

International conference **EXERCISE FOR HEALTH AND REHABILITATION**

BOOK OF ABSTRACTS



**18th December, 2015
Kaunas, Lithuania**

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**Kaunas
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Organizers



**LITHUANIAN UNIVERSITY
OF HEALTH SCIENCES**

Institute of Sports

and



Lithuanian Federation of Sports Medicine

The aim of the conference is to bring together physiotherapists, occupational therapists, adapted physical activity specialists, sports medicine doctors, physical medicine and rehabilitation physicians, trainers and all who are interested in the health strengthening and rehabilitation modalities.

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INVITED SPEAKERS

DOES GENERAL JOINT HYPERMOBILITY ASSOCIATED WITH THE KNEE LAXITY?

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It has been reported that over 70% of anterior cruciate ligament (ACL) injuries occur in noncontact situations and that females are at 2 to 8 times greater risk of ACL injury than males. Increased joint laxity and reduced knee stiffness in female knees have been suggested as possible explanations for the higher ACL injury rates in females (Boguszewski et al, 2015) Anterior cruciate ligament rupture leads to the front - lateral knee joint instability, quadriceps muscle hypotrophy, joint surface degeneration, meniscus injuries and the recurrent pain. The main problems arising for the following reasons: knee proprioception dysfunction, balance impairment and gait dysfunction, a lot of difficulties in casual activity, especially in sport and physical activities. In a 'normal' body, ligaments (which are the tissues that connect bones to each other) are naturally tight in such a way that the joints are restricted to 'normal' ranges of motion. This creates normal joint stability. Someone with ligamentous laxity, by definition, has loose ligaments. If muscular control does not compensate for ligament laxity, it may result joint instability.

Research aim – does general joint hypermobility associated with the anterior knee laxity in healthy and ACL deficient males and females?

Materials and methods. General joint hypermobility was assessed with Beighton score (Hakim et al 2003). The Beighton score is a popular screening technique for hypermobility. This is a nine – point scale and requires the performance of 5 manoeuvres, four passive bilateral and one active unilateral performance. It was originally introduced for epidemiological studies involving the recognition of hypermobility in populations. The Beighton score has subsequently been used internationally to define generalized joint laxity in all populations and all age groups. Most of the available prevalence studies used different cut-offs, ranging from >3 hypermobile joints to > 6 hypermobile joints of 9 assessed (both thumbs, both little fingers, both elbows, both knees and the trunk), and in some, only the dominant side was assessed. The most frequent choice of cut-off was > 4 hypermobile joints (Clinch J. et al, 2011).

The knee laxity was measured with robotic laximeter Genourob. The GNRB[®] is a knee laxity testing device for measurement of anteroposterior tibial translation at 20° of knee flexion thus reproducing the Lachman test position. A linear jack exerts gradually increasing thrust forces according to the examiner on the upper section of the calf. Laxity (mm of movement of the proximal tibia in the anterior direction relative to the femur) was calculated at test forces of 134 N, 150 N, 200 N and 250 N. The healthy knee should have not more than 1 mm side-to-side difference, the partial tear of ACL can be suspected when the side-to-side difference of anteroposterior tibial translation is 1–3 mm. More than 3 mm difference is indicating total ACL tear. Slope of curves of displacement was measured as a unique indicator of the functional instability of the knee. Difference of slopes of curves $\Delta P2$ ($\mu\text{m}/\text{N}$) was analysed: $\Delta P2 > 10$ – high of risk of

functional instability; $5 < \Delta P2 < 10$ – medium and $\Delta P2 < 5$ – low risk of functional instability.

Subjects: 21 healthy women (age – 22.7 ± 5.2 years) and 39 (age – 27.8 ± 4.2 years) men in the control group participated in the study, 24 women (age – 37 ± 2.2 years) and 71 men (age – 32 ± 3.2 years) with total ACL tear confirmed by the doctor and MRI were in the ACL deficient group. We have compared Beighton score, side-to-side difference at 134 N and slope curve means using Mann-Whitney Test. Spearman's coefficient was calculated in order to analyse correlation of the parameters in the ACL group. The degree of statistical significance was set at $P \leq 0,05$. Data presented in mean \pm standard error mean.

Results. Females in the control group and in the ACL deficient group had similar Beighton scores (ACL – 3.35 ± 0.6 points vs. control group – 1.95 ± 0.49 points). Statistically significant higher slopes (ACL – 18.56 ± 2.74 vs. control – 5.43 ± 1.06) and displacement difference values (ACL – 3.37 ± 0.34 mm vs control – 0.6 ± 0.1 mm) were in the ACL deficient knee females ($P \leq 0,05$). The same situation was observed in males - similar Beighton scores (ACL – 1.65 ± 0.22 points; control group – 1.95 ± 0.49 points). Statistically significant higher slopes (ACL – 16 ± 1.28 vs. control – 4.6 ± 0.54) and displacement difference values (ACL – 3.58 ± 0.22 mm vs. control – 0.6 ± 0.08 mm) were in the ACL deficient knee males ($P \leq 0,05$). Beighton score of ACL deficient females correlated ($r=0.56$; $p \leq 0.001$) with functional instability of the knee (slope curve) and with displacement difference at 250 N ($r=0.383$; $p \leq 0.05$). In males with the torn ACL Beighton score had correlated with the displacement difference at 200 N ($r=0.2$; $p \leq 0.05$).

Conclusion. The general joint hypermobility is not associated with knee laxity comparing healthy controls with ACL deficient males and females. Meanwhile in the ACL group Beighton score had correlated with the functional instability and knee laxity at 250N in females and with knee

laxity at 200N in males. Beighton score together with the laximetry gives us additional diagnostic information in the assessment of the patients with the ACL trauma.

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IF EVERY THING IS CHANGING ALL THE TIME REPETITION IN THERAPY HAS TO BE QUESTIONED

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Traditionally, rehabilitation as well as athlete's training is oriented on ideal prototypes that are mainly independent from the individual and the situation. This typically results in numerous repetitions and corrective instructions by the therapist's during the intervention. Despite Bernstein's (1967) famous statement about the impossibility of identical movements by "repeating without repetition" only marginal changes in training and therapy have been observed yet. First striking support for the individuality of movement patterns has been provided by the analysis of high performance athletes (Bauer & Schöllhorn 1997, Schöllhorn & Bauer 1998) as well as by the analysis of gait patterns (Schöllhorn et al. 2002). By just analyzing biomechanically measured movement patterns

during 200ms an individual person could be identified. Evidence for an even finer differentiation of movement repetitions within an individual were shown by assigning emotions (Janssen et al. 2008) to individual expressions of gait. Similarly, the identification of the grade of fatigue within the biomechanical gait patterns of an individual (Jäger et al. 2003, Janssen et al. 2011) provided first evidence for the dependence of gait patterns on situations. More recently, even stronger evidence for continuous changes of individual gait patterns could be shown. Within a single day (Horst et al. 2014) as well as on consecutive days (Horst et al. 2015) high rates of separation even without any intervention were possible. If health and rehabilitation is also understood as preparation for future events and coping with disturbances repeating despite the impossible repetitive based training seems to be suboptimal. In order to prepare patients and athletes for future events that will include new elements for granted more variable approaches are more promising. By increasing the variability during the learning process and relying on the human's ability to interpolate a much better preparation for new elements is achieved. Furthermore, higher variability not only prepares for unknown situations in future but also supports a self organizing process in order to find someone's self. Analyses of brain activities by means of EEG after different learning schedules support these consequences (Henz et al. 2015, Maus et al. 2015).

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FINNISH HEALTH PHYSICAL ACTIVITY RECOMMENDATIONS

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Increasing physical activity and decreasing sedentary lifestyle are the main objectives in the prevention and treatment of lifestyle-related diseases.

The UKK Institute is a private research institute, owned by the Urho Kekkonen Fitness Institute Foundation in Finland. One of its aims is to promote physical activity and health.

The UKK Institute's Physical Activity Pie has been updated 2009 to meet the guidelines for health-enhancing physical activity for adults (aged 18—64).

The new version of this graphic aid to health-enhancing physical activity puts more emphasis on the significance of muscular fitness to health. Physical activity that improves endurance has been given a total weekly duration that is based on the degree of strain needed to perform the activity.

The revision of the recommendation for health-enhancing physical activity is based on a broad review of the scientific literature, which continually provides more and more scientific evidence of the effect of physical activity on health.

CHALLENGES FOR THE EUROPEAN HEALTH AND FITNESS SECTOR MANOEUVRING BETWEEN SOCIOCULTURAL INFLUENCE, CONSUMERISM AND THE OVERESTIMATION OF THE BODY APPEARANCE

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With the prevalence of body cult in the Western society, more and more people feel pressure to conform to social expectations. Media constantly is bombarding with the messages how to be fit (thin or muscular), nice and forever young. In other words, in consumer society *Health* becomes an alibi for improving *Appearance* (Marquire, 2001). A large part of modern consumerist society is constantly concerned about weight loss/gain methods that promise rapid results. Seeking peer recognition and wanting to meet the society's expectations people often exhaust themselves with diets and/or excessive exercise (Sabbah et al, 2009; Jankauskienė, Pajaujienė, Mickūnienė, 2010, Jankauskiene, Pajaujiene, 2011; Pajaujiene, Jankauskiene, 2012).

The global pandemic of obesity is unquestionable truth with evidence (Dumith et al., 2010; WHO, 2014), but in addition another great concern is huge dissatisfaction with own bodies, depression, anxiety, low self-esteem, disordered eating, etc. The researches show that psychological factors play a crucial role in adherence to physical activity, exercise and fitness.

There is a big increase of leisure sports facilities across the Europe and especially in health and fitness sector. Paradoxically, but the increase in facilities that offer spaces and services related to physical exercise and sports activities was accompanied by a significant increase in obesity and a sedentary lifestyle (Swift et al., 2014). People exercising in fitness centres are observed to raise significant requirements

for their appearance, and sometimes have inadequate body weight perception (Pajaujiene, 2009). Fitness instructor's recommendation to go on a diet and advised slimming food supplements has a significant influence on physically active women's desire to lose weight (Jankauskienė, Kardelis, Pajaujiene, 2005). Critical comments from teacher or trainer was one of the most patent risk factor for developing eating disorders (Jacobi et al., 2011). Therefore the following **problematic issues** will be raised:

- If the socially adored body image might motivate customers for a healthy lifestyle, weight control, exercising behavior, and give long term results are open for this session?
- How people feel in the fitness environment? What are their expectations and behavior?
- Can exercise professionals do some harm to customers putting too much emphasis on body and appearance? What the role of exercise specialist and what education in this field is necessary?
- How body dissatisfaction is related with lifestyle characteristics and weight control behavior?
- How health and fitness industry could manoeuvre between media influence, consumerism, and the real health enhancing purposes?

