processing of the control group was 26.00(24.25-31.00) scores before therapy and 22.50(21.00-27.50) scores after therapy. The proprioceptive information processing score of the control group showed a statistically significant change ($Z = -2.536$; $p = 0.011$). The proprioceptive information processing score in the intervention group was 20.50(15.75-29.25) before the therapy and 15.50(9.25-25.00) after the therapy. The proprioceptive information processing score of the subjects in the intervention group showed a statistically significant change ($Z = -2.810$; $p = 0.005$). There were no statistically significant differences in proprioceptive information processing scores between the groups before therapy ($U = 56$; $p = 0.378$) or after therapy ($U = 50$; $p = 0.219$).

Conclusions. Both control and intervention groups showed significant improvements in vestibular and proprioceptive processing after the treatments. There were no significant differences between the pre- and post-treatment groups, indicating that physiotherapy is effective in improving sensory processing, regardless of the method.

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THE EFFECT OF EXTRA PHYSICAL ACTIVITIES ON CHILDREN’S BALANCE: A COMPARISON WITH PHYSICAL EDUCATION LESSONS

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Introduction. Physical activity (PA) contributes to children’s physical and cognitive development. If gross motor development is not mastered, children may experience lifelong difficulties in acquiring later motor skills (1). Physical education lessons (PE) offer a wide range of PA opportunities. However, attending PE is insufficient to assure that children engage in the needed levels of PA (2). Extra PA (EPA) is necessary for children to reach their optimal level of PA. Promoted PA improves balance performance and reduces the risk of falling in elderliness (3) and provides injury prevention (4). The primary aim is to evaluate the effect of EPA on balance in healthy children aged 5 to 11 years old and analyze the effect of gender, activity specificity.

Research methods and organization. This study was designed as cross-sectional and was conducted with the following inclusion and exclusion criteria: Participants who are aged 5-11 years, are currently enrolled in a regular PE framework, and have no intellectual and physical impairment were included in the study and having an intellectual and physical impairment were criteria for exclusion from the study. For the extra physical activity group (EPG), participating in EP for 6+ months was an additional inclusion criterion. Parents received a consent form and a questionnaire that contained questions regarding whether the child is participating in any EPA or not, if yes, for how long, and what kind of activity. Based on the questionnaire results, inclusion, and exclusion criteria, the participants were split into two groups: Children who took part in only PE were allocated into PEG (Physical education group), whereas children who engaged in any EP for 6+ months were allocated into EPG. The balance of both groups was assessed using the Bruininks-Oseretsky Test-2 (5). The research was approved by the Lithuanian Sports University Biomedical Research Ethics Committee on 15/03/2023 in Kaunas, Lithuania (2023 04 03 MNL-KIN (M)-2023-589). IBM SPSS Statistics Version 25 was used to complete the statistical analysis. Shapiro-Wilk was used to determine the normalization of the sample. Independent samples t-test was performed to compare the mean of the balance performance of the PEG and EPG, and across genders in each group. Kruskal-Wallis test proceeded to see if there were any statistically significant differences between the medians of the specificity of EPA. Levene’s test and Chi-square test were used to examine homogeneity and Shapiro-Wilk to test normality.

Results. In total, 36 female and 32 male subjects were recruited. In the PEG (n=36) there are 21 females and 15 males, whereas, in the EPG (n=32) there are 15 females and 17 males. The characteristics of the PEG participants are as follows age 8.05 ± 1.6 , BMI 15.52 ± 2.43 , weight

