The 2nd International Conference
EXERCISE FOR HEALTH AND REHABILITATION
The 11th of November, 2016
Kaunas, Lithuania

BOOK OF ABSTRACTS

The 2nd International Conference
EXERCISE FOR HEALTH AND REHABILITATION
The 11th of November, 2016
Kaunas, Lithuania

ORGANIZERS

LITHUANIAN UNIVERSITY OF HEALTH SCIENCES

Institute of Sports

and

FEDERACIJA

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 other specialists who are interested in the health promotion and rehabilitation modalities.
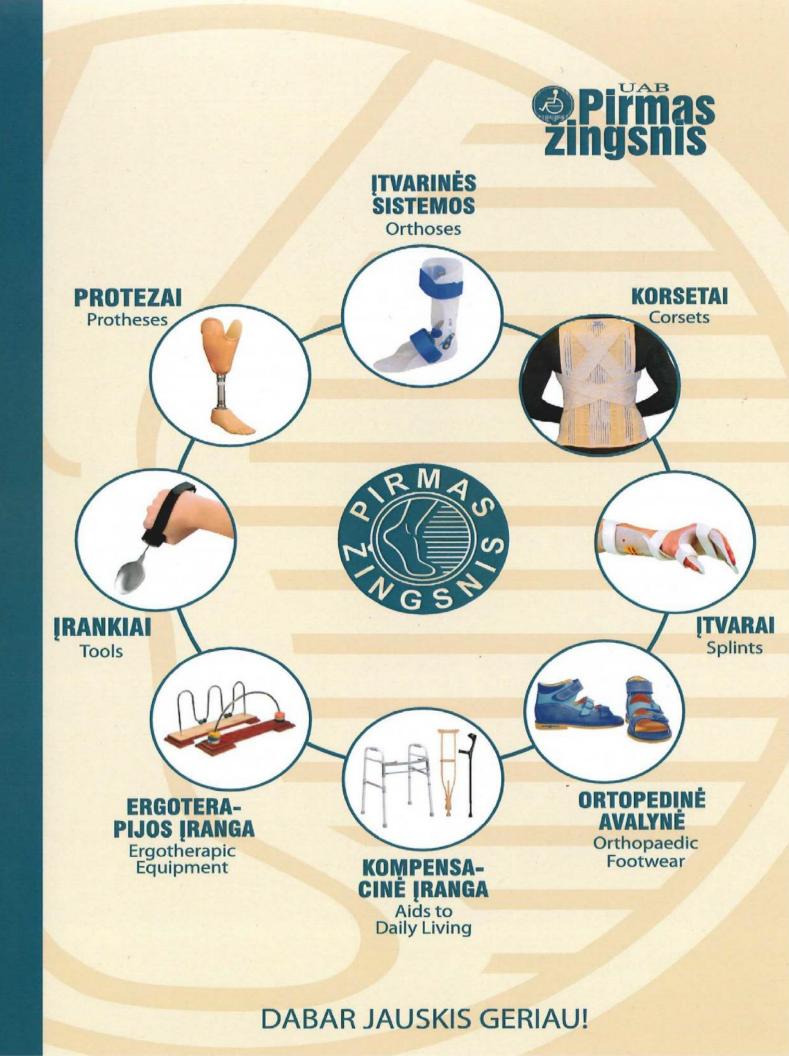
GENERAL SPONSOR:

SPONSORS:

UAB Pirmas zingsnis

ĮTVARINĖS SISTEMOS
Orthoses

PROTEZAI
Protheses

KORSETAI
Corsets

ĮRANKIAI
Tools

ĮTVARAI
Splints

ERGOTERA-PIJOS ĮRANGA
Ergotherapic Equipment

KOMPENSA-CINĖ ĮRANGA
Aids to Daily Living

ORTOPEDINĖ AVALYNĖ
Orthopaedic Footwear

DABAR JAUSKIS GERIAU!

Abstracts included in the „Book of Abstracts" were reviewed by one independent scientific referee.

Referees:
Prof. Dr. Alfonsas Vainoras (Lithuanian University of Health Sciences, Institute of Sports)
Assoc. Prof. Dr. Kristina Berškien (Lithuanian University of Health Sciences, Institute of Sports)
Assoc. Prof. Dr. Alg Daunoravi ien (Lithuanian University of Health Sciences, Institute of Sports)
Assoc. Prof. Dr. Alma Kaj nien (Lithuanian University of Health Sciences, Institute of Sports)
Assoc. Prof. Dr. Egl Lendraitien (Lithuanian University of Health Sciences, Department of Rehabilitation)
Assoc. Prof. Dr. Daiva Petruševi ien (Lithuanian University of Health Sciences, Department of Rehabilitation)
Assoc. Prof. Dr. Vytautas Poškaitis (Lithuanian University of Health Sciences, Institute of Sports)
Assoc. Prof. Dr. Laimonas Šiupšinskas (Lithuanian University of Health Sciences, Institute of Sports)
Assoc. Prof. Dr. Renata Žumbakyt -Šermukšnien (Lithuanian University of Health Sciences, Institute of Sports)
Dr. Ernesta Gurskien (Lithuanian University of Health Sciences, Institute of Sports)
Dr. Vilma Mauricien (Lithuanian University of Health Sciences, Institute of Sports)

Cover photo by Laimonas Šiupšinskas

CONTENTS

INVITED SPEAKERS

Taking advantage of a fluctuating world for health and performance

Prof. Dr. Wolfgang I. Schöllhorn
Johannes Gutenberg University of Mainz, Germany

The increase of fluctuations has been identified as a principle of living systems during a transition from one stable state to another. The differential learning (DL) approach took advantage of this idea in sports by teaching and learning movements without repetitions and without correctional feedback. Meanwhile numerous studies provide evidence for the positive effects of differential learning in various sports for different ages and different levels of performance. Due to the abstract and general basis of the DL approach in system dynamics and neuro-physiology the transfer to other areas of application was a logical consequence.

Meanwhile the DL approach has been transfered to writing skill acquisition in first graders, learning to play a music instrument, and in different areas of physio therapy. More recently, the principle of increase fluctuations have been applied to floors, chairs and desks as well. The results of these studies provide further evidence for the generality of the system dynamic principle on dissipative systems. Commonalities of all these different areas as well as the underlying mechanisms for the phenomena will be discussed.

Strategies for body weight reduction: break down the myths!

Dr. Simona Pajaujien
Lithuanian Sports University

The fitness industry has become an unregulated misinformation machine. In no other health field would be allowed the popular media to dictate the practice of professionals. In no other field is the information from the Internet, newspapers, and TV considered more accurate than information from governing bodies and credentialed professionals. It is commonplace for well-built "gurus" who lack any formal education, credentials, or training, to be given a platform to promote a methods, supplement, product, idea, or even TV show. Often the results they promise are physiologically impossible.

A fit body is not a reflection of someone's fitness knowledge. Getting and staying fit is a science that has been developing for decades. Science and research is progressing faster than ever, and we, exercise professionals, should build the bridge between theory and practice.

The prevalence of overweight and obesity has increased and is considered a pandemic (Flegal, 2012). So the body weight control strategies are on the top trends what are giving exercise professionals. Here are no mystic methods, exercises, pills, nutrition, only facts for weight loss

strategy. It's combination of physical activity and diet. But exercise programming for weight management is not a sprint, it is a marathon. A part of the population still has wrong imagination about weight control and exercising behavior. Educators and trainers should focus on the client education on the many health and lifestyle benefits of exercise, not on weight, and avoid provide unsubstantiated information.

The purpose of this workshop is to make participant an informed consumer in the health and fitness marketplace. The topic will cover how to spot fraud and how to make smart decisions about health and fitness products and services. We will try to bust dozens of myths, and provide more practical, evidence based suggestions for better and long-term weight loss strategy.

SHORT ORAL PRESENTATIONS SESSION

Short – term balance training in sitting position

Ieva Aleknait -Dambrauskien [1], Vytautas Poškaitis[1], Aurelijus Domeika[2], Vidmantas Zaveckas[1]
[1]Lithuanian University of Health Sciences, [2]Kaunas University of Technology

Introduction. Rapidly growth of technologies influences our posture and the main posture become sitting position. Long – term sitting position negatively affects intervertebral disc nutrition, however regularly changes of position could improve nutrition [1]. The poor postural control could be seen during sitting for persons who suffering from low back pain [2][3]. 37% of back pain results of all risk factors which is related with work environment, this is the biggest number of all damages [4].

