

The 10<sup>th</sup> International Scientific Conference  
**EXERCISE FOR HEALTH AND REHABILITATION**

The 28<sup>th</sup> of April, 2025

Kaunas, Lithuania

**BOOK OF ABSTRACTS**



2025  
April  
**28**

**X<sup>th</sup> INTERNATIONAL SCIENTIFIC CONFERENCE  
"Exercise for Health and Rehabilitation"**

**The 10<sup>th</sup> International Scientific Conference  
EXERCISE FOR HEALTH AND REHABILITATION**

**The 28<sup>th</sup> of April, 2025**

**Kaunas, Lithuania**

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## INVITED SPEAKERS

### GENETICS, PHENOTYPE, AND PSYCHOLOGY. BIOLOGICAL FACTORS INFLUENCING ATHLETIC PERFORMANCE AND INJURY RISK

**Austėja Letukienė**

*Ph.D. candidate, Vilnius University; Founder, "In Genes", Lithuania*

**Background:** Significant inter-individual variability exists in athletic performance trajectories and susceptibility to injury, even among athletes exposed to similar training and prevention programs. While environmental factors (training, nutrition, rehabilitation) are heavily emphasized, the substantial contribution of genetics (estimated at ~50%) is often underappreciated, leading to gaps in our understanding of athlete potential and risk. A comprehensive approach is needed to unravel this variability.

**Aim:** This presentation aims to elucidate the complex interplay between three interconnected biological levels – genetics, phenotype, and psychology – and their collective influence on athletic performance optimization and injury risk mitigation.

**Methods:** A conceptual framework integrating evidence from sports genetics, exercise physiology, biomechanics, and sports psychology was utilized. The distinct contributions and interactions of (I) genetic predispositions (inherent potential and risks), (II) dynamic phenotypic expression (measurable anatomical, physiological, and biomechanical traits shaped by genes and environment), and (III) psychological factors (motivation, stress response, mindset) were systematically examined.

**Results:** Genetics provide the foundational blueprint influencing baseline potential, adaptation capacity to training stimuli (e.g., muscle fiber type predisposition, aerobic potential enhancement, hydration needs), micronutrient requirements, and susceptibility to specific injuries (e.g., connective tissue weakness, inflammatory response). Genetic insights offer predictive value, particularly for long-term potential, independent of current phenotype. Phenotype represents the measurable, modifiable outcome of gene-environment interactions. Assessed through various tests (laboratory, performance, functional), it reflects the athlete's current state and includes direct, often modifiable, risk factors for injury (e.g., biomechanical faults, strength deficits, limited range of motion). Psychology directly modulates physiological function (e.g., heart rate variability, inflammation) and impacts performance (e.g., motivation, focus, stress management). Psychological factors are critical determinants of injury risk (e.g., Stress-Injury Model) and significantly influence rehabilitation adherence and outcomes (e.g., fear of re-injury, motivation, belief). These three components operate within a dynamic, interconnected system. Athletic success and injury occurrence often result from the interplay between genetic potential/predisposition, phenotypic readiness, environmental load (training/competition), and psychological drive. Notably, injury risk escalates when psychological ambition leads athletes to exceed their genetically influenced biological thresholds.

**Conclusion:** Maximizing athletic performance and minimizing injury risk necessitates a holistic, individualized approach that moves beyond siloed assessments. Synthesizing insights from genetic potential, dynamic phenotypic monitoring, and psychological profiling allows for more precise, personalized interventions. Integrating genomic information alongside traditional methods is transitioning from a niche concept to an essential must-have component for optimizing athlete health, enhancing training efficacy, predicting and managing injury risk, facilitating faster recovery, and promoting career longevity. Effective multidisciplinary collaboration is key to implementing this integrated model in practice.

**Keywords:** Sports Genetics, Athletic Performance, Injury Prevention, Phenotype, Sports Psychology, Personalized Medicine, Genotype-Phenotype Interaction, Overtraining.

## SHORT ORAL SCIENTIFIC PRESENTATION SESSION



### Best Presentation Award

## RELATIONSHIPS OF FUNCTIONAL STATUS, SPINAL MOBILITY AND POSTURAL DEFORMITIES WITH BALANCE AND QUALITY OF LIFE IN PATIENTS WITH ANKYLOSING SPONDYLITIS

**Jurgita Ragauskienė, Edita Jazepčikienė**

*Lithuanian University of Health Sciences, Department of Rehabilitation*

**Introduction.** Ankylosing spondylitis (AS) is a chronic, inflammatory rheumatic disease that results in structural deformity and limitation in spinal mobility by affecting the axial skeleton (1) AS leads to stiffness, back pain, functional impairment and poor quality of life (2). Morning stiffness from chronic inflammation can cause postural changes and balance issues (3). In Lithuania, no studies have assessed balance and quality of life in AS patients and rehabilitation usually focuses only on back pain and reduced mobility, using general exercise programs. The aim of this research is to determine the relationship of functional status, spinal mobility and postural deformities with balance and quality of life in patients with AS.

**Research methods and organization.** The study was conducted from October 2024 to February 2025 at the Department of Rehabilitation in Lithuanian University of Health Sciences. The study was approved by Kaunas Regional Biomedical Research Ethics Committee (No. BE-2-99). The study included 30 patients with AS (18 males, 12 females; mean age 42.27(±11.53) years; duration of illness - 9.57(±8.07) years). Inclusion criteria were age (18-65 years), diagnosis of AS and consent to participate in the study. All subjects had a single assessment and applied program was not used. Spinal mobility status of subjects was evaluated using the Bath Ankylosing Spondylitis Metrology Index (BASMI), functional status – using Bath Ankylosing Spondylitis Functional Index (BASFI). Occiput to wall distance (OWD) was measured for postural assessment. Subjects whose OWD was more than 5 cm were categorized as kyphotic (4). Berg Balance Scale (BBS) and Functional Reach Test (FRT) were used to evaluate functional balance. Quality of life was assessed with the EASi-QoL questionnaire. Statistical analysis was performed using IBM SPSS 30 Statistics. The characteristics of the subjects were described by mean (m) and standard deviation (SN) - m (±SN). Qualitative data were presented in absolute frequency (n) and percentage - n (%). To assess the relationship between the two quantitative variables, Spearman's correlation coefficient (r) was calculated. The relationship was considered weak for  $|r| \leq 0.3$ , moderate for  $0.3 < |r| \leq 0.7$  and strong for  $|r| > 0.7$ . Correlations with  $p < 0.05$  were considered statistically significant.

**Results.** The mean spinal mobility by BASMI in AS patients was 2.25(±1.44) scores. The mean functional status by BASFI was 3.25(±1.60) scores. The mean OWD in AS patients was 3.21(±1.86) centimetres. Kyphosis (with OWD >5cm) was found in 5 (16.7%) subjects. The mean BBS was 52.7(±4.62) scores. A small proportion of subjects - 4 (13.3%) - had a higher risk of falls (with BBS <45). The mean score of FRT was 28.56(±4.9) centimetres. The mean overall EASi-QoL score was 24.1(±13.44) scores. The highest number of subjects - 12 (40%) - reported a moderate impact of AS on their quality of life (with 18-35 EASi-QoL). Analysing relationships between functional balance and functional status, spinal mobility, postural deformities results statistically significant inverse, moderate relationships were found: between FRT and OWD ( $r = -0.370$ ;  $p = 0.044$ ), between FRT and BASMI index ( $r = -0.668$ ;  $p < 0.001$ ); between FRT and BASFI index ( $r = -0.425$ ;  $p = 0.019$ ); between BBS and OWD ( $r = -0.481$ ;  $p = 0.007$ ); between BBS and BASFI index ( $r = -0.515$ ;  $p = 0.004$ ). A statistically significant inverse, strong correlation was found between BBS and BASMI ( $r = -0.769$ ;  $p < 0.001$ ).

Participants who had better posture, better functional status and spinal mobility also had better functional balance. Analysing relationships between quality of life and functional status, spinal mobility and postural deformities results statistically significant, direct, moderate relationships were found: between EASi-QoL and BASMI index ( $r=0.478$ ;  $p=0.008$ ); between EASi-QoL and BASFI index ( $r=0.679$ ;  $p<0.001$ ). Between EASi-QoL and OWD relationships was not found ( $r=0.092$ ;  $p=0.629$ ). Participants who had better functional status and spinal mobility also had a lower impact of the disease on their quality of life.

**Conclusions.** The study revealed that the balance and quality of life of patients with ankylosing spondylitis are related to their functional status, spinal mobility and postural deformities. When spinal mobility and functional status deteriorate, balance tends to deteriorate and quality of life is negatively affected. Therefore, rehabilitation of patients with ankylosing spondylitis should focus not only on improving mobility, functional status and posture, but also on improving balance and quality of life.

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## Outstanding Presentation Award

### THE EFFECT OF DIFFERENT PHYSIOTHERAPY PROGRAMS ON THE HEAD AND NECK REGION'S FUNCTIONAL STATE IN WOMEN WORKING SEDENTARY JOB

**Gabija Zemeliauskaitė, Vilma Tamulionytė**

*Lithuanian University of Health Sciences, Department of Sports Medicine*

**Introduction.** These days more and more people work remotely or in computerized workplaces. Long working hours, stress, poor ergonomics and a lack of regular physical activity can lead to work-related musculoskeletal disorders [1]. Up to 42% of sedentary workers report pain in the neck and head region. It is important to emphasize that women experience pain in this region more often than men [2]. A regularly performed exercise program can be an effective method to improve functional state and minimize pain in sedentary workers [3]. The aim of this study is to evaluate the effect of different physiotherapy programs on the functional state of the head and neck region in women working sedentary jobs.

**Research methods and organization.** The research was approved by the Bioethics Center of Lithuanian University of Health Science and was performed at „Sanus Motus” clinic. Participants' inclusion criteria: young and middle-aged women (25-65 years) working sedentary job longer than four years; without history of cervical spine trauma, surgery, disc herniation; without acute pain; voluntary participation. 41 women (age 30-65 years) participated in the study. They were randomly

divided into two groups, with each group receiving a different physiotherapy program. The main part of each physiotherapy program included soft tissue mobilisation, mobility, stability, strengthening exercises, but there were some differences. Participants of the first group (PIRE) (n=22) performed post isometric relaxation-based exercises. Participants of the second group (SE) (n=19) performed stretching exercises for head and neck region. Both physiotherapy programs were performed twice a week for 55 minutes for 10 weeks. Participants were evaluated before and after physiotherapy program. The head and neck posture in the sagittal plane was evaluated measuring the Craniovertebral Angle (CVA) with the „Apecs“ program, „Stabilizer“ was used for evaluating the strength of deep neck flexors, pain and discomfort were evaluated with Numeric Pain Rating Scale. For determination of self-rated neck disability participants completed Neck Disability Index (NDI) questionnaire. Statistical analysis was performed using IBM SPSS Statistics 30.0.0. The nonparametric Wilcoxon test was used to compare two related samples, the nonparametric Mann-Whitney-Wilcoxon test was used to compare two independent samples. Data in the results section are presented as median (Xme) (minimum value (Xmin)-maximum value (Xmax)). The difference was considered statistically significant when  $p < 0.05$ .

