The 4th International Scientific-Practical Conference
EXERCISE FOR HEALTH AND REHABILITATION
The 29th of November, 2018
Kaunas, Lithuania

BOOK OF ABSTRACTS

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Institute of Sports

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eISBN 978-9955-15-587-4

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Mindful Movement: connecting physical and mental health and well-being

Dr. Josef Mattes
University of Vienna, Vienna, Austria

Mindfulness has been a hugely successful concept in areas ranging from mental health to well-being, and is applied in practice in fields like sports, education, and many others. Central to mindfulness is paying attention with a particular quality. The importance of attentional focus has been independently supported by a considerable amount of research in motor learning and performance. Attention is also central to flow, another important concept both in mental and physical well-being.

This talk will start with an overview of mindfulness concepts, concentrating on what is probably the most popular and best researched construct, rooted in MBSR (Mindfulness Based Stress Reduction) as developed by Jon Kabat-Zinn and colleagues. This inspired various applications in areas ranging from psychotherapy to sports, education, and many others. Empirical evidence for the efficacy of a number of such MBIs (mindfulness based interventions) will be presented. Next comes a brief introduction to the relations between mindfulness and Positive Psychology theories like Flow, Self-Determination Theory and the Dualistic Model of Passions.

Moving on to the area of movement science, attention is central not only to mindfulness and flow, but also well known to importantly influence motor learning and performance. Based on the empirical research in this area and the underlying theories it has been argued that this provides reasons to combine mindfulness and movement (Mattes, 2016), as do potential psychological benefits of such a combination (Mattes, 2018). A short overview of traditional and modern approaches to mindful movement will be followed by an introduction to one specific example, the Feldenkrais® Method and its relations to mindfulness, positive psychology, and other mindful movement systems (a practical introduction will be given in the afternoon workshop).

After this, the results of a meta-analysis (Mattes, under review 1) will be presented which studies the relative importance of different facets of mindfulness, and takes particular care to allow for possible publication bias. Time permitting, at the close of the talk some ñbig pictureò speculations will be mentioned: for example possible relations to Philosophy (Daoism; Buddhism ï cp. Mattes, under review 2; Pyrrhonism), to humanistic & psychodynamic psychotherapies, goal setting, judgement and decision making, or personality systems interaction theory.

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Mattes, J. Buddhism without negativity bias. Under review 2.

Facial injury in sport

Dr. Marijus Leketas
Lithuanian University of Health Sciences, Maxillofacial surgery department

Among all facial traumas in Lithuania ~32% happen during some sport activity. The following head parts are most frequently susceptible to traumas, namely the nose almost 36%, eyes ï 33% and the skull ï 30%. Upper jaw makes 13% and lower jaw reaches ï 7%.

There is no statistics in Lithuania as to what kind of sport causes what kind of facial traumas. However, we can take advantage of such kind of statistics in other countries, like the UK and Switzerland. In the UK, for instance, fighting sports traumas reach 36%. In Switzerland skiing is the main cause of facial traumas among all kinds of sport (26%). This only shows that traumas are determined by the kind of sport that dominates in a particular country.

This investigation of data is meant for medical specialists who work with sports people, usually sports medicine physicians. Some medical professionals specializing in other area than maxillofacial do not know how to treat a patient with some kind of trauma in emergency situation. No one can deny the fact that sports medicine physicians are knowledgeable and skilled enough to cope with limbs bones and ligaments injuries because these are the most common things in their work. However, since facial traumas are not as frequent sports medicine physicians lack this information. Therefore, we compiled a list of actions to be followed in such emergencies. Facial bones fractures, temporomandibular joint damages, oral cavity and teeth injuries were included in the list. Sports medicine physicians are familiarized with steps to follow in case of traumas during sports activities, trainings and sport events.

As practice shows, very often injured sports people arrive at emergency room without being given prior treatment. Such patients often arrive without proper immobilization of a broken bone and without proper transportation conditions of knocked out teeth. This negligence might result in the worsening of health condition of a patient, and thus it can make further treatment more complicated.

We also noticed a tendency that sports medicine physicians do not have enough knowledge to diagnose teeth injuries and decide if the sports person needs emergent treatment or the patient can be referred to the an outpatient clinic for treatment after a sports activity or sports event.

We do hope that sports medicine physicians will benefit greatly from this work. By applying this knowledge to their daily practice, sports medicine physicians will be able to reduce further complications in patientsôhealth.

Exercise capacity and adaptation to it

Dr. Sandra Rozenstoka, Andrejs Erglis
Sports laboratory - physical health, sports medicine and sports traumatology centre, Latvia;
Riga Stradins University, Latvia

The ability of athletes to do intensive training program is supported by adequate exercise capacity and adaptation to the physical exercise. Unadequate physical exercise could increase different health risks including overload and acute cardiovascular event. The aim of the study was to evaluate the exercise capacity and adaptation to the physical exercise in athletes with different training program, as assessed by cardiopulmonary exercise testing.

In a longitudinal prospective study athletes who performed high dynamic load sports underwent standard maximum cardiopulmonary exercise testing on the ISO certified Master screen CPX system. The exercise capacity and adaptation to the physical exercise were expressed with the physical working capacity of the body, the cardiac and respiratory response to the defined physical exercises, aerobic and anaerobic thresholds and other indicators.

The exercise capacity was significantly dependent on the regularity and duration of uninterrupted training period. The difference in exercise capacity was based on significantly higher aerobic and anaerobic capacity of athletes. The adaptation to the maximum work-rate and the functional parameters of the cardiorespiratory system were significantly dependent on the duration of training program: higher stroke volume, cardiac output, maximum relative oxygen uptake, metabolic equivalent and faster recovery. During the exercise testing decreased adaptation, prolonged recovery, nonspecific ST segment and T wave changes ischemic changes also were observed.

The exercise capacity and adaptation to the physical exercise were significantly better in athletes than it was in untrained individuals. More than half of all competing amateur athletes displayed a prolonged recovery and reduced adaptation to the physical exercise. Amateur athletesô health condition, adaptation and exercise capacity should be screened with the pre-competition medical assessment, the same as for professional athletes. It could protect a competing athlete from overtraining, reduces overload and decreases health risks.

Lateral ankle sprain – new evidence-based guidelines for diagnosis, treatment and prevention

Dalius Barkauskas
National Olympic Committee of Lithuania

Lateral ankle sprain is one of the most common acute injury in sports and in daily life. Only muscle strain incidence is reported to be higher, accounting for 10-55% of all acute injuries in sports [1]. Meta-analysis demonstrated a higher incidence of ankle sprain in females compared with males (13.6 vs 6.94 per 1000 exposures), in children compared with adolescents (2.85 vs 1.94 per 1000 exposures) and adolescents compared with adults (1.94 vs 0.72 per 1000 exposures). The sport category with the highest incidence of ankle sprain was indoor/court sports, with a cumulative incidence rate of 7 per 1000 exposures or 1.37 per 1000 athlete exposures and 4.9 per 1000 h [2].

It is very important to have practical and evidence based management protocol, because the main risk of improper management is chronic ankle instability (CAI), which may lead to (long-term) absenteeism from work and sports. When analyzing intrinsic and extrinsic risc factors it is important to stress risc of lower BMI and female gender. As well to include into rehabilitation and prevention protocols such modifiable risk factors as deficiencies in proprioception and range of motion

In severe ankle sprain a fracture should be excluded by proper use of the Ottawa ankle rules. It makes the whole diagnostic protocol much more cost effective. Only in suspicion of osteochondral defects, syndesmotic injuries and occult fractures, an MRI should be considered. Clinical evaluation is more effective when performed on 4-5 day post-injury [3].

Treatment must be focused on functional approach, combining functional support, early introduction of exercises therapy into rehabilitation protocol, manual mobilization techniques. Non steroid anti-inflammatory drugs (NSAID) are used primarily for pain and swelling reduction, but a delay of the natural healing process must be considered as the inflammation suppressed by NSAIDós is

a necessary component of tissue recovery. If immobilisation is considered to treat pain it should last maximum for 10 days and then functional treatment potocol should be applied [3].

Because previous injury is the major risk factor to be injuried prevention protocol should include neuromuscular exercises, usage of brace or taping techniques [3].

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Twist your brain in order to free your mind

Prof.dr. Wolfgang I. Schöllhorn
University of Mainz, Germany

Traditionally, therapeutic and training interventions are characterized by following a model that is independent of a person and independent of time. In consequence the therapists and coaches are trying to avoid deviations from this movements and are mostly overloading the patients and athletes with ample corrective instructions. In result, mainly this leads to frustration on both sides. In order to circumvent this process an errorless learning approach (Maxwell et al. 2001) as a form of implicit learning has been suggested. Two major problems accompany this approach. Firstly, it is quite problematic for movements to define exactly what an error is, and secondly, even in the corresponding experiments already shortly after the initiation of the intervention the number of errors increased substantially. From a cognitive psychologist point of view, by performing without errors the subject should avoid to develop theories about how to compensate for these errors. The underlying assumption is a limited capacity of the working memory and should not be reduced by this additional mental effort. Neuro-physiologically, the working memory is mainly associated with activities in the frontal lobe of the cortex. While errorless learning or implicit learning is trying not to activate this lobe, the differencial learning approach is pursuing completely the opposite. Neurophysiological studies provide evidence that the activity of the frontal lobe is a kind of overloaded by means of a multitude of complex movements (Henz et al 2018) and leads to increased slow waves (theta 4-8 Hz) and to brain states that are similar to meditation. By achieving this brain state not only positive effects on creativity have been observed (Santos et al 2018) Thereby, the access to additional capacity of the working memory seems to be opened and not only motor learning processes become more effective. How to overload the frontal lobe by means of gait variations in order to achieve such a brain state, will be experienced and discussed in this Ăsessionñ.

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Modern Mindful Movement: Lessons from the Feldenkrais Method®

Dr. Josef Mattes
University of Vienna, Vienna, Austria

Mind and body are interdependent and influence each other. Traditional methods of using the body to improve health and well-being (e.g., hatha yoga, qigong) have some empirical support, but often underlying assumptions that are incompatible with todayôs scientific knowledge. Among modern forms of somatics, the Feldenkrais method is based on principles of mindfulness, behavioural therapy, and central aspects of positive psychology theories (including harmony, autonomy, competence, organismic tendency for integration).

This workshop will illustrate the usefulness of mindful movement in a positive psychology context using lessons from the Feldenkrais method. (In Feldenkrais one speaks of ñlessonsò instead of ñexerciseò or similar terms, since the emphasis is on how the nervous system organizes movement, rather than on the purely musculoskeletal aspect that is so often dominant in sports and physiotherapy): Carefully chosen sequences of movement, performed mindfully, can foster a sense of what it might mean "act in a self-determined way" (in terms of Self-Determination Theory) and "harmoniously" (Dualistic Model of Passions), thus moving efficiently and effectively.

Outline of the material: After some introductory remarks about mindfulness, movement, and a brief overview of mindful movement systems both traditional (e.g., Aikido, Qigong) and contemporary, there will be a quick introduction to the Feldenkrais method. After that, the workshop consists entirely of experiential activities selected from the ñAlexander Yanaiò Feldenkrais lessons. The selection is geared especially towards illustrating how these lessons help develop the ability to act decisively but non-compulsively (i.e., harmonic passion), to experience personal growth rooted in satisfaction of basic psychological needs, and how this relates to both mental and physical well-being.

Illustrative examples of exercises and/or skills: 1) connections between eye muscles and the neck and back leading to understanding how movement (and by extension other action) can be ï and in most cases is ï more effective if performed with the whole body and a harmonious mind; 2) breathing in different body parts and positions and how this liberates the mind from preconceived ideas about universally ñcorrectò breathing; 3) exploring a movement in different positions and configurations to go beyond engrained habits; 4) experiencing the effects of movement performed purely in imagination after having performed the symmetric movement physically, making the deep connections between mind and body salient and useable.

Athlete‘s ECG: what is it normal or abnormal

Dr. Alma Kajėnienė[1], Irma Andriuškevičienė[2]
[1]*Lithuanian University of Health Sciences, Institute of Sports,*
[2]*Lithuanian Sports Medicine Center*

Traditionally, therapeutic and training interventions are characterized by following a model that is independent of a person and independent of time. In consequence the therapists and coaches are trying to avoid deviations from this movements and are mostly overloading the patients and athletes with ample corrective instructions. In result, mainly this leads to frustration on both sides. In order to circumvent this process an errorless learning approach (Maxwell et al. 2001) as a form of implicit.