A substantial body of evidence demonstrates that a general emphasis on appearance, fitness and weight control can promote a number of negative consequences (Pajaujiene, Jankauskiene, 2012; Jankauskiene, Pajaujiene, 2011; Pajaujiene et al, 2011). Although appearance improvement is the strong driving force for the health and fitness industry (Jankauskienė, 2008), we lack the millions of men and women in exercise sector. If our goal is to make Europe (and Lithuania) more active, we should discuss what could be barriers and obstacles for that.

Discussion and conclusions. The overview of studies suggest that Lithuanians still do not give adequate priority for physical activity. Furthermore, they have wrong imagination

about weight control and exercising behavior. It is also lack of experience, skills and knowledge about the health promotion through physical activity and healthy lifestyle. It is clear that recognition of fitness sector requires a systematic, multistage and cross-sectional approach to promote behavioral change, a new understanding of what it means to be "fit "and what to expect from the trainer as well as fitness services, promote the political, social, and environmental changes. Necessary dialogue across different stakeholder communities about the way in which exercise professionals might be better to meet growing societal need and expectations place upon them.

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LOWER LIMB INJURY RISK FACTORS SCREENING AND INJURY PREVENTION

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It is believed that injuries are an integral part of sport, especially at elite and professional levels and competitive sports require athletes to adapt to growing training loads. Also,

participating in sports has great health benefits in adolescents (Pate et al., 2000), yet it seems that highly trained young athletes have increased incidences of injuries (Oschgood-Schlatter disease, low back pain etc.) compared to less active counterparts. In young athletes it is believed that the growth occurring as the age increases is related to increased risk of injury due to the multiple factors like increased musculotendinous strain, decreased epiphyseal strength and decline in bone mineralization (Caine et al., 2008; Baxter-Jones et al., 2002). Since injuries might negatively effect young athletes' daily life and their attitude towards physical activity, the a growing problem of overuse injuries needs more attention (Kettunen et al., 2002). Previously, overuse injuries were more associated with endurance sports that require monotonous and repetitive actions like long distance running, cycling, swimming or rowing. But recent research has pointed out the high numbers of overuse injuries also in team sport athletes (Leppänen et al., 2015).

It has been shown that team sport athletes who perform <18 weeks of pre-season training and players whose off-season VO_{2max} values are lower may be at increased risk of overuse injuries (Gabbett and Domrow, 2005). Inadequate ratio between rest and training loads or fluctuations in competition and training ratio in team sports might lead to overuse injuries (Visnes and Bahr., 2013; Lian et al., 2005). Thereby it is important to constantly monitor the condition of athlete's musculoskeletal system by using simple clinical muscle length, strength and motor control measures to identify athletes who are at higher risk of sustaining an injury. By improving athlete's physical, psychological or motivational asymmetries throughout the playing season we can prevent overuse injuries and maximalize athletic performance.

ORAL PRESENTATION

EFFECTS ON LEG MUSCLE EXPLOSIVE POWER AFTER APPLICATION OF TIBIAL NERVE NEURODYNAMICS IN YOUNG FEMALES DURING VERTICAL JUMP

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Neurodynamics is a technique that uses specific active and passive exercises to improve mobility to different tracts of the nervous system (Shacklock, 2005). Some studies show that neurodynamic mobilization exercises can reduce pain, increase range of motion and strength in patients with neurological disorders (Villafañe, 2013). However there are little evidence about the effects of neurodynamic mobilization on strength in healthy individuals.

Research aim – to find out what is the effect on leg muscle explosive force during vertical jump, after applying neurodynamics of tibial nerve among young women.

Methods. Twenty two young women (18-22 years old) voluntarily applied to the research. They were randomized into two groups. Both groups performed general warm up for 5 minutes on veloergometer, revolutions per minute (RPM) =70, following 4 vertical jump sets of 3 jumps on special contact platform „Jump parameter gauge (SBM-1)“ measuring maximum vertical jump height. Group one had tibial nerve mobilization in between first, second and third jump sets, 2 minutes each. Control group had 2 minutes resting periods in between every set. Both groups had 15 second rest period between repetitions. Neurodynamic techniques were used as following: Hip flexion (HP)/ dorsi flexion (DF)/ eversion (EV),

passive knee extension (KE) and knee flexion (KF) (The international Noigroup faculty; 2005). Subject lying in supine position, holding one of their thighs with both hands flexing the hip so that the leg is relaxed. Researcher applies passive neurodynamics (one sided gliding technique): the researcher holds foot in dorsiflexion and eversion the whole time while performing passive knee flexion and extension, slow movements, 15 repetitions. Tibial nerve neurodynamics was performed for both legs. Statistica v.13.0 was used for statistical analysis. All data are presented as means and standard deviations. Comparison between the control and experimental groups was performed using non-parametric Wilcoxon signed-rank test. Mann-whitney U test was used to determine the difference between improvement of the results.

Results. Jump height insignificantly improved in first 3 jumps after application of neurodynamics in group one. Before the application jump height was 24,92(3,36) cm. After first application results insignificantly improved 24,99(3,98) cm., after second application it improved insignificantly as well - result was 25,02(3,87) cm. After third time of neurodynamic application jump height increased comparing with the first jump set, but decreased comparing with second and third sets, the result was 24,96(4,35) cm. This can be explained due to exhaustion of leg muscles. Although some improvement in vertical jump height was determined after first, second and third application of passive neurodynamic techniques, it was statistically insignificant ($p>0.05$). Same results were determined in control group, jump height insignificantly improved every each set. Comparing vertical jump improvement in both groups there was no significant difference ($p>0.05$). As a result there was no influence on leg muscle explosive power after application of passive tibial nerve neurodynamic technique.

Conclusions. After the experiment we concluded, that tibial nerve passive neurodynamic exercise have no effect on

leg muscle explosive power during vertical jump. However a more extensive study is planned for more detailed results.

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CORRELATIONS BETWEEN EARTH'S LOCAL MAGNETIC FIELD AND HEART RATE OF YOUNG INDIVIDUALS AND PROFESSIONAL RIDERS DURING DAILY ACTIVITIES AND INTERACTIONS WITH A HORSE

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Every cell in our bodies is under the influence of an external and internal environment of fluctuating invisible magnetic forces [1]. Because the magnetoreception of neural structures should be evolutionarily adjusted to these magnetic fields, humans may also have a special sensitivity to geomagnetic fields [2] The natural variation in the geomagnetic field in and around Earth has been reportedly involved in relation to several human cardiovascular variables, including heart rate (HR) [3].

Research aim - to compare correlations between Earth's local magnetic field's variations and heart rate of young individuals and professional riders during daily activities and interactions with horse.

Methods. Geomagnetic field's (GMF) data were taken from Global Coherence Monitoring System developed by HeartMath Institute (California, USA), a worldwide network of magnetometers that collect a continuous stream of data from the earth's magnetic field. One of the magnetometers is located in Baisogala, Lithuania. We were interested in three different frequency bands of local GMF: [0;1] Hz, [1;7] Hz and [7;45] Hz. These geomagnetic frequencies called Schumann resonances overlap with those of the human brain, and the cardiovascular and autonomic nervous systems heart rate (HR) of individuals was measured with „First beat“ heart rate monitors. The group of young individuals (non riders) included 15 students, age 27.4 ± 12.1 years (average \pm standard deviation). The group of professional horseriders included 7 individuals, age 26.3 ± 3.2 years old. Monitors recorded heart rate over 24 hours period. We analysed heart rate correlations with Earth's local magnetic field in different frequency bands during daily activities of different intensity and interactions with horse. Daily physical activities were differentiated to low, moderate and high intensity levels (according to metabolic equivalent values) and sleep phase. Interactions with a horse included stroking, brushing and feeding the horse directly from hand. Data are presented as median (min - max) and interquartile range (IQR). The statistical analysis was performed using “IBM SPSS Statistics 22.0”, “Microsoft Office Excel”, „MATLAB“ and „Spectrogram_ML“. For the evaluation of correlations Pearson's correlation coefficient was used. The nonparametric Mann-Whitney test was used for comparison of two independent samples. To compare two dependent samples, the nonparametric Wilcoxon test was applied. The difference was considered statistically significant at $p < 0.05$.

Results. It was observed, that during low-intensity physical activity, in a group of professional riders, HR and local GMF correlation coefficients of the median were negative in all frequency bands of GMF. In the first local GMF strength bar ([0, 1] Hz), HR of the young individuals and the local GMF correlation coefficients between HR of the young individuals and the local GMF median, was positive 0.01 (-0.26-0.49) IQR = 0.14, and between HR of professional riders and local GMF - negative - 0.08 (-0.12-0.38) IQR = 0.03. During high-intensity physical activity, it was observed correlations' analogy to low-intensity activity, it's only seen more shift of the correlations towards the negative meanings direction. During interactions with a horse, the difference established between HR of young individuals (non riders) and professional riders, at the second GMF frequency band [1; 7] Hz: young individuals -0.1 (-0.47-0.70), IQR=0.50 and professional riders -0.15 (-0.27-0.31), IQR=0.18, $p < 0.05$. Although there was no significant difference comparing these groups at the strength of other frequency bands of GMF, we noticed that medians of the correlations of professional riders' HR and GMF were more negative than in the other group.

Conclusions. In most cases, during low and high intensity physical activity and interactions with a horse, medians of the correlations between HR of professional riders and local GMF were more negative comparing to correlations between HR of young individuals and local GMF. These meanings tell us about professional riders' better adaptive mechanism to local GMF frequencies, what causes lower HR during physical activities and interactions with horse.

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CORRELATION BETWEEN LOW BACK PAIN, ENDURANCE OF TRUNK MUSCLES AND LUMBAR PROPRIOCEPTION

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It is widely recognised that proprioceptive input from muscles, joints and other receptors is necessary for the accurate control of movement and posture. Impaired proprioception in the lumbar spine has often been reported in people with low back pain, and back pain is associated with flexion-extension muscle imbalance. Individuals with poor endurance of lumbar extensor muscle will have effect on posture, balance as they are associated with poor proprioceptive input from the trunk muscles.