**Results.** There was no significant age difference between groups (PIRE 52.5(30;65) years, SE (n=19; 60(42; 65) years;  $U=135.5$ ,  $p=0.053$ ). CVA angle did not change in both groups (PIRE group: before 55(43-65) degrees; after 55(42- 65) degrees;  $Z=-1.698$ ,  $p=0.090$ ), SE group: before 53(45-60) degrees, after 53(44-60) degrees,  $Z=-0.914$ ,  $p=0.361$ ). There was no significant difference between the groups neither before ( $U=162$ ,  $p=0.222$ ) nor after ( $U=164$ ,  $p=0.242$ ) the physiotherapy program. The strength of deep neck flexors increased in both groups (PIRE group: from 26(22-30) mmHg to 28(24-30) mmHg;  $Z=-2.859$ ,  $p=0.002$ ), SE group: from 28(22; 30) mmHg to 30(24;30) mmHg;  $Z=-3.217$ ,  $p < 0.001$ ). There was no significant difference between groups neither before ( $U=188$ ,  $p=0.589$ ) nor after ( $U=178.5$ ,  $p=0.403$ ) the program. NDI score after physiotherapy program improved in both groups (PIRE group: from 4(0-13) to 2(0-12),  $Z=-2.717$ ,  $p=0.004$ ; SE group: from 6(1-25) to 4 (0-15)  $Z=-2.963$ ,  $p=0.001$ ). There was no difference between groups either before ( $U=145$ ,  $p=0.094$ ) nor after ( $U=157.5$ ,  $p=0.179$ ) the program. Pain and discomfort decreased in both groups (PIRE group: from 6(2-9) to 2(0-5)  $Z=-3.855$ ,  $p < 0.001$ ; SE group: from 5.5(2-8) to 4.5(0-7)  $Z=-3.165$ ,  $p < 0.001$ ). There was no significant difference between groups before program ( $U=124.5$ ,  $p=0.367$ ), but after the physiotherapy program participants of PIRE group showed better results than SE group's participants ( $U=90$ ,  $p=0.037$ ).

**Conclusions.** Regardless of the applied physiotherapy program, there was no significant change in head and neck posture in the sagittal plane among women working sedentary jobs. An improvement in self-rated neck disability and deep neck flexors strength was observed in both groups. Pain and discomfort also decreased in both physiotherapy groups, but in the group where post isometric relaxation-based exercises were performed the improvement was greater than in another, where stretching exercises were added.

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## Outstanding Presentation Award

# THE EFFECT OF AN INTERACTIVE REHABILITATION TOOL ON INDEPENDENCE AND HAND FUNCTION IN PATIENTS WITH PARKINSON'S DISEASE

Indrė Ramanauskaitė<sup>1</sup>, Jolita Rapolienė<sup>1</sup>, Daiva Baltaduonienė<sup>2</sup>

<sup>1</sup>*Lithuanian University of Health Sciences, Department of Rehabilitation*

<sup>2</sup>*LSMU Kaunas Hospital, Department of Physical Medicine and Rehabilitation, Lithuania*

**Introduction.** Parkinson's disease is one of the fastest growing neurological disorders in the world and poses a growing public health challenge. The prevalence of the disease has risen significantly over the last two decades, highlighting the need to improve access to healthcare, promote research and develop effective prevention and treatment strategies [1]. In today's society, technology has a clear impact on everyone's daily life, and healthcare professionals are looking for innovative and effective ways to improve impaired function, and are increasingly turning to the use of new technologies [2,3]. The aim of the study- To evaluate the effect of an interactive rehabilitation tool on independence and hand function in patients with Parkinson's disease.

**Research methods and organization.** The study was conducted from October 11, 2024 to February 1, 2025 at the Abromiskes Rehabilitation Centre. Approval for the study was obtained from the Bioethics Center of the Lithuanian University of Health Sciences. The study involved 28 individuals, including: 20 women and 8 men who had Parkinson's disease. Individuals were included in the study based on the following selection criteria: individuals who voluntarily agreed to participate in the study; individuals with Parkinson's disease; Mini-Mental State Examination score  $\geq 21$ . The subjects were randomly divided into 2 study groups by purposeful selection. Group I (T1) received individual regular occupational therapy (OT) sessions 5 times a week, group II (T2) received individual regular OT sessions 2 times a week, and 3 times OT sessions with the RAPAEEL smart pegboard. The duration of all OT sessions was 30- 40 min. The subjects were assessed at the beginning and end of the study, after 13 sessions (3 weeks). T1 consisted of 11 women and 3 men, and T2 consisted of 9 women and 5 men. The average age of the subjects participating in the study was  $71.5 \pm 7.94$  years. The average age of the subjects in T1 was  $73.7 \pm 7.32$  years, and in T2 -  $69.2 \pm 8.12$  years. The average duration of disease-  $8.92 \pm 4.11$  years. Data were collected using selected research tools: hand function was assessed by Nine-Hole Peg Test (9HPT) and independence was assessed by The Functional Independence Measure (FIM). Statistical data analysis was performed using IBM SPSS 30 software program. The non-parametric Mann-Whitney test was used to compare two independent samples. The non-parametric Wilcoxon test was used to compare two dependent samples. Quantitative data are presented as median (Md), minimum value (min), maximum value (max) and mean (m) - Md (min-max; m). A difference was considered statistically significant when  $p < 0.05$ .

**Results.** In T1 the total pre-study FIM score was 86 (70–98; 84.07) points, post-study- 98 (83–111; 96.85). When comparing results within a group, independence improved significantly ( $Z=3.304$ ;  $p<0.001$ ). In T2, the total pre-study FIM score was 89.50 (53–109; 85.07) points, post-study- 105.50 (63–120; 99.42). The independence in T2 also improved significantly ( $Z=3.302$ ;  $p<0.001$ ). Comparing FIM scores before the study, no statistically significant difference was found ( $U=112.50$ ;  $p=0.511$ ). Comparing FIM scores between the groups after the study, no statistically significant difference was found ( $U=121.50$ ;  $p=0.285$ ). Analysis of the right-hand finger dexterity data obtained from the 9HPT showed that, before the study, the finger dexterity speed in T1 was 29.50s (22–46; 32.21), after- 27s (20–43; 29.71). Comparing results within a group finger dexterity improved significantly ( $Z=-3.234$ ;  $p=0.001$ ). In T2 finger dexterity speed was 29s (20–59; 32.21), after study- 25s (16–50; 27.28). Comparing results within a group finger dexterity also improved significantly ( $Z=-3.330$ ;  $p=0.001$ ). There was no statistically significant difference before the study ( $U=93.50$ ;  $p=0.839$ ). Comparing

results obtained between the groups after the study, a significant difference was found ( $U=53.50$ ;  $p=0.041$ ). The participants in T2 showed a better improvement. Analysis of the left-hand finger dexterity showed that, before the study, the finger dexterity speed in T1 was 30s (24–49; 33.57), after- 28.50s (24–48; 32). Comparing results, finger dexterity after the study improved significantly ( $Z=-2.829$ ;  $p=0.005$ ). In T2, the pre-study finger dexterity speed was 30s (23–50; 33.42), after- 25s (19–46; 28.42). Comparing results, finger dexterity improved significantly ( $Z=-3.313$ ;  $p=0.001$ ). There was no statistically significant difference before the study ( $U=90.00$ ;  $p=0.734$ ). A post-study comparison between the groups revealed a significant difference ( $U=43.00$ ;  $p=0.011$ ). The participants in T2 showed a better improvement.

**Conclusions.** 1. The independence after the study in both groups increased significantly. Conventional occupational therapy and occupational therapy with interactive rehabilitation tool equally improve independence. 2. The finger dexterity of all individuals improved significantly. Individuals who used an interactive rehabilitation tool during occupational therapy sessions had statistically significantly greater improvement in finger dexterity compared to those who underwent conventional occupational therapy.

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## Outstanding Presentation Award

### A QUALITATIVE STUDY ON CO-PLAY EXPERIENCES OF PARENTS RAISING CHILDREN WITH AUTISM

**Brigita Nauckūnaitė, Indrė Bakanienė**

*Lithuanian University of Health Sciences, Children's Rehabilitation Clinic*

**Introduction.** Co-play between parents and children plays a vital role in developing social and communicative skills, particularly for children with autism [1]. Despite its importance, parents often face challenges in initiating and sustaining co-play due to the unique needs of their children [2]. Existing interventions typically focus on parent training but lack in-depth exploration of parents' lived experiences in these interactions [3]. Thus, understanding these experiences is crucial for improving support systems and interventions. This study aims to explore the experiences of parents raising children with autism in the context of co-play.

**Research methods and organization.** The research is designed as a qualitative study. To recruit potential participants, the UAB "Medgintras" Rehabilitation Center was approached, and upon receiving institutional approval, contact details of 8 eligible individuals were provided. With the approval of the LSMU Bioethics Center, data collection occurred from June to September 2024. Data were collected through semi-structured interviews, using 3 main questions formulated on the basis of relevant literature: What is Your perspective on co-play with Your child? How do You manage to

initiate co-play with Your child? What challenges do You face in engaging and maintaining co-play with Your child? Interviews were audio recorded using a dictaphone, field notes were also taken. The recordings were transcribed verbatim into Microsoft Word by the author. The data were coded by the researchers through a careful examination of the texts, with codes consisting of individual words or short phrases. Codes were organized into thematic categories. The analysis followed the reflexive thematic analysis steps described by V. Braun and V. Clarke (2006): familiarization with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and writing the report. The interpretation of the themes was data-driven, avoiding bias and ensuring neutrality throughout the process. The findings were presented using the participants' own language and terminology. Participants were selected through purposive sampling. The inclusion criteria required that participants were parents of children diagnosed with autism (ICD-10:F84.0), aged 2-5 years. Children with severe visual, hearing, or motor impairments were excluded. The sample size was determined based on data saturation—data were collected until the information began to repeat and its informativeness declined. In total, 6 parents participated. Written informed consent was obtained from each participant. The names of the participants have been changed.

**Results.** The thematic analysis revealed three core themes: parents' perspectives on co-play, strategies for initiating co-play, and challenges encountered in engaging and maintaining co-play with their child. Most participants viewed co-play as both an educational tool and a means of strengthening emotional bonds. For example, several parents emphasized that play helps children develop communication and social skills: "Through play, the child learns to wait for their turn, respond to others, and share" (Gusté). Additionally, many observed developmental progress during play, including improved interaction and even emergence of speech: "Now he not only leads me by the hand, but also says 'mama' and calls me by name" (Alma). Parents also reported that co-play deepens emotional connection and trust: "During play, we both learn to trust each other. I feel we're truly together" (Laura). Over half of the respondents stated that they better understood their child's needs and emotions during play sessions. To initiate co-play, parents commonly used verbal cues or visual stimuli. Most emphasized the importance of adapting to the child's interests: "I usually follow his lead, rather than trying to direct the game" (Rita). Half of the participants mentioned using reward systems to enhance engagement, tailored to the child's individual motivation. Structured play was also identified as effective in promoting longer and more focused interaction: "When there's a clear plan, he feels calmer and plays longer" (Alma). Challenges included maintaining the child's attention, emotional responses to overstimulation, and sudden play interruptions. Many noted short attention spans: "He often loses interest after just a few minutes" (Irma). Environmental factors like noise or clutter frequently disrupted engagement. As one parent stated: "Too many toys in the room distract her completely" (Aistè). Others emphasized the need for consistency and a predictable routine to support sustained co-play.

**Conclusions.** The study shows that parents of children with autism view co-play as essential for both learning and emotional bonding. Parents actively adapt to their child's needs, applying flexible strategies to initiate and sustain play. These findings help explain parental behavior in supporting their child's engagement and are consistent with existing knowledge on autism and play. The insights are clear, contextually grounded, and offer a meaningful contribution to early intervention practices.

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# EFFECTS OF AN INTERACTIVE PROGRAMME ON ENGAGEMENT IN ACTIVITIES AND COGNITIVE FUNCTIONING IN PEOPLE WITH SCHIZOPHRENIA

Gabija Batulevičiūtė<sup>1</sup>, Daiva Petruševičienė<sup>1</sup>, Gabrielė Subačė<sup>2</sup>

<sup>1</sup>*Lithuanian University of Health Sciences, Department of Rehabilitation*

<sup>2</sup>*LSMU Kaunas Hospital, Department of Psychosocial Rehabilitation, Lithuania*

**Introduction.** Schizophrenia is a chronic mental disorder characterized by disturbances in thinking, perception, and emotions that negatively affect participation in meaningful activities (1, 2). Traditional occupational therapy methods aim to restore human capabilities, but individuals with schizophrenia experience a persistent lack of motivation (3). The RehaCom program has proven effective in improving cognitive functions, but its application in patients with schizophrenia has not yet been sufficiently studied (4). The aim of the study is to evaluate the change in cognitive functions and engagement in activities of individuals with schizophrenia using an interactive program.