Cardiovascular related sudden death is the leading cause of mortality in athletes during sport and exercise [1]. These deaths occur in both sexes an in a wide range of individual and team sports. Among people younger than 35 years old, congenital heart diseases predominate: hypertrophic cardiomyopathy, arrhytmogenic right ventricular cardiomyopathy, congenital coronary anomalies, aortic valve stenosis, Marfan syndrome and ion channelopathies [2].

To recognize early possible risks, history and clinical examination is agreed to be the basis of pre-participation medical evaluation. However, there is a long-standing controversy about weather ECG at rest should also be mandatory for all the athletes [3]. There are certain limitations in the use of ECG in population screening, including but not limited to false-positive and false-negative test results, technical interpretation issues, ñgray zoneò ambiguous diagnoses and costs involved in arranging second-tier diagnostic testing [2]. Over the last decade, ECG interpretation standards have undergone several modifications to improve the accuracy of detecting potentially life threatening cardiac conditions in young athletes while also limiting false-positive results [1].

Regular and long-term participation in exercise (minimum of 4 hours per week) is associated with unique electrical manifestations that reflect enlarged cardiac chamber size and increased vagal tone. These ECG findings in athletes are considered normal, physiological adaptation to regular exercise and do not require further evaluation. Voltage criteria for left ventricular hypertrophy, right ventricular hypertrophy and incomplete right bundle branch block are common ECG findings in athletes. These reflect a physiological increase in cardiac mass from athletic cardiac remodeling. Common consequences of increase vagal tone include early repoliarisation, sinus bradycardia and sinus arrhythmia. Other, less common markers of increase vagal tone are junctional or ectopic atrial rhythms, first degree atrioventricular block and Mobitz type second-degree AV block [1].

Recent data suggests that some ECG findings previously categorized as abnormal may also represent normal variants or the result of physiological cardiac remodeling in athletes and do not usually represent pathological cardiac disease. These ECG findings, specifically axis deviation, voltage criteria for atrial enlargement and complete right bundle branch block, have been categorized as ñborderlineò findings in athletes [1].

Many pathological cardiac disorder associated with SCD exhibit abnormalities on ECG. T wave inversion is the most consistent electrical abnormality in patients with cardiomyopathy. ST segment depression, pathological Q waves and left bundle branch block are also recognized in cardiomyopatic disorders and ischemic heart disease. Primary electrical disease such as ventricular pre-excitation, long QT and Brugada syndrome are suggested by abnormal ECG findings. This findings always require further assessment [1].

When ECG abnormalities are identified, an athleteôs personal and family history should be questioned as part of a comprehensive clinical investigation. ECG is superior to history and clinical

exam in detecting hidden and congenital diseases. However, special education in sports cardiology is advised, courses and training in ECG interpretation in athletes are mandatory [3].

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Neuromuscular activation (Neurac) method in treatment, physical wellness and sport

Vidmantas Zaveckas

Lithuanian University of Health Sciences, Institute of Sports

Method was developed by physiotherapists in Norway, in cooperation with colleagues in other countries. Neurac is a method focusing on testing and treating neuromuscular control, aiming for pain relief and optimized function. Neuromuscular (NM) control involves all mechanisms related to the bodyôs control of movement. As a consequence of pain, NM control is altered. Optimizing NM is key to restore and/or enhance functional movement patterns. Elements in the Neurac method: clinical communication, clinical examination, Neurac testing, Neurac treatment, patient education, home exercise, follow-up over time. Neurac treatment has four main ingredients: 1. Suspension Exercise: closed kinetic chain (body-weight-bearing exercises) and unsteadiness (controlled instability provided by the ropes and slings); 2. Perturbation. Perturbing the ropes and slings manually to increase unsteadiness. Controlled vibration applied by Redcord Stimula. 3. Workload. Precise grading of the exercises. NM challenge gradually increased. 4. Pain Free Approach. No provocation of pain. Alternatively no increase of existing pain. Indications for Neurac Treatment - altered neuromuscular control: long term pain, recurrent pain, chronic musculoskeletal disorders, recent trauma, neurological disorders. Plausible explanation of immediate effect on neuromuscular function. 1. Neural adaptations related to motor units (increased number of active units, improved synchronization, increased firing frequency, improved sequence of recruitment). 2. Spinal reflexes and inhibitory mechanisms are altered. 3. CNS activates a more efficient motor program. Factors influencing modality choice from a Biopsychosocial perspective. 1. Patientôs level of function (Neurac can modify exercises to any functional level). 2. Aggravating and relieving postures and movements (Neurac can modify exercises avoiding contexts associated with pain, and offer a safe and supportive environment with graded exposure related to load and movement). 3. Ability to self-manage the exercise (Neurac home exercise program with exercises modified to the patients current functional level in familiar equipment that can be performed wherever and whenever the patient prefer to exercise). Neurac Method have been through a substantial development the last 15 years. First research project was initiated in 1992 and published in SPINE in 1997. Documentation directly related to Redcord ranges from single case studies to randomized controlled trials. Simplifying it is possible to say that Neurac is low tech - high knowledge.

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SHORT POSTER PRESENTATIONS SESSION

To roll or not to roll: functional status changes in middle age people with specific lower back pain

Justina Aleksonytė, Agnė Slapšinskaitė
Lithuanian University of Health Sciences, Institute of Sports

Introduction. Lower back pain (LBP) affects lumbar restriction, creates muscles tension and consequently affects functional status (1). Physical exercises are among the most popular method to treat LBP. However, alternative method such asYamuna Body Rolling balls is used to treat pain, tension and to improve the personsô functional state (2).
Research aim: to evaluate the changes of functional status in middle age people with specific lower back pain after physiotherapy program with and without rolling balls.
Research methods and organization. The study was approved by the Research Ethics Committee (Nr. BECï SR(M)ï 136). All participants signed the informed consent form before taking part in this study. Twenty three females and 20 males aged 45 to 59, who had lumbar radiculopthy with pain which lasted for more than 3 months with its intensity of less than 6 VAS, were enrolled to this study. The participants were divided into two groups: research group (RG, n= 20) and control group (CG, n= 23). Active lumbar movement was measurment with gonometer. All participants completed the Oswestry low back pain disabilities questionnaire. All tests were performed and questionaires fullfilled before the physiotherapy sessions (PS) and after the final PS. RG participated in 8 PS with rolling ball. For CG 8 PS with physical exercises were used. The sessions took place within a three-week time frame and one session lasted up to 30-40 minutes. In RG the rolling balls required participants to controll their own body weight in order to sink into the ball as the muscles elongated while in CG strengthing of the muscles was used. Data were analyzed using the program SPSS 22.0 (Statistical Package for the Social Sciences Inc., Chicago, IL, USA) and Microsoft Excel for Mac 2011 14.7.2program was used. Non-parametric dependent values were compared with Wilcoxon test, and two independent values were compared with non-parametric Mann-Whitney test. The results are presented as arithmetical averages ($\bar{x}$) and standard deviation (±SD). A significance level of $p<0.05$ was used if nothing else is specified.

Results. Oswestry disability index (ODI) results of RG before PS was 42.3±9.2 score, after PS was 39.7± 8.7 score. ODI score of RG statistically significantly increased (Z=ï 3.345; p=0.001). CG results of ODI before PS was 40.5±10.7 score and after PS ODI statistically increased to 36.9±10.0 score (Z=ï 4.080; p<0.001). There was no statistically significant difference in results of ODI between groups after PS (U=197.000; p=0.419).

Active forward flexion. RG results before and after PS were 48.8±6.3 and 53.9±6.7 degrees, respectively. In RG forward flexion increased (Z=ï 3.929; p<0.001). CG results before and after PS were 48.7±9.3; 53.3±9.5 degrees, respectively. In CG forward flexion results improved (Z=ï 4.206; p<0.001). There was no statistically significant difference between the groups in active forward flexion after PS (U=219.500; p=0.798).

Extension. RG results increased from 11.8±3.8 to 14.6±4.8 comparing the extension before and after PS (Z=ï 3.742; p<0.001) while in CG results it increased from 11.9±3 to 14.6±4.8 (Z=ï 3.962; p<0.001). There was no statistically significant difference between the groups after PS (U=223.500; p=0.844).

Lateral flexion to the right. In RG before PS and after PS results were 12.1±5.3 and 14.4±5.8, respectively (Z=ï 3.529; p<0.001). CG results were 11.4±3.8 and 14.2±4.8, before and after PS, respectively. CG results significantly increased (Z=ï 4.259; p<0.001). However, no statistically significant difference was observed between the groups (U=209.500; p=0.616).

Lateral flexion to left. Before and after PS results in RG were 11.8±5.0 and 14.3±5.9, respectively. We observed statistically significant difference (Z=ï 3.846; p<0.001). CG results increased from 12.0±4.6 to 14.0±5.3, before and after PS, respectively (Z=ï 3.644; p<0.001). No statistically significant difference was proved between the groups (U=223.500; p=0.874).

Conclusions: 1) Participantsô who suffered low back pain improved their functional status after 3 weeks of physical therapy with rolling balls and physical exercises. 2) New method rolling balls could be included in physical therapy practise as recommendable method to improve functional status for persons who suffer low back pain.

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Six-month Hatha yoga intervention on blood pressure for women with normal and elevated blood pressure

Gilija Bernotienė, Algė Daunoravičienė, Kristina Berškienė, Agnė Slapšinskaitė, Alfonsas Vainoras

Lithuanian University of Health Sciences, Institute of Sports

Introduction: Lately, yoga caught a huge interest among different research fields (1). Though one of discussion topics is yoga practice effects on blood pressure (BP; 2). No consensus exist how yoga effects cardiovascular system, as different conclusions are proposed (3). Specifically, there is a lack of studies on how yoga practice affects women with special focus on those with elevated BP.

Research aim: to determine the blood pressure changes after six-month yoga intervention for women with normal and elevated blood pressure.

Research methods and organization. Sixty-three participants were chosen for this study. Participants were recruited from yoga studios from one town. Participants were divided in two groups according to newest BP guidelines (4): normal BP, when systolic BP <120 mmHg and diastolic BP <80 mmHg (n=49; age 36.98 ± 10.02 years; BMI 21.53 ± 2.69 kg/m2; Systolic BP 109.12 ± 7.54 mmHg; Diastolic BP 67.08 ± 7.21 mmHg); elevated BP, when systolic BP Ó120 mmHg and diastolic BP Ó80 mmHg (n=14; age 39.93 ± 10.83 years; BMI 23.37 ± 4.17 kg/m2; Systolic BP 128.07 ± 7.91 mmHg; Diastolic BP 81.29 ± 5.55 mmHg). No difference was observed in age and BMI among groups (Age ï U=281.000, Z=-1.026, p=0.305; BMI - U=241.000, Z=-1.686, p=0.092). Measures (Systolic, diastolic and pulse pressures) were collected at baseline and 6 months after participation in yoga classes. BP was measured with automatic Omron m3 comfort BP monitoring device (Omron Inc., Japan).

Research was executed during 6 months period (5), participants attended yoga classes 2 times a week. After resting BP was measured while sitting, participants were instructed to relax in a supine position for 10 minutes. First 5 minutes were a relaxation and preparation for upcoming breathing exercise *uyyaji* which was also performed for 5 minutes (6). BP was measured at 5th minute during relaxation and at the 10th minute during breathing exercise.

Yoga classes were led by a certified and experienced yoga instructor. Each session lasted 90 minutes and consisted of 5 minutes of *pranayama* (i.e., breathing exercises), 15 minutes warm-up, 30-60 minutes of *asana* (i.e., yoga pose) practice, and 10 minutes of *savasana*.

For the statistical analysis of data, Wilcoxon 2 related samples test was used to compare changes in non-parametric measures. For parametric measures paired- samples t test was used. The results are presented as arithmetical averages ($\bar{x}$) and standard deviation (±SD). Statistical analysis was carried out using SPSS 23 (IBM Corp., Chicago, IL, USA), with the criterion for significance set at level of $p < 0.05$.

Research results. Changes in systolic, diastolic and pulse pressures were found after relaxation analysis before and after yoga intervention. At the beginning and after intervention in normal BP group systolic BPs were 103.84 ± 8.02 and 101.02 ± 7.75 mmHg, respectively (t=2.991; p=0.004). Whereas, BP varied from 115 ± 11.93 to 111.79 ± 8.27 mmHg (Z=-1.289; p=0.198) in elevated BP group. There was no significant change in diastolic BP during relaxation in elevated BP group (Z=-0.806; p=0.420) along with normal BP group (p=0.981). In normal BP groupôs pulse pressure has reduced from 40.06 ± 8.51 to 37.27 ± 8.22 mmHg (t=2.416; p=0.020), elevated BP groupôs pulse pressure had the same tendency of decrease from 40.86 ± 9.64 to 38.86 ± 5.29 mmHg, but it has not proved to be significant (Z=-0.409; p=0.682).