Research aim. The aim of this study is to compare person's trunk muscles activity and balance before and after training session on unstable training machine during sitting for low back pain patients.

Research methods and organization. 16 adults of both sexes were included in this study, participants' average (±SD) age was 30 (±10) years, height was 175.5 (±11.5) cm, mass was 76 (±19) kg. Inclusion criteria: low physical activity, sitting position at work place, low and moderate low back pain. All participants were verbally informed of the protocol, and read and signed a consent form. Ethical approval was obtained from the local university research ethics committee. Study participants were interrogated by special questioner and their static and dynamic body balance maintenance was tested on Biodex Balance System (BBS) during sitting and standing positions for 40 seconds three times each with 10 seconds rest between trails. Persons were informed about balance maintenance and their center of mass positioning in right direction. Participants were informed to keep their body alignment after verbal instructions during balance keeping. Moreover, trunk muscles activity was measured bilaterally by surface electromyograph during balance testing. Tested muscles, 3 abdominal wall muscles bilaterally: rectus abdominis, externus oblique, transversus abdominis and 2 back wall muscles bilaterally: multifidus and erector spine [5]. Following shaving and swabbing of the skin with rubbing alcohol to reduce skin impedance. Balance and trunk muscle activity was measured twice

before and after training session. During training session persons were instructed about body alignment which they have to maintain during training. Training lasts 6 weeks, 3 times per week for 15 minutes. Persons were training and doing trunk flexion/extension, arms extension/flexion and legs flexion/extension on unstable training device "REHABILI" in sitting positions. Methodology was selected on the basis of systematic review of balance training [6]. Data were analysed using SPSS 23.0. For small sample was used nonparametric Wilcoxon test. Data level for statistical significance was set at $p < 0.05$.

Results. The analysis of balance changes showed, that statistically significant results after training sessions was during stable and unstable standing positions ($p < 0.05$). Body balance became better. There were no statistically significant differences between stable standing in align posture, before and after training sessions ($p > 0.05$). However, standing on unstable surface in align posture showed statistically significant better results before and after training sessions on unstable training device "REHABILI" ($p < 0.05$). We found that stable and unstable sitting positions in usual posture and align posture showed statistically significant better results ($p < 0.05$). Trunk balance exercises were very important for patients with chronic low back pain and it could be effective in reducing disability and led to improvements of the physical components [7]. Statistically significant results were found when was compared electrical muscles activity before and after training sessions. Transversus abdominis muscle activity during standing on stable and unstable surfaces showed statistically significant increased results before and after training sessions ($p < 0.05$). The same results were seen in multifidus muscle electrical activity during standing on stable surface before and after training sessions ($p < 0.05$). Transversus abdominis muscle and multifidus muscle are important for co-contraction and training of co-contraction during stabilization exercises for prevention and treatment for low back pain [8]. However, some authors state that, increased muscle co-activation leads to degraded postural control during unstable seated balance [9]. Externus obliques activation showed statistically significant decreased results in align body posture during stable and unstable sitting ($p < 0.05$), also during unstable standing ($p < 0.05$). Authors researched that dynamic sitting provides muscle activity and could be useful for people whose dominant position is prolonged sitting [10].

Conclusions. Training of trunk balance, as shown in results, have positive effect for improvement of body balance in standing with usual posture and sitting positions with usual and align posture on stable/unstable surfaces. Trunk muscle activity transversus abdominis, multifidus and externus obliques became more active after training sessions. There was no low back pain increment of trained persons' observed.

Reference list:

1. Angela Maria Lis, Katia M. Black, Hayley Korn, and Margareta Nordin. Eur Spine J. 2007 Feb; 16(2): 283–298.
2. Claeys K, Brumagne S, Dankaerts W, Kiers H, Janssens L. Eur J Appl Physiol. 2011 Jan; 111(1):115-23.
3. Dankaerts W, O'Sullivan P, Burnett A, Straker L. Spine (Phila Pa 1976). 2006 Aug 1; 31 (17):2017-23.
4. 10 facts on physical activity. WHO, 2014. http://www.who.int/features/factfiles/physical_activity/en/
5. James W. Youdas, Mallory M.P. Boor, Arynn L. Darfler, Margaret K. Koenig, Katherine M. Mills, and John H. Hollman. Sports Health. 2014 Sep; 6(5): 416–421.
6. Lesinski M, Hortobágyi T, Muehlbauer T, Gollhofer A, Granacher U. Sports Med. 2015 Apr; 45(4):557-76.

7. Gatti R, Faccendini S, Tettamanti A, Barbero M, Balestri A, Calori G. J Orthop Sports Phys Ther. 2011 Aug; 41(8):542-52.

8. MacDonald DA, Moseley GL, Hodges PW. Man Ther. 2006 Nov; 11(4):254-63.

9. Reeves NP, Everding VQ, Cholewicki J, Morrisette DC. Exp Brain Res. 2006 Oct; 174(4): 694-700.

10. Holmes MW, De Carvalho DE, Karakolis T, Callaghan JP. Hum Factors. 2015 Nov; 57(7):1149-61.

Burnout among physiotherapists and associations with work environment

Greta Braž nait , Gražina Krutulyt

Lithuanian University of Health Sciences, Department of Rehabilitation

Introduction. Burnout has been defined as a syndrome which can cause serious conditions such as impairment of mental and physical state [1]. Burnout syndrome also could be characterized as emotional exhaustion and depersonalization. Medical doctors, nurses, teachers and physiotherapists are specialists who suffer from burnout syndrome the most [2]. It is important to do preventive work against burnout syndrome in order to ensure good quality of specialist, who work with people, work [3].

Research aim. Research aim – to assess burnout among Lithuanian physiotherapists who work in different workplaces.

Research methods and organization. We have done the survey with 64 physiotherapists : 52 women (81,2%) and 12 men (18,8%) from whole Lithuania. Duration of the investigation was 8 weeks. Physiotherapists received two questionnaires to fulfill. One of them was a demographic data sheet. Participants were asked about their gender, age, length of service, education, workplace, workload and other variables of demographic data and work environment. Other questionnaire was Maslach burnout inventory (MBI). The MBI is a 22-item questionnaire for measuring the severity of burnout (consists of three dimensions: emotional exhaustion, personal achievements and depersonalization). Physiotherapists had to indicate on a six point Likert scale the frequency with which they experience some specific feelings related to their job. Burnout could be defined as low, moderate and high [3]. Statistical analysis was made using „IBM SPSS Statistics 22.0".Verification of statistical hypotheses were selected $p < 0.05$ significance level. To identify and test the strength of a relationship between burnout syndrome and specific variables of work environment we used Spearman's Rank correlation coefficient, Kruskal – Wallis test and Mann-Whitney Test.

Results. First of all, we assessed the general level of burnout among Lithuanian physiotherapists. The mean values of different dimensions are : emotional exhaustion – 23,97 (±13,59) – moderate level of burnout; personal achievements – 36,64 (±8,09) – low level of burnout; depersonalization – 9,42 (±7,06) – moderate level of burnout. The highest level of emotional exhaustion according place of work was assessed in the private clinic - 30,5 (29,07±14,22), the lowest – in educational institutions, sports centers - 12 (15,64 ±11,74). The highest level of second burnout dimension - the personal achievement - according place of work was assessed in the hospitals - 35 (35,95±7,91), the lowest – in educational institutions, sports centers - 42,5 (40,5±7,47). The highest level of depersonalization

according place of work was assessed in the hospitals - 8 (10,21±6,6), the lowest depersonalization level was found in the educational institutions, sports centers - 7,5 (8,29±6,6). We have found that there was no statistically significant correlations between gender, age, education, lenght of servise and burnout syndrome. Low positive correlations were assessed between emotional exhaustion dimension of burnout and mean amount of patients per day (r = 0,311) (p<0,05) as well as depersonalization dimension of burnout and mean amount of patients per day (r = 0,350) (p<0,05).