**Research methods and organization.** After the selection of subjects, 30 people - 11 women and 19 men with schizophrenia - participated in the study. The subjects were divided into two treatment groups of 15 subjects each: treatment group I and treatment group II. Group I received conventional group occupational therapy 5 times a week for 1 month, 45 minutes to 1 hour, and Group II received conventional occupational therapy 3 times a week, and occupational therapy using the RehaCom programme 2 times a week for 1 month, 45 minutes to 1 hour. Group I consisted of 10 males (67%) and 5 females (33%) with a mean age of 34.07 ( $\pm 6.88$ ) years, Group II consisted of 9 males (60%) and 6 females (40%) with a mean age of 30.13 ( $\pm 5.07$ ) years. Although the subjects in group I were older, the age difference between groups was not statistically significant ( $p > 0.05$ ). Inclusion criteria: Able-bodied patient, whose capacity is not limited by a court order under the laws of the Republic of Lithuania, diagnosed with schizophrenia; moderate or mild cognitive impairment (scores 11-25 on the MMSE); oriented, able to speak and participate in activities. Exclusion criteria: Incapacitated; patient has psychotic symptoms; severe cognitive impairment; severe comorbidities. Subjects were assessed twice: before and after the study. The Mini Mental State Examination (MMSE) was used to assess cognitive function. Patients' engagement in activities was assessed with the Willingness Questionnaire. IBM SPSS version 30 was used for statistical analysis of the study data. MS Excel 2019 was used to display the graphs. The Wilcoxon criterion was used to compare two dependent samples. Results were considered statistically significant at  $p \leq 0.05$ . Pearson's correlation coefficient was used to assess the relationship between the two variables. Quantitative data are presented as median (Xme), minimum (Xmin), maximum (Xmax) and mean (X) - Xme(Xmin - Xmax; X).

**Results.** Patients' involvement in the activities was assessed by the Willingness Questionnaire. The scores were summed and assigned to one of four categories: passive (0-16 points), uncertain (17-32 points), influential (33-48 points), voluntary (49-64 points). The assessment was carried out during the first session and the last session. In the second group, which received conventional occupational therapy and occupational therapy using the RehaCom programme, engagement in activities was passive before occupational therapy, with a mean score of 16 (11-31; 19.8), and increased to an influential level at the end of rehabilitation, with a score of 46 (39-52; 46.13) out of 64 possible points on the willpower questionnaire. There was a statistically significant improvement in engagement in activities during rehabilitation ( $Z = -3.408$ ,  $p < 0.001$ ). In the second group, which received conventional occupational therapy and occupational therapy using the RehaCom programme, cognitive function scores before rehabilitation averaged 20 (11-22; 19.13), with moderate cognitive impairment, and at the end of rehabilitation, 13.3% of the score had increased to mild cognitive impairment, with a mean score of 22 (16-24; 21.67) out of a possible 30. There was a statistically significant improvement in cognitive function during rehabilitation ( $Z = -3.059$ ,  $p < 0.05$ ). To determine the relationship between cognitive function and engagement in activities, the baseline scores of the Brief Mental State Test and the Willingness Questionnaire were compared. There was a moderate, statistically significant positive

relationship between cognitive function and engagement in activities ( $r=0.45$ ,  $p=0.008$ ). When the relationship between cognitive function and engagement in activities was assessed within groups, a statistically significant moderate strength positive relationship was found ( $r=0.54$ ,  $p=0.039$ ) in group I, while no statistically significant positive relationship was found in group II ( $r=0.32$ ,  $p=0.246$ ).

**Conclusions.** 1. In the second group, engagement in activities increased significantly during rehabilitation, moving from a passive to an active level, indicating a positive impact of the programme on patient activity. 2. The cognitive function of the second group of patients showed a statistically significant improvement at the end of rehabilitation, moving from moderate to mild cognitive impairment, indicating the effectiveness of the Rehacom programme in improving cognitive function. 3. A positive and statistically significant relationship was found between cognitive function and baseline scores of engagement in activities in both groups. Better cognitive function is associated with higher engagement in activities.

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## THE EFFECT OF A PROPRIOCEPTION TRAINING EXERCISES PROGRAM ON THE DYNAMIC AND STATIC BALANCE OF BASKETBALL PLAYERS AGED 12-15 YEARS

Giedrė Bernatonytė, Ernesta Aukštuolytė – Bačienė, Algė Daunoravičienė

*Lithuanian University of Health Sciences, Department of Sports Medicine*

**Introduction.** Ankle sprains are the most common lower limb injury among athletes, accounting for 16-40% of all sport-related injuries [1]. Improving balance control is one of the ways to help prevent ankle joint injuries. Proprioception plays a key role in controlling balance, and proprioception training exercises are one of the most important measures to reduce ankle injuries [3]. A review of the scientific literature shows that few studies evaluate the risk of ankle injuries in young individuals (12-15 years old) using proprioception training programs. Aim of the study: to evaluate the impact of a proprioception training program on dynamic and static balance in 12-15-year-old basketball players.

**Research methods and organization.** The study was conducted at the Capital Basketball School, from September to November 2024. The study was approved by the LSMU Bioethics Center, No. 2024 - BEC3-T-023. Written consent to participate in the study was obtained from the participants and their parents (guardians). The study involved 20 individuals, who were divided into two groups: the experimental group ( $n=10$ ) and the control group ( $n=10$ ). During the study period, both groups participated in regular basketball training sessions. The experimental group underwent a 9-week proprioception training program. The program was conducted three times a week, every other day, with a duration of ~20 minutes. Average age of the experimental group - 13.90(1.10) and control group - 14.00(1.05). Inclusion criteria: 12-15 years of age; Attending basketball training at least 3 times a

week and at least 2 years; No ankle or knee injuries in the past six months; Not participating in training for other sports

**Research methods:** Dynamic balance was assessed using the Y Balance Test. The participant was asked to push a block in three directions: anterior, lateral, posterior. The final result was calculated using a special formula that takes into account the participant's legs length [4]. Static balance was assessed using the Balance Error Scoring System (BESS). Participants had to perform three standing tasks on a solid surface and platform: standing with feet together, on the non-dominant leg, heel-to-toe position, with the dominant leg in front [5]. Data analysis was performed using IBM SPSS Statistics 29.0 software. To compare two related samples with small sample sizes, the non-parametric Wilcoxon test was applied, for two independent samples, the non-parametric Mann-Whitney-Wilcoxon test was used. Data were presented as median (Md), minimum (min), and maximum (max) values, mean (m) – Md(min – max; m); average. The difference was considered statistically significant when  $p < 0.05$ .

**Results.** In the experimental group, the median of the left leg Y balance test results before the intervention was 125,50 (103-154; 124,30), and after – 133,50 (111-159; 133,50). A statistically significant difference was found ( $Z = -2,807$ ;  $p = 0.005$ ). The median of the right leg results before the intervention was 22 (91–155; 122,20), and after – 132 (101–162; 133,10). A statistically significant difference was found ( $Z = -2.807$ ;  $p = 0.005$ ). In the control group, the median of the Y test for the left leg before the 9-week period was 115,50 (98–129; 115,10), and after – 121 (102–140; 120,70). A statistically significant difference was found ( $Z = -2.812$ ;  $p = 0.005$ ). The median of the right leg before the 9-week period was 114,50 (101–137; 114,40), and after – 121,50 (108–143; 121,50). A statistically significant difference was found ( $Z = -2,809$ ;  $p = 0.005$ ). When comparing the results of both groups at the first testing session, the right and left leg Y - test results were similar, respectively ( $U=34$ ;  $p=0.225$ ) and ( $U=27$ ;  $p=0.082$ ). After the intervention, statistically significant results were found for the left leg ( $U=22.50$ ;  $p=0.037$ ) and the right leg ( $U=23$ ;  $p=0.040$ ). When evaluating static balance, the experimental group's BESS score before the intervention was 50 (44 - 54; 49.70), and after the intervention, it was 56 (52 - 58; 55.40). The difference was statistically significant ( $Z=-2.820$ ;  $p=0.005$ ). In the control group, the BESS score at the first testing session was 50.50 (45 - 59; 50.50), after 9 weeks - 55.50 (50 - 60; 55.10). A statistically significant difference was found ( $Z=-2.818$ ;  $p=0.005$ ). Before the intervention, the experimental group's BESS test result did not significantly change from the control group ( $U=47.50$ ;  $p=0.849$ ). After the intervention, there was no significant difference in the BESS test results between the experimental and control groups ( $U=47$ ;  $p=0.853$ ).

**Conclusions.** The dynamic balance of basketball players aged 12-15 improved after nine weeks of proprioception exercises. Although dynamic balance also improved for those attending regular basketball training, a greater effect was observed in the experimental group. When assessing the changes in the static balance of young basketball players, a similar improvement was observed both in those attending regular basketball training and those additionally performing proprioception training exercises.

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# SLEEP QUALITY AND FUNCTIONAL STATUS OF THE LUMBAR SPINE AND LOWER LIMBS IN NURSES AND NURSES' ASSISTANTS

Lauryna Bumblytė, Vilma Tamulionytė

*Lithuanian University of Health Sciences, Department of Sports Medicine*

**Introduction.** Nurses and nurses' assistants are demanding professions which consist of long working hours and physically debilitating tasks [1]. The challenging nature of their work can significantly impact their physical well-being including functional status of the lumbar spine, lower limbs and sleep quality. Investigating sleep quality and functional status is essential for improving such specialists' job satisfaction which is closely linked with quality patient care [2,3,4]. The aim of this research is to assess sleep quality and functional status of the lumbar spine and lower limbs of nurses and nurses' assistants.

**Research methods and organization.** Ethical approval for the research was obtained from the Bioethics Center of the Lithuanian University of Health Sciences 2024-BEC2-1074. In total 28 women were involved in this study: 16 of them were nurses (51.1%) and 12 were nursing assistants (42.9%). For the purposes of data analysis and comparison, participants were divided into two groups according to their professional roles – nurses and nurses' assistants. Inclusion criteria were 25–65-year-old women, nurses and nursing assistants, who have no less than 3 years of work experience. Exclusion criteria involved diagnosis of intervertebral disc herniation or recent trauma of the lumbar spine or lower limbs ( $\leq 4$  months). The study used a questionnaire survey about the specialists and the characteristics of their work, and Pittsburgh Sleep Quality Index (PSQI) was used to assess participants' sleep quality. Mobility of the lumbar spine was assessed using Modified Schober Test. Lower limb mobility was assessed by applying Single leg Stand on Tip Toe Test. Data analysis was performed using IBM SPSS Statistics 30.0 software. Quantitative data that were analyzed using nonparametric criteria are presented as median (Md), minimum (min) and maximum value (max) – Md(min-max). For comparison of two independent samples, when the sample size is less than 25, the nonparametric Mann-Whitney-Wilcoxon test was used. Qualitative variables were described by frequency and relative frequency percentage. Significance level -  $\alpha=0.05$ .