BP changes after breathing exercise followed similar tendencies as after relaxation. In normal BP group systolic BPs at the beginning and after intervention were 105.16 ± 8.37 mmHg - 100.29 ± 7.76 mmHg, respectively (t=4.718; p=0.000). This also occurred in elevated BP groupôs systolic BP, as it changed from 117.29 ± 7.64 to 111.57 ± 9.86 mmHg (Z=-1.961; p=0.050). There was no significant change in diastolic BP during breathing exercise in elevated BP group (Z=-1.924; p=0.054) along with normal BP group (p=0.132). Pulse pressure in normal BP group changed from 38.96 ± 7.25 to 35.51 ± 9.43 mmHg (t=2.552; p=0.014), in elevated BP group ï 39.64 ± 4.86 to 39 ± 9.94 mmHg (Z=-0.063; p=0.950), respectively.

Conclusions: This study revealed that Hatha yoga intervention of six-month can reduce systolic blood pressure for those with normal blood pressure, but has not proved to be significant for women with elevated blood pressure. It also revealed, that this intervention does not have an impact on diastolic blood pressure in both groups. Pulse pressure, which was reduced in women with normal blood pressure, have not changed in women with elevated blood pressure.

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Effect of exercises on unstable surfaces on the balance and mobility of persons suffering from lower back pain

Mantas Buckiūnas, Vilma Mauricienė
Lithuanian University of Health Sciences, Institute of Sports

Introduction. Exercises on unstable surfaces can be more effective than strength-enhancing exercises to reduce low back pain [1]. Exercising on unstable surfaces helps to improve coordination, adaptive mechanisms of motor control, muscular co-activation, postural correction, which are very important aspects for activation of the limbs and the trunk muscles in order to maintain balance. Improved stabilization function helps to protect the sore inflamed muscles and joints from overload [2].
Research aim: to assess the effect of exercises on unstable surfaces on the balance and mobility of subjects suffering from lower back pain.
Research methods and organization. The study involved 21 females and 19 males aged 30 to 60 years, who had lower back pain, worked sedentary job and did not exercise at all. An average age of participants was 43±9.8 years. The participants were divided into two groups: I group (n= 20) and II group (n= 20). A questionnaire was used to collect information about the gender, age and physical activity of the subjects. The mobility was measured using modified Schober test for trunk flexion and trunk side bending was measured with a goniometer. The balance was evaluated with flamingo and functional reach tests. Measurements were taken twice: before and after the research. The I group conducted training program using only unstable surfaces while II group trained without using any instability surfaces. Applied training programs lasted for 35 to 40 minutes, 4 times/week, for 5 weeks. Data analysis was performed with IBM SPSS v 22.0 software package. Two dependent samples were compared using non-parametric Wilcoxon test, and non-parametric Mann-Whitney test was used to compare two independent samples. The results are presented as averages (X), median (Xme), minimum (Xmin), maximum (Xmax) values ï X(Xme; Xmin-Xmax). The significance level $p<0.05$ was chosen.
Results. Flamingo test results of I group were 9.8±3.5(10; 3-14) tries before and 7.5±3.9(6.5; 1-14) tries after training. The balance of I group increased (p=0.005). Test results of II group were 10.4±3.3(11,5; 7-14) tries and 7.5±3.9(6,5; 1-14) tries after training. The balance of II group also

increased (p=0.008). There was no statistically significant difference between groups nor before (p=0.529) neither after (p=0.289) training. Functional reach test results of I group were 37.4±6.3(38; 28-50) cm before and 49±6.4(49; 36-60) cm after training. The balance of I group increased (p=0.001). Test results of II group were 35.6±5.2(36; 29-47) cm before and 46.9±5.6(46; 38-59) cm after training. The balance of II group increased (p=0.001). There was no statistically significant difference between groups nor before (p=0.414) neither after (p=0.231) training.

Modified Schober test results of I group were 7±1.5(7; 5-10) cm before and 9.6±1.4(9; 7-12) cm after training. The mobility of I group increased (p=0.001). Test results of II group were 6.1±1.8(6; 3-10) cm before and 8.7±2(9; 5-12) cm after training. The mobility of II group also increased (p=0.001). There was no statistically significant difference between groups nor before (p=0.072) neither after (p=0.174) training. Trunk lateral bending to the right/ left sides test results of I group were 9.5±2.8(9; 7-18)° / 9,5±3(9,5; 6-17)° before and 11±3.3(10; 7-19)° / 11±3,2(10; 7-19)° after training. The mobility of I group increased (p=0.001). Test results of II group were 9.7±2.7(8,5; 5-15)° / 9,2±2,6(9; 6-14)° before and 11.2±3.3(10; 6-17)° / 10,1±3(10; 7-16)° after training. The mobility of II group increased (p=0.001). There was no statistically significant difference of right side bending results between groups nor before (p=0.779) neither after (p=0.904) training. There was also no statistically significant difference of left side bending between groups nor before (p=0.883) neither after (p=0.678) training.

Conclusions. Both training programs (exercises on unstable surfaces and exercises without instability surfaces) had positive effect for balance and mobility improvement for peoples suffering from lower back pain.

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The effect of Mulligan knee taping technique on knee pain and knee function in patellofemoral pain syndrome.

Giedrė Damušytė, Laimonas Šiupšinskas
Lithuanian University of Health Sciences, Institute of Sports

Introduction. Patellofemoral pain syndrome (PFS) is multifactorial condition and one of the most common causes of knee pain [1]. PFS is associated with lower extremity changes in strenght, flexibility and neuromuscular function. Long lasting pain can disrupt muscular function and intermuscular coordination [2]. ñBest Practice Guideò recommends multimodal intervention in PFS to involve taping as a beneficial method in combination with exercises [3].

Research aim: to evaluate the effect of Mulligan knee taping technique on knee pain intensity and knee function in patellofemoral pain syndrome.

Research methods and organization. Subjects aged between 17 and 45 were eligible for inclusion if they satisfied these criteria: 1) Chondromalacia patella, retropatellar or peripatellar pain; 2) Knee pain for longer than six weeks; 3) Pain during at least two activities: prolonged sitting, ascending-descending stairs, squatting, jumping and/or running; 4) Pain intensity equal or higher than 3 according to numeric pain rating scale (NPRS). All subjects were informed about the research and signed the

informed consent form. Ethical approval was obtained from Lithuanian University of Health Sciences ethics committee. Subjects were divided into two groups: KT group consisted of 11 subjects (age 28.73±3.44 year, BMI 22.3±2.8) received exercise program five times per two weeks and TP group consisted of 11 subjects (age 26.45±4.55 year, BMI 23±1.5) received the same exercise program of the same duration with additionally added Mulligan knee taping technique. All tests were performed three times: before therapy, after therapy and one week follow up after the therapy. Demographic data and anterior knee pain (Kujala) questionnaires were used. Pain intensity was measured with NPRS while lower extremity function by single leg hop and Y balance anterior reach tests. Statistical data analysis was performed using IBM SPSS Statistics 22.0 (Statistical Package for the Social Sciences Inc., Chicago, IL, USA) program. The quantitative results are presented as median (min; max). The comparison of two independent samples was carried out with non-parametric Mann-Whitney test. The comparison of two dependent samples was performed with non-parametric Wilcoxon test. The difference was considered to be statistically significant when $p < 0.05$.

Results. Before therapy pain was evaluated similarly in KT and TP group (U= 48.5, p = 0.438), specifically the results were as follow 4(3; 8) and 4(3; 6) scores in KT and TP group, respectively. After the therapy pain intensity lowered until 2 (0; 4) in both groups, showing statistically significant change in both groups (KT - Z=-2.949, p=0.003; TP - Z=-2.961, p=0.003). Before the therapy Kujala questionnaire results were similar in both groups (U=38.5, p=0.151). The results were as follow 74 (64; 84) and 72 (66; 76) in KT and TP group, respectively, and after the therapy increased until 85 (73; 100) and 83 (75; 91), showing statistically significant change in both groups (KT - Z=-2.814, p=0.005; TP - Z=-2.936, p=0.003). Before the therapy single hop test was evaluated similarly in KT and TP group (U=38.5, p=0.151), specifically the results were as follow 171 (115; 205) cm and 175 (120; 215) cm in KT and TP group, respectively. At the end of the research the results statistically significantly increased in KT group until 175 (122; 212) cm (Z=-2.805, p=0.005) and in TP group until 180 (117; 225) cm (Z=-2.581, p=0.01). No significant changes were observed in Y balance anterior reach test (p>0.05).

Conclusion. Both groups improved knee function and lowered pain intensity. Exercise therapy with and without Mulligan knee taping technique has the same positive effect for knee pain intensity and knee function in patellofemoral pain syndrome.

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Are health wellness changes associated with intensity-specific physical activity levels among university students?

Laura Daniusevičiūtė-Brazaitė[1], Laura Tamkutė[2]
[1] *Faculty of Social Sciences, Arts and Humanities, Kaunas University of Technology, Lithuania,*
[2] *Faculty of Chemical Technology, Kaunas University of Technology, Lithuania*

Introduction. Many studies have shown the positive effects of short-term regular moderate-to-vigorous physical activity on health, well-being, and performance (Warburton et al., 2006). Little is currently known about the effect of such interventions on total wellness, a concept which encompasses much more than physical health. Many studies have shown that university students are at risk for higher rates of chronic diseases, including high blood serum cholesterol, increased blood pressure, and greater body mass index (BMI) (Spencer, 2002).

Research aim: to evaluate physical activity in daily living activities among students, comparing genders, and to determine whether such activities were associated with improvement in total wellness.

Research methods and organization. The analyses are based on online survey data from the short version of the International Physical Activity Questionnaire (IPAQ) and Wellness Evaluation of Lifestyle (WEL) inventory, which were conducted among university and college students across Lithuania from February 2015 to July 2015.

In total, 900 students from Lithuanian universities and colleges participated in the study. There were 439 females and 461 males, and the mean age was 23 years old. Each subject volunteered to participate after being informed of the purpose and experimental procedures. The IPAQ assesses physical activity levels by asking participants to answer questions regarding the frequency (days per week), duration (in hours and minutes), and level of intensity (walking, moderate, or vigorous) of physical activity during the previous seven days. The IPAQ is scored using the Metabolic Equivalent of Task (MET) method, in which different activities and levels of intensity are assigned different MET estimates. In this study, total MET-minutes per week were calculated separately for walking, moderate, and vigorous intensity activities (Craig et al., 2003). The WEL task of self-regulation includes twelve additional components: (1) sense of worth; (2) sense of control; (3) realistic beliefs; (4) emotional awareness and coping; (5) intellectual stimulation, problem solving, and creativity; (6) sense of humour; (7) exercise/physical activity; (8) nutrition; (9) self-care; (10) stress management; (11) gender identity; and (12) cultural identity (Myers et al., 2000). The inventory consists of 103 items represented as self-statements to which respondents reply using a five-point Likert scale with the following options: (a) strongly agree, (b) agree, (c) undecided or neutral, (d) disagree, and (e) strongly disagree. Total wellness was determined by calculating a total percentage of the sum of the five life tasks of spirituality, work and leisure, friendship, love, and self-regulation. Statistical analysis was performed by using *SPSS 20.0* software for *Windows*. The correlation among variables was evaluated by Chi-squared tests. For all tests, $p<0.05$ was considered significant.

Results. Sedentary time didnôt differ between genders ($p < 0.08$). In addition, females spent significantly more time on light intensity physical activity compared with males ($p < 0.01$). Paired sample t-tests indicated significantly higher IPAQ scores for females compared with males (females 1625 ± 553.8 males 568 ± 531.5 MET-min/week) for walking ($p < 0.001$). IPAQ scores for moderate intensity physical activity were higher in males (649 ± 494.9 MET-min/week) than females (194 ± 225.3 MET-min/week) ($p < 0.001$). This also occurred for vigorous intensity physical activity; it was higher for males (733 ± 829.3 METmin/week) than females (291 ± 495.8 MET-min/week) ($p < 0.001$). The WEL scale values of moderate intensity physical activity didnôt differ for gender. The total

wellness percentage scores for vigorous intensity physical activity was higher in males ($p < 0.001$), as were sense of worth, sense of control, emotional responsiveness ($p < 0.001$), and stress management ($p < 0.05$).

Conclusions: The main findings of this study indicate that moderate and vigorous intensity physical activity affects total wellness scores and improves sense of worth, sense of control, emotional responsiveness, and stress management at a greater level in males than females. In addition, females spent more time on light intensity physical activity compared with males.