Research aim - to find out correlation between endurance of trunk muscles and lumbar proprioception in people with and without low back pain.

Methods. Eighty three relatively healthy volunteers (33 males, 50 females) participated in the study (age range 20-38 years; with mean age 21.9 ± 2.83 yr.). Participants were divided into two groups according reported back pain during 3 past months. Low back pain was assessed using numeric pain intensity scale. Endurance of trunk muscles (in seconds) was measured according test suggested by McGill (2007). Four point kneeling method was used to measure the lumbar

reposition sense. The subjects were assessed for Neutral Position Sense and Target Reposition Sense as a measure of lumbar proprioception. The reposition errors were recorded using the bubble inclinometer in degrees. The subjects were positioned in four points kneeling with hip and knee at right angles. The hands were placed shoulder width apart. The subjects were blindfolded. The bubble inclinometer was placed at S2 region and the subjects were then asked to perform extremes of anterior and posterior pelvic tilts. To measure neutral reposition sense the subject were asked to position the pelvis in neutral. They were then asked to perform extremes of anterior pelvic tilt after which they were asked to readapt the neutral position. To perform target reposition sense the subjects were taken to fixed position blindfolded (10 degrees anterior pelvic tilt) and were asked to maintain that position for 5 s. They were then brought back to neutral position and asked to readapt the target position again. For both neutral and target reposition sense 3 readings were recorded and the average of the 3 readings were taken for analysis. Data was analyzed using SPSS version 17. Descriptive statistics, including mean and standard deviation (SD) were calculated. A Pearson product-moment correlation coefficient was computed to assess the relationship between endurance of trunk muscles and lumbar proprioception. A T-test was used to define difference between persons with and without back pain. A “p” value of less than 0.05 was considered to be statistically significant.

Results. 83% of subjects complained with low back pain (69% females; 31% males). Static endurance of back extensors (118.3±25.5 vs. 92.3±22.3 sec.) and trunk flexors (141.2±24.7 vs. 108.0±23.9 sec.) was significantly lower in subjects with low back pain. There was imbalance ($p < 0.05$) between back extensors and back flexors in people with low back pain (92.3±22.3 vs. 108.0±23.9). Static endurance of right side (61.9±30.3 vs. 50.2±28.2 sec.) and left side bridge (61.9±50.1 vs. 51.7±30.2 sec.) didn't differ significantly in subject with low back pain and without pain. There was no

statistical difference in recognition of Neutral Position Sense (4.2 ± 4.4 vs. 4.3 ± 3.7) and Target Reposition Sense (8.6 ± 2.0 vs. 9.0 ± 2.1) between subject with and without back pain. There was a poor negative correlation between lumbar endurance and back pain ($r = -0.3$, $p < 0.05$), and no significant correlation was found between lumbar proprioception in both the neutral position sense and the target position sense and back pain, and lumbar endurance.

Conclusion: There was no strong significant correlation between lumbar proprioception, back pain and endurance of trunk muscles.

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CHANGES OF FUNCTIONAL OUTCOMES OF FOAM ROLLING, CORE STABILITY, FLEXIBILITY AND STRENGTH EXERCISES IN ELITE YOUNG BASKETBALL PLAYERS

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Sports injuries in young athletes are a public health issue which deserves special attention. Young athletes should have proper background of fundamental movements to stay injury free and develop performance and skills needed from the specific sport. Effective prevention can be achieved with training programs originating from the field of physiotherapy and medicine [1].

Research aim - to assess functional outcomes of foam rolling, core stability, flexibility and strength exercises of elite young basketball players.

Methods. We have investigated 31 (16 girls and 15 boys) young most talented Lithuanian basketball players selected by Lithuanian Basketball Federation for project "Talent generation 2015". The average age of girls was 15.4 ± 0.27 years, weight – 64.9 ± 7.11 kg, height 176 ± 6.58 cm, BMI 20.65 ± 0.66 kg/m². The average age of boys was 15.3 ± 0.29 years, weight 67.2 ± 11.8 kg, height 183.6 ± 9.74 cm, BMI 19.77 ± 1.85 kg/m². The duration of study was five months. During this period players had six intensive training weekends. The personalized program for each participant was created and consisted of foam rolling, core stability, flexibility and strength exercises. The participants were taught how to perform exercises by the team physiotherapist. Functional outcomes were assessed by: Upper (UQYBT) and lower (LQYBT) quarter Y balance tests [4], The Landing Error Scoring System (LESS) [3], Functional Movement Screen (FMS) [2], an isokinetic dynamometry (The Biodex System 4 Pro) at 60 and 180°/s/n. [5]. Differences were assessed using Wilcoxon Rank Sum Test. The degree of statistical significance was set at $p < 0.05$. The results are presented in means \pm standard deviation.

Results. The composite score of UQ-YBT increased in girls: right arm stability mean before intervention was 95.49 ± 6.03 , after – 95.52 ± 7.03 , left arm stability mean before was 95.95 ± 4.53 , after – 96.86 ± 5.27 ($p < 0.05$). In boys: right arm stability mean before intervention was 97.06 ± 8.44 , after – 104.96 ± 7.95 ($p < 0.05$). The composite score of LQ-YBT has increased in both groups $p < 0.05$. In girls - the right leg stability mean before intervention was 99.39 ± 9.82 , after – 103.19 ± 9.34 , left leg stability mean before was 100.47 ± 9.43 , after – 103.44 ± 9.33 . In boys - stability of right leg increased from 101.94 ± 6.72 before, to 105 ± 8.39 cm after, left leg stability mean before was 100.46 ± 9.43 , after was 103.44 ± 7.67 . The

isokinetic knee flexion/extension ratio at speed 60°/s in girls hadn't changed. In boys - left knee flexion/extension ratio increased from 0.5 ± 0.02 to 0.57 ± 0.03 ($p < 0.05$). The knee flexion/extension ratio at speed 180°/s in girls increased in left side from 0.5 ± 0.02 to 0.58 ± 0.03 ($p < 0.05$). In boys - isokinetic strength ratio: right side before intervention was 0.55 ± 0.02 , after - 0.64 ± 0.03 ; left side before was 0.53 ± 0.02 , after - 0.59 ± 0.02 ($p < 0.05$). FMS total score in girls - has increase from 16.2 ± 0.57 points to 17.25 ± 0.29 after the exercise program ($p < 0.05$), which is showing improvement of quality of functional movements. The LESS test score decreased in boys. Score before intervention was 7 ± 0.6 and after - 4.5 ± 0.7 ($p < 0.05$) showing increased jump landing biomechanics.

Conclusions. The results of functional movement test and dynamic stability of lower quarter test had increased after five months of training in young female basketball players. Meanwhile the results of jump landing biomechanics task and dynamic stability of upper quarter test increased in young male basketball players. Gender is an important factor in the selection of exercises for young basketball players. It seems that training and prevention programs of non-contact sport related injuries should be addressed to the gender and is having different effect on functional outcomes.

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IDENTIFICATION OF INDIVIDUAL GAIT PATTERNS BY MEANS OF SUPPORT VECTOR MACHINES

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Human movements exhibit individual features, which should find consideration in training [1]. Differences of gait patterns from different individuals have been stated by inter-subject variability [2]. Within this range of variability, gait patterns from individual persons can be distinguished from each other by pattern recognition tools [3, 4]. However, small sample sizes are a limitation of previous studies on individual gait characteristics.

Research aim - to search for discernable characteristics of time continuous gait patterns between individual persons by means of support vector machines.

Methods. 128 healthy subjects (52 female, 76 male; 23.8 ± 9.1 years; 1.76 ± 0.08 m; 71.3 ± 13.0 kg) without gait pathology and free of lower extremity injuries participated in the study. The study was carried out according to the Declaration of Helsinki and all subjects provided their informed written consent. The subjects walked ten times over a distance of ten meters, while the three-dimensional ground

reaction force was recorded by two force plates (Kistler, Type 9287CA, Switzerland) at a frequency of 1000 Hz. The subjects were instructed to walk barefoot at self-selected speed. The gait analysis was conducted for one gait stride per trial. The stride was defined from right foot heel strike to left foot toe off and was determined using a vertical ground reaction force threshold of 25 N. The ground reaction force data was filtered by a second order Butterworth bidirectional lowpass filter at a cut off frequency of 30 Hz and normalized to the subject's body mass. Each variable was time-normalized to 100 data points and scaled to a global minimum of 0 and a global maximum of 1. The classification of gait patterns based on concatenated vectors of all variables, which results in an input vector of 1×600 per trial. In total, a matrix of size 1280×600 ($1280 = 128$ subjects \times 10 trials; $600 = 100$ time points \times 2 ground contacts \times 3 dimensions) built the data basis of the support vector machines classification. Support vector machines [5] are supervised learning approaches for pattern recognition. The ability to distinguish gait patterns of one subject from gait patterns of other subjects has been investigated in a multiclass classification using a "one-versus-all" algorithm. The L2-regularized L2-loss support vector classification of the Liblinear Toolbox 1.4.1 [6] was used with a linear kernel function. The classification rates were conducted by a cross-validation through the leave-one-out-method [7].

Results. The results emphasize the remarkable amount of individual characteristics in human gait. The application of support vector machines result a classification rate of 99.6% or rather 1275 of 1280 gait vectors have been assigned correctly to the corresponding individual. Thus, support vector machines are able to find unique characteristics for gait patterns of an individual, which can be differentiated from gait patterns of other individuals. A comparison between the given classification rate of 99.6% and the theoretical random classification rate by dividing one by the total number of cases (in this experiment $1/128 = 0.8$ %) verifies the significance of

the present findings. The results are in agreement with previous studies [3, 4] and show even higher classification rates, which might be due to barefoot walking and unchanged walking condition in the present study. Furthermore, the results emphasize that clustering normal subjects into “families” of walking strategies or functional groups [8] as well as quantifying the amount of variability in terms of inter-subject-variability [2] are coarse approaches on the topic of individual differences in gait patterns. Individual differences of gait patterns illustrate their importance for therapy [3, 9] and the design of investigations [8]. In this context, gait analysis based on group averages and normal reference data might not be capable to respect individual needs properly.