**Results.** The average age of the nurses in the study was 41.5 (s = 10.8) years, and the average age of the nursing assistants was 41.8 (s = 10.9) years. On average, the nurses worked 30 (s = 12.6) hours per week, and the nursing assistants - 33.3 (10.7) hours per week. The lumbar spine mobility in both groups (nurses and nurses' assistants) was 4.5 (2-8) cm. When comparing the lumbar spine mobility of nurses and nursing assistants, no statistically significant difference was found (U = 98; p = 0.945). For 50% of participants this feature was not optimal. Healthy lower back range of movement is around 5-7 cm or more, so results suggest that participants had limited movement in their lower back. The nurses' functional mobility of the right lower limb was 13.5 (6-20) times, and on the left limb - 14.5 (8-20) times. The functional mobility of the right lower limb of the nurses' assistants was 12 (6-18) times, and on the left side 11 (6-20) times. Standard of the norm is 20 times. For 91.1% of participants this feature was not optimal. When comparing the functional mobility of the lower extremities of nurses and nursing assistants, no statistically significant difference was found on either the right side (U = 86; p = 0.664) or the left side (U = 67; p = 0.189). The sleep quality of the nurses was 13.5 (4-19) points and nurses' assistants were 14 (7-20) points. 57.1% of participants endure moderate or severe sleep disturbances. When comparing the sleep quality of nurses and nursing assistants, no statistically significant difference was found (U = 99; p = 0.909).

**Conclusions.** Limited lumbar spine and lower limbs mobility are common both in nurses and nursing assistants. More than half of participants had moderate or severe sleep disturbances. There was no difference in lumbar spine, lower limbs mobility and sleep quality between nurses and nurses' assistants.

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## THE EFFECT OF MYOFUNCTIONAL THERAPY AND ELECTROSTIMULATION ON PATIENTS EXPERIENCING FACIAL MUSCLE PAIN, UTILIZING MYOFASCIAL RELEASE

Ieva Bučinskaitė, Eglė Lendraitienė

*Lithuanian University of Health Sciences, Department of Rehabilitation*

**Introduction.** Facial muscle pain significantly affects daily functioning and quality of life, often linked to temporomandibular joint (TMJ) dysfunction and myofascial pain syndrome (3). These conditions are common in adults, with 5-12% of the population experiencing TMJ disorders or orofacial pain in their lifetime (1). This pain can limit jaw movement, cause emotional distress, and impair quality of life (2). This study evaluates the effectiveness of combining myofunctional therapy, transcutaneous electrical nerve stimulation (TENS), and myofascial release in treating facial muscle pain, focusing on pain reduction and functional improvement.

**Research methods and organization.** The study was conducted at the Balčiūnų Clinic in Marijampolė, involving 30 patients aged 25–60 years, all with chronic facial muscle pain. Participants were randomly divided into two equal groups of 15. Group 1 received myofunctional therapy combined with myofascial release, and Group 2 received Transcutaneous Electrical Nerve Stimulation (TENS) combined with myofascial release. Inclusion criteria: Jaw or head pain, persistent or recurrent pain in the masticatory muscle area lasting at least three months, pain intensity  $\geq 2$  on the Visual Analog Scale, and age between 18–65 years. Exclusion criteria: Systemic inflammatory diseases, severe dentoalveolar anomalies, facial-jaw trauma, generalized pain syndromes, pregnancy, or pacemakers. Study group: The age of participants was 40.83 years, with 10 men and 20 women. The interventions lasted for 3 months, with sessions held three times a week, each lasting 30–40 minutes. Measured variables: Pain intensity was assessed using the VAS (0–10), range of motion was measured in centimeters, stress levels were assessed using the Perceived Stress Scale (PSS, 0–40), and the severity of Temporomandibular Dysfunction (TMD) was assessed using the Fonseca Questionnaire (0–100). The analysis of the results was performed using the IBM SPSS Statistics program. Nonparametric criteria were chosen for data analysis because the sample is small and the normality criterion is not met. The Wilcoxon Signed-Rank test was used to compare two dependent samples. The Mann–Whitney U test was used to compare two independent samples, to compare the effects of different interventions. Statistical significance was set at  $p < 0.05$ . Paired data (pre- and post-intervention): The Wilcoxon Signed-Rank test this test was appropriate for analyzing changes in variables before and after the interventions. Independent group comparisons: The Mann–Whitney U test was applied to compare two independent groups when the data distribution was non-normal Statistical significance was set at  $p < 0.05$ .

**Results.** The study demonstrated significant improvements in facial muscle pain intensity and range of motion following the interventions. Pain intensity was assessed using the Visual Analog Scale (VAS), which ranges from 0 (no pain) to 10 (unimaginable pain). Before the interventions, the median pain score was 5.50 (min = 2; max = 10), which significantly decreased to 2.00 (min = 0; max = 7) after the interventions. This reduction was statistically significant ( $Z = -4.867$ ,  $p < 0.001$ ), confirming the efficacy of the interventions in reducing pain. Moreover, there was no statistically significant difference in post-intervention pain between patients who received different interventions ( $U = 105.5$ ,  $p = 0.790$ ), indicating that both approaches were equally effective. The second research objective aimed to assess and compare the changes in facial muscle movement amplitude between the two groups before and after therapy. In Group 1, which received myofunctional therapy combined with myofascial release, the median amplitude before intervention was 4.30 cm (min = 3.20; max = 5.40), and after the intervention increased to 5.10 cm (min = 4.40; max = 6.00). This improvement was statistically significant ( $Z = -3.524$ ,  $p < 0.001$ ). Improvement was also observed in Group 2, which received TENS combined with myofascial release. The median amplitude before the intervention was 3.70 cm (min = 2.70; max = 5.10), and after the intervention it increased to 4.85 cm (min = 3.30; max = 5.50). This difference was statistically significant ( $Z = -2.966$ ,  $p = 0.003$ ). Although Group 1 showed better outcomes, the difference between the two groups was not statistically significant ( $U = 78.50$ ,  $p = 0.161$ ). Stress levels, measured using the Perceived Stress Scale (PSS), significantly decreased in both groups after the interventions. In Group 1, the median stress level before the intervention was 20.00 (min = 16.00; max = 25.00), which significantly decreased to 16.00 (min = 13.00; max = 23.00) after the intervention ( $Z = -3.425$ ,  $p < 0.001$ ). Similar results were observed in Group 2, where the median stress level before the intervention was 18.00 (min = 11.00; max = 23.00) and decreased to 15.50 (min = 6.00; max = 19.00) post-intervention. This change was statistically significant ( $Z = -3.15$ ,  $p = 0.002$ ). Combined analysis of both groups also showed a significant overall decrease ( $Z = -4.634$ ,  $p < 0.001$ ). Importantly, no significant differences were found between the two groups after the intervention ( $U = 105.5$ ,  $p = 0.790$ ), suggesting that both interventions had a comparable effect in reducing perceived stress. However, it should be noted that based on the PSS score interpretation, both before and after the interventions, the participants' stress levels remained within the moderate range (14–26). This suggests that factors other than TMD may have contributed to the participants' perceived stress. Finally, Temporomandibular Dysfunction (TMD) severity, assessed using the Fonseca Index (FI), showed significant improvement in both groups. The FI ranges from 0 to 100, with the following classifications: 0–15: minimal TMD symptoms, 20–40: mild TMD symptoms, 45–65: moderate TMD symptoms, 70+: severe TMD symptoms. The median Fonseca Index score before the interventions was 40 (mild TMD symptoms), and post-intervention it was 20 (minimal TMD symptoms). In Group 1, the median FI score before the intervention was 70 (min = 55; max = 80), which significantly decreased to 32.50 (min = 15; max = 50) post-intervention ( $Z = -3.537$ ,  $p < 0.001$ ). Group 2 also demonstrated significant improvement, with the median score before the intervention being 70 (min = 35; max = 80), and decreasing to 32.50 (min = 15; max = 45) after the intervention ( $Z = -3.31$ ,  $p = 0.001$ ). The overall analysis ( $Z = -4.803$ ,  $p < 0.001$ ) confirmed that both interventions significantly reduced facial pain severity and were equally effective in improving patients quality of life.

**Conclusions.** Both myofunctional therapy and electrostimulation, combined with myofascial release, significantly reduced facial muscle pain, improved muscle function, and decreased the severity of temporomandibular joint disorders. The interventions showed comparable efficacy in improving pain intensity, range of motion, and stress levels, suggesting their potential as effective treatments for patients with chronic facial muscle pain and temporomandibular joint dysfunction.

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## CHANGE IN FUNCTIONAL INDICATORS OF INDIVIDUALS PARTICIPATING ACTIVELY IN RUGBY, APPLYING DYNAMIC NEUROMUSCULAR STABILIZATION

Karolis Čereška, Brigita Zachovajevienė, Laimonas Šiupšinskas

*Lithuanian University of Health Sciences, Department of Sports Medicine*

**Introduction.** Rugby is an intense and contact-based sport with very high popularity worldwide. It is one of the team sports that causes the most injuries. With the continuous improvement of sports functional research, as athletes' physical and psychological indicators change, injury prevention measures, exercises, and methods also evolve (1). Currently, the dynamic neuromuscular stabilization (DNS) system is frequently applied in sports, and it would be beneficial to understand the benefits of this method for changes in athletes' functional movements (2,3). Research aim was to assess the change in functional indicators of individuals actively playing rugby, applying dynamic neuromuscular stabilization.

**Research methods and organization.** The research was approved by Lithuanian University of Health Sciences Bioethics Center (2024-BEC2-470). The study conducted from August till September 2024 in „Prorehab“ clinic. Selection criteria: men, actively playing rugby at least twice a week for no less than two years: age 18-35 years, without any active trauma. In the study participated 30 players. The participants were randomly assigned into two groups of 15: regular warm-up common components – mobility drills, dynamic stretches, jogging, sprints. DNS warm-up – re-establish ideal movement patterns, improve joint centration, alignment, enhance core stability and neuromuscular control. Age in group-with DNS was  $25.7 \pm 5.78$  years and without -  $26.2 \pm 5.9$  years. The participants were tested twice: before the intervention and after it. Before every rugby training session, all players performed a general warm-up for 5 minutes. DNS warm-up group did the DNS warm-up exercises for 15 min (on all four with knee lifted 3 sets of 40 sec, crawling 2 sets of 10 steps forward and back, bear 2 sets of 10, supine rolling to sides 2 sets of 10, high sit with leg movements 2 sets of 10, dead-bug 3 sets of 10) and another group - just a regular rugby-based warm-up 15 min. The total intervention lasted for 5 weeks, 3 times a week. The following tests were used to evaluate the participants and assess their data: Functional movement assessment scale (FMS), Y balance test for the lower extremities - for dynamic stability and balance testing, Agility T-test. The Wilcoxon test (Z) was applied to examine two dependent samples. For two independent samples, the non-parametric Mann-Whitney Wilcoxon test (U) was used. Data are presented as median (xme), minimum value (xmin), maximum value (xmax), and arithmetic mean (m). A statistically significant difference is considered when  $p < 0.05$ .

**Results.** In the DNS warm-up group, dynamic stability improved: left leg before 96.7 (81-121; 97.4) score, after 100 (86-126; 101.1) score;  $Z = -3.297$   $p < 0.001$ , right leg before 99.3 (74-124; 96.56 score, after 99 (78-126; 98.66) score,  $Z = -3.297$ ;  $p < 0.001$ . In the regular warm-up group, dynamic stability improved: left leg before 96.8 (82-107; 96.7) score, after 100 (88-110; 99.1) score; ( $Z = -3.408$ ,  $p < 0.001$ ), right leg before 97.3 (80-106; 96.45) score, after 100 (87-108; 98.4) score,  $Z = -3.408$ ,  $p < 0.001$ . Analysis revealed no significant difference between the groups, neither before (*left leg* ( $U = 106.5$ ;  $p = 0.803$ ), *right leg* ( $U = 107$ ;  $p = 0.830$ )), nor after the program - *left leg* ( $U = 112$ ;  $p = 0.983$ ), *right leg* ( $U = 110.5$ ;  $p = 0.943$ ). In the DNS warm-up group, functional movements improved: before 12(10 - 14; 12.13) score, after 13(10 - 14; 12.6) score,  $Z = -2.333$ ;  $p = 0.031$ . In the regular warm-up group, functional movements' results showed no change: before 13(10 - 14; 12.53) score, after 13(10 - 14; 12.73) score,  $Z = -1.732$ ;  $p = 0.250$ . Analysis revealed no significant difference between the groups, neither before ( $U = 92.5$ ;  $p = 0.409$ ), nor after the program ( $U = 108$ ;  $p = 0.861$ ). In the DNS warm-up

group, agility improved: before 10.79(10.20 – 11.87; 10.83) sec., after 10.46(10.11 – 11.75; 10.61) sec.,  $Z=-3.410$ ;  $p<0.001$ . In the regular warm-up group, agility result also showed improvement: before 10.97(10.34 – 11.76; 11.04) sec., after 10.87(10.15 – 11.42; 10.89) sec.,  $Z=-3.409$ ;  $p<0.001$ . Analysis revealed no significant difference between the groups before ( $U=70.5$ ;  $p=0.083$ ), but after the program results showed a significant difference ( $U=62$ ;  $p=0.036$ ).