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Virtual training with RIABLO: influence on patients‘ gait after knee anterior cruciate ligament reconstructive operation

Tomas Gembeckas[1], Eglė Milinavičienė[2,3], Simona Stakauskienė[3], Alma Kajėnienė[1]

[1]*Lithuanian University of Health Sciences, Institute of Sports,*

[2]*Lithuanian University of Health Sciences, Rehabilitation Clinic,*

[3]*AB "Eglės" sanatorium*

Introduction. Every year in Lithuania approximately 750 anterior cruciate ligament (ACL) trauma are recorded and about 500 operations are performed [1]. After ACL reconstruction asymmetry of motion and force are persisted for up to 2 years. Consequently, it results in asymmetric gait patterns which increases the risk of further trauma [2]. Riablo (Corehab Trento, Italy) - the new method for measuring physical exercise with wearable sensors and patented biofeedback for compensation correction. There is insufficient amount of evidence of systemsô application for patient's rehabilitation.

Research aim: The aim of this study was to evaluate the influence of virtual training system Riablo on patients gait after knee anterior cruciate ligament reconstructive operation.

Research methods and organization: The research was conducted in 2017 November - 2018 September, at AB "Eglã" sanatorium in Birštonas. Seventeen participants after ACL reconstructive operation were divided into 2 groups (duration of outpatient rehabilitation ï 18 days). Group 1 (n=9, age 32.11±8.43 years) performed regular physiotherapy (1 hour per day), group 2 (n=8, age 32.25 ±7.57 years) performed regular physiotherapy (30min) and virtual training system Riablo (30min). The gait was evaluated by computer hardware Zebris (Medical GmbH Isny, Germany). The following gait indicators were estimated before and after the research: foot rotation asymmetry, step length asymmetry, step width and steps per minute.

Data were analysed and processed with Statistical Package for the Social Sciences (Inc., Chicago, IL, USA). Data are presented as median (minimum value; maximum value; average). The Mann - Whitney U test was applied for quantitative indications to compare independent variables median between 1 and

2 groups, when normality assumption was not satisfied. A non-parametric Wilcoxon Z test was used to compare the two dependent samples.

Results. Before the research statistically significant difference between the groups in foot rotation asymmetry was not found (U = 27.50; p = 0.42). Foot rotation asymmetry in group 1 before the research was 3.60 (1.50; 10.30; 4.48)° and after research it was 3.10 (0.30; 6.90; 3.57)° (Z= -1.36; p=0.17). In group 2 foot rotation asymmetry before the research was 3.10 (0.80; 6.50; 3.22)°, after the research 2.45 (0.20; 3.40; 2.13)°,(Z = -2.17; p=0.03). Before the research statistically significant difference in steps length asymmetry between groups was not observed (U = 48.00; p = 0.27). In group 1 steps length asymmetry before the research was 3.00 (1.00; 6.00; 3.11) cm, after research 2.00 (0.00; 4.00; 2.22) cm, (Z= -2.06; p=0.04). In group 2 steps length asymmetry before the research was 4.00 (1.00; 6.00; 3.88) cm, after the research 1.00 (0.00; 5.00; 2.13) cm, (Z= -2.03; p=0.04). Before the research statistically significant difference in steps width between the groups was not observed (U = 25.50; p= 0.32). In group 1 steps width before the research was 15.00 (10.00; 20.00; 15.67) cm, after the research 14.00 (9.00; 19.00; 14.67) cm, (Z= -0.94; p=0.34). In group 2 steps width before the research was 13.00 (11.00; 18.00; 13.50) cm, after research 11.00 (8.00; 14.00; 10.63) cm, (Z= - 2.55; p=0.01). Before the research statistically significant difference between groups in steps per min was not observed (U = 42.00; p= 0.60). In group 1 number of steps per minute before the research was 90.00 (71.00; 101.00; 88.67) steps/min, after the research 87.00 (76.00; 104.00; 89.78) steps/min, (Z= -0.35; p=0.72). In group 2 number of steps per minute before the research was 91.50 (80.00; 108.00; 92.00) steps/min, after the research 95.50 (78.00; 112.00; 96.63) steps/min, (Z= -2.03; p=0.04).

Conclusions: Virtual training system Riablo helps efficiently improve men's gait after the anterior cruciate ligament reconstructive operation: decreases foot rotation asymmetry, step width and increases number of steps taken per minute.

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The change of functional state and pain intensity while applying different physical exercises programs in people who suffer from lower back pain

Giedrė Griciūnaitė, Vilma Mauricienė

Lithuanian University of Helath Sciences, Institute of Sports

Introduction. Low back pain is one of the most important problems leading to the deterioration of functional state and life quality in society nowadays. Therefore, it is important to apply a suitable treatment in order to prevent these problems [1]. Physical exercise programs could be used to reduce pain, increase strength, endurance, joint mobility and maintain overall movement balance [2].

Research aim: to assess the change of functional state and pain intensity while applying different physical exercises programs for people who suffer from lower back pain.

Research methods and organization: 25 young and medium age people (18 women and 7 men) who suffer from lower back pain participated in the research. The Bioethics Centre granted a permission in order to perform a research. Participants randomly were divided into two groups. Participants of the first group (9 women and 4 men; average age - 49.5 ± 10.8 years) performed physical exercises

program for spine stabilisation, integrating body awareness elements. Body awareness apply purposeful physical exercises highlighting better breathing, body sensations, concentration, mind ï body integrity and muscle tension reduction. Participants of the second group (9 women and 3 men; average age - 48.7 ± 12.9 years) performed physical exercises program for spine stabilisation without integration of body awareness elements. Physiotherapy procedures and massage were also applied to all participants. Both groups performed exercises program twice a week for 60 minutes, total 10 activities. Pain intensity level was assessed by a Numeric analogue pain scale, and functional state - using Roland-Morris questionnaire and Oswestry disability index. Data analysis was performed with IBM SPSS Statistics 22.0 program. Nonparametric criteria (Wilcoxon and Mann-Whithney) were used. Significance level $p<0.05$ was chosen. Data are presented as mean and standard deviation.

Results. Before the physical exercises program the intensity of perceived pain was similar in both groups (Z=-0,738; p=0.460). Before the exercise program pain intensity in the first group was 7.77 ± 1.25 points, after ï 5.38 ± 1.33 points. Pain intensity level after the physical exercises program statistically significantly decreased in the first group (Z=-3.21; p=0.01). Before the physical exercises program pain intensity in the second group was ï 7.5 ± 0.96 points, after ï 6.58 ± 1.11 points. Pain intensity level after exercises program significantly decreased also in the second group (Z=3.05, p=0.02). After physical exercises program application pain intensity decreased more significantly in the first group (Z=-2.08; p=0.037).

Participantsó functional state, evaluated with Roland-Morris questionnaire, before physical exercises program application was similar in both groups (Z=-0.91; p=0.362). Before the exercises program the first group got on average 8,62 ± 3.61 points, after ï 5.69 ± 2.13 points. Functional state after the exercises program statistically significantly improved in the first group (Z=-3.19; p=0.001). Before the exercise program the second group got on average 8.5 ± 3.18 points, after ï 5.67 ± 2.46 points. Functional state in the second group also significantly improved (Z=-3.11; p=0.002). Data analysis revealed no significant difference between the groups after performance of physical exercises programs (Z=-0.11; p=0.911).

Participantsó functional state, evaluated using Oswestry disability index, before the physical exercises program was similar in both groups (Z=-0.3; p=0.764). Oswestry disability index before the exercise programme in the first group was 34 ± 12.05%, after - 17.54 ± 8.27%. These changes were statistically significant (Z=-3.18; p=0.001). Oswestry disability index before the exercise program in the second group was 32.33 ± 16.16%, and after - 23.17 ± 13.92%. These changes were also statistically significant (Z=-3.06; p=0.002). After physical exercises program application participantsó functional state did not differ statistically significantly between groups (Z=-1.01; p=0.313).

Conclusion. Both applied exercises programs were effective for the functional state improvement and pain intensity decrease in patients with low back pain. Although the exercises program with body awareness elements was more effective for pain intensity decrease.

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The change of climbers' shoulder complex functional performance after application of a specialized exercises program

Sylwia Grygieńć, Vilma Mauricienė, Vytautas Poškaitis
Lithuanian University of Health Sciences, Institute of Sports

Introduction: Rock climbingôs popularity continues to rise. According to scientific literature, climbers get injured mostly in their upper extremities (Schöffl V. R et al., 2013). Climbers naturally elevate the shoulder during typical static postures. Modified shoulder position induce higher activation of the scapula stabilizing muscles than physiological shoulder position. Active centering of the glenohumeral joint is recommended to prevent muscular imbalance and overuse syndromes (Baláġ J.et al., 2017).
Research aim: to evaluate the climbersó shoulder complex functional performance changes after the application of a specialized exercises program.
Research methods and organization. The study included 13 climbers (7 women, 6 men) attending the climbing workouts. Inclusion criteria: age more than 18 years; climbing experience more than 3 months; climbing indoor, bouldering. Climbers age was 28 (19-50; 30.8) years. Participants had 36 (6-180; 60.6) months of climbing experience. Each participant was examined 2 times: before and after the application of a specialized exercise program. Specialized exercises program was applied for one month. It included stretching, strength/stabilising and proprioception exercises for shoulder complex. Research methods: 1. Questionnaire (socio-demographic data collection); 2. Lateral scapular slide test and upper quarter Y balance test - for shoulder complex functional performance assessment. Data statistical analysis was performed using SPSS 23.0 for Windows program. The non-parametric Wilcoxon criteria was used to compare the two dependent samples. The results are presented as a median, minimum and maximum values and average ï Me(Min-Max; X). The difference, when $p < 0.05$, was considered statistically significant.
Results. Lateral scapular slide test: during the study, the difference of distances between the right and left female scapulas and the spine (measuring the symmetry) did not change significantly in the first (when shoulder abducted 0°) (Z = -1.089; p=0.276), the second (when shoulder abducted 45°) (Z= -0.108; p=0.914) and the third (when shoulder abducted 90°) shoulder position (Z= 0.0; p=1.0). The distances were within the normal range before and after the study. The difference of distances between the right and left male scapulas and the spine (measuring the symmetry) did not change significantly in the first (when shoulder abducted 0°) (Z= -0,707; p=0.480) and the third (when shoulder abducted 90°) shoulder position (Z= -0.106; p=0.916), but in the second position (when shoulder abducted 45°), there was a tendency of this difference decrease after the program (Z= -1.633; p=0.102). The distances were within the normal range before and after the study.
Upper quarter Y balance test**:** during the study, the dynamic stability (composite score) of femalesó upper extremities did not change significantly (left: Z= -0.507; p=0.612, right: Z= -0.845; p=0.398). The difference of reaching distances between the right and left femalesó upper extremities (measuring the risk of trauma) did not change significantly in all three directions: superio lateral (Z= -0.105; p=0,916), medial (Z= -1,156; p=0,246) and inferio lateral (Z= -0,736; p=0,462). The reaching distances were within the normal range before and after the study. The dynamic stability of malesó left upper extremity did not change significantly (Z= -1.153; p=0.249), but the stability of the right upper extremity significantly changed (Z= -1.992; p=0.046). The difference of reaching distances between the right and left malesó upper extremities did not change significantly in two directions: superio lateral (Z= -0.153; p=0,249) and inferio lateral (Z= -0,632; p=0,527), in the medial direction, there was observed a tendency of this difference decrease after the program (Z= -1,483; p=0,138).

Conclusions: 1. Specialized exercise program for climbers did not change the position of scapulas both in females and males. 2. Specialized exercise program for climbers did not change dynamic stability of both upper extremities in females but decreased dynamic stability of right upper extremity in males ($p<0.05$).

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Immediate effects of neurodynamic sliding on ipsilateral and contralateral lower limb mobility and stretch tolerance in young assymptomatic subjects

Adelė Januškevičiūtė, Vilma Mauricienė

Lithuanian University of Health Sciences, Institute of Sports

Introduction. Usually in sports and rehabilitation for muscle extensibility improvement various stretching techniques are used. Sensory theory suggests that increases in muscle extensibility after single stretching session comes not from affecting the mechanical properties of the muscle but result from modified sensation of stretch or pain [1]. Stretch tolerance improvement could be achieved not only by stretching muscles but by other techniques such as neurodynamic mobilization [2, 3].

Research aim: to evaluate immediate effects of neurodynamic sliding technique on ipsilateral and contralateral lower limb mobility and stretch tolerance in young asymptomatic subjects.