Conclusions. Physiotherapists from Lithuania suffer from moderate level of burnout in emotional exhaustion and depersonalization dimensions, as well as from low level of burnout in personal achievement dimension. Physiotherapists who work in the private clinics and hospitals tend to suffer from burnout more, however educational intitutions, sport centres, gyms are the places where burnout syndrome manifests less. Big number of patients per day has statistically significant associations with higher level of burnout.

Reference list:

1. Ilic, M., Todorovic, Z., Jovanovic, M., Ilic I. Burnout Syndrome Among Medical Students at One University in Serbia: Validity and Reliability of the Maslach Burnout Inventory—Student Survey. Behavioral Medicine (2016) 42: 1–6.
2. liwi ski, Z. et al. Burnout among physiotherapists and length of service. International Journal of Occupational Medicine and Environmental Health (2014) 27(2):224 – 235.
3. Embriaco, N., Papazian, l., Kentish-Barnes, N., Pochard, F., Azoulay, E. Burnout syndrome among critical care healthcare workers. Current Opinion in Critical Care (2007) 13:482–488.

Quality of functional movements and sports injury incidence in high level female basketball players

Toma Garbenyt -Apolinskien [1], Saul Salatkait [1], Laimonas Šiupšinskas[1,2], Rimtautas Gudas[1,3]

[1]Lithuanian University of Health Sciences, Medical Academy, Institute of Sports, [2]Lithuanian Sport University, Department of Rehabilitation and Applied Biology, [3] Hospital of Lithuanian University of Health Sciences Kaunas Clinics, Sports Trauma and Arthroscopic Unit

Introduction. Basketball is one of the most popular sports, and it is also one of the highest contributors to sport and recreation - related injuries [5]. Many studies suggest that the injury rate for female athletes is higher compared to men [1]. There is a general tendency that the majority of injuries affect the lower limbs [2]. In our study we decided to analyse and pay attention to women athletes which may suffer from injury of lower extremity.

Research aim. To assess quality of functional movements and sports injury incidence in high level female basketball players.

Research methods and organization. There were 498 testing sessions done on 165 Lithuanian Women's Basketball League players during 2013-2016 game seasons. The data from 67 players was analyzed, of which 17 players have later sustained lower limb sports injuries. All players completed prie-participation health questionnaire. Where was asked about their fatique, injuries and illnesses. All

participants performed the Functional Movement Screen (FMS) tests. The FMS is a comprehensive screen to assess the quality of fundamental movement patterns for presumably identifying an individual's physical limitations or asymmetries [2]. Also players had to do the modified star excursion test (YBT LQ) which was used to assess player's dynamic balance [4]. LESS (Landing Error Scoring System) was implemented to evaluate whole body and lower limb biomechanical changes during jumps [3]. Statistical analysis was performed with SPSS 22 Software . The degree of statistical significance was set at P < 0.05. Differences were assessed using Mann-Whitney test. The results are presented in means ± standard deviation.

Research results. Over the course nine knee injuries, six ankle injuries and other two lower limb injuries were recorded. Comparison of FMS scores showed statistically significant difference between groups (p = 0,032). Uninjured basketball players FMS total score were 15 ± 0,23, injured basketball players – 13,1 ± 0,99. An FMS specified cut-off value of 14 or below is suggested to indicate an elevated risk of injury [2]. The results of LESS test score between the groups were not statistically significant (p = 0,131). Uninjured basketball players LESS total score were 6,9 ± 0,32, injured basketball players – 5,1 ± 1,12. (Values of numbers: (0=4) excellent; (4-5) good; (>5<=6) average; (6<) poor (2)) [3]. Comparing results of the composite score of YBT-LQ between the groups were not statistically significant. In uninjury players group right leg stability mean was 103,6 ± 0,92, in injured players group right leg stability mean was 105,1 ± 1,65 (p = 0,237). In uninjury players group left leg stability mean was 105,8 ± 0,81, in injured players group left leg stability mean was 104,3 ± 1,27 (p = 0,138).

Conclusions. 1. Over the course of the players sustained these lower limb injuries: ankle ligament tears, knee cruciate ligament tears, meniscal and Achilles tendon tears. 2.Uninjured players overall scored better in FMS than the group that later sustained injuries. We can therefore suggest that greater functional movement quality is related to lowered sports injury risk. 3.The dynamic balance results of our participant female basketball players' were not related to the risk of sustaining sports injuries.

Reference list:

[1] Cook G., Burton L., Hoogenboom B. (2006). Pre-participation screening: The use of fundamental movements as an assessment of function - Part 1. N Am J Sports Phys Ther, 1(2), 62 – 72. Doi: PMC2953313.

[2] Dorje C, Gupta RK, Goyal S, Jindal N, Kumar V, Masih GD. Sports injury pattern in school going children in Union Territory of Chandigarh. Journal of clinical orthopaedics and trauma 2014;5:227-232.

[3] Padua A, Marshall W, Boling C, et al. The Landing Error Scoring System (LESS) Is a Valid and Reliable Clinical Assessment Tool of Jump-Landing Biomechanics. The American Journal of Sports Medicine.2009.

[4] Plisky P. J., Rauh M. J., Kaminski T. W., Underwood F. B. Star excursion balance test as a predictor of lower extremity injury in high school basketball players. Journal of Orthopedic & Sports Physical Therapy 2006; 36 (12): 911 – 919.

[5] Scanlan A, MacKay M. Sports and Recreation Injury Prevention Strategies: Systematic Review and Best Practices.

[6] Ito E, Iwamoto J, Azuma K, Matsumoto H. Sex-specific differences in injury types among basketball players. Open Access Journal of Sports Medicine 2015:6 1–6.

The balance changes in post-menopausal women with osteoporosis after the application of Tai Chi exercise program

Ema Lašinyt , Vilma Mauricien

Lithuanian University of Health Sciences, Medical Academy, Institute of Sports

Introduction. Osteoporosis is an emerging medical and socioeconomic threat characterised by a systemic impairment of bone mass, strength, and microarchitecture (1), resulting in increased bone fragility and fractures (2). Due to degenerative changes in morphology and structure, the balance function decreases and restricts the walking function or daily activities (3). Tai Chi is a traditional Chinese mind-body exercise (4) that has the potential to overcome the impairments associated with frailty (5).

Research aim. To evaluate balance changes in post-menopausal women with osteoporosis after application of Tai Chi exercise program.

Research methods and organization. Study included 13 post-menopausal women with osteoporosis. The average age was 74.2 years (the range of the age was 67 – 81 years), the average height was 158.6 cm, the average weight was 67.1 kg. Tai Chi exercise program lasted for eight weeks. Two, one-hour group training sessions were taught per week. Balance assessment was performed three times: before Tai Chi exercise program, after 4 weeks and after 8 weeks of application of Tai Chi exercise program. Balance measurements were conducted using platform „Sigma Balance Pad". Assessment included the following stages: 1) Calibration of the platform; 2) Information about the procedure and instructions how to act in case of balance loss; 3) Pilot testing of the balance without data recording; 4) Repeated calibration of the platform; 5) Testing of the balance with data recording. Assessment of the balance included two conditions: standing on both legs, eyes opened (60 s) and standing on both legs, eyes closed (30 s). Patient's safety was ensured during whole procedure. Balance evaluation was based on 6 objective indicators: average deviation X (cm), average deviation Y (cm), average velocity X (cm/s), average velocity Y (cm/s), path length (cm), area (cm²). Statistical analysis was conducted using SPSS 22.0. The non-parametric Friedman's test for K-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 deviation in X axis before Tai Chi exercise program was -0.04 cm (minimum value: -0.27 cm, maximum value: -0.01 cm), after 4 weeks it was -0.05 (minimum value: -0.24 cm, maximum value: 0.01 cm) and -0.01 cm (minimum value: -0.18 cm, maximum value: 0.02 cm) after 8 weeks of exercise and these changes was statistically significant ($p=0.028$) while the deviation in Y axis did not change significantly ($p=0.29$). Before application of the program velocity in X axis was 0.18 cm/s (minimum value: 0.13 cm/s, maximum value: 0.41 cm/s), after 4 weeks of training it was 0.17 cm/s (minimum value: 0.07 cm/s, maximum value: 0.29 cm/s) and 0.12 cm/s after 8 weeks (minimum value: 0.07 cm/s, maximum value: 0.24 cm/s) of Tai Chi program. The measured changes were statistically significant ($p=0.007$). The velocity in Y axis before training was 0.18 cm/s (minimum value: 0.14 cm/s, maximum value: 0.45 cm/s), after 4 weeks it was 0.19 cm/s (minimum value: 0.10 cm/s, maximum value: 0.30 cm/s) and 0.15 cm/s (minimum value: 0.05 cm/s, maximum value: 0.29