Conclusions. Similar to the human finger print, gait patterns exhibits unique characteristics for an individual person. Gait patterns from different individuals can be distinguished for a comparatively large sample of 128 subjects and provide evidence for the clearly individual nature of walking. Hence, diagnoses and therapy should respect individual persons rather than focus on stereotypes and normal data.

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RELATIONSHIPS BETWEEN ADOLESCENTS AND THEIR BEST CLASSMATES' PHYSICAL ACTIVITY: A PILOT STUDY IN LITHUANIAN, NORWEGIAN AND SWEDISH HIGH SCHOOLS

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Physical activity (PA) plays an important role in our life because of several reasons. Well known that regular physical activity reduce the risk of: hypertension, coronary heart disease, diabetes, stroke, cancer or depression (1). That's why it is important to understand physical activity determinants. In one study it was find out, that boys and girls of primary school, whose best friends are physically active, have higher level of physical activity (2).

Research aim - to investigate the relationships between high school students' of Lithuania, Sweden and Norway and their best class friends' physical activity levels.

Methods. In total, one hundred and eighty three schoolchildren of 16 – 18 years of age from one secondary school in Lithuania, one secondary school in Norway, and one secondary school in Sweden took part in this pilot study: from Lithuania there were 64 students (28 boys), from Norway - 60 (32 boys), and 59 students were from Sweden (33 boys). To measure their total amount of physical activity (i.e. the energy expenditure in MET-minutes/week) during the past seven days, the short form of an International Physical Activity Questionnaire (IPAQ) was used (3). This questionnaire collects data on the duration, the frequency and the intensity of physical activity over the past seven days. The level of PA of the respondents was determined using IPAQ scoring protocol guidelines (4). Additional question to determine how much time (min/day) student spends with his/her best classmate after school was added. Statistical analysis. Averages of the research data, standart deviations and percentage was calculated using IBM SPSS Statistics 19 for Windows. The differences between groups were determined using One – Way ANOVA. The relations between the level of student’s physical activity and his best class friend’s level of physical activity were determined using correlations of Pearson coefficient. The level of results’ significance was determined when the error probability was less than 0.05.

Results. Comparing high school students’ physical activity according to country and sex, Lithuanian adolescent girls expend more energy in ToPA than Norwegian and Swedish girls ($p < 0.05$). When ToPA is stratified into activities of different intensity, Lithuanian girls expend significantly more energy in walking than girls from Norway and Sweden, and more energy in MPA than Norwegians. In VPA the energy expenditure of Norwegian boys and girls is lower than of Lithuanian and Swedish ($p < 0.01$). Statistically significant, but negative relationship between high school students’ and their best classmate’s levels of physical activity was found only in Swedish boys ($r = -0.41$; $p < 0.05$).

Conclusions. Norwegian adolescents, both boys and girls, expend significantly less energy in physical activities than their counterparts from Lithuania and Sweden. In adolescence the boys and girls, whose best friends are physically active, does not necessarily have higher level of physical activity as it was found in primary school.

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THE EFFECT OF POSTURAL TAPING ON POSTURE AND PHYSICAL CAPACITY IN POST-MENOPAUSAL WOMEN WITH OSTEOPOROSIS

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Osteoporosis is a systemic bone disease characterized by low bone mass which affects physical, emotional and social components of health (1). Due to reduced bone mineral density, postural changes are the most common and visible manifestations of this disease (2). Reduced physical capacity levels can also be affected by osteoporosis, leading to

decreased quality of life (3). Postural taping is used to diminish greater thoracic kyphosis and facilitate activity of the postural muscles (4).

Research aim - to evaluate posture and physical capacity changes after the application of postural taping in post-menopausal women with osteoporosis.

Methods. Study included 8 post-menopausal women with osteoporosis. The average age was 74.1 years (the range of the age was 69-79 years), the average height was 159.0 cm, the average weight was 70.7 kg. Sagittal curve of the thoracic kyphosis was measured using flexicurve ruler which was aligned from the seventh cervical to the second sacral vertebra. The head position in the sagittal plane was evaluated by calculating forward head angle using Contemphas motion analysis system: the digital images of spine sagittal plane were analyzed using the Templo 8.0 software. Physical capacity was assessed by evaluating handgrip strength, static and dynamic balance, flexibility, back and abdominal muscle endurance. Handgrip strength was measured using Saehan hydraulic hand dynamometer. Static balance was evaluated by near tandem stand test and the dynamic balance was evaluated by functional reach test. Flexibility was measured by the sit and reach test. For abdominal muscles endurance assessment abdominal muscles endurance test was used and the endurance of back extensor muscles was evaluated using back extensor muscles endurance test. All of these tests were performed before and after application of postural taping. Tape was applied bilaterally using the "X" technique: the application of tape started from the anterior aspect of the acromioclavicular joint, over the upper trapezius muscle, and then diagonally towards the spinous process of the seventh thoracic vertebra, where the endings of both tapes intersected. Postural taping was applied three times for each participant. Statistical analysis was conducted using SPSS 22.0. The non-parametric Wilcoxon's test for two-related samples was used and medians with

minimum and maximum values were presented. The level of statistical significance was set at $p < 0.05$.

Results. The thoracic kyphosis angle before application of postural taping was 24 degrees (20 - 28 degrees). After the application of postural taping the thoracic kyphosis angle was 21 degrees (18 - 28 degrees). It was found that the change of thoracic kyphosis angle was statistically significant ($p = 0,033$), while the head position in the sagittal plane did not change significantly ($p \geq 0.05$). After the assessment of physical capacity components, we found that before application of postural taping the value of functional reach test was 33 cm (22 - 36 cm) while after taping application the test result was 39 cm (24 - 44 cm). After the calculation of functional reach test results, we found that these changes were statistically significant ($p = 0.018$). No statistically significant changes in handgrip strength, static balance, abdominal and back extensor muscle endurance, flexibility were found ($p \geq 0.05$).

Conclusions. The evaluation of posture in postmenopausal women with osteoporosis after application of postural taping showed that thoracic kyphosis angle statistically significantly improved ($p < 0.05$). Assessing physical capacity components changes after application of postural taping, only dynamic balance improved in postmenopausal women with osteoporosis and these changes were statistically significant ($p < 0.05$).

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ECG PARAMETERS AND PSYCHO-EMOTIONAL STATE INTERRELATIONS AMONG HEALTHY STUDENTS

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Assessment of psychological and physiological interaction is becoming more and more important in science world these days [1, 2]. However, there is still not enough studies on psycho-physiological effects among young healthy students. Studies that had been carried out using relaxation techniques showed great improvement on subjects' cardiovascular function [3], others proved that relaxation techniques improve the quality of life [4].

Research aim - to evaluate psycho-physiological interrelations among healthy students.

Methods. Study subjects consisted of 17 4th-year students (9 females, 8 males) at Lithuanian Academy of Music and Theatre. Procedure. Each participant was measured twice – in the morning and in the evening of the same day. At first, a participant had to lay down for 5 minutes in a total rest. Then a

5-minute relaxation technique Heart Lock-In, developed by the Institute of HeartMath (California, USA) was applied. During those two stages participants were attached to the ECG registration equipment. ECG registration methods. The computerized electrocardiograph analysis system “Kaunas-Load”, developed at the Institute of Cardiology of Lithuanian University of Health Sciences, was used for ECG parameters registration, initial data processing, noise filtering and ECG complexes recognizing. The following ECG parameters were addressed: RR interval, JT interval and QRS interval. Psycho-emotional state was measured by a questionnaire, designed together with a research department at the Institute of HeartMath. The questionnaire consisted of questions measuring four dimensions of psycho-emotional state: physical vitality, emotional vitality, social connectedness and overall wellbeing. Participants were asked to subjectively evaluate their state considering their experiences and feelings over last few hours prior the survey. The data was processed using Microsoft Excel and IBM SPSS Statistics 22.0 programs. Pearson correlation coefficient (r) was calculated for the estimation of correlation between geomagnetic field fluctuations and data of participants.

Results. Analysing dynamic changes of ECG parameters during two different stages – laying in rest and applying relaxation technique, and relating those parameters to psycho-emotional state, obvious dynamic changes were found in RR and QRS parameters (regulatory systems) – in the morning, during the application of the relaxation technique, level of RR and QRS intervals was significantly positively correlated with emotional vitality ($r = 0.392$ and 0.487 , respectively), whereas JT interval was significantly correlated both during rest time and during relaxation technique ($r = 0.396$ and 0.389 , respectively). Strongest significant correlation was found between social connectedness and QRS interval both during rest ($r = 0.509$) and during relaxation technique (r

= 0.459). However, this relationship was significant only in the evening.

Conclusions. The study has revealed that there is a link between students' physiological reactions and their inner experiences. Importance of psycho-emotional status on ECG parameters has been observed and is obvious. Such findings deserve further analysis on students' health dynamics and search for tools how to help them self-regulate and avoid negative consequences on their health status.

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ANTHROPOMETRIC AND HEALTH-RELATED FITNESS CHARACTERISTICS IN PHYSIOTHERAPY STUDENTS SECOND AND FOURTH YEARS OF STUDYING

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The health-related benefits of physical activity are well known. Participation in a physical activity could improve social well-being, as well as physical and mental health, among children and adolescents [1-2].

Research aim - to evaluate anthropometric and health-related fitness characteristics in physiotherapy students second and fourth years of studying.

Methods. Subjects. 28 females and 12 males participated in this investigation. All subjects were 19-23 years old, healthy and studying physiotherapy. Anthropometry. The height and weight of the subjects were measured to nearest 0,1 cm and 0,1 kg, respectively. Body mass index was calculated. Body fat percentage by skinfold thickness. In total, four skinfolds (triceps, biceps, subscapular and iliac crest) were measured by using medical skinfold caliper. Everything was measured with 0,1 mm accuracy. The same spot was measured 3 times and then calculated arithmetical mean 1mm accuracy. Physical fitness. EUROFIT test battery was used to evaluate health-related fitness of students. Health-related fitness has been divided into two groups: musculoskeletal fitness and motor fitness. The following parameters were measured: dynamic sit-up, hand grip, sit-and-reach, single leg balance and plate tapping. Detailed instructions were given for each test. The students were not allowed to perform preliminary trials unless explicitly instructed to do so. Statistical methods. Standard statistical methods were used to calculate mean,

standard deviation and Pearson correlation coefficients. Strength of relationship was categorized as weak, moderate and strong. Statistical comparison between the groups (second year and fourth year) were made using paired samples T-test. Data was calculated using IBM SPSS statistics 22. Statistical significance was set at $p < 0.05$. All Eurofit fitness tests and anthropometric measurements were obtained twice with one year between the two measurements.