**Conclusions.** The application of only rugby-based warm-up and warm-up based on dynamic neuromuscular stabilization improved the dynamic balance and agility. More expressed agility changes were observed in DNS warm-up group. Functional movements improved only in the DNS warm-up group of individuals actively playing rugby.

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## PECULIARITIES OF DENTAL CARE PROFESSIONALS' HEAD AND NECK POSTURE AND FUNCTIONAL STATUS

**Gabija Dusevičiūtė, Vilma Tamulionytė**

*Lithuanian University of Health Sciences, Department of Sports Medicine*

**Introduction.** Musculoskeletal system disorders are recognized as one of the most common disorders among dental care professionals. These degenerative disorders often affect practitioner's muscles, ligaments, tendons, bones, joints, blood vessels and nerves, resulting in discomfort and pain [1]. Mentioned problems can cause irreversible damage and contribute to early retirement [2]. These specialists often have difficulty in controlling the stability of correct posture and following the principles of ergonomics. This is the key to a safe work environment, personal health, and productivity [3]. The aim of this research is to evaluate the peculiarities of head and neck posture and functional state also their correlations in dental care professionals.

**Research methods and organization.** Ethical approval for the research was obtained from Bioethics center of Lithuanian University of Health Sciences. In total there were 30 dental care specialists (dentists and dental hygienists) with an average age of 42.2 years (from 30 to 64) and an average work experience of 17.7 years (from 5 to 40). Of all subjects that participated in the study 21 were women and 9 were men. Inclusion criteria were young and middle-aged (30-65), dental health specialists (dentists and dental hygienists) who have more than 5 years of work experience. Exclusion criteria were arthritis, head and neck region trauma ( $\leq 3$  months), osteoporosis, intervertebral disc herniation in the cervical spine, severe instability in cervical spine, dizziness. Participants were assessed once and physical condition was examined using the following methods: assessment of the head neck region's posture in the sagittal plane, while sitting and standing, using the "Posture Screen" mobile application and assessment of the neck region' functional status using a questionnaire "Neck disability index". The statistical analysis was performed using SPSS 30.0 and „Excel” software. Data were analyzed using descriptive statistics and Wilcoxon signed-rank test. Quantitative data are presented as median (me) and minimum (min) and maximum (max) values, mean ( $\bar{x}$ ) - me (min-max;  $\bar{x}$ ). Qualitative data are presented as percentages. Spearman's correlation was used to determine correlations. The relationship when  $|r|\leq 0.3$  was considered weak, when  $0.3<|r|\leq 0.7$  - was considered moderate, and when  $|r|>0.7$  - was considered strong. The difference was considered statistically significant when  $p<0.05$ .

**Results.** The head and neck posture in the sagittal plane (while sitting) was 2.98 (2.06–3.74; 2.85) cm. Analysis of these results showed that 33.33% of the subjects had optimal head posture in the sagittal

plane, while 66.67% exhibited forward head posture. In the standing position, the head and neck posture in the sagittal plane was 2.83 (1.91–3.66; 2.69) cm. Analysis revealed that 46.67% of the participants had optimal head and neck posture, while 53.33% had forward head posture. A statistically significant difference was found when comparing head and neck posture in sitting versus standing positions ( $Z = -13.59$ ;  $p < 0.001$ ), indicating more optimal posture in the standing position. Assessment of participants' neck functional status showed that 23.33% had no neck disability, 50% had mild disability, 16.67% had moderate disability, 6.67% had severe disability, and 3.33% had complete disability. The Neck Disability Index (NDI) score was 8 (0–35; 8.55) points. Correlation analysis demonstrated a significant, direct, moderate relationship between neck disability and head and neck posture in both standing ( $r = 0.69$ ,  $p < 0.001$ ) and sitting ( $r = 0.65$ ,  $p < 0.001$ ) positions: increased neck disability was associated with a more pronounced forward head posture.

**Conclusions.** The study revealed that more than half of the dental care specialists exhibited neck disability and non-optimal head and neck posture in the sagittal plane. Also, the greater the neck disability was, the more pronounced forward head posture was observed.

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## THE IMPACT OF POSITIONING EQUIPMENT USAGE AND TUMMY TIME ON INFANT DEVELOPMENT

**Rūta Gasiulienė, Indrė Bakanienė**

*Lithuanian University of Health Sciences, Department of Children's Rehabilitation*

**Introduction.** Infant development is a continuously evolving process influenced by both internal and external factors. Daily parental choices regarding infant positioning play a significant role in this process (1, 2). The increasing use of positioning equipment raises concerns about its potential negative impact on motor development, particularly in relation to "container baby syndrome." To enable infants to explore their environment and develop essential skills, frequent position changes are necessary (3). Tummy time is crucial for motor skill development, yet not all parents are aware of its benefits and the optimal duration (4, 5). The study aimed to determine the impact of positioning equipment and tummy time on infant development.

**Research methods and organization.** The study was conducted via an online platform from July to December 2024. Prior to data collection, ethical approval was obtained from the LSMU Bioethics Center (Approval No. 2024-BEC2-790). The study involved the Ages & Stages Questionnaire (ASQ) and a researcher-designed questionnaire, which included demographic questions to describe the sample, as well as questions about parental use of infant positioning equipment and tummy time practices. Parents were instructed to indicate the average amount of time per day their infant spent in each positioning device as well as the time spent in prone (tummy) position while awake. "Containers" included infant car seats, baby bouncers, rockers, sleeping nests etc. Infant development was assessed using the ASQ covering five domains: communication, gross motor, fine motor, problem-solving, and personal-social skills. Responses were categorized into three levels: typical development (norm), monitoring zone (gray zone), and at-risk for developmental delay (black zone). The survey targeted parents of infants aged 6 to 12 months who had no diagnosed genetic disorders or chronic illnesses. The majority of respondents were aged 30–35 years (40.8%,  $n = 42$ ), while only 4.9% ( $n = 5$ ) were

older than 40 years. The average age of the infants was  $9.04 \pm 1.57$  months. Most participating families had one child (median = 1), with 68.9% of families raising one child, 27.2% raising two, and 3.9% raising three children, indicating a sample primarily composed of smaller families. Information on the child's gender and which parent completed the questionnaire was not collected, as the study primarily focused on associations between environmental caregiving factors and aspects of infant physical development. Statistical analysis was performed using IBM SPSS Statistics 30.0. Data is considered statistically significant at  $p < 0.05$ .

**Results.** A total of 106 respondents completed the questionnaire, with 103 responses being suitable for the study. 100% of all respondents reported using infant positioning devices. The most frequently mentioned device was the infant car seat, reported by all respondents. The data reflect the total estimated time per day the infant spent in any of the listed devices, regardless of whether the child was awake or asleep during use. The minimum reported time spent in the device was 15 minutes, while the maximum was 240 minutes. The median time spent in positioning devices was 60 minutes. Meanwhile, the tummy time ranged from 0 to 240 minutes, with a median of 30 minutes. The non-parametric Mann-Whitney U test showed that the relation between the time spent in positioning devices and body posture and tone changes was not statistically significant ( $U = 603$ ,  $Z = -1.938$ ,  $p = 0.053$ ), though a trend was observed. On the other hand, the tummy time differed significantly between infants with and without body posture and tone changes ( $U = 589$ ,  $Z = -2.049$ ,  $p = 0.040$ ). However, there was no statistically significant effect of infant movement asymmetry on time spent in positioning devices ( $U = 1027$ ,  $Z = -0.345$ ,  $p = 0.730$ ) or on tummy time ( $U = 944$ ,  $Z = -0.965$ ,  $p = 0.335$ ). The analysis of ASQ-3 results revealed that developmental difficulties were most frequently observed in the gross and fine motor domains, with 23.3% and 17.5% of children, respectively, falling into the monitoring (gray) or risk (black) zones. Despite this, Mann-Whitney U tests showed no statistically significant differences in tummy time or positioning device time between children with typical development and those in the gray or black zones across all five ASQ-3 developmental areas ( $p > 0.05$ ). These findings suggest that the amount of time spent in positioning devices or in tummy time did not have a statistically significant association with developmental outcomes in the studied sample.

**Conclusions.** The study highlights the need to provide parents with information on the importance of positioning for infants. Although all infants were placed in positioning devices daily, no significant associations were found between time spent in these devices and developmental outcomes. However, infants with altered body posture and tone spent significantly less in tummy time. Monitoring tummy time may be relevant for early motor development support.

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# CHANGES IN FLEXIBILITY AND LOW BACK PAIN IN LONG-DISTANCE RUNNERS UNDERGOING DIFFERENT PHYSIOTHERAPY PROGRAMS

Paulina Kukauskaitė, Ernesta Gurskienė

*Lithuanian University of Health Sciences, Department of Sports Medicine*

**Introduction.** Dramatically increased amateur female participation in long-distance running over the past few decades has coincided with a rise in sports injuries and a decline in women's health, particularly related to the onset of lumbar pain (1). A lack of mobility can significantly restrict movement and increase the risk of injury during running. When elements of body movement function improperly, the overall movement becomes dysfunctional, leading to pain (2). Various physiotherapy techniques are applied to address these issues (3). Therefore, the aim of this study is to evaluate changes in flexibility and lumbar pain in long-distance runners following different physiotherapy interventions.

**Research methods and organization.** The study received approval from the Bioethics Center of the Lithuanian University of Health Sciences (Approval No. 2024-BEC2-873). The research was conducted in November 2024 at the healthcare facility MB Kinezis. Women attending the clinic with complaints of lower back pain and who engage in recreational long-distance running (over 3 km) at least twice a week were invited to participate. Women experiencing acute pain, using pain relief medication, having comorbid conditions or disorders that could interfere with the study process, or engaging in other physical activity programs were excluded. A total of 22 women participated in the study. Participants ranged in age from 20 to 37 years. They were selected using purposive sampling and randomly assigned into two physiotherapy intervention groups: a “Exercise group” (n=11) and a “Foam rolling group” (n=11). Both groups were homogeneous in terms of age, height, and weight ( $p>0.05$ ). Participants in the “Exercise group” performed four exercises daily for two weeks, each session lasting 15 minutes, focusing on flexibility, core stability, and strength enhancement. Participants in the “Foam rolling group” performed daily 15-minute sessions of self-massage targeting the lower limbs and gluteal muscles over the same two-week period. A custom-designed questionnaire was used to assess inclusion and exclusion criteria. Pain intensity was evaluated using a Numeric Analog Scale, and flexibility was assessed using the Sit and Reach test. Height was measured with a stadiometer, and body weight was measured using a calibrated medical scale. Data analysis was performed using IBM SPSS Statistics 30.0.0.0 and Microsoft Excel 2016 statistical packages. The Mann–Whitney U test was used to compare independent samples, and the Wilcoxon signed-rank test was applied for dependent samples. Quantitative data are presented as median ( $X_{me}$ ), minimum ( $X_{min}$ ), maximum ( $X_{max}$ ), and mean ( $X$ ). P-value of  $<0.05$  were considered statistically significant.