cm/s) after 8 weeks of program. These changes were statistically significant (p=0.009). After the assessment of balance, we found that path length was 18.05 cm (minimum value: 12.85 cm, maximum value: 36.15 cm) before Tai Chi program, 19.86 cm (minimum value: 10.08 cm, maximum value: 30.43 cm) after 4 weeks of training and 14.19 cm (minimum value: 4.35 cm, maximum value: 28.86 cm) after 8 weeks of Tai Chi and these changes were statistically significant (p=0.012). The measured balance area before application of program was 0.36 cm² (minimum value: 0.23 cm², maximum value: 2.20 cm²), after 4 weeks it was 0.26 cm² (minimum value: 0.10 cm², maximum value: 1.25 cm²) and after 8 weeks of Tai Chi exercises it was 0.14 cm² (minimum value: 0.26 cm², maximum value: 0.81 cm²). The measured changes were statistically significant (p=0.012). No statistically significant changes were found in balance assessment with eyes closed (p 0.05).

Conclusions. 1) The evaluation of balance with eyes opened in post-menopausal women with osteoporosis after Tai Chi exercise program showed statistically significant changes (p<0.05) while in eyes closed condition no significant changes were observed (p 0.05). 2) The assessment of balance with eyes opened showed that deviation in X axis, velocity in X and Y axes, path length in X and Y axes and balance area statistically significantly improved (p<0.05).

Reference list:

1. Rachner TD, Khosla S, Hofbauer LC. New Horizons in Osteoporosis. Lancet. 2011 Apr 9; 377(9773): 1276–1287.
2. Curtis EM, Moon RJ, Dennison EM, Harvey NC, Cooper C. Recent Advances in the Pathogenesis and Treatment of Osteoporosis. Clin Med (Lond). 2015 Dec;15 Suppl 6:s92-6.
3. Song QH, Zhang QH, Xu RM et al. Effect of Tai-chi exercise on lower limb muscle strength, bone mineral density and balance function of elderly women. Int J Clin Exp Med 2014;7:1569–76.
4. Wayne PM, Manor B, Novak V., et al. A systems biology approach to studying Tai Chi, physiological complexity and healthy aging: design and rationale of a pragmatic randomized controlled trial. Contemp Clin Trials. 2013;34(1):21–3.
5. Manor B, Lough M, Gagnon MM, et al. Functional benefits of tai chi training in senior housing facilities .J Am Geriatr Soc. 2014;62(8):1484–89.

Effects of performing abdominal hollowing and abdominal bracing exercises on abdominal muscle activity during curl-up exercise

Giedr Praškevi i t [1], Ieva Aleknait -Dambrauskien [1,2], Vilma Mauricien [1]
[1]Lithuanian University of Health Sciences, Medical Academy, Institute of Sports, [2]Kaunas University of Technology

Introduction. Effective maneuvers such as abdominal hollowing (AH) and abdominal bracing (AB) that increase trunk muscle activation before dynamic loading conditions are necessary for preventing injuries of the spine [1,2]. Although there are some studies analyzing AB and AH maneuvers in a different starting position [3,4] there were no studies found showing trunk muscle activity while performing these maneuvers during dynamic exercise such as curl-up exercise.

Research aim. The aim of this study was to investigate the effects of abdominal hollowing and abdominal bracing exercises on abdominal muscle activity during curl-up exercise.

Research methods and organization. This study was approved by the Bioethics Center of the Lithuanian University of Health Sciences. This study was performed in Kaunas University of Technology. Twenty young subjects, 10 males and 10 females (body mass index, 21.3 ± 2.3) whose ages ranged from 20 to 32 (age, 25.4 ± 2.9 years) participated in the study. None of them experienced musculoskeletal injury in the previous 12 months. The sites for electrode placement were prepared as in previous studies [5,6] Surface electrode pairs were placed on the muscles on the right side only, as left and right side EMG signal symetry has been demonstrated in core muscles during supine and prone position exercises [6]. EMG data were collected from rectus abdominis (RA), external oblique abdominis (OE) and internal oblique abdominis (OI) muscles. For normalization of the EMG data, a maximum voluntary isometric contraction (MVIC) was performed for each muscle and EMG amplitude recorded. Subjects were positioned in electromechanical dynamometer (Humac Norm; CSMI, Stoughton, MA). All participants were asked to perform trunk flexion and lateral trunk flexion to generate maximal EMG activity for each of three abdominal muscles. The EMG data of each muscle during curl-up were normalized as a percentage of MVC. All participants were instructed how to perform AH, AB and curl-up exercises correctly. EMG activity was recorded using recording device (Telemyo 900; Noraxon USA, Inc.) EMG signals were collected and processed using Noraxon MR 3.6 Software. The SPSS 22.0 computer program was used for data analysis. Descriptive results are presented as the mean SD. Non-parametric Wilcoxon test was used to compare two related samples.

Results. In the starting position of curl-up exercise %MVC of RA muscle was significantly higher while performing AB maneuver (31.0 ± 38.4) than AH (13.5 ± 10.4) (p<0.05). There was no statistically significant difference (p≥0.05) between these two maneuvers in OE and OI muscles activity. During hollowing %MVC of OE was 17.0 ± 12.6 and %MVC of OI - 46.9 ± 31.6 , during AB %MVC of OE was 27.3 ± 17.8 and %MVC of OI was 38.1 ± 25.7. In the up (lifting) phase %MVC of RA muscle was significantly higher while performing AB maneuver (95.2 ± 65.4) than AH (66.6 ± 35.1), p<0.05. In this phase there was no significant difference between AH (40.8 ± 19.6) and AB (47.6 ± 20.3) maneuvers in %MVC of OE muscles, p≥0.05. %MVC of OI muscles was significantly higher during AH maneuver than AB (107.8 ± 70.7 and 81.0 ± 51.8), p<0.05. In the down (landing) phase %MVC of RA muscles while performing AH maneuver was significantly lower than performing AB maneuver (45.2 ± 31.9 %MVC and 62.6 ± 40.9 %MVC), p<0.05. There was no statistically significant difference between these two maneuvers in %MVC of OE muscles, p≥0.05. During AH maneuver %MVC of OE was 30.1 ± 14.9, during AB maneuver – 30.1 ± 14.9. In this phase the %MVC of OI muscles was significantly higher while performing AH maneuver than AB maneuver (73.9 ± 55.2 and 53.1 ± 35.0), p<0.05.

Conclusions. In all the phases of curl-up exercise the highest %MVC of RA muscles were while performing bracing maneuver (p<0.05). The %MVC of OI muscles were higher while performing hollowing maneuver in lifting and landing phases of curl-up exercise (p<0.05). We found no statistically significant difference in %MVC of OE muscles between these two maneuvers in all the

phases (p≥0.05).

Reference list:

1. Ishida H., Suehiro T, Kurozumi Ch, Watanabe S. Comparison between the effectiveness of expiration and abdominal bracing maneuvers in maintaining spinal stability following sudden trunk loading. Journal of Electromyography and Kinesiology 2016;26:125–129.

2. Vera-Garcia FJ, Elvira JL, Brown SH, McGill SM. Effects of abdominal stabilization maneuvers on the control of spine motion and stability against sudden trunk perturbations. Journal of Electromyography and Kinesiology 2007;17(5):556–67.

3. Chanthapetch P, Kanlayanaphotporn R, Gaogasigam Ch, Chiradejnant A. Abdominal muscle activity during abdominal hollowing in four starting positions. Manual Therapy 2009;14:642–646.

4. Maeo S, Takumi Takahashi T, Takai Y, Kanehisa H. Trunk muscle activities during abdominal bracing: comparison among muscles and exercises. Journal of Sports Science and Medicine. 2013;12, 467-474.

5. Escamilla RF, Babb E, DeWitt R, et al. Electromyographic analysis of traditional and nontraditional abdominal exercises: implications for rehabilitation and training. Physical Therapy. 2006;86:656-671.