Results. Measured anthropometric characteristics in second year of studying: women height mean 170, 57cm (± 6.56), men 184, 75cm (± 6.74), weight mean for women 62, 37kg (± 13.14), men - 74, 83kg (± 12.03), BMI mean 21,44 (± 3.03) and body fat percentage mean for women 29, 85% (± 5.23), men 21, 58% (± 5.01). In fourth year of studying body fat percentage mean decreased for women 28, 11% (± 5.07), man 18,51% (± 4.45) in others characteristics no change appeared. Eurofit test standards and students results showed that BMI was in norm scale, but body fat percentage were over norm scale. Health-related fitness items in second year of studying: plate tapping with left arm mean 61,84 taps (± 9.23), with right arm 63,36 taps (± 7.31). Single leg balance mean 65,83 seconds (± 20.85) with right leg and 66,23 seconds (± 21.60) with left leg. Hand grip mean with right arm 36,15kg (± 9.69), with left arm 33,30kg (± 10.89). Sit-and-reach mean 10,41cm (± 6.96), dynamic sit up 25,95 sit ups (± 5.82). In fourth year of studying significantly increased plate tapping mean with both hands 66 taps (± 9.34), but decreased single leg balance mean 60 seconds (± 20.13) with both legs, in others characteristics no change appeared. By Eurofit fitness test standard students fit norms in each category.

Measured anthropometric characteristics correlated between each other positively and relationship was strong. Just two characteristics from anthropometric and physical fitness correlated together positively: BMI and hand grip (0.349 $p < 0.027$); body fat percentage and dynamic sit-up (0.369 $p < 0.022$). Correlation between health-related fitness items was

strong with plate tapping, single leg balance and hand grip between left and right sides ($r > .0610$, $p < 0.000$). Also negative correlation was found between dynamic sit-ups and plate tapping (in both hands) (-0.444 , $p < 0.005$), and between dynamic sit-ups and hand grip (both hands) (-0.470 $p < 0.003$). Paired samples T test showed that there was no statistical significant difference between first test and retest in fourth year of studying.

Conclusions. Students anthropometric characteristics - body fat percentage decreased after 2 years of studying. Plate tapping with both hands increased in fourth year of studying, but single leg balance decreased. Students by anthropometric and health-related fitness test characteristics matched norms. Physiotherapy students in second and fourth years of studying remain athletics by eurofit test standard. That's why we could claim that physiotherapy students devote sufficient time to their physical properties to develop and maintain good physical shape.

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POSTER PRESENTATION

GENETIC RISK FACTORS FOR MUSCULOSKELETAL INJURIES IN LITHUANIAN ATHLETES

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In sports medicine the diagnosis and prevention of injuries constitute a large part of a daily practice. Exercise-induced skeletal muscle injuries depend on race, age, physical activity or inactivity and other extrinsic and intrinsic factors. Composition of a genetic profile is an intrinsic factor predisposing individuals towards higher risk of injury. The ACE(I/D), ACTN3(R577X), AMPD1(C/T), MB(A/G) polymorphisms have been shown to impact musculoskeletal injuries and elite athletic status.

Research aim - the aim of this study was to analyze the influence of risk-related candidate polymorphisms in genes closely associated with the mechanisms of skeletal muscle damage and repair.

Methods. The Lithuanian Bioethics Committee approved the study and written informed consent was obtained from each participant. A total of 180 Lithuanian elite athletes (81 endurance-oriented, 44 sprint/power-oriented, 55 “mixed group”) and 255 healthy unrelated individuals without any competitive sport experience (controls) were genotyped using polymerase chain reaction and/or restriction fragment length polymorphism. The ACE (angiotensin converting enzyme gene, insertion/deletion I/D), ACTN3 (α -actinin-3, R577X, rs1815739), AMPD1 (adenosine monophosphate deaminase-1, C/T, rs17602729), MB (myoglobin gene, A/G, rs7293)

polymorphisms genotype and allele frequency differences between groups were assessed by Chi-squared tests at a significance level $\alpha=0.05$. Logistic regression model was used to estimate effects of risk genotypes on a type of sport category which athletes are practicing: speed/power versus endurance; speed/power versus mixed and endurance versus mixed.

Results. For ACE (I/D) and MB (A/G) polymorphisms the genotype frequencies were significantly different between the total athlete and control group (ACE II/ID/DD: 28/47/26% vs 25/37/38%; $P=0.01$; MB AA/AG/GG: 19/64/16% vs 27/45/27%; $P=0.0004$). There were no significant AMPD1 (C/T) and ACTN3 (R577X) allele or genotype frequency differences between the athlete groups and the controls. ACE genotype distribution in sprint/power athletes (II 41%; ID 39%; DD 20%) significantly differed from endurance athletes (II 21%; ID 48%; DD 31%, $P=0.034$) and controls ($P=0.016$). The ACE I allele in the sprint/power athletes (60%) was more frequent compared to endurance athletes (45%, $P=0.034$) and controls (43%, $P=0.016$). Having the musculoskeletal injuries risk-related ACE II genotype increases chances by 2.94 times (95% CI, 1.07-8.07) of being in sprint/power sport. Other markers did not show significant differences between the study groups.

Conclusions. Sprint/power-oriented Lithuanian athletes are more likely to have the musculoskeletal injuries risk allele (I) of ACE gene compared to endurance athletes and controls. We suggest that the ACE (II) genotype predisposes towards increased risk of developing muscle damage in sprint/power sports. Generally, genetic profiles can be used to characterize risks of injuries for a given individual, possibly helping to apply specific treatments and prevention.

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NORDIC WALKING INFLUENCE FOR YOUNG PEOPLE BODY COMPOSITION AND MOOD: PILOT STUDY

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These days, sedentary lifestyle, high-calorie and very limited exercising are the reasons why people are feeling their health regression (Saulicz, 2015) and this also leads abnormal body composition. Physical activity affects mental health – sometimes it can be as effective as medications to treat mental problems, but generally, physical activity is associated with better mood and mental well-being (Otto, 2011).

Research aim - to evaluate young people body composition and mood using the Nordic Walking.

Methods. Young people, between 18 and 25 years old were selected as research subjects. All participants were informed about this study before participating. This study was approved by the Lithuania Health Science University Center of Bioethics. The study involved 15 healthy subjects, who voluntarily participated in the study. Nordic walking training was done 2 times per week, walking 5 kilometers distance in one hour period for five weeks. Mood was assessed before and

after of every training. Mood questionnaire consisted of 4 questions (mood, working capacity, emotional state and physical well-being) which scored between 1 and 10 points and one question about tension and stress where subjects had to answer yes or no. Body composition was measured one time per week after training by segmental bio-electrical impedance (BIA) with segmental body composition monitor. This monitor had retractable handgrip electrodes with standard feet electrodes. Before measurement, age, sex, height of a subject had to be recorded in the device. After introduction subjects had to stand on a BIA, hold the electrodes with hands being lowered and stand until special sound was heard. Monitor measured the following parameters: weight (kg), full body fat (%), right/left arm fat (%), right/left leg fat (%), trunk fat (%), full muscle mass (kg), right/left arm muscle mass (kg), right/left leg muscle mass (kg), trunk muscle mass (kg), total body water (%), physique rating, metabolic age, full bone mass (kg), visceral fat rating, resting metabolism (kcal/day). Segmental left and right side of body composition will not be discussed in this study. Statistical analysis was performed using „SPSS Statistics 17.0“ and „Microsoft Office Excel 2013“ software. Verification of statistical hypotheses were selected $p < 0.05$ significance level. Data was analyzed using Wilcoxon Signed Ranks Test.

Results. This pilot study examined how mood and body composition changes after 10 trainings using Nordic Walking. The results of the study shows that weight, total body fat, total body water, bone mass, physique rating, metabolic age, visceral fat rating and resting metabolism did not change significantly between first and fifth week of training. Total body muscle mass did not change significantly between first and third week. The reason could be that study was too short. But there are some states, where change is significant. In contrast to other results, muscle mass increased and had significant difference between third week and fifth week ($p < 0.05$). In comparison, results of mood, working capacity,

emotional state and physical well-being, before and after the first, fourth and sixth training has improved ($p < 0.05$). Comparing results before and after second training, mood, working capacity and emotional state has improved ($p < 0.05$), but physical well-being did not have significant difference. Comparing results before and after third and seventh training, mood, physical well-being and emotional state has improved ($p < 0.05$), but working capacity did not change. In the eighth training mood did not improve, it was probably caused by bad weather. Comparing results before and after ninth training, mood and emotional state has improved ($p < 0.05$), but other states did not change. Before and after of all trainings, stress and tension did not have significant difference, subjects did not feel stress and tension.

Conclusions. Nordic Walking trainings improved participants mood, emotional state, working capacity and physical well-being, except when the weather was bad. Body composition has changed - muscle mass increased ($p < 0.05$).

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EFFECT OF PILATES METHOD EXERCISE FOR RESPIRATORY FUNCTION FOR PEOPLE WITH CHRONIC OBSTRUCTIVE LUNG DISEASE DURING REHABILITATION

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The chronic obstructive lung disease is characterized by the presence and progression of irreversible airflow obstruction which, impairs exchange in lungs and tissues [1]. According to the World Health Organisation (WHO) data, approximately 600 million people suffer from chronic obstructive lung disease worldwide [1,5]. The Lithuanian statistic data show that in 2012 about 60 thousand Lithuanian residents had this disease [2,4]. Rehabilitation of patients with lung diseases is proven to be an effective method, especially when commenced early following exacerbation of the disease [3]. Some of the potentially effective rehabilitation methods are pilates exercises that reduce bronchi reactivity and bronchospasm and active breathing exercises which strengthen the breathing muscles, improve expectoration, strengthen breathing muscles and stimulate better heart and blood vessels performance at the same time resulting in better blood circulation in lungs [3,6,7].

Research aim - to determine the effect of Pilates exercise method for the respiratory function for people with obstructive chronic lung disease during rehabilitation.