**Results.** Before the intervention, participants in the “Exercise group” reported pain intensity scores of 5 (3–6; 4.4) points on the Numeric Analogic Scale. After the intervention, the scores were 4 (1–8; 4) points. The within-group comparison revealed no statistically significant difference ( $Z = -0.906$ ;  $p = 0.365$ ). In the “Foam rolling group” pre-intervention pain intensity was 5 (2–8; 4.6) points, whereas post-intervention results showed a significant decrease to 2 (0–5; 2) points. The comparison before and after the intervention revealed a statistically significant reduction in pain ( $Z = -3.035$ ;  $p = 0.002$ ). When comparing the two groups, no statistically significant difference in pain intensity was observed before the intervention ( $U = 54$ ;  $p = 0.695$ ). However, a statistically significant difference was found post-intervention ( $U = 28$ ;  $p = 0.030$ ). Prior to the intervention, participants in the “Exercise group” demonstrated flexibility results of 6 (1–15; 7.7) centimeters in the Sit and Reach test. After the intervention, the results were 5 (1–13; 7.2) centimeters. The comparison within the group showed no statistically significant difference ( $Z = -0.857$ ;  $p = 0.391$ ). In the “Foam rolling group” pre-intervention flexibility was 5 (0–14; 5.8) centimeters, and post-intervention results decreased to 3 (-1–11.5; 3.7) centimeters. A statistically significant change in flexibility was observed ( $Z = -2.273$ ;  $p = 0.023$ ). When comparing the groups, a statistically significant difference in flexibility was observed before the intervention ( $U = 29.5$ ;  $p = 0.041$ ), while no significant difference was found after the intervention ( $U = 50.5$ ;  $p = 0.525$ ).

**Conclusions.** Comparison of young long-distance female runners showed that foam rolling led to greater lower back pain reduction and flexibility than exercise programme. While initial pain levels were similar, only the foam rolling group improved significantly. Although the exercise group had better pre-intervention flexibility, only foam rolling enhanced it, equalizing flexibility between groups post-intervention.

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## THE EFFECT OF DYNAMIC NEUROMUSCULAR STABILIZATION ON THE PELVIC AND LUMBAR FUNCTIONAL CONDITION IN POSTPARTUM WOMEN

Urtė Malinauskienė, Brigita Zachovajevienė

*Lithuanian University of Health Sciences, Department of Sports Medicine*

**Introduction.** The physiological and anatomical changes that occur during pregnancy can significantly affect the musculoskeletal system and reduce the quality of life for postpartum woman (1, 2). Also, childbirth strongly affects pelvic floor muscle function and is linked to future urinary and fecal incontinence, as well as pelvic organ prolapse (3). The Dynamic Neuromuscular Stabilization (DNS) method, based on neurodevelopmental principles, is a potential approach to reduce the impact of these demanding changes that occur during pregnancy and childbirth due to its focus on sagittal stabilization mechanisms (4). Therefore, the aim of this study was to evaluate the effect of DNS exercises on lumbopelvic functional parameters in postpartum women.

**Research methods and organization.** The Kaunas Regional Biomedical Research Ethics Committee approved the study: Nr. BE-2-92. The study was conducted between November of 2024 and February of 2025 at the "Fiziomedika" Functional Medicine Clinic in Kaunas. All participants signed informed consent forms. Inclusion criteria were postpartum women in the first 5-9 months after giving birth vaginally, age between 20-35 years, first or second birth, no history of pelvic trauma, rheumatic disease, osteoporosis. The study involved 24 participants (83.3% first-time mothers), with a mean age of 29.5 years and 6.5 months postpartum. Participants were examined twice, six weeks apart - before and after the exercise program, which was based on DNS methodology guidelines and functional positions. Participants were instructed to perform this home-based exercise program for six weeks, at least 3–4 times per week, for up to 30 minutes. To ensure participants engagement in the study, they were asked to keep a diary after each exercise session. To assess functional changes in the pelvis and lumbar region relevant indicators were evaluated. A modified Schober test was used to assess lumbar mobility. Pelvic-lumbar stability was assessed using the pressure biofeedback device. Pelvic floor muscle strength was evaluated using a hand-held dynamometer. The static endurance of the back and abdominal muscles was assessed using the McGill tests. The functional state of the pelvic floor muscles was assessed using the questionnaire - Pelvic Floor Distress Inventory Short Form-20 (PFDI-20). Data statistical analysis was performed with IBM SPSS Statistics 30.0.0.0. Dependent samples were compared using Wilcoxon tests. The McNemar test was used to compare qualitative data. Quantitative data are presented as median (xme), minimum value (xmin), maximum value (xmax), and mean ( $\bar{x}$ ), qualitative data are presented as absolute frequency and percentage - n(%). Differences were considered statistically significant if  $p < 0,05$ .

**Results.** Lumbar mobility statistically significantly improved ( $Z=-3,346$ ;  $p<0,001$ ) by 0,4 cm. The test results at first were 5,5 (3,5-7; 5,3) cm, after DNS 6 (4-7,5; 5,7) cm. Pelvic-lumbar stability statistically significantly ( $p=0,039$ ) improved. After DNS only 4 (16.7%) of the participants had pelvic-lumbar instability. Abdominal and back muscles static endurance statistically significantly improved (flex:  $Z=-2,485$ ;  $p=0,013$ ; ext:  $Z=-3,245$ ;  $p=0,001$ ). At first, flexion static endurance was 34 (11-75; 37,1) seconds, after DNS 52 (10-78; 46,3) s. At first, extension static endurance was 41 (15-63; 40,9) s, after DNS 56 (24-73; 51,4) s. Looking at pelvic floor muscle changes - the final score of the questionnaire was statistically significantly reduced after DNS ( $Z=-3,823$ ;  $p<0,001$ ). A positive change in functional state of pelvic floor muscles was observed for 19 (79,16%) participants with the greatest effect on urinary incontinence. The incontinence scale score was 31,24 (0-62,50; 26,9) points at the first examination and 6,24 (0-54,16; 16,14) points after. Pubococcygeus m. strength statistically significantly increased when observed the right ( $Z=-3,625$ ;  $p<0,001$ ) and left ( $Z=-3,795$ ;  $p<0,001$ ) sides. Right side muscle strength was 6,3 (3,9-7,3; 6) kg and 6,4 (4,9-8,4; 6,5) kg after DNS. For the left side at first 6,2 (4-7,2; 6) kg and after DNS 6,5 (5-8,3; 6,5) kg. Iliococcygeus m. strength statistically significantly increased when observed the right ( $Z=-3,606$ ;  $p<0,001$ ) and left ( $Z=-2,836$ ;  $p=0,005$ ) sides. The right side muscle strength before was 6,6 (3,9-7,5; 6,3) kg, after DNS 6,8 (5-8,4; 6,8) kg. The left side muscle strength at first was 6,6 (3,8-7,5; 6,3) kg, after 6,8 (5-8,5; 6,7) kg. Ischiococcygeus m. strength statistically significantly increased when observed both sides ( $Z=-3,253$ ;  $p=0,001$ ). Before DNS muscle strength on the right side was 6,1 (4-8; 6,3) kg, after 6,9 (5-8,6; 6,8) kg. On the left side before was 6 (4,3-8,1; 6,2) kg, after DNS 6,9 (5,3-8,7; 6,8) kg.

**Conclusions.** The study showed that dynamic neuromuscular stabilization exercise program improves lumbar mobility, pelvic-lumbar stability, static trunk endurance and pelvic floor muscle strength and function parameters for postpartum woman.

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## ASSOCIATIONS BETWEEN LUMBAR STABILITY AND PRIOR INJURIES IN BADMINTON PLAYERS

**Gabrielė Matijošaitytė, Laimonas Šiupšinskas**

*Lithuanian University of Health Sciences, Department of Sports Medicine*

**Introduction:** Popular and recognized as the fastest racquet sport, badminton requires strength, speed, agility, and precision, along with good motor coordination and the ability to perform complex racquet movements (1). Sudden directional changes, jumping, lunging near the net, and fast arm movements to hit the ball from various body positions increase injury risk (2). The sport demands high physical fitness and involves complex movements that stress the upper and lower extremities, as well as the trunk (3). This study aimed to assess lumbar stability in badminton players, and to identify associations between these variables and sports-related injuries.

**Research methods and organization:** The study was approved by the Lithuanian University of Health Sciences Bioethics center (2024-BEC2-1108). The study included 30 players from the JSO (Young Lithuanians Sports Organization) badminton club including 13 men and 17 women, aged between 23

and 43 years, with at least 3 years of playing experience and training three or more times per week. Individuals experiencing acute upper limb or spinal injuries were excluded from the study. The study began with the collection of data on the badminton player and their previous injuries using a questionnaire. Trunk muscle endurance was assessed through static endurance tests targeting the abdominal and back muscles, and the ratio between these muscle groups was subsequently calculated. Following single-time measurements, the obtained results were processed using IBM SPSS Statistics (version 29.0.2.0). Due to the small study size, nonparametric statistics were used. Data in the text are presented as the median (minimum and maximum values; mean). The Mann–Whitney–Wilcoxon test (U) was used to compare two independent samples. A nonparametric Kruskal-Wallis test was used. Differences between groups were considered statistically significant at  $p < 0,05$ .

**Results:** Static abdominal muscle endurance in the male group were 45 (15–60; 44)s., and in the female group – 37 (10–56; 35)s. It can be observed that men have a higher average abdominal muscle endurance than women. The difference in static abdominal muscle endurance between men and women was statistically significant ( $U=63$ ;  $p=0.048$ ). The static back muscle endurance time in the male group was 39 (30–42; 36)s., while in the female group it was 27 (23–33; 28)s. Male participants demonstrated greater back muscle endurance compared to females. The difference in static back muscle endurance between men and women was statistically significant ( $U=59$ ;  $p=0.031$ ). The abdominal and back static endurance ratio in the male group was 1.25 (1–2; 1.28), and in the female group – 1.33 (1–2; 1.36). The average ratio was slightly higher in females than in males, although the difference was minimal. The difference in the abdominal and back endurance ratio between men and women was not statistically significant ( $U=107$ ;  $p=0.902$ ). Back muscle endurance in females differed significantly depending on the duration of activity limitation (in days) ( $\chi^2(2) = 6.157$ ;  $p=0.046$ ). In contrast, back muscle endurance in males did not differ significantly based on the duration of activity limitation ( $\chi^2(2)=1.496$ ;  $p=0.473$ ). No significant differences were found between different time periods in the male group ( $p > 0.05$ ). In the female group, a significant difference was identified between the 8–21 day and  $>21$  day periods ( $p=0.044$ ). This indicates that the difference in endurance between females whose activity was limited for 8–21 days and those whose activity was limited for more than 21 days is statistically significant.

**Conclusions:** Female athletes, static abdominal muscle endurance was significantly correlated with the number of days missed due to injury. Stronger back muscles were associated with shorter recovery periods, indicating that greater endurance is linked to reduced time away from sport.

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## **THE IMPACT OF DIFFERENT PHYSIOTHERAPY PROGRAMS ON PAIN, FUNCTIONAL AND PHYSICAL CONDITIONS IN INDIVIDUALS WITH LOWER BACK PAIN**

**Laura Medišauskaitė, Eglė Lendraitienė**

*Lithuanian University of Health Sciences, Clinic of Rehabilitation. Kaunas*

**Introduction.** Lower back pain (LBP) is a leading cause of disability worldwide, affecting quality of life, mobility, and work ability (1). In 2020, it was estimated that over 600 million people were affected globally, with a projected increase to 843 million cases by 2050 (2). Although physiotherapy is widely applied to manage LBP, there is no consensus on the most effective rehabilitation strategies (3). Recent

attention has focused on integrating balance exercises, but their added value remains unclear. The aim of this study was to evaluate the impact of physiotherapy programs with and without balance exercises on pain, functional disability, balance ability, and trunk muscle endurance in individuals with lower back pain.