6. Kippers JKV, Richardson CA. Muscle fibre orientation of abdominal muscles and suggested surface EMG electrode positions. Electroencephalography and Clinical Neurophysiology. 1998;38:51-58.

Physical therapy increases arm muscle strength and motion accuracy in patients with Parkinson's disease

Saul Sipavi ien [1], Irina Klizien ©[2,3], Mindaugas Pliuskis[1], Audron Astrauskien [2], Jovita Vilkien [2], Šar nas Klizas[4]

[1]*Lithuanian Sports University, Department of Applied Biology and Rehabilitation,* [2]*Kaunas University of Technology, Department of Education Sciences,* [3]*Kaunas University of Technology, Sport Centre,* [4]*Lithuanian University of Health Sciences, Department of Health Psychology*

Introduction. Parkinson's disease (PD) is a chronic, progressive neurodegenerative disorder characterized by bradykinesia, tremor, rigidity, postural instability and muscle weakness [1]. PD is thought to be caused by the death of dopaminergic neurons in the substantia nigra of the basal ganglia. Currently 1% of people older than 60 years, and 4% of people older than 80 years suffer from PD and the risk increases in proportion with age [2,3].

Research aim. The purpose of the present study was to develop an 8-week program, performed with an isokinetic dynamometer, and evaluate its impact on arm muscle strength and accuracy of movement in patients with Parkinson's disease.

Research methods and organization. The study involved 20 subjects. The experimental group (EG) consisted of 11 men with Parkinson's disease (stage II of the disease according to the modified Hoehn and Yahr scale) age 79.3 ± 6.0, height 173.7 ± 5.7 cm and weight 77.2 ± 8.1 kg, while the control group (CG) comprised nine healthy men, age 77.9 ± 1.0, height 169.8 ± 8.8 cm and weight 83.4 ± 6.4 kg. The program with the isokinetic dynamometer "Biodex Medical System PRO 3" (certified ISO 9001 EN 46001) was applied twice a week for 8 weeks in both test groups. Over an 8-week testing

period (testing twice per week, a total of 16 tests), subjects performed test exercises. Test I: five arm flexion and extension movements repeated three times (with a 1 min resting interval) at a velocity of 180°/s in isokinetic mode. The flexor and extensor muscle strength in both arms was measured. Test II: five arm flexion and extension movements repeated three times (with a 1 min resting interval) at a velocity of 60°/s in isokinetic mode. This measured flexor and extensor muscle strength in both arms. Test III: individual maximal isometric strength in each arm was measured. The subjects had to maintain maximum arm strength over 30s in isometric mode. The fatigue index of the arm muscle was evaluated. Arm muscle fatigue index = strength after 30s of primary strength. Test IV: the subjects had to maintain 20% of their individual arm maximal isometric strength as closely as possible for 30s (the subjects were able to observe their power curve in the monitor). The accuracy of arm motion was evaluated over two time intervals: from 15 to 20s, and from 20 to 25s. The subjects performed five arm movements three times at 180°/s velocity and five arm movements three times at 60°/s velocity in isokinetic mode. Each time the subjects had to maintain maximum arm strength over 30s in isometric mode. They then had to maintain 20% of their individual arm maximal isometric strength for 30s as closely as possible. Data analysis was performed using SPSS version 22.0 software (IBM Corp., Armonk, NY, USA). The normality of the data was evaluated using the Shapiro–Wilk test. Data were analyzed by analysis of variance, and homogeneity of variances was tested using the Levene test. Differences between means were tested by the post-hoc Bonferroni criterion. The level of significance was $p < 0.05$.

Results. After the experiment, the arm extensor muscle strength (at 180°/s of angular velocity) increase ($P<0.05$) compared with the initial results: CG 53.3 ± 15.5% (right), 50.6 ± 18.0% (left) and EG 55.2 ± 13.5% (right), 57.5 ± 11.7% (left). The arm flexor muscle strength (at 180°/s of angular velocity) also showed increase ($P <0.05$) compared with the initial results: CG 46.6 ± 18.4% (right), 66.2 ± 18.2% (left) and EG 49, 2 ± 7.0% (right), 50.2 ± 8.3% (left) ($P <0.05$). Over the time interval from 15 to 20s the variability of motion decreased, with CG values of 39.9 ± 12.1% (right), 51.0 ± 13.9% (left) and EG 9.2 ± 4.7% (right), 14.3± 2.4 % (left). Over the time interval from 20 to 25s the variability decreased: CG 40.6 ± 11.2% (right), 49.8 ± 12.3% (left) and EG 20.9 ± 4.3% (right), 17.9 ± 3.8% (left).

Conclusions. An eight-week exercise program performed using an isokinetic dynamometer increased arm muscle strength and movement accuracy in people with Parkinson's disease.

Reference list:
1. Earhart GM, Falvo MJ (2013) Parkinson disease and exercise. Compr Physiol, 3, 833–848.
2. Borrione P, Tranchita E, Sansone P, Parisi A (2014) Effects of physical activity in Parkinson's disease: A new tool for rehabilitation. World J Methodol, 26, 133-143.
3. Schenkman M, Hall DA, Barón AE, Schwartz RS, Mettler P, Kohrt WM (2012) Exercise for people in early- or mid-stage Parkinson disease: a 16-month randomized controlled trial. Phys Ther, 92, 1395–1410.

Detection of pain topology during incremental exhausting cycling

Agn Slapšinskait [1], Natàlia Balagué[1], Robert Hristovski[2], Selen Razon[3]
[1]*Complex Systems in Sport Research Group, INEFC Barcelona University,* [2]*Univ. St. Cyril and Methodius, Macedonia,* [3]*West Chester University, USA*

Introduction. In the course of endurance activities, individuals experience exertive pain- the injury-free pain form [1,2]. The presence of pain per se attracts attention on the bodily regions [3]. Although pain is universally recognized perception, it is unknown how local pain dynamics and different pain patterns influence endurance activities. On the other hand, perception of pain and attention to pain seem to be interrelated through hierarchical dynamical processes showed through data modeling [4].

Research aim. The purpose of the present study was to unravel pain topology during incremental cycling performed until volitional exhaustion and detect a potential nested metastable dynamics.

Research methods and organization. Following a 2min rest period, participants performed a progressive incremental test on a cycle ergometer (Sport Excalibur 925900) with saddle and handlebar specifications adjusted to their preference. For the purposes of the test, they were instructed to pedal at 60rpm with an initial load of 30W and increases of 25W/min for female and 30W/min for male, until they could no longer maintain the pedaling rate for 5 consecutive seconds while in the sitting position. Participants performed the test with no verbal communication except for indicating bodily locations with pain after the researcher's prompts. Using the body map, every 15s during exercise, participants reported bodily regions with discomfort and pain. All the locations for each participant were transformed to binary vectors, where 1 means presence of discomfort and/or pain, and 0 – no discomfort or pain, in order to obtain the time series with topological configuration of the perceived discomfort and/or pain areas while performing the constant cycling and running tasks. The null hypothesis of a constant median (with no significant differences) over time was tested using non-parametric repeated-measures Friedman ANOVA. Effect sizes (Cohen's d) were computed to demonstrate the magnitude of standardized differences in medians where effect sizes neared $p < 0.05$ level.

Results. During incremental cycling, the reached maximal load corresponded to $228 \pm 17W$ and $240 \pm 30W$ for females and males, respectively. The Friedman ANOVA revealed a significant effect of time for the total number of locations with discomfort and pain, 2 (15, 4) = 49.249, $p < 0.001$, during the incremental cycling test. The number of locations resulted in a significant difference between temporal windows: 1st vs. 3rd time intervals, $Z = -2.97$; $p < 0.05$, $d = 1.59$, 95% CI [0.65, 2.04]); 3rd vs 5th time intervals, $Z = -3.26$; $p < 0.05$, $d = 0.81$, 95% CI [-0.35, 1.73]), and 1st vs 5th time intervals, $Z = -2.17$; $p < 0.05$, $d = 2.27$, 95% CI [1.11, 2.74]). The number of locations and the probability of experiencing discomfort and pain at select locations increased during the test until reaching 4.26 ± 0.59 in the 5th temporal window. The dominant locations with discomfort and pain at exhaustion included left and right quadriceps, lower back and left ankle. Both the waxing and waning experience of pain were also identified. Exertive pain exhibited metastable dynamics, dwelling around select bodily regions for some time to transient into another one quickly after. Pain within physical exercise was distributed in

different amount of locations, for instance, less when 3 locations were felt by 7% participants while 27% reported more when 10 locations as being painful. A total of 37 different areas were reported and marked as painful for all participants throughout the cycling test. Finally, three individual and consistent dynamic patterns of discomfort and pain emerged during cycling and running: adder (e.g., adding pain locations throughout effort), jumper (switching among pain locations throughout effort), and adder-jumper (e.g., adding and switching among pain locations throughout effort).