Methods. The study involved 60 patients suffering from chronic obstructive lung disease. The patients were divided into two groups, each containing 30 patients. The

groups were labelled as Group I and Group II. The patients were treated from exacerbating COPD at an in-patient institution. Speech-language exercises were applied to Group I whereas Group II patients were doing active breathing and pilates methodical exercises. In addition to the previously mentioned methods both of the groups had traditional rehabilitation methods applied, which includes 15 physical therapy procedures, halotherapy, physiotherapy and water therapy. The objective (spirometry, arterial blood pressure, thorax excursion) and subjective (shortness of breath) indicator values were measured in both patient groups before and after the rehabilitation methods were applied. Thoracic excursion test was carried out according to the recommendations of the European Association of COPD ENCPA and the World Health Organization. The research data were calculated and compared using the methods of mathematical statistics SPSS'20 for Windows and Microsoft Office Excel 2013 software. Arithmetic means, standard deviations, statistical reliability of the results were calculated and evaluated. For verification of statistical hypotheses, the significance level of ($p < 0.05$) was chosen.

Results. Forced expiratory volume (FEV1) increased by 3,7 and 3,6 percent, Tiffeneau ratio (FEV1/VC) increased by 1,5 and 3,0 percent, Gensler ratio (FEV1/FVC) went up by 1,3 and 3,0 percent, the result of forced vital capacity of lungs improved by 1,4 and 3,2 percent in Group I and II respectively. Systolic and diastolic arterial pressure was normal following the physiotherapy procedures. Group I subjects' mean chest excursion was 5.4 cm. before, and 5.9 cm after physiotherapy was applied ($p < 0.001$). Group II subjects' mean chest excursion was 4.8 cm before physiotherapy and 6.1cm after it. The given results indicate that after the procedure chest excursion increased by 0.5 cm. in group I, whereas group II demonstrated a 1.3cm increase in chest excursion.

Conclusions. Pilates method of exercise had a better impact on improving lung ventilation, blood pressure and chest

rates than normal rehabilitation. Pilates method of exercise had a statistically significant improvement in the comparison with the conventional rehabilitation group of patients, but the results of the degree of dyspnea remained moderate and limiting the patient's physical activity. Both male and female lung function indicators were significantly better after Pilates method of exercise but for female group results were better than for male group.

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VISUAL MOVEMENT THERAPY EFFECTS ON PATIENTS AFTER ISCHEMIC STROKE GAIT AND BALANCE

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Ischemic stroke occurs when the blood supply to the brain is interrupted, resulting in a deficiency of oxygen that causes brain cells to die. This damage to the brain often results in impaired mobility, paralysis and balance problems (1). Hemiparesis, or restricted movement and loss of strength on one side of the body, affects about 80% of stroke survivors. Spasticity, a condition where muscles are tight and stiff, is another common effect of a stroke. Due to occurring conditions the individuals has difficulties to move their arms, walk and maintain their balance (2). During the study, the possibility of using visual movement for aid was established. The device allows user to control games using thier body. Audio and image sensors are used during this therapy. Players not only can play video games, but control game from within, use their body sensors, and become controllers themselves (3).

Research aim - to evaluate visual movement therapy impact on the patients after stroke gait and balance.

Methods. Sixty patients after ischemic stroke participated in the study. Participants were classified into two groups: control group and study group. Physical therapy for participants of both groups' participants was applied. Visual movement therapy was additionally applied for the study group's participants. Balance pillows were used for the balance, gait training and weight transfer during the physical therapy. The visual movement therapy has been used in a variety of visual rehabilitation games: gait and balance exercise. The research was held for 3 weeks. Everyday patients practised twice a day, for half an hour. Berg Balance Scale was used to evaluate subjects balance, the tasks were performed by

sitting and standing, Mini-mental test was performed for assessment of thinking and Tinetti Balance and Gait test was used to assess the mobility and gait. Tests were conducted before the rehabilitation and after 3 weeks of rehabilitation. The nonparametric tests (Mann–Whitney test and Wilcoxon test) were used for comparisons of two samples. The results are presented as as median (xme), interquartile range (IQR) and mean (x)– xme (IQR; x). The difference was considered statistically significant at $p < 0.05$.

Results. Berg balance test results of control group before the research were 42(2;42,47) and after the research 42(3;47,23). The balance of control group significantly improved after the research. In the study group Berg balance test results before the research were 42(3;42,53) and after the research - 52(4;52,53). The balance of study group also significantly improved ($p < 0,001$). Before the research the balance of both groups did not differ significantly ($p = 0,957$), while after the research the results were better in the study group ($p < 0,001$). Mini-mental test results of control group before research was 25(5;24,5) after the research 30(0;29,87). We found out that the thinking of control group after physical therapy significantly improved. The study group Mini Mental test results before the research was 24(4;24,17) and after the research 30(0;29,83). We found out that the thinking of the study group also significantly improved ($p < 0,001$). By comparing the two groups before and after the research we found that they didn't differ. Tinetti gait and balance test results of control group before research was 9 (2; 8,3) and after the research 10 (1;10,17). We found out that the balance of control group significantly improved after physical therapy. The study group's Tinetti gait and balance test results before the research were 9 (1;8,53) and after the research - 12 (0;11,9). We found out that gait, balance of the study group significantly improved ($p < 0,001$). By comparing the gait and balance of two groups, before the research we found out it was same ($p = 0,794$), while the results after the research were

greater in study group ($p < 0,001$), which was subjected to physical and visual movement therapy. Up and go test results of control group before the research was 26(10;24,53) and after the research 11 (5;12). We found out that the gait speed of the control group after physical therapy significantly improved. The results of study group's Up and Go test were 26(5;26,1) and after the research - 10(5;11,1). We found out that the gait speed of the study group also significantly improved ($p < 0,001$). By comparing the gait speed of two groups before the research we found out that it was same ($p = 0,509$) and results after the research were not significantly different among groups ($p = 0,127$).

Conclusions. Visual movement therapy has been more efficient for the gait and balance improvement in patients after ischemic stroke.

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FUNCTIONAL MOVEMENTS CORRELATIONS WITH BODY BALANCE

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Bad movement pattern and bad body balance can cause muscle and bones injuries. It is very important to understand how functional movement and body balance correlate to each other [1].

Research aim - to evaluate functional movements and body balance correlation.

Methods. Three hundred fifty five 18-24 years young people (109 men and 246 women) participated in this study. All participants were right-handed; they didn't have any other diseases. We took single test to score functional movement and body balance. Functional movements were evaluated using Functional Movement Screen (FMS). Functional Movement Screen consist of 7 (deep squat, hurdle step, in-line lunge, shoulder mobility, active straight leg raise, trunk stability push-up, rotary stability) fundamental movement patterns. Each movement is graded from 0 to 3. A zero is given if any pain is present during the movement. A score of 1 is given if the participant cannot complete the task. A score of 2 is given if the participant is able to complete the task with modification or with signs of restriction or instability. A score of 3 is given if the participant is able to complete the task according to the test's criteria. A total of 21 is the highest score possible. In our abstract we are analyzing two functional movements: trunk stability push-up and rotary stability.

Balance were assessed using a computerized platform "Libra" (Italy, 2002, 93/42/CEE). On this platform were performed 6 exercises. The first 3 tests were taken in sagittal plane and other 3 tests in frontal plane. The first and fourth

tests were conducted with feedback – participants saw the line in the computer screen and tried to hold on it as straight as possible. The second and fifth tests were taken in different plane without feedback. The third and sixth tests participants performed with closed eyes. All these tests were taken with straight knees, requirement for participants was – don't bend the knees. All movements should be fixed in one body segment – hips. Statistical analysis was performed using „IBM SPSS Statistics 22.0“ and „Microsoft Office Excel“ programs. The significance level $p < 0.05$ was used for the verification of statistical hypotheses. To identify and test the strength of a relationship between two sets of data we used Spearman's Rank correlation coefficient.

Results. We noticed that Functional movements correlate to each other, but our aim was to find out if functional movements correlate to body balance. Functional movement stepping correlate with body balance three tests: two tests in sagittal plane (test with feedback ($r=-0,12$) and test with closed eyes ($r=-0,12$)) and one test in frontal plane (test with feedback ($r=-0,15$)). Functional movement right ($r=-0,17$) and left ($r=-0,13$) leg raising correlate with body balance test in sagittal plane without feedback; and right leg raising functional movement test correlate with balance test in frontal plane with feedback ($r=-0,13$).

Conclusions. Functional movement test stepping correlate with two body balance test in frontal plane, and one test in sagittal plane; functional movement leg raising correlate with one body balance test in frontal plane and in one body balance test in sagittal plane.

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CORRELATION BETWEEN BABIES MOTOR FUNCTION AND 6-7 YEARS OLD CHILDREN'S POSTURE, BODY BALANCE AND HAND FUNCTION

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Every year more and more are diagnosed specific development disorder of motor function in infancy. This diagnosis is adjusted very well by physical therapy [1]. There are not many studies focused on whether specific developmental disorder of motor function in infancy correlate with 6-7 years old children's posture, body balance and hand function and what is the changes of this correlation after physical therapy in infancy.

Research aim - to observe how motor function in infancy correlate with 6-7 years old children's posture, body balance and hand function.

Methods. Thirty-five 6-7 years (17 boys and 18 girls) old children participated in this study. All children were right-handed. All children had specific development disorder of motor function (ICD10-F-82) in infancy being 4-11 months old. All these children in infancy participated in physical therapy program (16 physical therapy procedures) and after the program their motor delay disappeared – motor development matched the child age. Babies motor development evaluation (before and after physical therapy) was done using certified assessment scale – Munich Functional Developmental Diagnostics. The posture by W.K. Hoeger scale, balance by computerized platform were assessed for 6-7 years old children. On the balance platform were performed 6 exercises. The first 3 tests were taken in sagittal plane and other 3 tests in frontal plane. The first and fourth tests were conducted with feedback – children saw the line in the computer screen and tried to hold on it as straight as possible. The second and fifth

tests were taken in different plane without feedback. The third and sixth tests participants performed with closed eyes. All these tests were taken with straight knees, requirement for participants was – don't bend the knees. All movements should be fixed in one body segment – hips. For fine motor function assessment were used Purdue Pegboard. Participants did 3 exercises on this board – right and left hand and both hands. This study was approved by Regional Biomedical Research Ethics committee. Written informed consent was obtained from all participants' parents/guardians. Statistical analysis was performed using „IBM SPSS Statistics 22.0“ and „Microsoft Office Excel“ programs. The significance level $p < 0.05$ was used for the verification of statistical hypotheses. To identify and test the strength of a relationship between two sets of data we used Spearman's Rank correlation coefficient.