**Research methods and organization.** This study included 30 participants aged 20–50 years with lower back pain. The study was conducted from October to December 2022 at the Lithuanian University of Health Sciences (LSMU) Kaunas Hospital, Children's Diseases Clinic, Rehabilitation Department "Žibutė," with approval from the LSMU Bioethics Center (Approval No. BEC-SR(M)-08). Participants were randomly divided into two groups: the experimental group ( $n = 15$ ; mean age  $32.3 \pm 12.2$  years) and the control group ( $n = 15$ ; mean age  $30.8 \pm 10.8$  years). Inclusion criteria: age 20–50 years, presence of lower back pain, voluntary consent. Exclusion criteria: chronic comorbidities, diagnosed spinal pathologies (e.g., scoliosis, herniation), history of trauma in the last 12 months. The experimental group performed physiotherapy with core strengthening, stretching, stabilization, and balance exercises. The control group received conventional physiotherapy without balance exercises. Sessions were conducted three times per week for four weeks, each lasting 30 minutes. Pain was measured using the Self-Assessment Scale (SAS). Functional disability was assessed with the Oswestry Disability Index (ODI). Balance was evaluated using the Fullerton Balance Test. Static endurance of abdominal, back, and lateral trunk muscles was measured using standardized endurance tests: timed static holding until fatigue. Statistical analysis was performed using IBM SPSS Statistics 23.0. Normality was tested with the Kolmogorov-Smirnov test. For comparisons, the Mann-Whitney U test (independent samples) and the Wilcoxon Signed-Rank test (paired samples) were used. Statistical significance was set at  $p < 0.05$ .

**Results.** Both groups showed significant reductions in back pain. In the experimental group, pain decreased from  $3.73 \pm 1.79$  to  $2.45 \pm 1.51$  ( $p < 0.05$ ), and in the control group from  $3.36 \pm 1.50$  to  $2.72 \pm 1.62$  ( $p < 0.05$ ). No significant difference in pain reduction between groups was observed ( $p > 0.05$ ). The experimental group demonstrated a significant decrease in functional disability (ODI:  $10.63 \pm 3.91$  to  $9.82 \pm 3.31$ ;  $p < 0.05$ ), whereas no significant change was observed in the control group ( $9.91 \pm 3.75$  to  $9.27 \pm 3.23$ ;  $p > 0.05$ ). Disability scores were lower in the control group both before and after therapy ( $p < 0.05$ ). Balance scores assessed by the Fullerton Test did not show significant changes within or between groups ( $p > 0.05$ ). Static endurance of the back muscles significantly improved in both groups ( $p < 0.05$ ), with significant differences observed between groups both at baseline and post-intervention ( $p < 0.05$ ). Abdominal and lateral trunk muscle endurance also improved significantly within each group ( $p < 0.05$ ), but no significant difference between groups was found after the intervention ( $p > 0.05$ ).

**Conclusions.** Both physiotherapy programs effectively reduced back pain and improved trunk muscle endurance. However, the addition of balance exercises did not provide superior effects on balance ability or functional disability compared to conventional physiotherapy alone. Physiotherapy remains a reliable method to enhance physical condition and reduce pain in individuals with lower back pain.

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# EVALUATION OF MUSCLE STRENGTH, DYNAMIC BALANCE, AND INJURY RISK IN RIDERS WITH DIFFERENT LEVELS OF RIDING EXPERIENCE

Vytautė Narauskaitė, Algė Daunoravičienė

*Lithuanian University of Health Sciences, Department of Sports Medicine*

**Introduction.** Systematic, long-term equestrian training influences the dynamic balance, posture, and musculoskeletal function of riders [1]. Riding requires the ability to adapt to constantly changing balance conditions, not only to perform technical elements but also to reduce the risk of falls and injuries [2]. Studies show that riding develops postural control, motor skills, and muscle tone, however, differences between riders with varying experience remains unclear. Understanding how experience influences balance and posture is key, as even advanced riders may develop asymmetries that increase injury risk [3]. This study aims to assess muscle strength, dynamic balance, and injury risk in riders with different experience levels.

**Research methods and organization.** The study was approved by the LSMU Bioethics Centre and conducted from June to December 2024 at the physiotherapy clinic “Aktyvus Judėjimas.” A total of 29 participants (age 25.07 (3.23)) were divided into two groups based on horseback riding experience: 8–10 years (n=13, age 23.85 (2.48)) and 11–20 years (n=16, age 26.06 (3.49)). Mean age did not significantly differ between groups ( $t(27) = -1.925$ ;  $p = 0.065$ ). Inclusion criteria: active equestrian participation  $\geq 8$  years, regular competition attendance, no other sports, no musculoskeletal pain in the past 3 months, and no injuries in the past 2 years that disrupted training. Lower limb and trunk muscle strength was assessed using a Lafayette dynamometer, measuring maximum isometric strength of the thigh extensors, flexors, abductors, adductors, internal and external rotators, and trunk flexors and extensors. Each muscle group was tested three times. Participants maintained resistance for 3 seconds, with a 45-second rest between trials. The highest value was recorded [4,5]. Dynamic balance and injury risk were assessed using the Y-Balance Test (YBT). Participants stood on one leg and used the other to push a marker in three directions—forward, backward-inward, and backward-outward. Each leg was tested three times per direction, and the best result was used for analysis. Distance was measured and normalized to leg length. Differences between legs and a composite score related to injury risk were analyzed [6]. Data analysis was performed using IBM SPSS Statistics 29.0. The Mann-Whitney U test was used for small independent samples ( $n < 30$ ). Quantitative data are presented as median (xme), minimum (xmin), maximum (xmax), and mean (x), formatted as xme (xmin–xmax; x). Qualitative data are presented as percentages. Associations between qualitative variables were tested using  $\chi^2$ , and strength of associations was evaluated with Cramér’s V. The significance level was set at  $\alpha = 0.05$ .

**Results.** There was no statistically significant difference in the strength of the right and left thigh flexor muscles between riders with varying levels of riding experience ( $U=88.0$ ;  $p=0.480$ ;  $U=93.0$ ;  $p=0.627$ ). In the group of riders with 11–20 years of experience, the strength of the right thigh extensor muscles was 31.95 (26.5–45.4; 33.76) kg, and the left was 32.70 (26.2–47.5; 34.27) kg. In the group with less experience, the tested muscle strength was 28.10 (16.30–41.1; 26.71) kg for the right and 28.0 (15.9–39.9; 26.55) kg for the left leg. These differences were statistically significant for both the right ( $U=45.0$ ;  $p=0.010$ ) and left ( $U=39.5$ ;  $p=0.005$ ) sides. Thigh abductor strength in both limbs did not differ significantly between groups ( $U=88.0$ ;  $p=0.480$ ;  $U=93.0$ ;  $p=0.627$ ). However, significantly greater adductor strength was observed in the more experienced group (right:  $U=53.5$ ;  $p=0.027$ ; left:  $U=48.5$ ;  $p=0.015$ ). No statistically significant differences were identified in thigh external rotation strength (right:  $U=76.0$ ;  $p=0.219$ ; left:  $U=88.5$ ;  $p=0.497$ ). Internal rotation strength was significantly higher in riders with 11–20 years of experience (right:  $U=42.0$ ;  $p=0.007$ ; left:  $U=41.0$ ;  $p=0.006$ ). More experienced riders exhibited significantly greater trunk extensor 32.25 (24.70–38.9; 31.75) kg and flexor 32.25 (35.1–42.5; 39.11) kg strength compared to less experienced participants: extensors – 21.90 (19.70–27.6; 22.52) kg; flexors – 28.30 (27.0–30.3; 28.48) kg ( $U=5.0$ ;  $p < 0.001$ ;  $U=0.0$ ;  $p < 0.001$ ). The YBT revealed significantly greater reach distances in all directions among riders with 11–20 years of experience: anterior (right:  $U=50.0$ ;  $p=0.018$ ; left:  $U=57.0$ ;  $p=0.039$ ), posteromedial

(right:  $U=56.0$ ;  $p=0.035$ ; left:  $U=53.0$ ;  $p=0.025$ ), and posterolateral (right:  $U=50.0$ ;  $p=0.019$ ; left:  $U=44.0$ ;  $p=0.009$ ). When assessing lower limb injury risk, 53.8% ( $n=7$ ) of riders with 8–10 years of experience were at risk, compared to 12.5% ( $n=2$ ) with 11–20 years ( $V=0.44$ ;  $p=0.041$ ).

**Conclusions.** Riders with longer horseback riding experience exhibited greater strength in the right and left thigh extensors, adductors, internal rotators, as well as back and abdominal muscles compared to those with less experience. The strength of the right and left thigh flexors, abductors, and external rotators did not differ between the two groups. More experienced riders demonstrated better dynamic balance and a lower risk of lower limb injuries.

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## EFFECTS OF SLING SYSTEM AND ELASTIC RESISTANCE BAND EXERCISES ON NECK FUNCTION AND PAIN INTENSITY IN INDIVIDUALS WITH NON – SPECIFIC NECK PAIN

Ieva Naujokaitė, Eglė Lendraitienė

*Lithuanian University of Health Sciences, Department of Rehabilitation*

**Introduction:** Neck pain is the 4th most common cause of pain-related disability and ranges from 30% to 50% in the general population (1). Conservative methods are still the most important in pain relief. Research is being conducted to find the best way, combining several therapies (2). Studies have shown that active therapy is more effective than passive therapy. During the sling exercise program, the deep muscles surrounding the spine are activated, which maintain balance and posture (3). It restores normal movement patterns and increases the amplitude of movements by unloading the forces of gravity (4). The aim of this study was to compare the effects of a sling system and elastic resistance bands exercises on neck function and pain intensity.

**Research methods and organization:** This study was approved by the Bioethics Center of the Lithuanian University of Health Sciences. (Approval No. 2024-BEC2-987). All participants provided written informed consent. The study was conducted from November to February (2024-2025). 22 patients (6 men and 16 women), aged 25-62 with non-specific neck pain, were enrolled. There were 2 study groups. The average age of the group 1 was 41,55 (26-61) years, and the group 2 was 44,45 (25-62) years. Inclusion criteria were: negative neurological tests (Spurling, distraction, arm nerves stretching tests); pain intensity is assessed by no more than 5 points on the VAS scale; working-age

individuals (18-64); pain lasts longer than 3 months. Exclusion criteria: patients with fractures, infectious or oncological diseases; spinal surgery performed in the last 12 months; taking pain medication. They were randomly assigned into two groups: group 1 (n=11, 4 men 7 women): neck stretching and strengthening exercises + elastic resistance band; group 2 (n=11, 2 men 9 women): neck stretching and strengthening exercises + sling system. The exercises were performed for a total of 7 days, 4 of which were elastic resistance bands or sling system exercises. The training session lasted 30 minutes. Both groups performed exercises to stretch and strengthen the neck and shoulder girdle. Pain intensity was assessed using Visual Analogue Scale, functional condition was evaluated with Neck Disability Index which is designed to assess self-rated physical disability caused by neck pain. Deep neck flexors endurance was evaluated by The Deep Muscle Endurance Test. The analysis of the results was performed using the IBM SPSS Statistics program. Arithmetic mean (m), median (xme), minimum (xmin), maximum (xmax) of the data were calculated. The Mann-Whitney U test was used for independent samples and Wilcoxon for depended samples with a non-normal distribution. Significance level  $p < 0.05$ .