27.214± 7.9, and height 131.139± 11.49. The characteristics of the EPA participants are as follows (Mean ± SD): age 8.49± 1.43, BMI 16.59± 2.26, weight 30.19± 6.8, and height 134.2± 10.16. Levene's test revealed no significant difference in variances of characteristics across groups, (Age F (1, 66) = 1.7, p = 0.06), Weight F (1, 65) = 0.3, p = 0.55, Height F (1, 66) = 1.1, p = 0.29, BMI F (1, 65) = 0.01, p = 0.92). A chi-square test was performed to analyze the homogeneity of genders and it was homogenous, X² (1, N = 68) = 0.89, p = 0.34). Shapiro-Wilk test revealed the normality of the balance data (PEG W= 0.97, p=0.45, EPG W= 0.95, p=0.25). Therefore, an independent samples t-test was used to compare the means of PEG and EPG on balance. There was a significant difference between the means of groups on balance (t (66) = -2.2, p = 0.02). The mean of EPG (M=15.53) was 2.47 (95% CI: -0.3, -4.6) higher than the mean of PEG (13.05). Kruskal-Wallis test performed and revealed a non-significant difference in EP activity specificity among the 7 groups (basketball (n=2), soccer (n=4), swimming (n=3), martial arts (n=7), gymnastics (n=5), dance (n=6), other (n=5)) (H = 3.62, df = 6, p= 0.72). However, gymnastics participants had the best balance performance with a mean score of 20.9, and those taking part in basketball had the lowest scores with a mean of 6.5 Independent samples t-test revealed a significant difference between the means of gender in EPG on balance (t (30) = 2.22, p = 0.03). The mean of females (M= 17.2) was 3.14 (95% CI: 0.2, 6.02) higher than the mean of males (14.05). However, the difference between the means of genders in PEG was not significant (t (34) = 0.64, p = 0.52, MD=1).

Conclusions. EPG attendees (EPG) showed better balance than PE-only (PEG) attendees. These findings suggest a role for additional time dedicated to physical activity in promoting motor abilities, particularly balance. The specificity of EP did not influence the balance; however, due to the small sample sizes in some groups, this result should be interpreted with caution. Lastly, in the PEG, there is no significant difference between genders whereas in the EPG females significantly performed better than males.

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BALTIC COUNTRIES OCCUPATIONAL THERAPISTS' PERSPECTIVES TOWARDS THE USE OF INTERACTIVE SYSTEMS DURING OCCUPATIONAL THERAPY PROCEDURES

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Introduction. Interactive technologies and mobile applications are increasingly being incorporated into various rehabilitation fields and applied to diverse patient groups (1). Consequently, a growing recognition of benefits brought by the advancement of rehabilitation technology in occupational therapy can be observed (2). The implementation of interactive

systems in occupational therapy practice needs to progress and expand to a higher level (3). However, limited research on this topic has been conducted in Lithuania. Therefore, this study aims to analyse the perspectives of occupational therapists in the Baltic countries on the use of interactive systems in occupational therapy practice.