Results. We assessed four motor development functions of babies – sitting (position from lying on back to sitting position), standing (vertical body position), crawling (position from lying on belly to standing on four (hands and legs)), grabbing (hand function); and posture, body balance, hand function for 6-7 years old children. Performing Purdue Pegboard test with right hand for 6-7 years children we get weak and moderate correlation between these motor function in infancy: crawling function before physical therapy ($r=-0,52$), sitting function before ($r=-0,41$) and after ($r=-0,34$) physical therapy, walking function before physical therapy ($r=-0,4$), grabbing function after physical therapy ($r=-0,34$). We got weak correlation between sitting function in infancy before physical therapy and leg position ($r=-0,35$) for 6-7 years children; also weak correlation is between balance, while 6-7 years old children took a test in frontal plane without feedback and sitting function before physical therapy ($r=-0,4$) and walking function after physical therapy ($r=-0,4$) for babies.

Conclusions. Crawling, sitting, walking, grabbing functions in infancy correlate with 6-7 years old children's right hand function and body balance in frontal plane.

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PHYSICALLY ACTIVE AND INACTIVE INDIVIDUALS HEART RATE CONNECTIONS WITH EARTH GEOMAGNETIC FIELD ACTIVITY

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The possibility that Earth's geomagnetic activity can affect humans has been debated for long time [1]. Cells in human body is involved in an environment of both external and internal fluctuating magnetic fields that can affect virtually every cell and circuit in biological systems to a certain degree, depending on the specific biological system and the nature of the magnetic fields [2].

Research aim: - to find connections between physically active and inactive individuals heart rate and earth geomagnetic field activity.

Methods. Research took place in Lithuanian University of Health Sciences, Institute of Sports. Students were invited to participate in a research. 20 students agreed to participate in this research. They were asked to wear heart rate monitor for 15days. Earth geomagnetic activity information was collected from GCI's Global Coherence Monitoring System, a worldwide network of magnetometers that collect a continuous stream of data from the earth's magnetic field. 20 participants were divided into two categories physically active 12 students and physically inactive 8 students. Period of day was divided into 4. Morning from 6 a.m. to 12 p.m., day from 12 p.m. till 6

p.m., evening from 6 p.m. till 12 a.m., night from 12 a.m. till 6 a.m. Students that was physically active twice a week for 30 minutes or longer was counted as physically active and people that was physically active less than that was counted as physically inactive. Physical activity included aerobic physical exercises, skiing, running, power exercises and other variations of physical activity. For statistical analysis IBM SPSS 22 and Microsoft Office Excel programs were used. Significant levels was checked with Wilcoxon Test and was accepted as significant when $p < 0.05$. We compared three different variations of Earth's geomagnetic field activity. One of variation took place in range from 0 till 1 which is related to human body metabolic system functions, second range was from 1 till 7 which is related with rest state of human physiology, and third is from 7 till 45 and it is related with Schumann resonance. In order to retain intelligent thinking there needs to be a constant, synchronization system that continuously stabilizes the brain. Humans requires and electromagnetic signaling system, supported by a biochemical system. The Schumann Resonance signal provides a brain frequency range matching electromagnetic signal, providing the synchronization needed for intelligence [3].

Results. Compared data of physically active people average correlations of heart rate and Earth's geomagnetic field activity, we found that physically active people has higher correlation at 0 till 1 frequency (0.06 ± 0.2) compared with 1 till 7 frequency (0.01 ± 0.2). Compared correlation in 0 till 7 frequency with 1 till 45 (0.01 ± 0.2) frequency, we found that frequency from 0 till 1 is higher than 1 till 45 frequency. We also found that 1 till 7 and 7 till 45 frequencies correlations has no difference for physically active people. Data of physically inactive people didn't showed significant differences when we compared different fields. There was no difference between physically active and physically inactive people correlations of heart rate and Earth's geomagnetic field activity.

Conclusions. In a physically active people group we found statistically significant difference between heart rate and Earth's geomagnetic field activity. Significantly higher connections were found in the Earth's geomagnetic field different frequencies, related with metabolic system function, Schumann Resonance – providing synchronization for human brain and organism rest state.

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THE CHANGES OF TRUNK STABILITY AND MOBILITY IN YOUNG AGE WOMEN WITH APPLICATION OF PILATES AND YOGA METHODS

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The reported lifetime prevalence of back pain and associated disability ranges from 54% to more than 80%, and the point prevalence rate is around 20% in the general population. Interventions including yoga [3] and Pilates [2] could potentially lead to cost savings [3]. Yoga and Pilates

which have, both been gaining in popularity over the last decade are two mind–body exercise interventions that address both the physical and mental aspects of pain and health improvement [2].

Research aim - to set the changes of trunk stability and mobility in young age women with application of Pilates and Yoga methods.

Methods. The study was conducted in 2014 November - 2015 February. The contingent consisted of "Yoga Academy" and women's sports club "Akela" the 25-35 years old beginners of practicing Yoga and Pilates. Selection criteria: age form 25 till 35 years, sex – female, duration of practicing - beginners. The study included 36 women: 18 of them practiced Pilates, 18 - Yoga. The average of the age – 30.28 (SD 3.2) years. The effectiveness of methods were set by applying the static trunk muscle endurance and Schober test. The evaluation was carried out before and after methods application - at the beginning and after 3 months practice. Data analysis was done with the software of SPSS 22.0. To compare two independent samples we applied Mann - Whitney criteria, and for two dependent samples - Wilcoxon signed-rank test. The results described by the median values (minimum - maximum values). Observe the differences considered significant when $P < 0.05$.

Results. The medium centimeter's median of Schober test before Pilates is 6 (3-7), and after method - 6 (4-8). In assessing the results of Schober test in Pilates group, the determined difference was statistically significant ($P = 0.006$). The medium centimeters median of Schober test before Yoga is 5.50 (3-7), and after application of the method - 7 (6-9). The observed difference - statistically significant ($P = 0.0001$). In assessing the results of Schober test between methods, the medium centimeters median before approaches - 6 (3-7), after application of methods - 7 (4-9). The observed difference is statistically significant ($P = 0.0001$). The medium ratio's medians of trunk muscle endurance before Pilates: between the abdomen and back muscles (AB) 0.57 (0.29-1.11), between

right and left sides of the trunk (RL) 0.97 (0.52-2), left side of the trunk and back (LB) 0.34 (0.15-0.86), between right side of the trunk and back (RB) 0.40 (0.12-1.19). The medium ratio's medians of trunk muscle static endurance after Pilates: between AB 0.97 (0.88-1.10), between RL 0.82 (0.62-1.78), between LB 0.55 (0.32-0.86), between RB 0.52 (0.24-1.13). Statistically significant differences before and after application of Pilates are determined between AB ($P = 0.0001$), LB ($P = 0.002$), RB ($P = 0.006$). The medium ratio's medians of trunk muscle static endurance before Yoga: between AB 0.42 (0.21-0.86), RL 0.94 (0.42-1.80), LB 0.44 (0.20-0.58), RB 0.33 (0.17-0.82). The medium ratio's medians of trunk muscle static endurance after yoga: between AB 0.70 (0.53-1.31), RL 1.00 (0.91-1.19), LB 0.58 (0.45-1.25), and RB - 0.56 (0.43-1.44). Statistically significant differences before and after application of yoga is determined between AB ($P = 0.001$), LB ($P = 0.001$), RB ($P = 0.022$). In assessing the medium ratio's medians of trunk muscle static endurance between methods, values differences of trunk muscle endurance is determined statistically significant only between the AB ($P = 0.0001$).

Conclusions. Before Pilates, imbalance of trunk muscles was dominating while lumbar mobility was reduced. Pilates increased abdominal and back muscles endurance ratio to normal, reduced imbalance and increased lumbar mobility. Before Yoga, imbalance of trunk muscles was dominating while lumbar mobility was reduced. Yoga reduced imbalance and increased lumbar mobility to normal. Pilates is more effective in increasing stability of abdominal and back muscles than yoga, but yoga has a greater effect on lumbar mobility.

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EFFECT OF PILATES EXERCISE ON STUDENTS' BALANCE, COORDINATION AND CHANGE IN STATIC ENDURANCE OF TRUNK MUSCLE

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Recently scientists have drawn attention to the fact, that physical activity of adults and children decreases and the style of life is very inactive. Modern lifestyles are increasingly encourages young people to allow passive leisure time, which may impair balance, flexibility and static endurance of trunk muscles. Hypokinesia, lack of exercise, active and passive activity changes deficiency weakens the health.

Research aim - to determine whether Pilates exercise has an effect on students' balance, coordination and change of static endurance of trunk muscle.

Methods. The study was conducted at the Lithuanian University of Health Sciences, Institute of Sports. II-III year students were tested (n=25, age - 20.44 (3.25)). Subjects were divided into two groups: research group (n=11, age - 21.73 (3.64)), those who attended Pilates twice a week; and control group (n=14, age - 21.29 (1.68)), those who didn't have any physical activity. The tests were carried out three times with the research group: at the beginning of the study (BEFORE), after 2 months of Pilates exercises (AFTER) and after a 2 months break (AFTER THE BREAK), the control group was tested twice: at the beginning of the study (BEFORE) and 2 months later (AFTER). Flamingo Test - it's a test where

balance of a person standing on a dominant foot on a narrow balance beam is tested. It is measured how many times the person falls off the balance beam in one minute. Sit-Reach test – during the test one's flexibility by bending forward is being assessed. The test is done by sitting on the floor, the soles of the feet are placed flat against the device and making best effort to reach forward along the measuring line as far as possible. Static Trunk's muscle endurance assessment test – during this assessment abdominal muscles static endurance (AMSE) and back muscles static endurance (BMSE) are tested. SPSS 22.0 software was applied to analyse the data. The data are presented as median (min., max.). For the assessment of three independent samples was applied Friedman criteria, for the evaluation of two independent samples - Man-Witney-Vilcoxon criteria. Differences of $p < 0.05$ were considered as statistically significant.