**Results:** Pain: Before physiotherapy, the pain assessment of the group 1 and the group 2 were 4 (2-5; 4,09) scores. There were no statistically significant differences between groups before physiotherapy ( $p=1,000$ ;  $U=60,500$ ). After physiotherapy, the pain assessment of group 1 was 4 (2-5; 3,64) scores, and group 2 was 2 (1-5; 2,45) scores. A statistically significant change was found in group 1 ( $p=0,025$ ;  $Z=-2,236$ ) and group 2 ( $p=0,004$ ;  $Z=-2,842$ ). After the intervention, there was a statistically more significant change in group 2 ( $p=0,036$ ;  $U=30$ ) compared to group 1. Deep neck flexors endurance (in seconds): Before physiotherapy, the endurance of the group 1 was 22 (11-35; 21,73) seconds, and the group 2 was 28 (13-42; 28,27) seconds. There were no statistically significant differences between groups before physiotherapy ( $p=0.094$ ;  $U=86$ ). After physiotherapy the deep neck flexors endurance of the group 1 was 26 (16-44; 26,45) seconds, and the group 2 was 31 (17-45; 32,45) seconds. A statistically significant change was found in group 1 ( $p=0,003$ ;  $Z=2,952$ ) and group 2 ( $p=0,003$ ;  $Z=2,992$ ). Neck Disability Index: Before physiotherapy, the disability score of the group 1 was 9 (4-21; 11,27) scores, and the group 2 was 7 (2-18; 7,64) scores. There were no statistically significant differences between groups before physiotherapy ( $p=0.081$ ;  $U=34$ ). After physiotherapy the neck disability index of group 1 was 8 (4-17; 9,27) scores, and the group 2 was 3 (1-14; 4,45) scores. A statistically significant change was found in group 1 ( $p=0,005$ ;  $Z=-2,825$ ) and group 2 ( $p=0,003$ ;  $Z=-2,947$ ). After the intervention, there was a statistically more significant change in group 2 ( $p=0,010$ ;  $U=21,500$ ) compared to group 1.

**Conclusions:** After physiotherapy in both study groups pain intensity decreased, and neck functional status improved statistically significantly in patients with non-specific neck pain. Comparing the results of physiotherapy using elastic resistance bands and a sling system, the physiotherapy with sling system was more effective on decreasing neck pain intensity and functional disability in patients with non-specific neck pain.

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# ASSESSMENT OF SHOULDER GIRDLE AND TRUNK MOBILITY AND STABILITY IN YOUNG RECREATIONAL VOLLEYBALL PLAYERS

Kristina Šeputytė, Laimonas Šiupšinskas, Vidmantas Zaveckas

*Lithuanian University of Health Sciences, Department of Sports Medicine*

**Introduction.** Despite their fundamental role in volleyball biomechanics and injury prevention, shoulder girdle mobility along with trunk stability remain under-researched areas [1]. Evidence suggests that range of motion and stability tests may help identify early neuromuscular imbalances; however, their use in recreational sports is not yet standardized [2]. Given the physical demands of volleyball, implementing sport-specific, evidence-based assessments and preventive strategies is essential for reducing injury risk and optimizing readiness in non-professional settings [3]. This study aims to assess the mobility and stability of the shoulder girdle and trunk in recreational volleyball players.

**Research methods and organization.** The study was conducted from 1 June to 1 November 2024 at the Sports Medicine Clinic of the Lithuanian University of Health Sciences. Ethical approval was granted by the Lithuanian University of Health Sciences Bioethics Center (No. 2024-BEC2-652). Participants were assessed once to examine relationships between selected variables related to the mobility and stability of both the shoulder girdle and trunk. Inclusion criteria: adults aged 18–44, engaged in regular recreational volleyball training for at least one year, and without acute upper limb sports injuries in the past six months. Exclusion criteria: upper limb pain within the last six months. Thirty recreational volleyball players participated—12 men and 18 women. The average age was 24.83(±4.94) years, height 172.90(±8.63) cm, weight 68.83(±9.86) kg, and volleyball experience 4.37(±2.22) years. Goniometry was used to assess active shoulder range of motion, while a measuring tape and two rulers evaluated scapular position and movement. Inclinationometry measured trunk range of motion. The Closed Kinetic Chain Upper Extremity Stability Test assessed upper limb function and scapular stability, and the Simple Shoulder Test questionnaire evaluated the shoulder joint condition. A structured self-administered questionnaire was also used. Statistical analysis was conducted using IBM SPSS 30.0. The Shapiro–Wilk test assessed normality ( $n < 50$ ). Quantitative data meeting normality assumptions are presented as mean (m) and standard deviation (SD) –  $m(\pm SD)$ . The Wilcoxon signed-rank test was used for non-normally distributed dependent samples, while the paired sample t-test was used for normally distributed paired data. Cohen’s d was calculated to determine effect size. Statistical significance was set at  $p < 0.05$ .

**Results.** A statistically significant difference was found in both internal ( $Z = -4.801$ ;  $p < 0.001$ ) and external ( $Z = -4.846$ ;  $p < 0.001$ ) shoulder rotation between dominant and non-dominant arms at 90° abduction. Internal rotation was greater and external rotation lower on the dominant side. Total rotational range of motion (TROM) did not differ significantly ( $Z = -0.902$ ;  $p = 0.367$ ), suggesting compensation between rotation directions. These results reflect sport-specific adaptations linked to repetitive overhead activity in volleyball. A significant difference was also identified in active lateral trunk flexion between the left and right sides ( $t(29) = 3.721$ ;  $p < 0.001$ ). The mean amplitude for left-side flexion was 25.75° (±3.42), while for right-side flexion it was 22.35° (±3.12). The effect size (Cohen’s  $d = 0.679$ ) indicated a moderate strength of effect. Greater left-side flexion could be attributed to the compensatory activation of contralateral trunk muscles during right-handed spiking actions, which was the dominant side for most participants. In the assessment of trunk stability, 30% of participants exceeded expected values in trunk extension, suggesting strength and control in this direction, consistent with the biomechanical demands of volleyball. However, the highest proportion of participants falling below normative thresholds (16.7%) was observed in trunk flexion, indicating potential muscular weakness or control deficits in this direction. A statistically significant difference in scapular stability between the dominant and non-dominant arm was found ( $t(29) = -10.682$ ;  $p < 0.001$ ). The protrusion of the scapula on the dominant side was greater ( $14.68 \pm 0.45$  mm) than on the non-dominant side ( $13.02 \pm 0.67$  mm), indicating reduced scapular control. The effect size was very

large (Cohen's  $d = 1.95$ ). Despite expectations that the dominant arm would demonstrate greater strength, this finding highlights potential scapular dysfunction due to overuse and muscular imbalance. **Conclusions.** The study showed that recreational volleyball players exhibited functional asymmetries between dominant and non-dominant sides: internal rotation was greater and external rotation lower in the dominant arm, scapular protrusion was more pronounced, and lateral trunk flexion was greater to the left. These asymmetries reflect sport-specific loading and underscore the need for balanced training and prevention to reduce dysfunction and overuse injuries in recreational volleyball players.

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## **CHANGE IN FATIGUE, QUALITY OF LIFE, AND PHYSICAL CAPACITY INDICATORS OF PERSONS WITH MULTIPLE SCLEROSIS USING COMPLEX MOBILITY AND RESPIRATORY FUNCTION IMPROVEMENT EXERCISE PROGRAM**

**Urtė Žaltauskaitė, Eglė Lendraitienė**

*Lithuanian University of Health Sciences, Department of Rehabilitation*

**Introduction.** Multiple sclerosis is a chronic neurological disorder affecting over 2.8 million people worldwide, often leading to fatigue, disability, and poor quality of life [1]. Fatigue, one of the most disabling symptoms, affects over 80% of patients and is frequently resistant to medication [2]. While exercise is recognized as an effective non-drug approach to fatigue, most programs focus only on mobility, neglecting respiratory muscle weakness, which also limits function in MS [3,4]. Combining mobility and breathing exercises in rehabilitation may improve outcomes, yet this remains underexplored [5,9]. This study evaluates the effects of such a combined program on fatigue, endurance, and quality of life using validated multidimensional tools.

**Research methods and organization.** The study was conducted at the Multiple Sclerosis Association “Feniksai” with ethical approval from the Lithuanian University of Health Sciences Biomedical Research Ethics Committee (Approval No. 2024-BEC2-016). Participants were individuals diagnosed with multiple sclerosis (MS) for over 2 years, experiencing fatigue, of low-to-moderate physical activity, and physically capable of participating in an exercise program. Exclusion criteria included severe spasticity, inability to walk, chronic respiratory or joint diseases, or injuries that could limit participation. A total of 27 participants (mean age  $41.85 \pm 13.2$  years) were assigned to two groups: the intervention group ( $n = 12$ ; 6 males, 6 females) and the control group ( $n = 15$ ; 9 males, 6 females). The intervention group engaged in a structured group-based exercise program (stretching, strengthening, and respiratory exercises) three times per week for three weeks (30 minutes per session), alongside to routine educational and recreational activities. The control group participated only in the latter. Primary outcomes were assessed pre- and post-intervention using standardized tools: fatigue (Modified Fatigue Impact Scale, MFIS [6]; Visual Analog Scale, VAS [8]), quality of life (Multiple Sclerosis Quality of Life-54, MSQOL-54) [7], and physical endurance (6-Minute Walking Test, 6MWT [9]). Additional data included age, sex, MS type, disease duration, and physical activity levels. No statistically significant baseline differences were observed between groups ( $p > 0.05$ ). The data was analyzed using SPSS 29. Normality was assessed using the Shapiro–Wilk test. Depending on data

distribution, within-group comparisons were conducted using either paired t-tests or Wilcoxon signed-rank tests, while between-group comparisons used independent t-tests or Mann–Whitney U tests. Spearman’s correlation was used to explore associations among fatigue, quality of life, and endurance. Significance was set at  $p < 0.05$ .

**Results.** Prior to the intervention, no significant differences were observed between the intervention and control groups across all key measures. Total fatigue scores (MFIS) were  $38.53 \pm 17.18$  vs.  $37.33 \pm 21.36$  ( $p = 0.750$ ), cognitive and psychosocial fatigue components also did not differ ( $p = 0.599$ ;  $p = 0.656$ ). Mental quality of life Mental Health Composite was  $58.42 \pm 24.56$  vs.  $53.98 \pm 21.50$  ( $p = 0.621$ ), and physical quality of life Physical Health Composite  $59.69 \pm 23.65$  vs.  $53.27 \pm 21.80$  ( $p = 0.471$ ). Fatigue intensity (VAS) was  $5.00 \pm 1.20$  vs.  $5.50 \pm 1.17$  ( $p = 0.300$ ), and 6-minute walk test results were  $488.93 \pm 85.04$  m vs.  $518.42 \pm 80.92$  m ( $p = 0.367$ ). These findings confirm that the groups were comparable at baseline. Following the intervention, mental quality of life (MSQOL-54 Mental Health Composite) improved significantly in the intervention group ( $t(11) = -2.52$ ,  $p = 0.024$ ), while physical fatigue decreased (mean change =  $-2.56$ ), though not significantly ( $Z = 38.5$ ,  $p = 0.375$ ). Cognitive fatigue also showed a non-significant decrease (mean =  $-2.75 \pm 10.5$ ,  $p = 0.492$ ). Between-group comparisons of change revealed statistically significant improvement in physical fatigue ( $U = 137.5$ ,  $p = 0.021$ ) and physical performance as measured by the 6-minute walking test ( $U = 8.5$ ,  $p < 0.001$ ), both favoring the intervention group. Other domains such as pain, emotion, and cognition showed non-significant improvement trends. Spearman’s correlation analysis showed strong and significant negative relationships between total fatigue and physical quality of life ( $\rho = -0.78$ ,  $p < 0.001$ ), mental quality of life ( $\rho = -0.73$ ,  $p < 0.001$ ), and physical performance (6MWT:  $\rho = -0.82$ ,  $p < 0.001$ ). These results indicate that lower fatigue levels were associated with higher quality of life and better physical capacity. Furthermore, a strong positive correlation was found between physical and mental quality of life domains ( $\rho = 0.87$ ,  $p < 0.001$ ), suggesting interdependence between these two constructs

**Conclusions.** The structured mobility and respiratory function improvement program led to significant positive changes in individuals with multiple sclerosis. Mental quality of life and physical endurance improved significantly after the intervention. A statistically significant reduction in physical fatigue was also observed compared to the control group, indicating the program’s effectiveness in improving core health indicators.

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