Research methods and organization. The Bioethics Centre of Lithuanian University of Health Sciences (BEC-SR(M)-310) approved this research. A quantitative study was conducted based on a questionnaire created by the author which consisted of 25 questions. The first 7 questions were dedicated to gather participants demographic data, while the remaining were created to determine occupational therapists' perspective towards the implementation of interactive systems in rehabilitation. The questionnaire was distributed by the following methods: for Lithuanian occupational therapists the questionnaire was published in "Lietuvos Ergoterapeutai", a private group on "Facebook" platform, while to Latvian and Estonian therapists it was sent via email to members of their respective Societies of Occupational Therapists. The survey answers were gathered from June 1st to November 1st, 2023. Inclusion criteria: respondents work according to the acquired professional qualifications of an occupational therapist and they apply interactive systems as a mean of patient rehabilitation. All respondents voluntarily agreed to participate in the study. In total, 93 respondents answered the questionnaire. According to demographic data, the majority of respondents, 69 (74.2%), are from Lithuania, 12 (12.4%) from Latvia, and 12 (12.4%) from Estonia. 84 (90.3%) are female, and 9 (9.7%) are male. Participant's average age was $29,56 \pm 6,5$. 50 (53.8%) of respondents have used interactive systems as part of their practice and were the focus of this study, while 43 (46.2%) have stated that they have not used any type of interactive system. Statistical analysis was performed using the IBM SPSS Statistics 29 software package. Statistical methods used in this study were descriptive statistics and non-parametric binominal test to compare the proportions of two groups. Quantitative data is presented as n- number of cases and %- percentages. The significance level was set at $p < 0.05$. Specialists from Lithuania, Latvia and Estonia were asked to identify categories of interactive systems they used in their respective fields of work, ranging from paediatrics, geriatrics and neurology to traumatology and psychiatry. The interactive systems' categories discussed were virtual reality, computer systems and mobile applications. Results revealed computer systems were identified as the most used interactive system type across all fields of work, reported by 80% (n=44) of therapists in Lithuania, 90% (n=9) of Estonian therapists, and all therapists from Latvia. Most respondents reported the use of mobile applications in paediatrics field, best demonstrated in data obtained from Lithuanian 47,4% (n=9) and Estonian respondents 66,7% (n=2). The use of this technology can as well be observed in Latvia in the geriatric field 66,7% (n=2). A scarce use of virtual reality was observed in both Lithuania 20% (n=11) and Latvia 30% (n=3), with its application spread mainly in neurology field: Lithuania 23,1% (n=3) and Latvia 33,3% (n=1). Furthermore, respondents were asked to rate the patient's engagement during sessions involving interactive systems. 24% (n=12) of respondents evaluates engagement as excellent, majority of respondents- 46% (n=23) said that engagement is good, 26% (n=13) evaluates engagement as average and the least of respondents 4% (n=2) evaluates engagement as minimal. As well, the results revealed statistical significance of the respondents evaluating patient engagement as good-excellent ($p= 0.007$), compared to the respondents evaluating it as minimal-average.

Conclusions. Computer systems have been found to be the most widely used interactive systems in occupational therapy practice, while the use of mobile applications can be observed in pediatric, psychiatry, and neurology fields. Virtual reality was implemented the least across the Baltic region. Occupational therapists perceive that the use of interactive systems positively impacts patient engagement, with statistical significance ($p=0.007$) indicating higher ratings for engagement compared to lower ratings.

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THE EFFECT OF ONLINE AEROBIC ACTIVITY VERSUS CONVENTIONAL PHYSIOTHERAPY ON MIGRAINE'S SYMPTOMS, STRESS AND SLEEP QUALITY IN MIGRAINE PATIENTS

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Introduction. Many people suffer from migraines and while medical treatment reduces migraine attack, it does not prevent it, nor does it affect the quality of sleep, stress and symptoms associated with migraine(1). It is therefore important to find out which exercises could improve sleep quality, reduce stress and migraine's symptoms, which helps to improve quality of life. Aerobic exercise is known in literature to reduce migraine pain scores, but how it affects migraine's symptoms themselves, and thus sleep quality and stress-there is a lack of good quality evidence(2). The aim of this study is therefore to assess the effects of online aerobic activity and conventional physiotherapy on migraine's symptoms, stress and sleep quality in migraine patients.

Research methods and organization. First, the study was approved by the Kaunas Regional Biomedical Research Ethics Committee Nr. BE-2-35. After completing the form, study followed participants for three months. During this period, data on migraine attacks were collected continuously. After the three months, participants underwent assessments for migraine's symptoms, sleep quality, and stress levels. After that, participants completed an aerobic exercise combined with walking or a conventional physiotherapy three times a week, 45 minutes, for three months online. After the exercises, the participants were evaluated again. Participants: Forty four participants took part in the study. They were divided into two groups: an aerobic exercise program group (n=22) and conventional physiotherapy program group (n=22). Participants completed an aerobic exercise program combined with walking or a conventional physiotherapy program three times a week, 45 minutes, for three months online. Participants' inclusion criteria: headache attacks lasting 4-72 hours, pain intensity between 4 and 10 points, low to moderate level of physical activity, migraine symptoms, the migraine has been diagnosed by a neurologist. Exclusion criteria: free of neurological, cardiovascular, respiratory, oncological diseases, persons under 18 and over 65, women planning a pregnancy and women who are pregnant. Methods: Pre- and post-study assessments: 1) Migraine symptoms - questionnaire data 2) Sleep quality assessment - Pittsburgh Sleep Quality Questionnaire 3) Stress assessment - Perceived Stress Scale Statistical methods: data analysis was performed using IBM SPSS software. The non-parametric Wilcoxon criterion was used to compare the two dependent samples when they were small, and the Mani-Whitney-Wilcoxon criterion was used to compare the two independent samples. Quantitative data analysed using non-parametric criteria are presented as median (Md). A p-value < 0.05 was considered statistically significant.