Results. Before Pilates method of research group Flamingo test results was 7 (0;13) times/min, after two months of Pilates method applying Flamingo test results was 4 (0;10) times/min, and after two month of break - 7 (0;12) times/min. After Pilates method, it was found that, statistically significant improvement in balance ($P=0.001$), as well as statistically significant results deteriorated after the break ($P=0.023$). In assessing the results of the control group (BEFORE - 3 (0;9) times/min; AFTER - 4 (0; 7) times/min), it didn't change ($P=0.301$). Compared to the research and control group the test results no significant effects ($p=0.418$). The evaluation of the test results of Sit-Reach test (BEFORE - 35.17 (16.68;38.67) cm; AFTER - 36.17 (25.00;41.22) cm; AFTER THE BREAK - 29.50 (21.33;40.00) cm) showed a statistically significant improvement in flexibility after Pilates method ($P=0.04$), followed by a break – become low ($P=0.04$). The evaluation result of the control group (BEFORE - 34.67 (18.67;43.00) cm, AFTER - 34.67 (18.67;43.00) cm) doesn't change ($P=0.241$). Compared to the research and control group the test results no significant effects ($P=0.322$). The evaluation of the test results

of abdominal muscles static endurance (AMSE) (BEFORE - 56 (17;126) sec., AFTER - 80 (31;148) sec., AFTER THE BREAK - 53 (26;129) sec.). It provided that after Pilates method AMSE improvement ($P=0.025$), followed by a break - becomes low ($P=0.011$). In assessing the results of the control group AMSE (BEFORE - 63 (23;140) sec., AFTER - 71.50 (30;137) sec.), No statistically significant changes ($P=0.273$). Compared to the research and control groups results of AMSE, no significant effects ($P=0.456$). The evaluation of the test results of back muscles static endurance (BMSE) (BEFORE - 159 (59;233) sec., AFTER - 180 (91;287) sec., AFTER THE BREAK - 180 (85;244) sec.), No statistically significant changes were observed ($P=0.773$). In assessing control group results of BMSE (BEFORE - 180 (80;241) sec., AFTER - 185 (89;244) sec.) - the change has not been established ($P=0.574$).

Conclusions. The evaluation of the research group a balance and flexibility observed that the research group balance and flexibility after 2 months Pilates improved, while after the break – deteriorated. The evaluation of the research group static endurance of trunk muscle noted that the abdominal muscles static endurance after 2 months Pilates improved, while after the break - deteriorated. The back muscles static endurance significantly affected.

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YOUNG AGE PERSONS AND PROFESSIONAL RIDERS HEART RATE, BLOOD PRESSURE AND BIOPSYCHOSOCIAL SATISFACTION DURING DAILY ACTIVITIES AND INTERACTIONS WITH A HORSE

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For centuries people have talked about the relationship between “a man and his horse,” and the “bond that exists between a horse and a rider.” Researchers have attempted to look at the heart and brain states of the horse and human bond [1]. It is found that baseline blood pressure and heart rate were lower in those who had horses than those without [2]. It is found an evidence that human interactions with horses provided improved psychological and physiological wellbeing [3].

Research aim - to evaluate young age people and professional riders heart rate, blood pressure and biopsychosocial satisfaction during daily activities and interactions with a horse.

Methods. The study involved 22 people, the group of young individuals (non riders) included 15 students, age 27.4 ± 2.31 and the group of professional horseriders included 7 individuals, age 26.285 ± 3.20 years (on average \pm SD). In both groups was measured daily heart rate, blood pressure, measured biopsychosocial satisfaction, comparing daily activities (such as low, medium and high physical activity and sleep) and interactions with a horse (such as the flattering, brushing, feeding and riding). For heart rate (HR) measurement we have used “First beat“ heart rate monitors. Monitors recorded heart rate over 24 hours period. We analysed heart rate during daily activities of different intensity and

interactions with horse. Daily physical activities were differentiated to low, moderate and high intensity levels (according to metabolic equivalent values) and sleep phase. Interactions with a horse included stroking, brushing and feeding the horse directly from hand. Data are presented as median (min - max) The statistical analysis was exercised using “IBM SPSS Statistics 22.0”, “Microsoft Office Excel”, „MATLAB For the evaluation of correlations Pearson’s correlation coefficient was used. The nonparametric Mann–Whitney test was used for comparisons of two independent samples. To compare two dependent samples, the nonparametric Wilcoxon test was applied. The difference was considered statistically significant at $p < 0.05$.

Results. Increasing the intensity of physical activity, heart rate increases in both groups ($p < 0.05$). Horse fluttering during a median heart rate for young people was 93.50 (72-120; 93.43) beats/min., brushing - 97.5 (75-113; 95) beats/min., feeding - 100.5 (83-111; 99) beats/min., riding a horse - 93.0 (82-130; 101) beats/min. Professional riders median heart rate was significantly lower in fluttering 77,00 (65-92; 79) beats/min., brushing 85,00 (72-95; 83) beats/min. and feeding 84,00 (71-94; 84) beats/min., compared to young age persons ($p < 0.05$). Young persons HR horse feeding was significantly higher than fluttering horse (< 0.05). After sessions with a horse compared the physical and emotional state and social interaction scores with each other, it was found that the physical condition score of the young age persons were significantly higher and emotional condition score ($p < 0.05$). Young persons HR was significantly higher $14.29 \pm$ beats/min. during fluttering the horse or low physical activity ($p < 0.05$). Young persons HR was statistically significantly higher in 9 beats/min. horse grooming and feeding than moderate-intensity physical activity ($p < 0.05$). Young persons systolic blood pressure after interactions with a horse statistically significant decrease from 115 (98-146) to 108.77 (86-138) mmHg ($p < 0.05$). Comparing the two groups emotional state before and

after the sessions with a horse, found a statistically significant difference in the young age persons group ($p < 0.05$). As well as social interaction scores comparing before and after the interactions with the horse statistical significance of the young age group ($p < 0.05$).

Conclusions. After the sessions with the horse physical condition in young age persons is increasing more than the emotional state ($p < 0.05$). When young age persons flattering, brushing and feeding the horse HR is higher than the low and medium daily physical activity ($p < 0.05$). After sessions with a horse young age persons systolic blood pressure decreased, and satisfaction of emotional wellbeing and social interaction increases ($p < 0.05$).

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APPLICATION OF ECCENTRIC EXERCISES AFTER RECONSTRUCTION OPERATION OF ANTERIOR CRUCIATE LIGAMENT

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Anterior cruciate ligament rupture – the most common around knee joint in the structures injury (4). Rehabilitation takes up to 6 months (9). Eccentric exercises affect the joints as stabilizer (3). Researchers compared joint mobility and muscle length change. Results were better in eccentric exercise program (5, 7). Static stretching is used to improve muscle flexibility (6). During eccentric muscle contraction, muscle-tendon complex is trained and allows absorbing forces (8).

Research aim - to evaluate the application of eccentric exercises program effect after reconstruction operation of anterior cruciate ligament.

Methods. The study was carried out at Karoliniškės polyclinic in 2015. The study included patients undergoing anterior cruciate ligament (ACL) arthroscopic surgery. The investigation was organized by establishing the selection criteria used for the selection of persons participating in the study: age between 25-45 years old; primary ACL reconstructive surgery; transplant - the same leg, the back of the thigh muscle tendon; postoperative period without complications; physiotherapy start - no earlier than one month after reconstructive ACL surgery. The study comprised the selection of 12 criteria after primary ACL reconstructive surgery. Later, the patients in the study, were randomly divided into two groups: a control group who received usual physiotherapy program; research group - applied eccentric exercise program. Physiotherapy has started after 4 weeks after ACL reconstructive surgery. The most important patient's data was recorded in the study protocol: patient's diagnosis; when

injuries and surgery; patient's complaints; knee flexion/extension range of motion and muscle strength, pain assessed by visual analog scale (VAS); stand/sit and static balance tests measured before and after physiotherapy. All patients after reconstructive surgery were given outpatient physiotherapy. The time was divided in 7 individual physiotherapy session with duration of 45 minutes each.

All patients during the study were verified with the same methods, which included analysis of: history- age, gender, when trauma occurred, when performed arthroscopic surgery, physical activity level; evaluation of knee range of motion using goniometer; evaluation thigh muscle strength using Lovett scale; subjective assessment of pain using the VAS; Station-sit the test; balance evaluation using the balancing error calculation system; „Tegner Lysholm 'knee scale (1,2). Statistical analysis was performed using Microsoft Office Excel 2003 statistical packages.

Results. The research group with the knee flexion amplitude at the beginning of the study was with average of - 110.3 degrees, the control group – with 97.6 degrees. After re-measurement the research group difference in average was 21.7 degrees, while in control group slightly higher - 24 degrees. All patients' flexion amplitude average was 5.4 degrees before and 1.3 degrees after physiotherapy. The difference in research group was average 2.3 degrees, while the difference in control group was twice higher, i.e. 5.6 degrees. The research group had a higher proportion resulted in 83.3 percent of patients, that muscle strength was assessed 5 points, while only 16.7 percent resulted in 4 points. The control group results were worse because of 33.3 percent resulted in test force that at the end of the study was assessed 5 points, while the remaining 66.7 percent resulted in 4 points. Sit-to-Stand test evaluation resulted in observing the average difference between the research group 7 times, while in the control group 5.7 times. The research group pain intensity average before physiotherapy was 5.2 points. At the end patients', pain intensity decreased in

average to 0.2 points. The research group overall mean pain intensity decreased by 5 points, while the control group resulted in 5.5 points. Static balance evaluation. Both groups in position I on the ground did not make mistakes. Patients repeating the same position on unstable surface in the research group showed average of counted errors- 0.2 errors, in the control group- 0.5 errors. Keeping position II on the ground 4 errors were determined, followed by eccentric exercises errors dropped to 1.5. Test result keeping the III position on the ground the research group showed result of 2.1 errors and respectively 0.33. The control group results were very similar. The evaluation according „Tegner Lysholm Knee Scoring Scale” in research group showed better results than in the control group in the beginning, because only 83.3 percent of test the knee joint condition was considered poor. Repeatedly 33.3 percent after tests results were assessed as excellent, while 66.7 percent of results were assessed as good condition.

Conclusions. Usual physiotherapy program and eccentric exercises program had similar effect on patients’ knee joint mobility, thigh muscle strength, pain, static equilibrium and knee joint function.

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