Conclusions. Our findings advance the understanding of generated sequential switching dynamics and further support the view that human brain is intrinsically organized into active, mutually interacting complex and nested functional networks. Considering understanding individual-specific patterns of perceived pain (adder, jumper and adder-jumper) can allow practitioners to train for improved skills to help control pain or to shift their attention from one pain location to another.

Reference list:

1. Kress, J, & Statler T. A naturalistic investigation of former Olympic cyclists' cognitive strategies for coping with exertion pain during performance. J Sport Behav. 2007;30(4):428–52.
2. Slapsinskaite A, Razon S, Balagué Serre N, Hristovski R, Tenenbaum G. Local Pain Dynamics during Constant Exhaustive Exercise. PLoS One [Internet]. 2015;10(9):e0137895. Available from: http://dx.plos.org/10.1371/journal.pone.0137895
3. Wiech K, Ploner M, Tracey I. Neurocognitive aspects of pain perception. Trends Cogn Sci. 2008;12(8):306–13.
4. Rabinovich MI, Tristan I, Varona P. Hierarchical nonlinear dynamics of human attention. Neurosci Biobehav Rev [Internet]. Elsevier Ltd; 2015;55:18–35. Available from: http://dx.doi.org/10.1016/j.neubiorev.2015.04.001

POSTER PRESENTATIONS SESSION

Computer-based cognitive training program effect on memory and independence in patient after stroke

Daiva Baltaduonien [1]**, Raimondas Kubilius**[1]**, Viktorija Repšait** [2]

[1]*Lithuanian University of Health Sciences, Rehabilitation Department,* [2]*Lithuanian University of Health Sciences, Institute of Sports*

Introduction. Stroke is a leading cause of death and a source of persistent disability around the world [1]. Stroke affects the cognitive domain. Memory is important in various situations, especially those that require the simultaneous holding and manipulation of information or complex reasoning. One proposed method for optimizing the effects of therapy is the use of computerized cognitive rehabilitation training.

Research aim. The purpose of this study was to evaluate the effects of computerized cognitive rehabilitation training program on memory and independence for patients after stroke.

Research methods and organization. The study was designed as a randomized trial. 49 patients after ischemic stroke participated in the study. Before the study, patients were randomly divided into two groups: control group (CG) and study group (SG). In the control group were 26 patients (53.06 percent), of those 61.5 percent men and 38.5 percent women. In the study group - 23 patients (46.94 percent; men – 41.7 percent, women – 58.3 percent). The mean age of the patients in CG was 77.4 years (SD, 7.4; range, 61-89) or in SG – 70.48 years (SD, 11.48; range, 54-93). The control group patients were given a standardized rehabilitation program tailored to the individual usual occupational therapy (5 times per week). The study group patients besides the usual standardized occupational therapy (2 times/week) had the occupational therapy based on the computerized cognitive rehabilitation training program (PssCogRehab 2012, USA) (3 times/week). The computerized cognitive rehabilitation training program has been used in a variety exercise for memory, problem solving, attention, visual spatial. The duration of the session - 45 min. Rehabilitation time - 32 days. In addition, during the rehabilitation the patients were subject to the same amount of physical therapy, physiotherapy procedures, social worker's and psychological counseling. The methods of the study were the following: The Montreal Cognitive Assessment (MoCA) for cognitive function, Functional Independence Measure (FIM) for activity in daily life. Tests were conducted before the rehabilitation and after 32 days of rehabilitation. Statistical data analysis was performed using IBM SPSS Statistics 22.0 program. The comparison of two independent samples was carried out by using the non-parametric Mann-Whitney test. The comparison of two dependent samples was carried out by using the non-parametric Wilcoxon test. The quantitative results are presented as median (xme), minimum (xmin), maximum (xmax) value and mean (x) – xme (xmin - xmax; x), qualitative – percent. The difference was considered to be statistically significant when $p < 0.05$.

Results. Before the research MoCA test score in the control group was 16(11-26; 18.05) points, and after research - 21(9-27; 20.38) points. The cognitive functions of control group significantly improved after the research (U=-2.60; p=0.009). In the study group, MoCA test score before research was 17(7-27; 17.82) points, and after research - 24(14-29; 22.41) points. The cognitive functions of study group also significantly improved (U=-3.90; p<0.001). After research, the mean total MoCA test score increased statistically significantly in both groups (p<0.05). A statistically significantly greater (U=-2.36; p=0.18) change between the groups was observed in the study group. Evaluated memory by MoCA test results of control group before research was 0(0-5; 1.33) point after the research 2(0-5; 2.14) points. We found out that the memory of control group after standardized rehabilitation program significantly improved (U=-2.56; p=0.01). The study group the memory MoCA test results before the research was 0(0-4; 1.05) point and after the research 2(0-5; 2.50) points. We found out that the memory of the study group also significantly improved (U=-3.37; p=0.01). We found no statistically significant differences between the groups, but we observed a trend showing greater change for the memory task in the study group than in the control group (U=-1.48; p=0.139). Before research the total FIM score in the control group was 79(72-97; 81.67) points and after the research - 107(92-120; 106.14) points (U=-4.02; p<0.001). In the study group before the research the total FIM score was 81(65-91; 80.82) points and after the research – 107.5(94-121; 108.5) points (U=-4.11; p<0.001). The evaluation of total FIM score in the control and the study groups before and after the research revealed

no statistically significant differences, but there was a trend showing greater independence levels changes in the study group (U=-1.62; p=0.116).

Conclusions. Both patients groups improved memory and independence after occupational therapy sessions, but the patients who used computer-based cognitive training program along occupational therapy sessions recovered their memory and independence more effectively than their counterparts after standardized rehabilitation program.

Reference list:
1. Jaracz K, Grabowska-Fudala B., Kozubski W: Caregiver burden after stroke: towards a structural model. Neurologia i Neurochirurgia Polska 2012, 46(3): 224–32.

Concatenation between cardiovascular parameters during low intensity of exercising at constantly changing conditions

Gilija Bernotien [1], Deivydas Veli ka[1], Kristina Poderien [2], Alfonsas Vainoras[1], Jonas Poderys[2]
[1]Lithuanian University of Health Sciences, [2]Lithuanian Sports University

Introduction. Cardiovascular system is a vital body system and plays an important role in long-term adaptation to workloads. There are relatively small cardiovascular changes at onset of low intensity exercising and thus could be a good situation to vary by exercising tasks and compare dynamical concatenation between cardiovascular parameters. A lot of studies have showed the Differential Training (DT) is more effective than the traditional training based on repetition at constant conditions.

Research aim. The aim of this study was to compare the changes in dynamical concatenation during the DT tasks between ECG parameters what according to the integral model represents the metabolic changes in myocardium and commands of systemic or organ level.

Research methods and organization. 13 healthy adult male volunteers take part in this study. After adaptation to the laboratory environmental all participants performed two balance tests by standing on LIBRA balance board. The first balance task was without additional disturbances and during the second balance task the participant was asked to perform squats, i.e. this task while each next squat should be performed at constantly changing conditions, what means this situation was more close to the methodology of DT. The continuous 12-lead ECG registration was done before and after each balance task. Continuous ECG registration during both balance tests and during the rest was 3 minutes. In this study the changeable parametric interactions and its dynamics during exercise tasks ECG parameters monitoring and its data sequences analysis based on mathematical method founded upon matrix theory were applied (1). According to the model of integral evaluation of body functioning during exercising (2) the concatenation between ECG parameters representing commands of systemic level (RR intervals) commands of organ level (QRS) and metabolic changes in myocardium (JT intervals) were taken for calculations of discriminants, i.e. $D_{RR/QRS}$; $D_{RR/JT}$ and $D_{QRS/JT}$.