Results. Migraine symptom questionnaire Migraine Symptom Questionnaire was 22 scores before aerobic exercise and 19 scores after. The difference between the pre- and post-program questionnaire scores in the first treatment group was statistically significant ($Z=-3.943$; $p<0.001$). Migraine Symptom Questionnaire was 21 scores before conventional physiotherapy and 20 scores after. Difference between the pre- and post-program questionnaire scores of the second treatment group were statistically significantly different ($Z=-2.284$; $p=0.022$). The overall migraine's symptoms were reduced in both groups. There was a statistically significant difference in the change in migraine symptoms between the first and the second treatment group ($U=46.5$; $p<0.001$). An aerobic exercise program is more effective than conventional physiotherapy in reducing the overall symptoms of migraine. Sleep quality questionnaire Sleep quality

questionnaire was 8 scores before aerobic exercise and 7 scores after. Difference in the sum of the questionnaire before and after the program was statistically significant ($Z=-3.328$; $p<0.001$). A lower score indicates an improvement in sleep quality. Sleep quality questionnaire was 10 scores before conventional physiotherapy and 10 scores after. There was no statistically significant difference between pre- and post-exercise questionnaire scores of the second treatment group ($Z=-1.279$; $p=0.201$) Perceived stress questionnaire Perceived Stress Questionnaire was 20 score before aerobic exercise and 17 score after. The sum of the questionnaire of the first treatment group before and after the program is statistically significantly different ($Z=-3.938$; $p<0.001$). A lower score indicates a reduction in stress. Perceived Stress Questionnaire was 22 score before conventional physiotherapy and 21 score after. There was no statistically significant difference in the sum of the questionnaire of the second treatment group before and after the program ($Z=-1.811$; $p=0.07$).

Conclusions. Aerobic exercise reduced migraine symptoms and stress and improved sleep quality. Although a conventional physiotherapy reduced migraine symptoms, aerobic exercise had a greater impact on symptoms reduction. The conclusions drawn from the study are limited by the absence of detailed participant demographics. Further research incorporating participant demographics and controlling for potential confounding variables is necessary to strengthen the conclusions and enhance their generalizability.

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THE EFFECT OF ONLINE AEROBIC ACTIVITY VERSUS CONVENTIONAL PHYSIOTHERAPY ON MIGRAINE'S SYMPTOMS, STRESS AND SLEEP QUALITY IN MIGRAINE PATIENTS

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Introduction. Alzheimer's disease (AD) is the sixth leading cause of death in the US, marked by cognitive decline, impaired social skills, and memory loss [1,2]. Pharmaceutical treatments offer limited relief, emphasizing the importance of non-pharmacological approaches. Occupational therapy, including therapeutic readings, emerges as a significant non-medication intervention. Literature indicates that therapeutic reading increases involvement, engagement, and emotional well-being [3]. With increasing research interest in the benefits of therapeutic reading for AD patients, this study aims to evaluate changes in activity participation among AD patients utilizing group occupational therapy using therapeutic readings and artistic activities.