Research methods and organization. This study involved twenty one young asymptomatic subjects (mean age 22.43±0.34 years, range 21-25 years). Subjects were assigned into two groups ï neurodynamic mobilization group (NDG) and control group (CG). NDG participants performed neurodynamic sciatic nerve mobilization with their dominant leg for 60 sec and repeated it 5 times. Neural sliding technique in a seated Slump position was used, where participant performed alternating movements of knee extension/ankle dorsiflexion with cervical extension, and knee flexion/ankle plantarflexion with cervical flexion [3]. CG participants get no intervention and was sitting still (approximately 6 min.) between two testing sessions. Measurements of muscle extensibility and stretch tolerance were performed before and right after intervention. The passive straight leg raise (PSLR) test was used to determine changes in hamstring muscle extensibility. PSLR results are expressed in degrees and were measured by smartphone app Clinometer. For stretch tolerance each participant indicated their perception of stretching sensation during every muscle extensibility testing by marking a point in a 10 cm visual analogue scale. The comparison of two independent samples was carried out by using the non-parametric Mann-Whitney test. The comparison of two dependent samples was carried out by using the non-parametric Wilcoxon test. The data are presented as median (xme), minimum (xmin), maximum (xmax) value and mean ($\bar{x}$) ï xme (xmin - xmax; $\bar{x}$). The difference was considered statistically significant when $p<0.05$.

Results. Before intervention PSLR result in NDG in non-dominant leg was 75 (42-91; 70.45)° and after intervention ï 80 (43-96; 77.55)°. In the dominant leg PSLR before was - 73 (40-93; 71.73)° and after intervention ï 79 (47-108; 80.64)°. The improvement is statistically significant in both ï non-dominant ($Z= -2.81$; $p=0,005$) and dominant ($Z=-2.85$; $p=0.004$) legs. Control group PSLR results also

statistically significant improved from 72.5 (54-85; 70.2)° to 81 (54-89; 77.8)° in non-dominant leg (Z=-2.67; p=0.008) and from 76 (56-93; 73.3)° to 83 (56-96; 79)° in dominant leg (Z=-2.67; p=0.008). There were no differences before (non-dominant (U=50.5; p=0.756) and dominant (U=52; p=0.863) leg) and after intervention (non-dominant (U=50.5; p=0.756) and dominant (U=50.5; p=0.756) leg) between two groups. Stretching sensation in NDG non-dominant leg decreased from 3.4 (2.2-6.3; 3.73) to 3.03 (0.5-5.1; 2.77) and from 3.5 (1.8-6.7; 3.6) to 2.3 (1.5-5.8; 2.77) in dominant leg. Changes observed in both legs were statistically significant (non-dominant (Z=-2.45; p=0.014) and dominant (Z=-2.22; p=0.026). In CG perception of stretching intensity also decreased statistically significant from 2.85 (0.4-5.9; 3.01) to 1.8 (0.2-5.4; 2.45) in non-dominant leg (Z=-2.43; p=0.015) and from 3.5 (0.4-6.4; 3.2) to 2.2 (0.2-5.4; 2.41) in dominant leg (Z=-2.14; p=0.032). There were no statistically significant differences between groups, when comparing stretching sensation before (non-dominant (U=43; p=0.426), dominant (U=53.5; p=0.918) leg) and after intervention (non-dominant (U=43; p=0.426), dominant (U=48; p=0.654) leg).

Conclusions. After neurodynamic sciatic nerve mobilization hamstring extensibility improved in mobilized and contralateral leg. Despite the improvement of muscle extensibility, perception of stretching intensity significantly decreased. However, the same changes were observed in the control group.

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The effect of balance exercises for the dynamic stability of lower limbs and for the quality of functional movements of the professional football players

Meida Mačiulaitytė, Vytautas Poškaitis

Lithuanian University of Health Sciences, Institute of Sports

Introduction. Football is one of the most popular sport in the world, both for children and for adults (Hassanian-Moghaddam et al., 2017). This sport is also one of the most dangerous for health, as it is in football sports, male professionals 38%, amateur level 28% of all recorded injuries (Ekstrand et al., 2011). Balance is one of the prevention efforts aimed at reducing the risk of injuries in professional sports and thus improving not only the physical aspects of the athlete but also the overall team performance (Emery et al., 2005).

Research aim: to determine the effect of balance exercises to the legs dynamic stability and to the quality of functional movements.

Research methods and organization. The study was conducted from 2018 of January to 2018 of November in the team of A division team. The study involved 20 professional male football players (age 25 ± 7). All subjects are professional football players, playing in the top of Lithuanian league. They didnąt get any serious or acute injuries in three months, which would have stopped the training cycle for more than a week. The participants in the study were tested twice before the season starts and

at the end of the season. First, new season players were questioned about past injuries that occurred in the last three months. The subjects selected on the first day of the study were FMS ((Functional Movement Screen) and Y-Balance tests. After two days of rest, we tested explosive power. Between first preseason testing and season ending testing, during the season was applied a balance control program. Methods: Since the beginning of the investigation in 2018 month of January, were registered the players injuries which have been incurred in competitions. To assess the purpose of balance exercises and the quality of functional movements associated with the risk of injuries, players who meet the criteria were tested with these tests: The FMS (Functional Movement Screen) test to assess the functional quality of the movements performed with Ò14 points indicates, that the current movement asymmetry and this can affect joints and muscle injuries. Therefore, we use FMS to test the quality of motion and asymmetry (Mokha et al., 2016). Explosive strength dynamic jump, a 90 ° inclination, and a maximum jump to a height this is how the jump height of the test lift was measured in centimeters (Chamari et al., 2004). Used Hardware (Just Jump & Run Handheld Computer & Companion Jump Mat ~ Standard version). During the game, football players must maintain a unilateral balance, both static and dynamic, during the movement; therefore, in order to determine the benefits of equilibrium exercises for dynamic stability, the subjects.

Results. Y balance test score: The average difference between the total pre-survey aggregate index was 0.24 ± 4.35 per cent, after the program was 0.13 ± 1.98 per cent. The total difference of the total index fell by 0.11 ± 2.71 percent, and this is statistically insignificant as $p > 0.05$ ($Z = -0.087$; $p = 0.931$). Assessment of Functional Movement Screen: The mean FMS before the test was 16.83 ± 2.01 points, after the program 19.89 ± 0.96 points. The total FMS score increased by 3.06 ± 1.47 points and statistically significant, since $p < 0.05$ ($Z = -3.739$; $p = 0.000$). Estimation of one-leg jump test: the mean single-jump asymmetry average was reduced by 2.94 ± 2.95 percent, which is statistically significant as $p < 0.05$ ($Z = -3.071$; $p = 0.002$). The mean symmetry of the three-point zigzag dropped by 1.9 ± 1.87 percent, which is statistically significant as $p < 0.05$ ($Z = -3.480$; $p = 0.001$). The mean symmetry of the three jumps decreased by 1.73 ± 1.34 percent, which is statistically significant as $p < 0.05$ ($Z = -3.681$; $p = 0.000$). The mean symmetry for three jumps has decreased by 2.07 ± 3.19 percent, which is statistically significant because $p < 0.05$ ($Z = -2.243$; $p = 0.025$). Evaluation of the Vertical Jump Test: The mean vertical jump increased by 7.89 ± 4.73 centimetres, which is a statistically significant difference as $p < 0.05$ ($Z = -3.729$; $p = 0.000$). Injury Assessment: The average of missed training has decreased by 9.89 ± 8.51 and is statistically significant as $p < 0.05$ ($Z = -3.663$; $p = 0.000$). Non-contact injury and test interfaces: statistically significant negative correlations between back injuries and left side shoulder width after results ($r = -0.600$; $p = 0.008$) and total results ($r = -0.604$; $p = 0.008$) were detected because $p < 0{,}05$, if the results of the shoulders were poorer, there were more injuries. If the length of the right leg in the lying back position is higher, the back injuries experienced more ($r = 0.520$; $p = 0.027$), because $p < 0.05$. Statistically significant negative correlations were found between right leg injuries and left leg three jumps before ($r = -0.591$; $p = 0.010$) and after results ($r = -0.591$; $p = 0.010$), because $p < 0.05$. Right foot injury is dependent on the three-point zigzag symmetry index ($r = 0.500$; $p = 0.035$), because $p < 0.05$, the higher the symmetry index is, the injury of the right leg is more frequent.

Conclusions: 1. The established balance exercise program significantly improved the quality of the legôs movements, that show Y balance test score. 2. It was determined that applied balance exercise program, improved the results of the vertical jump significantly. 3. The established balance exercise program significantly increased the dynamic stability of the legôs. 4. After analysing the non-contact injury and the links of the studied indicators, it was established that poor one leg jump test results show the potential increased risk of injuries.

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Basketball free throw biomechanics: movement variability's impact on throwing accuracy and dynamic stability of the upper limb

Tadas Mikelionis, Laimonas Šiupšinskas, Rimtautas Gudas
Lithuanian University of Health Sciences, Institute of Sports

Introduction. The ability to shoot an effective free throw in basketball is critical to any playerôs success (1). The study of movement variability is relevant for analyzing athleteôs biomechanical qualities. (2). Skilled players are considered to exhibit less variability (3) and that it needs to be minimized for optimal performance (2). However, from the dynamical systems perspective, variability is necessary for the movement system to adapt (4), and therefore dynamic stability and variability are related.

Research aim: to determine basketball free throw movement variability's impact on accuracy and dynamic stability of the upper limb.

Research methods and organization. In this study there were 11 professional division B basketball players. The mean age of the participants was 26,18±3,73; the average height 196,18±9,15 cm; the average weight 94,27±14,39 kg.

Every participant was asked to perform 20 free throws in a row. The participants had time to warm-up and to do as many shots as needed before the evaluations. None of the test subjects had upper limb pain or injury in a week prior to the testing.

Each free-throw was filmed using two cameras, both in the frontal and the sagittal planes. Special markers were placed on greater tubercle of humerus, head of radius, olecranon process of elbow, middle part and triquetral bone of wrist, distal part of V metacarpal bone, greater trochanter tuberosity of femur. Angles and positions of the upper limb were measured using motion analysis program ñKinoveaò as follows: -In the frontal plane ï angle of the humerus and angle of the forearm to vertical axis in cocking and release phases; -In the sagittal plane ï angle of shoulder, elbow, wrist flexion or extension in cocking and release phases. To measure variability of every set of upper limb position parameters, coefficient of variation was calculated as the ratio of the standard deviation to the mean. Accuracy of each player was calculated in percentages, based on the number of successful throws. Dynamic stability was evaluated using Upper Quarter Y-Balance Test (UQYBT). The following

correlations were evaluated: -between variability and accuracy; -between variability and dynamic stability; -between dynamic stability and accuracy.

Statistical analysis was performed using Microsoft Office Excel and SPSS 23.0 Statistics software package. Quantitative variables were presented as the mean and standard deviation (mean±SD). In order to assess the relationship between two nonparametric variables, Spearmanós coefficient (r) was used. The significant differences were considered with p<0,05.

Results. The mean accuracy of the players was 86,36±7,78 %.

The average value of dynamic stability (composite score of UQYBT) of the team was 94,14±3,19, with the lowest value of 88,15 and the highest of 97,89.

There was significant strong negative correlation between angle of the humerus to vertical axis in release phase and the accuracy (p=0,004, r=-0.791) ï therefore, the lower variability considering shoulder movement in the release phase, the greater number of successful shots and accuracy of the free throws. It was also found that there is a strong positive correlation between accuracy and angle of both wrist extension and flexion in release phase (p=0,048, r=0,523) ï the greater variability of wrist movement in release phase results in greater number of successful shots. However, no relation was found considering accuracy and other variability parameters. This suggests that variability of these values does not have an impact on throwing success. Considering the relation between movement variability and dynamic stability, strong negative correlation between variability of angle of the humerus to vertical axis in release phase and dynamic stability was found (p=0,046, r=-0,536). Therefore, this may suggest that lower variability of the shoulder in release phase means not only greater accuracy, but also greater dynamic stability of the joint - accordingly, greater dynamic stability results in greater accuracy. Finally, it was found that the relation between dynamic stability and accuracy was significant (p=0,04) with r=0.623, which indicates strong positive correlation between the variables.

Conclusions: 1. Lower movement variability of the shoulder in the frontal plane and higher movement variability of the wrist in the sagittal plane, during release phase, result in greater throwing accuracy. 2. There is a significant correlation between variability of free throw biomechanics and dynamic stability; lower variability of the shoulder results in better dynamic stability. 3. There is a strong positive relation between dynamic stability and accuracy ï dynamic stability is necessary for accuracy.

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Assessment of change in functional parameters of cardiovascular system of future actors in performance of various roles and relaxation exercises

Agnė Narušienė, Alfonsas Vainoras, Ernesta Gurskienė
Lithuanian University of Health Sciences, Institute of Sports

Introduction. There is a tendency that young actors experience stress, anxiousness and depression [1]. As well other factors that may negatively affect the wellbeing of actorsô health are a busy routine, lack of sleep and huge pressure to perform even in the case of illness [2]. The research aims to define the reactions of cardiovascular system while practising relaxation exercises and in the situations of real performance.