Results. The results of this study was analysed on the statement that the complexity of dynamic system decreases with the loss of parametric independence (3). Some studies (4) showed that the

increase of concatenation between cardiovascular indices starts at the onset of exercising. This type of changes can be observed during some stages of workload but reaching some functional state (fatigue) the increase of concatenation changed in an opposite direction, i.e. the decrease or loss of these concatenation leads to inability to continue exercising.

Results obtained during the study showed that there was no a drastic differences between the values of registered ECG parameters while performing both balance tests by standing on LIBRA balance board. The values of RR intervals were 0.93 ± 0.04 s – before exercising; 0.85 ± 0.03 s – during the first and 0.69 ± 0.02 s – during the second exercise tasks. The results obtained during this study showed that even low intensity of exercising at constantly changing conditions trigger some changes between cardiovascular parameters. The increase of concatenation between systemic and organ level of commands while exercising was observed ($D_{RR/QRS}$ was 0.24 ± 0.01 – before exercising and $DRR_{/QRS}$ was 0.14 ± 0.01 and 0.16 ± 0.01 – during the first and second balance tasks). There was no significant changes in concatenation between parameters representing peripheral (organ) regulatory commands and metabolic changes (the initial values of $D_{QRS/JT}$ was 0.28 ± 0.01; during the first balance task 0.27 ± 0.01 and 0.25 ± 0.01 – during the second task). The concatenation between systemic regulatory commands and metabolic changes significantly ($0<0.05$) decreased. We should point that the increase of complication of the motor task lead to more expressed decrease of this concatenation, i.e. $D_{RR/JT}$ – 0.13 ± 0.05 while performing the first balance task and $D_{RR/JT}$ was 0.16 ± 0.06 while performing the second balance task, i.e. the squats at constantly changing conditions.

Conclusions. The results obtained during this study allows to discuss about the hypothesis that decrease of concatenation between systemic regulatory commands and metabolic changes could be one of possible chain that's activating and enhancing the efficiency of long-term adaptation at conditions of DT.

Reference list:
1. Bikul ien , L., Navickas, Z., Vainoras, A., Poderys, J., Ruseckas, R. (2009). Matrix Analysis of Human Physiologic Data // *Proceedings of International Conference on Information Technology Interfaces*. – University of Zagreb – P. 41–46.

2. Vainoras, A. (2002). Functional model of human organism reaction to load – evaluation of sportsman training effect. *Education, Physical Training, Sport*, 3, 88–93.

3. Costa M. D., Peng C.K., Goldberger A. L. Multiscale Analysis of Heart Rate Dynamics: Entropy and Time Irreversibility Measures. Cardiovascular Engineering, 2008; V.8, 88-93.

4. Poderys J., Bikul ien L., Trink nas E., et al.Matrix analysis of ECG parameters may be a way to improve quality of functional state monitoring during exercising. Baltic_Journal_of_Sport and Health Sciences, 2015; (5), 39–45.

Effect of 2-10 Hz low frequency vibration on human blood flow in the feet

Lauryna Gailiūnien[1], Mantas Venslauskas[2], Gražina Krutulyt[1]
[1]Lithuanian University of Health Sciences, [2]Kaunas University of Technology

Introduction. Vibration induces physiological effects that are strongly influenced by parameters such as the frequency, amplitude, duration of vibration, and the direction of exposure [3]. Whole body vibration receives attention in regards to its characteristic of being able to alter the peripheral circulation without significantly stressing the cardiovascular system [2]. Conversely, low frequency vibration used as a training tool appears to increase muscle strength, but little is known about its effects on peripheral circulation [1].

Research aim. To determine the effect of 2–10 Hz low frequency vibration on human blood flow in the feet.

Research methods and organisation. Participants: fifteen 20-25-year-old healthy young men, who are not involved in any sports activities in their daily lives. Methods: infrared thermography has been used to determine temperature variations on the surface of the feet. The temperatures on the surface of chosen feet were recorded before, immediately after, as well as 5, 10 and 15 minutes after low frequency vibration therapy (30mins). Tools used in the research: a vibration machine which includes, following a patent, a frameset, a lying position human body support surface, a restraint for adjusting the angle between the upper body or at least a part of the upper body and the support surface, adjustable leg support, and an oscillator. 1-10 Hz frequency vibration generated by the machine creates a sufficient amount of force to cause the required displacement of the limbs. Thermovision: a thermal camera (FLIR SC7500) is a very flexible camera with the highest levels of sensitivity, accuracy, spatial resolution and speed. The thermal camera was orthogonal to the body part and was positioned approximately 1 m away from the skin surface. Statistical methods: the Kruskal – Wallis test was used for statistical analysis.

Results. 1. Toe temperature measurement results: at the beginning of investigation, the toe temperature was 19 degrees. After vibration was applied, the toe temperature increased to 19.3 degrees. 5 minutes later, the toe temperature increased to a statistically significant level of 19.5 degrees ($p<0.05$). 10 minutes later, the toe temperature started to decrease statistically significantly to 19.4 degrees, and 15 minutes later, dropped to 19.3 degrees compared with the results after 5 minutes when vibration was applied ($p<0.05$). 2. Foot arch temperature measurement results: at the beginning of investigation, the foot arch temperature was 26 degrees. After vibration was applied, the foot temperature increased to a statistically significant level of 26.5 degrees ($p<0.05$). 5 minutes later, the foot temperature decreased to 26.3 degrees. 10 minutes later, the temperature increased to 26.4 degrees. 15 minutes later, the temperature dropped to 25.9 degrees.

Conclusions: 1. After 5 minutes of vibration, the toe temperature started to increase ($p<0.05$). 2. 10 minutes later, the toe temperature started to decrease ($p<0.05$). 3. The foot temperature increased immediately after vibration ($p<0.05$). 4. 2-10 Hz low frequency vibration have a positive effect on human blood flow in the feet.

References:
1. Kerschan – Schindi K., Grampp S., Henk C., Resch H., Preisinger E., Fialka-Moster V. Whole-body vibration exercise leads to alterations in muscle blood volume. Clinical physiology. 2001; 21(3):377-82.
2. Lohman III E.B., Sackiriyas S.B., Bains G.S., Calandra G., Lobo C., Nakhro D., et al. A comparison of whole body vibration and moist heat on lower extremity skin temperature and skin blood flow in healthy older individuals. Medical science Monitoring. 2012;18(7):415-424.
3. Sonza A., Robinson C.C., Achaval M., Zaro M.A. Whole body vibration at different exposure frequencies: infrared thermography and physiological effects. The Scientific World Journal. 2015; 452657:1-11.

The influence of specialized training programme on rugby players scapular stability and shoulder injury risk reduction

Dainius Grigali nas, Vytautas Poškaitis, Vidmantas Zaveckas
Lithuanian University of Health Sciences

Introduction. Rugby football continues to grow in popularity internationally and within the United States [2]. Upper limb injuries, incorporating the shoulder to fingers, have been reported to account for between 14% and 28% of all rugby injuries and to be more severe and associated with the longest absence from competition compared with other injuries. To date, there has been little research with a focus on upper limb injury incidence and associated risk factors in rugby union football [3].

Research aim. The aim of this study is to evaluate the influence of specialized training program on professional rugby players scapular stability and shoulder injury risk reduction.

Research methods and organization. 30 men, professional rugby players were included in this study, first group who were made as a study group participants mean (±SD) age was 19.27 (±0.96) years and control group participants mean (±SD) age was 19.20 (±1.01), 1st group height was 186.73 (±3.49) cm, while 2nd group height was 186 (±4.34), 1st group mass was 96,47 (±6,51) kg while 2nd group mass was 95.20 (±8.04) kg. Inclusion criteria: men, rugby playing experience more than 5 years, history of low or moderate shoulder pain. All participants were verbally informed about the research and signed the informed consent form. Ethical approval was obtained from the Lithuanian University of Health Sciences ethics committee. Study participants have received two questionnaires about their shoulder joint functioning (Penn shoulder score, Dr. Hutton shoulder score – in these questionnaires there was a VAS (visual analogue scale of pain) which was measured before and after the research. Also, before and after the research participants were tested by Y dynamic balance test for upper limb and its modification test, closed kinetic chain upper extremity stability test and lateral scapular slide test before and after the specialized training program was implemented. The modification of Y balance test was recorded by digital camera in order to capture the scapular motions during the test performance. 15 professional rugby players were randomly assigned to do the specialized training program while the others 15 were doing usual trainer's given program for 3 months. Specialized training program was specially made of the exercises which strengthens the main scapular stabilizing muscles (upper, middle and lower trapezius and serratus anterior) and also, while doing these exercises

researchers were helping to keep the correct scapular position, in every session researchers were looking at the exercises phases if they are correctly done. Usual trainer's given program was made of usual strengthening exercises for the upper body and the participants were only instructed about the exercises before doing it. Before all the trials, participants were informed verbally how to perform the tests and were given an attempts to try the test before the results were counted. Between every repetition, participants were able to rest for 30 seconds to avoid the fatigue impact on the results. Training program lasted for 3 months, 3 times per week. Statistical methods. Data were analyzed using SPPS 23.0. To compare two independent samples Mann-Whitney test was used. To compare two related samples, Wilcoxon test was used. Data level for statistical significance was set at $p < 0.05$.