Research methods and organization. The Lithuanian University of Health Sciences Bioethics Center (BEC-SR(M)-132) approved the study. This quantitative study was conducted at „Kauno Panemunės socialinės globos namai“ and „Pimanovų fondo globos namai“. It was conducted from June 6 to September 4, 2023. Inclusion criteria: patients diagnosed with AD, exhibiting mild to moderate cognitive impairment (scoring 11-25 on the Mini-Mental State Examination), possessing orientation, speech ability, and capacity for group participation. Exclusion criteria: end-stage AD, severe hearing or visual impairment, aphasia, severe comorbid conditions. The study involved 26 female participants, randomly divided into Study I group and Study II group. Study I group, with a mean age of 80.77 ± 2.8 years, received group occupational therapy using artistic activities. Study II group aged 78.31 ± 2.6 years, received group occupational therapy sessions using therapeutic reading. Occupational therapy sessions were conducted twice weekly

for three months (12 weeks), for 45 minutes each. Participants were assessed three times: before the study, during the middle of the study, and after it, using the Six Item Cognitive Impairment Test (6CIT) for memory and concentration of attention, the Volition Questionnaire for activity engagement, and the Social and Group Skills Assessment for social skills and behavior in group activities. The Volition Questionnaire and the Social and Group Skills Assessment were conducted with the researcher observing the participants, while the 6CIT was assessed during the survey. Statistical analysis was performed using the SPSS 29 version. Descriptive statistics included median (Xme), minimums (Xmin), maximums (Xmax) for characterizing variables—Xme(Xmin-Xmax). The non-parametric Friedman criterion compared three dependent small samples, while the non-parametric Mann-Whitney criterion contrasted two independent small samples. Significance was established as $p < 0.05$.

Results. In Study I, the cognitive function score was 22(12-26), with consistent scores for assessments II and III. Similarly, Study II exhibited a score of 20(10-26) for assessment I, with no change in scores for assessments II and III. Statistical analysis revealed no significant difference in all three assessments for Study I ($\chi^2(2)=4$; $p=0.135$) and Study II ($\chi^2(2)=0$; $p=1.00$). This indicates that cognitive functions remained stable in both groups. Regarding engagement in meaningful activities, Study I scored 27(15-50) for assessment I, II – 33(16-50), III – 38(16-56). While Study II scored for assessment I 30(15-57). II – 33(16-59), III- 33(18-63). A significant difference was observed in the assessment of Study I ($\chi^2(2)=23.787$; $p < 0.001$) and Study II ($\chi^2(2)=18.875$; $p < 0.001$). This indicates that the participant's engagement in meaningful activities has increased. Regarding social and group skills, Study I scored 44(30-50), II- 42(29-48), III- 42(29-48). While Study II scored 43(30-50) for assessment I, II- 40(30-50), III-38(28-47). Significant differences were observed in the assessments (Study I: $\chi^2(2)=16.545$; $p=0.002$; Study II: $\chi^2(2)=16.545$; $p < 0.001$). This means that social and group skills improved. Before occupational therapy, cognitive function did not differ significantly between groups ($U=59.5$; $p=0.204$). Midterm and third assessment results were similar and not statistically significant ($U=62.5$; $p=0.264$). There was no statistical significance in engagement in meaningful activities scores between Study II and Study I before occupational therapy sessions ($U=91$; $p=0.762$), interim assessment ($U=89$; $p=0.840$), nor were the final assessment results ($U=77.5$; $p=0.719$). Analysis of the Social and Group Skills assessment before occupational therapy revealed no significance ($U=71$; $p=0.511$). Interim ($U=67$; $p=0.39$) and final ($U=69.5$; $p=0.448$) assessment results showed no statistically significant differences between groups.

Conclusions. 1. In Study II group social skills and participation in meaningful activities significantly improved after applying group occupational therapy using therapeutic readings. 2. In Study I group, engagement in activities and social skills significantly improved after applying group occupational therapy using artistic activities. 3. Comparing cognitive function, social skills, engagement in meaningful activities, results between groups revealed no statistically significant differences.

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