Research aim: to evaluate the change in functional parameters of cardiovascular system while performing various roles and relaxation exercises depending on the sex.

Research methods and organization. The research has been carried out at the Lithuanian Academy of Music and Theatre. The participants of the research ï 21 students of third year: 11 male students (of the average age of 21.5 ±2.7 years), 10 female students (of the average age of 20.5 ±1.2 years). BMI of the male students: 21.96 ±2.4 kg/m², KMI of the female students: 20.92 ±1.8 kg/m².

Course of research. The monitoring of ECG lasted for 25 minutes and was divided into 5 stages each taking 5 minutes: the first stage ï 0ï 5 min (rest, progressive muscle relaxation), second stage ï 5ï 10 min (drama), third stage ï 10ï 15 min (comedy), fourth stage ï 15ï 20 min (tragedy), fifth stage ï 20ï 25 min (rest, autogenic training). To evaluate how deeply the actors can relax in short time, 5 min relaxation was chosen. Different roles were interpreted by the participants according to the same dialogue from William Shakespeareôs ñMacbethò.

Methodology of research. Computer-based ECG monitoring system ñKaunas ï KrÎ visò created in the Institute of Cardiology at LSMU was used to record ECG, to process the initial data, to filter the noise, to recognise ECG complexes and to measure its parameters. In the end of each stage the average duration of JT and RR intervalsô cardiac cycles was recorded. The HCR was counted as follows: HRC=60/RRx1000.

Statistic methods of data processing. Statistical data analysis was carried out by the programme SPSS (Statistical Package for Social Sciences). To count the averages (M) and standard deviations (±SD), data processing followed the descriptive statistics method. The data of dependent samples were analysed on the ground of the analysis of one-way repeated- measures data. The difference is considered statistically significant in case of $p<0.005$.

Results. The analysis of results of female studentsô group shows that the average value of highest values of HCR is recorded at the second stage ï 105.39 ± 13.00 bpm, and the lowest values of HCR indicators were recorded at the first and fifth stages, 85.36 ± 16.09 bpm and 73.80 ± 19.60 bmp, respectively, $p<0.05$. The analysis of male studentsô group results discloses that the highest values of HCR indicators were recorded at the fourth stage performing tragedy roles, i.e. 111.63 ± 24.96 bpm, and the lowest ï at first and fifth stages, 77.02 ± 8.00 bpm and 65.19 ± 9.95 bpm, respectively, $p<0.05$. In the groups of male and female students the average values of HCR indicators in different research stages significantly differed ($p<0,05$), except the recorded average values ($p>0,05$) in the female studentsô group while comparing the performance of drama and tragedy, comedy and tragedy; in the groups of male students ï drama and comedy, comedy and tragedy.

The comparison of the changes in the duration of JT interval in the female studentsô group indicated that the longer duration of JT interval was recorded at the first and fifth stages, 258.30 ± 27.70 ms and 291.90 ± 32.29 ms, respectively, while the shorter duration of JT interval was recorded at the second,

third and fourth stages, 219.30 ± 21.56 ms, 224.00 ± 21.34 ms and 218.67 ± 18.88 ms, respectively, $p<0.05$. The analysis of the male studentsô group shows that the longer duration of JT interval was recorded at the first and fifth stages, 275.40 ± 19.38 ms and 300.70 ± 26.12 ms, respectively, after the performance of relaxation exercises, while the shorter duration of JT interval was recorded at the second, third and fourth stages, 227.10 ± 18.66 ms, 223.00 ± 19.41 ms and 214.20 ± 32.59 ms, respectively. The durations of JT intervals in the groups of female and male group at different stages of the research differed significantly ($p<0,05$), except when comparing the durations of intervals in the group of female students performing drama and comedy, drama and tragedy, and comedy and tragedy; in the group of male students ï drama and comedy and comedy and tragedy.

Conclusions: The research has shown that future actorsô heart contraction rate tends to be the most infrequent while performing relaxation exercises; the most intensive for female students performing drama and tragedy, and the role of tragedy for males. The duration of JT interval of future actors was the longest while performing relaxation exercises, and significantly shortened while performing roles.

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The change of teenagers', who play volleyball, speed of motion and strength, when applying the specialized exercises program

Jurgita Naseckaitė, Ernesta Gurskienė

Lithuanian University of Health Sciences, Institute of Sports

Introduction. Volleyball is now one of the five biggest international sports. The level of participation at all levels internationally continues to grow exponentially [1]. A number of consistent techniques, applied to the game, improved specialized player positions, offensive and defensive structures. During the game it is vital to combine different physical abilities such as endurance, strength and speed [2]. Due to the importance of these traits it is important to constantly evaluate and adapt optimal physical exercise programs in this fast changing sport, in order to obtain the best results.

Research aim: to evaluate the change of teenagersô, who play volleyball, speed of motion and strength, when applying the specialized exercises program.

Research methods and organization. There were 22 teen girls that were attending the volleyball training regularly (average age 15 (14; 17) years, average BMI 20.8 (18; 26) kg/m2). All the girls were attending volleyball practice 5 times a week. The study lasted for 2 months. Testing was performed twice - before and after applying the specialized exercise program, based on the results of the first assessment. The program was created and alternated to focus on the weaker physical abilities. The program was performed before the regular volleyball practice. Duration of the program ï 30 minutes. After warmup and stretching exercises, participants performed exercises improving the strength of the upper extremities, speed of motion, endurance and force. The following methods were used: Plate Tapping test for speed of motion assessment; Handgrip Test (only dominant arm), Bent Arm Hang test and 2 kg ball throwing test for strength evaluation [3]. Statistical analysis was performed using ñIBM SPSS Statistics 22ò program. All data are presented as median, minimum, maximum values and

average ï Me (Xmin; Xmax; x). The Wilcoxon signed-rank test was used to compare two related samples. Change was considered statistically significant when p <0.05.

Results. After specialized exercise program Plate Tapping test results 12.6 (8.2; 17.3; 12.8) sec were better than before 14.6 (9.3; 19.9; 14.6) sec, (Z=-4.107; p<0.001). After specialized exercise program Handgrip Test (measures static arm strength) results 27 (21; 35; 26.6) kg were better than before 25 (20; 35; 25.6) kg, (Z=-3.372; p=0.001). After specialized exercise program Bent Arm Hang test results 13.5 (3; 37; 14.7) sec were better than before 9 (0; 29; 9.5) sec, (Z=-4,120; p<0.001). After specialized exercise program 2 kg ball throwing test results 6.9 (4.9; 9.1; 6.8) meter were better than before 6.2 (4.2; 8; 6.2) meter, (Z=-4.075; p<0.001).

Conclusions: We found out that teenagersô, who play volleyball, speed of motion and strength increased after specialized training program.

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Instant effects of tissue flossing on ankle range of motion and dynamic balance in handball players

Dominykas Pakarklis, Laimonas Šiupšinskas

Lithuanian University of Health Sciences, Institute of Sports

Introduction. Ankle range of motion (ROM) is very important during walking, going upstairs, running or jumping. Decreased ankle ROM can lead to harmful biomechanical problems [1]. In sports physiotherapy there are more and more specialists who use tissue flossing method for ankle ROM and sports performance [2]. In this study we investigated tissue flossing method on ankle ROM and dynamic balance.

Research aim: to evaluate instant effects of tissue flossing on ankle range of motion and dynamic balance in handball players.

Research methods and organization. Four Lithuanian A division handball teams agreed to participate in the study. The selection criteria were met by 26 athletes ï 14 females (mean age 21,64 ± 4,24) and 12 males (mean age 25,08 ± 4,32). One leg of the same person was in tissue flossing group (TFG) and other leg was in control group (CG). In research form it was already indicated which leg will be in TFG or CG. Tissue flossing band was applied on calf, 10 cm above calcaneus with 50% of stretch and each layer of band overlapped the previous layer by about 50%. In sitting position, participants were asked to perform 25 maximum plantarflexion and dorsiflexion movements of both ankles (approximately 2 min.). Measurements of ankle ROM and dynamic balance were performed before and after intervention. Goniometer was used to measure amplitude of active ankle dorsiflexion and plantar flexion in open kinetic chain (OKC). Inclinometer (ĂClinometerñ mobile app) was used to measure amplitude of active dorsiflexion in closed kinetic chain (CKC). Y balance test was used to evaluate dynamic balance. For comparison of two independent samples Student T test was used and if assumption of normality was violated - non-parametric Mann-Whitney test took place. For comparison

of two dependent samples Paired Student T test was used and if assumption of normality was violated - non-parametric Wilcoxon test was used. Shapiro-Wilkós W test was used to check assumption of normality. Quantitative data, when assumption distribution was normal, presented as mean (x) and standart deviation (SD) - x±SD, when assumption distribution wasnót normal - median (xme), minimum (xmin), maximum (xmax) value and mean (x) ï xme (xmin - xmax; x). The difference was considered statistically significant when $p < 0.05$.

Results. Before intervention TFG ankle active ROM of dorsiflexion in OKC was 8 (4-12; 7,65)° and after intervention 9 (6-12; 8,88)°. TFG ankleôs amplitude increased significantly (Z=-3,373; p=0,001). Before intervention CG ankle active ROM of dorsiflexion in OKC was 8 (5-12; 7,69)° and after intervention 8 (6-12; 8,85)°. There were no significant difference before and after intervention (Z=-1,414; p=0,157). Before intervention there were no difference between TFG and CG ankle ROM of dorsiflexion in OKC (U=337,5; p=0,992), but there were significant difference after intervention (U=215,5; p=0,022).

Before intervention TFG ankle active ROM of dorsiflexion in CKC was 39 (27-44; 37,58)° and after intervention 41,5 (30-49; 40,54)°. TFG ankleôs amplitude increased significantly (Z=-4,161; p<0,001). Before intervention CG ankle ROM of dorsiflexion in CKC was 40 (27-44; 38,31)° and after intervention 40 (27-47; 39,19)°. CG ankleôs amplitude also increased significantly (Z=-2,84; p=0,005). There were no significant difference between TFG and CG ankle ROM of dorsiflexion in CKC before (U=288; p=0,358) and after intervention (U=300,5; p=0,491).

Before intervention TFG leg dynamic balance in anterior reach direction was 67,87 ± 5,66 and after intervention 69,19 ± 5,69. There were no significant difference before and after intervention (t(25)=-1,858; p=0,075). Before intervention CG leg dynamic balance in anterior reach direction was 67,69 ± 6,48 and after intervention 67,75 ± 6,77. There were no significant difference before and after intervention (t(25)=-0,083; p=0,934). Also there were no difference between TFG and CG before (t(50)=0,091; p=0,928) and after intervention (t(50)=0,831; p=0,41).

Conclusions: After 2 minutes of tissue flossing ankle dorsiflexion in OKC and CKC improved, but dynamic balance in anterior reach did not changed. However CG ankle dorsiflexion in CKC was also improved.

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Different Kinesio taping® techniques for knee extension torque variability in healthy men

Martynas Ramanauskas[1], Darius Einars[1], Sergej Sosunkevič[2,3,4], Monika Pocienė[1], Vaida Azlauskienė[5]

[1]Klaipėda State University of Applied Sciences, Lithuania,
[2]Lithuanian University of Health Sciences, Institute of Anatomy,
[3]Biofirst Clinic, Kaunas, Lithuania,
[4]Kaunas University of Technology, Biomedical Engineering Institute, Lithuania,
[5]Private Practice, Telšiai, Lithuania

Introduction. Variability is one of the most common features of human movement, however increase in variability is associated with high injury risk [1]. Kinesio taping® affects movement variability by stimulating cutaneous mechanoreceptors and providing extra proprioceptive information without visual feedback [2, 3]. Many studies attest effects of Kinesio taping®, nevertheless no studies examined knee extension torque variability in performance of knee isometric exercise in healthy subjects.

Research aim: to identify effect on two different Kinesio taping® techniques for knee extension torque variability in healthy men.

Research methods and organization. Each subject read and signed a written informed consent form consistent with the principles outlined in the Declaration of Helsinki. The study was conducted in Lithuanian Sports University (Kaunas, Lithuania). The protocol of the study was approved by the Lithuanian Sports University Bioethics Committee.

Twelve healthy men (age 23,58 ± 2,15 years old, weight 90 ± 10,37 kg, right dominant leg) were randomly allocated into two groups: 1) Kinesio taping® muscle technique of quadriceps muscle group (KT1 (n=6), tape applied with 25% tension for rectus femoris with passive quadriceps muscle stretching); 2) Kinesio taping® ligament technique of ligaments group (KT2 (n=6), tape applied with 100% tension over projection of medial and lateral collateral knee ligaments at 90° knee flexion angle).

In the beginning maximal voluntary knee isometric contraction (MVIC) and torque variability at 20% of MVIC were measurement. Firstly, these measurements were made without Kinesio taping® techniques at 60°, 90° knee angles without visual feedback (VF). Further torque variability at 20% of MVIC was measured in KT1 and KT2 groups. We used Biodex System Pro 3 (Biodex Medical Systems, 20 Ramsay Road, New York, United States).

Isometric knee extension torque coefficient of variation (VC) with standard deviation (SD) were calculated.

Data analysis was performed using IBM SPSS Statistics software (v. 18,0; IBM Corporation, Armonk, NY, United States). Nonparametric tests (Wilcoxon for dependent samples and Mann-Whitney for independent samples) were used. Significance level of $p < 0.05$ was used to determine statistical significance.

Results. No significant (p=0,21; p=0,97) differences were found between without Kinesio taping® (3,48 ± 1,62; 2,81 ± 0,90) and KT1 (2,86 ± 0,76; 2,79 ± 1,10) at 60°, 90° knee angles without VF. There were no significant (p=0,48; p=0,11) differences without Kinesio taping® and KT2 (3,01 ± 1,22; 2,28 ± 0,95). Finally, we found no significant (p=0,71; p=0,62) differences between KT1 and KT2 groups.

Conclusions: Variability of extension torque was not diminished neither with Muscle Kinesio taping® technique nor with Ligament Kinesio taping® technique. Taking into consideration that Kinesio taping® techniques in our study were not able to decrease movement variability in healthy men, it did not affect motor function.

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Association of physical activity with ocular pseudoexfoliation syndrome and vascular diseases

Ugnė Rumelaitienė, Martynas Špečkauskas, Dalia Žaliūnienė

Lithuanian University of Health Sciences, Department of Ophthalmology

Introduction. It is acknowledged that little physical activity is one of the risk factors of vascular diseases development (1). Pseudoexfoliation syndrome (PEX) is an age-related disorder and affects about 0.2-30.0% of population older than 60 years worldwide (2). Lithuanian society is getting older and number of vascular diseases is growing accordingly (3). Education of society about influence of physical activity to healthy aging is valuable.

Research aim: to find objective clinical sign in the eye (PEX), which can be easily used as a predictor of small physical activity. To find associations between physical activity and vascular diseases.

Research methods and organization. This follow-up study is part of prospective cohort study on Health, Alcohol and Psychosocial factors In Eastern Europe (HAPIEE) (4) and the part of programme ñHealthy agingò (5). Baseline study was conducted in 2006 when 1033 participants were drawn from main HAPIEE study for ophthalmic examination. The follow-up study in 2016 was financed by Research Council of Lithuania (grant No. SEN-15028). 686 participants (55-83 years-old) were examined. 55 participants were excluded because of difficult determination of PEX in subjects with both pseudophakic eyes. All study participants answered to standard questionnaire regarding lifestyle: weekly hours of physical activity doing household works (PhAH) and weekly hours of physical activity doing sports (exercising, walking)(PhAS), alcohol consumption; vascular diseases as arterial hypertension, ischemic heart disease (IHD), stroke, dyslipidemia, diabetes mellitus (DM). PhAH was divided to subgroups: inactive <19 and active Ó19 hours/week. PhAS was divided to subgroups: inactive <5.4 and active Ó5.5 hours/week. Clinical diagnosis of PEX was made by slit-lamp examination after diagnostic mydriasis with 1 drop of 1% cyclopentolate. Diagnosis of PEX was approved by presence of typical grayish-white exfoliation material on the anterior capsule surface of the lense. Statistical analysis was performed using IBM SPSS Statistics version 20 software. Chi square (ϛ2) test and binary univariate and multivariate logistic regression (LR) analyses were used. Risk factors for vascular diseases in multivariate logistic regression analyses were PhAH, PhAS, body mass index (BMI), alcohol consumption, education, marital status, smoking habits, gender).

Results. The prevalence of PEX was found 34.2% in this contingent. The risk of PEX among inactive persons was in average 1.4 fold higher as compared with active PhAH persons (OR=1.415, 95% CI (1.006-1.991), p=0.046). There were more 56.6% (121) inactive PhAH persons in PEX vs 48.4% (201) in No- PEX group (p>0.05) and 34.7% (75) inactive PhAS persons in PEX vs 29.5% (122) in No-PEX group (p>0.05). After multivariate adjustment for age, BMI and physical activity doing sports less than <5.4 hours/week were each associated with a significantly higher risk of IHD except intermediate alcohol intake frequency (1-4 times of alcohol consumption/month) significantly lowered the risk. After multivariate adjustment for age, BMI and physical activity doing sports less than <5.4 hours/week were each associated with a significantly higher risk of DM except the secondary education significantly lowered the risk.

Conclusions. The PEX as predictor of small physical activity was found in low physical activity doing household works (56.6%) and physical activity doing sports (34.7%). Low physical activity doing sports increased the risk of IHD by 1.5 time (OR=1.500, 95% CI (1.023-2.200), p=0.038) and the risk of DM by 1.7 time (OR=1.740, 95% CI (1.015-2.984), p=0.044).

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The influence of pelvic asymmetry in handball players on dynamic balance and the symmetry of the lower extremities

Akvilina Sakalauskienė, Brigita Zachovajevienė

Lithuanian University of Health Sciences, Institute of Sports

Introduction. A very large part of athletes and individuals perform high-level activities, but their main moves are not effective, because bad movement patterns are created that train the already existing problem (1). In handball, one of the main factors affecting the rate of throwing/passing is torso-pelvic muscles, which are responsible for the stability of the pelvic and the spine (2). Unfortunately, in handball sport, lower extremity traumas occur in the ankle (from 8-45%) and in the knee (from 7-27%) (3).

Research aim: to determine the influence of pelvic asymmetry in handball players on dynamic balance and the symmetry of the lower extremities.

Research methods and organization. The study was carried out at the Instituteof Sports of the Faculty of Nursing of the Lithuanian University of Health Sciences. The permission of the Bioethics Center of the Lithuanian University of Health Sciences (No.: BEC-SR(M)-193) and the consents of the subjects to participate in the study were obtained for the study. 42 professional handball athletes were interviewed for the study, of which, as a result of health disorders and screening criteria, the study involved 30 professional handball players of 18-30 years old. By visual observation of posture according to W. K. Hoegerôs methodology, all 30 women were divided into two groups. DA group consisted of women with posture and pelvic asymmetry and the DS group consisted of women with posture and pelvic symmetry. Study methods: 1. Assessment of dynamic balance (using modified star excursion balance test). The asymmetry index (cm) between the right and left legs is calculated by the formula: Summing up the movement to the forward, postero-medial, postero-lateral, then the movement amount is divided by the length of the leg and multiplied by 3. Asymmetry >4cm indicates functional imbalance associated with increased risk of trauma (4). 2. Assessment of lower extremity symmetry (using one-leg hop tests: 1 hop, 3 hops, 3 zig zag hops, 6-meters for time). The lower extremity symmetry index (ESI) was obtained by dividing the best result performed with the non-dominant leg by the best result performed with the dominant leg and expressing the result as a percentage. The symmetry index of 90 percent and more indicates normal extremity symmetry (5).
The statistical analysis was performed using Microsoft Word 2010, Microsoft Office Excel 2010, and SSPS for Windows 23.0 program. The quantitative data, when the normality assumption was not satisfied, is presented as the median (me), the minimum value (min), the maximal value (max) - me (min; max). The nonparametric Mann-Whitney U test was used for the difference between DA and DS groups. Differences when p <0.05 are statistically significant.
Results. The handball players with the asymmetry of the pelvic asymmetry had a symmetrical index of the lower extremities performing 1 hop ï 88.24(79; 94), performing 3 hops ï 89.49(87.78; 95.10), 3 zig zag hops ï 93.69(88.69; 97.60), performing 6-meter hops for time ï 88.71(82.72; 96.40). When evaluating the symmetry index of lower extremities in the DS group, the following results were determined: performing 1 hop ï 92.71(91;97), performing 3 hops ï 94.91(91.50; 97.79), performing 3 zig zag hops ï 95.62(91.53; 98.00) and performing 6-meter hops for time ï 92.69(88.94; 95.05). Comparison of lower extremity symmetry indices between DA and DS groups revealed statistically significant differences in performing 1 hop (U=16,00; p=0,01), 3 hops (U=16,50; p=0,01), 3 zig zag hops (U=57,00; p=0,022) and 6-meter hops for time (U=45,00; p=0,004). The following results of dynamic balance asymmetry between the right and left legs, in the DA group, the asymmetry index is 3.7(1,02;10.20), which suggests that the functional balance between the legs is symmetrical. In the assessment of asymmetry between the right and left legs, in the DS group, the asymmetry index is 3.6(0.4;9.70), which suggests that the functional balance between the legs is symmetrical. Comparing the results of dynamic balance between the left and right legs, in the DA and DS groups, revealed statistically significant differences were not determined (U=100,00; p=0,637).
Conclusions. 1. Pelvic asymmetry in handball players has no impact on dynamic balance (p>0.05); 2. Pelvic asymmetry in handball players determines the asymmetry of the functional movements of lower extremities performing 1 hop, 3 hops, 3 zig zag hops and 6-meter hops for time (p<0.05).
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Progressive muscle relaxation method's efficiency for emotional state and pain intensity of patients with low back pain

Sergej Sosunkevič[1,2,3], Vilma Mauricienė[4], Andrius Rapalis[3,5], Martynas Ramanauskas[6]
[1]Lithuanian University of Health Sciences, Institute of Anatomy,
[2]Biofirst Clinic, Kaunas, Lithuania,
[3]Kaunas University of Technology, Biomedical Engineering Institute, Lithuania,
[4]Lithuanian University of Health Sciences, Institute of Sports,
[5]Department of Electronics Engineering, Kaunas University of Technology, Lithuania
[6]Klaipėda State University of Applied Sciences, Lithuania,

Introduction. Low back pain (LBP) is a common disorder which significantly affects clinical status of patients. LBP occurs at least once a year for 22-65% of all population [1, 2]. The treatment of LBP can be carried out by using drugs or mechanical and physical (skeletal muscle relaxants, the McKenzie method) impact [3]. LBP usually occurs in conjunction with insomnia which may lead to depression, anxiety, and disability [4]. Insomnia can be treated by using progressive muscle relaxation (PMR) [4, 5, 6].
Research aim: to evaluate the efficiency of progressive muscle relaxation method for patients with low back pain emotional state and pain intensity.
Research methods and organization. Forty men participants (age 42.00 ± 7.96 years) with confirmed diagnosis of lumbar intervertebral disc herniation were enrolled in the study. Participants were randomly divided into the I group (age 42.05 ± 8.98 years) and II (age 41.95 ± 7.03 years) groups. The study was conducted in Biofirst Clinic (Kaunas, Lithuania). The protocol of the study was approved by the Lithuanian University of Health Sciences Bioethics Center. The McKenzie and PMR methods were applied for the II group, while, for the I group only the McKenzie method was applied. All subjects had 10 treatment procedures (3 procedures a week). McKenzie and PMR methods were carried out according to a standardized protocol (6, 7]. In addition, relaxing music was used during PMR method.
Pain level was assessed using the Visual Analog Scale, anxiety and depression level ï the Hospital Anxiety and Depression Scale. Data analysis was performed using IBM SPSS Statistics software (v. 18.0; IBM Corporation, Armonk, NY, United States). Nonparametric tests (Wilcoxon and Mann-Whitney) were used. Significance level of $p < 0.05$ was chosen.
Results. There was no significant difference in pain intensity level between groups before treatment. Pain intensity level of I group before treatment was 6.00 ± 2.03 points, meanwhile, of II group ï 6.35 ± 1.86 points. Such pain intensity level is appreciated as a severe pain level. Pain intensity level after treatment significantly decreased ($p < 0.05$) in both groups to a middle and mild intensity level (I group ï 4.05 ± 1.60 points, II group ï 2.55 ± 1.80 points). However, the change of pain intensity level was greater in II group compared to I group ($p<0.05$).

The anxiety level before treatment was significant different between I and II groups. Anxiety level of I group before treatment was 11.15 ± 2.78 points, while, of II group ï 9.25 ± 2.75 points. Anxiety level after treatment significantly decreased ($p < 0.05$) in both groups.
The depression level before treatment didnõt differ significantly between I and II groups. Depression level of I group before treatment was 10.20 ± 2.17 points, while, of II group ï 9.70 ± 1.66 points. Depression level after treatment also significantly decreased ($p < 0.05$) in both groups (I group ï 8.60±1.67 points, II group ï 7.90±1.02 points). However, the depression level decreased more in the II group ($p<0.05$).
Conclusions. This study demonstrated that the McKenzie and the progressive muscle relaxation methods both are effective for patients with low back pain. Although progressive muscle relaxation method in conjunction with the McKenzie method is more efficient compared to only the McKenzie method for improving emotional state and decreasing pain intensity of patients with low back pain.
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Effect of differential learning on fine motor and visual – motor integration of primary school students with Autism spectrum disorder

Gina Šegždaitė, Viktorija Kaktienė
Lithuanian University of Health Sciences, Institute of Sports

Introduction. Autism Spectrum Disorder (ASD) is a neurodegenerative disorder that is clinically described as a disorder in social interaction, communication, and the reduction of interests or activities due to repeated, disturbing stereotyped behavior [1]. Due to these deficits, children with ASD experience fine motor [2] and visual ï motor impairments [3], which, due to the abnormal model of motor learning, contribute to the learning and performance of motor skills [2].
Research aim: to evaluate the impact of differential learning on fine motor and visual - motor integration of primary school students with autism spectrum disorder.
Research methods and organization. The study involved 27 primary school students with autism spectrum disorder. Before the study, students were divided into two groups: study group I (SG I) and

study group II (SG II). The SG I consisted of 14 students (2 girls and 12 boys), the SG II consisted of 13 students (3 girls and 10 boys). The average age of the children with autism spectrum disorder in SG I was 8,29 (SD, 1,14) years, SG II ï 8,23 (SD, 1,01) years. The methods of the study were the following: The Purdue Pegboard test for fine motor (tasks for dominant (right) hand and both hand), The Beery ï Buktenica Developmental Test of Visual ï Motor Integration (Beery VMI, Berry VMI full form subtest for visual ï motor integration). Tests were conducted twice before and after 4 weeks of continous interventions. The SG I children were given usual occupational therapy (5 times per week for 30 minutes) which was performed without changing conditions of the task: sitting on the table, performing tasks with the uniform color, shape and texture. The SG II children besides the usual occupational therapy (3 times per week for 30 minutes) had the occupational therapy based on the differential learning method program (2 times per week for 30 minutes). During the differential training, the subjects performed the tasks on the basis of the following variations: variation of the subject (tasks submitted by the occupational therapist or introduced by the child himself); variation in the different body postures (sitting, standing, laying, squatting, etc); variation in the conditions of performance (using the materials of different size, color or texture). Statistical data analysis was performed using IBM SPSS Statistics 22.0 program. The non ¬ï parametric Mann ï Whitney test was used to compare two independent samples. The non ï parametric Wilcoxon test was used to compare two dependent samples. The difference was considered to be statistically significant when $p < 0.05$. The quantitative data is presented as an average (X) and standard deviation (SD) ï X (SD).

Results. Before the study the fine motor (dominant (right) hand) test results of the children in both groups did not differ. After analyzing the results, we found that the children of the SG I with a dominant hand (right hand) put an average of 7.71 ± 1.98 pegs in the first testing and 8.07 ± 1.90 pegs in the second testing. The average number of pegs in the SG II at the time of the first testing was 8.54 ± 2.50, while in the second testing was 10.23 ± 2.45 pegs. In compare of first and second testing results both groups were significantly affected (SG I ($Z = -2.236$; $p = 0.025$); SGII ($Z = -3.256$; $p = 0.001$). Children undergoing ordinary occupational therapy combined with differential learning, put significantly ($Z = -2.203$; $p = 0.028$) more pegs with the dominant hand than children after usual occupational therapy alone.

Before the study the both hands test results of the children in both groups did not differ. In the SG I the average number of pairs of pegs put during the first testing was 6.07 ± 2.65, while during the second testing was 6.21 ± 2.72. In the SG II, the average number of pairs of pegs put during the first testing was 7.31 ± 2.81, during the second testing was 8.46 ± 2.82. When comparing the results of putting pegs with both hands of the children in both groups significant change ($Z = -3.035$; $p = 0.002$) was found in the SG II. The children of the study group, who had undergone differential learning along with the usual occupational therapies, added more pairs of pegs than children who only performed usual occupational therapy tasks ($Z = -1.958$; $p = 0.049$).

Before the study, the visual ï motor integration between the children of the SG I and SG II did not differ. During the visual ï motor integration assessment, children undergoing routine occupational therapy copied 15.29 ± 4.14 figures during the first testing and 15.86 ± 4.20 figures in the second testing. In the SG I, the average number of figures copied in the first testing was 16.46 ± 3.20, while in the second testing was 19.38 ± 2.84. Significant change of copied figures ($Z = -3.228$; $p = 0.001$) was found in the SG II. Children, after the usual occupational therapy combined with differential learning (SG II), copied significantly more figures compared to those in the SG I ($Z = - 2.118$; $p = 0.038$).

Conclusions. Following the intervention, fine motor skills and visual ï motor integration skills of primary school students with autism spectrum disorder have improved in both groups. Children

undergoing ordinary occupational therapy combined with differential learning were better at performing the majority of the tasks for the improvement of fine motor and visual ï integration skills.

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Repetitive or differential exercises are better for elderly women with lower back osteochondrosis?

Eimantas Vainauskas, Agnė Slapšinskaitė

Lithuanian University of Health Sciences, Institute of Sports

Introduction. Differential learning is a learning method that includes variations in joints, movement geometry, velocity, acceleration, time structure and rhythm as well as variations of ñclassicalò movement errors, equipment and environment, and combinations of all variations without any movement repetition (1, 2). Nowadays, for optimization of the performance flexibility, therapists are strongly encouraged to translate research from differential learning area towards clinical practise (3).

Research aim: to compare the functional state and pain dynamics of elderly women with lower back osteochondrosis while using repetitive exercise or exercises based on differential learning approach.

Participants were recruited from ñSBÿ Kauno rajono socialiniÔpaslaugÔcentrasò and took part in the study during the period of 09/02/2012 to 06/27/2012. Participants signed an informed consent and were involved in the study that was approved by local bioethics centre (No. BEC-SR(M)-94). Twenty-eight participants (68.86 year old, SD = 3) were divided into two-equal groups of 14 participants, respectively. First group was called as repetition based (PGT) and the second group as differential learning based (DMGT). For both groups the training was held twice a week and lasted 60 minutes. In total 24 workouts were applied to all participants. Strength exercises were used during every PGT groupôs workout, while strength exercises combined with balance exercises were applied in every third session. Exercises for balance, strength, coordination and flexibility were applied during every DMGT workout. A special workout program was developed for DMGT group. It consisted of exercises with high level of variability and none of the exercises were used twice in the following workout. This was done with the purpose to maximize the effect of differential learning. At the end of every DMGT group workout, 10 minutes of meditation were performed using the mobile application ĂatsipÎ skñ as a source of m-Health. A non-parametric Wilcoxon test was used to compare two dependent samples and for two in-dependent samples we used Mannï Whitneyôs test. Data is presented as mean ± standard deviation if not mentioned differently. We set the significance level at $p < 0.05$. Methods of research:

ÅEndurance was evaluated through 6-minute-walk test;

ÅRange of motion in waist flexion was measured with modified ñSchoberò test;

ÅBalance was evaluated with modified clinical test of sensory interaction in balance (CTSIB-M).

ÅPain was evaluated before and after each session trough numerical rating scale (NRS).

Results. The results of 6-minute walk test. DMGT results became longer in 91.71 ± 42.59 meters (Z = -3.297; p = 0.001) while PGT group increased the walked distance by 56.86 ± 11.87 meters (Z = -

3.297; p = 0.001). However, no statistically significant difference was observed between the groups (U = 71; p = 0.215).
Results of modified ñSchoberò test. DMGT group results after the intervention were higher by 1.57 ± 0.65 centimetres (Z = -3.314; p = 0.001). While PGT group results increased by 0.64 ± 0.774 centimetres (Z = -2.460; p = 0.014). The comparison between the groups revealed statistically significant difference (U = 34; p = 0.003).
Results of modified clinical test of sensory interaction on balance. DMGT group results after the intervention were longer by 14.71 ± 14.54 seconds (Z = -3.059; p = 0.002). While PGT group results after the intervention were longer by 7.64 ± 5.98 seconds (Z = -3.170; p = 0.002). However, no statistically significant difference was observed between the groups (U = 83; p = 0.491).
Results of numerical rating scale (NRS). Differences between DMGT and PGT groups in numerical rating scale (NRS) ratings changed from 8 to 14 and from 17 to 24 workouts, and were showed to be statistically significant ($p < 0.05$). Specifically, the numerical rating scale results (NRS) after intervention were observed from 7 to 24 workout ($p < 0.05$). The change of numerical rating scale (NRS) results between DMGT and PGT groups were statistically significant ($p < 0.05$) in workouts 3, 9 and 10.
Conclusions: 1) Positive effects in elderly women with lower back osteochondrosis were seen in both groups. 2) The group comparison showed that in differential learning based group (DMGT) better results were obtained in ñSchoberò test. 3) After 24 workouts, according to numerical rating scale (NRS) results, pain intensity was lower in differential learning based group (DMGT) compared to repetition based group (PGT).
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The peculiarities of young physically active women trunk muscles electrical activity during kneeling and crawling

Vilma Valantinaitė, Algė Daunoravičienė
Lithuanian University of Health Sciences, Institute of Sports

Introduction. Crawling ï one of the motor movements, that is acquired in childhood and is important for the formation of specialized moves [1]. This movement should not be forgotten also in the adult age, because it improves core stability, balance, by activating trunk global and local muscles [2]. Crawling exercises are becoming more popular as modern exercises. These exercises belong to the horizontal movement. Compared to the vertical moves, the spinal cord is protected from pressure, by lower gravity force [3].
Research aim: to assess the electrical activity of trunk superficial and deep muscles during kneeling and crawling
Research methods and organization. The study involved 20 physically active women (training 3- 5 times a week). The average age of the participants was 24 ± 1.98 years. Criteria for selection of

subjects: voluntary consent to participate in the study; no diagnosed neurological and musculoskeletal disorders; no musculoskeletal injuries in the last three months; no pain in the lower back, knees, hips, shoulders and wrists in the last three months. The electrical activity of the trunk muscles, measured by an electromyograph (Myotrace 400). Testing trunk superficial (musculus rectus abdominis, musculus erector spinae) and deep muscles (musculus obliqus abdominis internus, musculus multifidus). The electrical activity of the muscles was analyzed in kneeling supportive stance (quadruple), quadruple raised knees and crawl. Duration of each position was 5 seconds. Exercise was analyzed at the time when maximal isometric contraction of the muscle was obtained within 3-5 seconds. In order to receive normalized data, maximal voluntary muscle contraction was recorded during these movements: trunk flexion and extension, trunk flexion with rotation and hip extension. During these movements, researcher gave resistance, and participant had to hold for 5 seconds. Average data was recorded in the 5 seconds interval and selected for statistical analysis. Results are obtained and expressed in percentage of the maximum isometric muscle contraction. Results are obtained and expressed in percentage of the maximum isometric muscle contraction. Statistical analysis was performed using SPSS 22.0 program. Non-parametric Wilcoxon criterion, were used for the comparison of dependent samples. The significance level of $p<0.05$ was chosen.

Results. After evaluating the electrical activity of the trunk muscle in the first position, i.e. quadruple, abdominal and back surface muscle, statistical significance was not determined ($p = -0.55$; $Z = -0.6$). Also comparing trunk deep muscle electrical activity, the result was not statistically significant ($p = 0.6$; $Z = -0.32$). In the quadruple with knees up position, the electrical activity of the rectus abdominal muscle was statistically significantly higher than the erector spinae muscles ($p = 0.0001$; $Z = -3.32$). In the evaluation of trunk deep muscles, the oblique abdominis internus muscles were more active than multifidus ($p = 0.0001$; $Z = -3.92$). During crawling, the activity of both superficial and deep abdominal muscles was statistically significantly higher than back muscleso electrical activity. The electrical activity of the rectus abdominal muscle was higher than the electrical activity of erector spinae muscles ($p = 0.0001$; $Z = -3.92$) and the obliques abdominal internus muscles electrical activity was higher than the electrical activity of multifidus muscles ($p = 0.001$; $Z = -3.3$).

Conclusions: In the quadruple position, electrical activity of young physically active womenós trunk muscles didnót differ significantly. Trunk muscle activity has changed as the difficulty of the task increased: in the position of quadruple raised knees position and during crawling, abdominal superficial and deep muscles electrical activity was higher than electrical activity of back muscles.

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