Results. Before the training programs were done, Y balance test for upper limb composite scores results between groups were not statistically different/significant (p 0.05). In the first group, before the training program was implemented median of Y balance test for upper limb composite scores results of the right hand was 87.5 (86.3-89; 87.5) and after the specialized training program was done, median was 88.1 (87.7-89.2; 88.3). We found statistically significant better results after the specialized training program in the first group ($p<0.05$). In the first group, before the training program was implemented median of Y balance test for upper limb composite scores results of the left hand was 86.3 (84.4-88.5; 86.66) and after the specialized training program was done, median was 87.3 (85.9-89.3; 87.69). Also, we found statistically significant better results after the specialized training program in the first group ($p<0.05$). Moreover, in the control group, who has done the usual trainer's given program, before the program was done, median of Y balance test composite scores results of the right hand was 87.6 (86.2-89.9; 87.63) and after trainer's given program was done, median was 87.9 (86.4-89.5; 87.78). Also, before the program was done, median of Y balance test composite scores results of the left hand was 85.9 (85-87.5; 86.14) and after trainer's given program was done, median was 86.3 (84.8-88.3; 86.36). We found no statistically significant results after the program implementation in Y balance at both hands composite scores results (p 0.05). Also, we found that in the first group before doing the specialized training program median was 30 (30-33; 30,67) times and after the implementation of specialized training program median was 34,6 (33-37; 34,97) times in the closed kinetic chain upper extremity stability test (CKCUEST), results were statistically significant better ($p<0.05$) when comparing with the control group. In the first group, before the implementation of the specialized program median was 4 (4-5; 4.33) and after the program was done median was 1 (0-3; 0.93). In the second group, before the implementation of the usual trainer program median was 4 (4-5; 4.33) and after the program was done median was 2 (1-5; 2.73). We found statistically significant reduction of pain by visual analogue scale (VAS) in both groups ($p>0.05$).

Conclusions. Training of the scapular stabilizing muscles have positive effect for improvements of CKCUEST and Y balance test for upper limb composite scores results. Pain reduction of the shoulder joint was obtained after both programs were made.

Reference list:
1. Gray J. Preventative rehabilitation for rugby injuries to the shoulder complex – evidence-based literature review. 2009 [online]. Prieiga per internet :
http://www.sarugby.co.za/boksmart/pdf/BokSmart%20%20Shoulder%20Injury%20Prevention%20Review%20 Article.pdf. [ži r ta: 2015 gruodžio 18].

2. Kaplan KM, Goodwillie A, Strauss EJ, et al. Rugby injuries: a review of concepts and current literature. Bull NYU Hosp Jt Dis 2008; 66:86–93.
3. Usman J, McIntosh AS. Upper limb injury in rugby union football: results of a cohort study. Br J Sports Med 2013; 47:374–379.

Research of the specialized training program effect for gymnasts lower back pain, activeness of the deep body's muscle activation and motion control in the lumbar-pelvic region

Aura Kilinskait , Vytautas Poškaitis
Lithuanian University of Health Sciences

Introduction. Lower back pain – one of the most common reasons that affects working age people, their quality of life and work abilities (2). Due the little attention paid to the children in earlier generations, research about value of back muscle exercises is not observed, meaning there is a missing proof about their value to the health. It is believed that an early application of stabilizing exercises for children, whose bodies are yet developing, may have a greater importance rather than applied to the adults (1).

Research aim. Evaluate the impact of specialized training programs for girls engaged in sports, artistic and aerobic gymnastics, lower back pain, deep body muscle activation and lumbar - pelvic movements control.

Research methods and organization. The study was carried out at Kaunas Centre sports school. The study involved 39 girls aged 10 to 17, who have or had a lower back pain, for more than for 4 days and used no medication to control the pain. The girls were divided into four groups and different gymnastic branches: engaged in sports gymnastics (n = 10), artistic gymnastics (n = 10) and aerobic gymnastics (n = 10). There was also a control group assigned to all the branches (n = 9). The study followed test methods: survey ("duration of back pain questionnaire", "Beacke everyday physical activity questionnaire", "Roland - Morris functional disability questionnaire" and pain scale (SAS)), static body - pelvic stability and deep body muscle activation assessment using "Stabilizer" waist - pelvic movements governance rating 6 tests set by Hannu Luomajoki "Movement control test"), back, stomach and side body muscles strength endurance evaluation of static tests carried out. Measurements were taken twice, before and after the research. Specialized training program has been applied to three tests groups of 35 to 40 minutes, 3 times/week, 18 times.

Specialized training program consisted of three parts:

The introductory part - used breathing exercises, general physical education exercises (5 - 10 minutes);

In the main part - 6 specialized exercises (15 - 20 minutes);

The final part - breathing and relaxation exercises (5 - 10 min.) were performed.

For statistical calculations IBM SPSS v 19 software package was used. Two non-parametric dependent values were compared using Wilcoxon test and binary dependent values were compared using

McNemar's test. Independent qualitative sizes were compared using Fisher Exact criteria, quantitative not parametric Kruskal Wallis H. Qualitative data like percentage, not parametric quantitative data median. $P < 0.05$ was considered statistically significant.

Results. An average age of participants was 12.6 years (median 12.5 years), comparing to the gymnastics groups, statistically significant difference was not found ($P > 0.05$).

Pelvis muscle static endurance median before training session was AG, MG, SG, KG in groups were as follows: 118; 165; 230; 144s ($p = 0.017$); Back muscle static endurance: 170; 212; 167; 140 ms ($p=0.018$), right side static endurance: 93; 101; 108; 80 ms ($p = 0.0195$), Left side static endurance: 75; 103; 107; 83 ms ($p = 0.0195$), Difference between pelvis and back: 31; 80; 55; 27 ms ($p = 0.119$), difference between right and left sides: 4; 6; 10; 7 ms ($p = 0.801$).

After the specialized training, analysing all performers, a statistically significant ($p < 0.05$) change was noticed, "Stabilizer I - II" correct performance and results in position on all fours. The initial measurements 45.0 percent study ($n = 18$) had "Stabilizer I" correct position after training 55 percent ($n = 22$) ($p = 0.08$). "Stabilizer II" correct performance results percent between the percentage of subjects arose from 52.5 percent ($n = 23$), up to 70 percent, ($n = 28$) ($p = 0.06$). In position number four the results were also significantly improved by 20 percent of all study objects ($p = 0.08$). Statistically significant ($p < 0.05$) improvement in abdominal static patience results: examination results median before training 166s, 172s after exercises ($p = 0.01$). Also decreased belly and back static endurance difference from 50 seconds to 36 seconds, Wilcoxon $p < 0.001$. Statistically significantly improved were both, left and right sides of the static endurance, median respectively: from 97 to 99 seconds. ($p = 0.03$) and from 98 to 100 seconds ($p = 0.02$). Analysing static endurances before and after the training results in groups, aerobic gymnastics group had a statistically significant improvement ($p = 0.018$) and the difference between the abdomen and the back static endurance ($p = 0.043$). Before the training session, all participants from free callisthenics had the best back muscle endurance parameters, whereas participants from Artistic gymnastics had the best pelvic muscle endurance parameters. Other endurance parameters before specialized training sessions, between groups, showed no significant difference.

Artistic gymnastics groups had a statistically significant difference between the abdominal and back static muscles endurance (median: from 80.0 to 64.0, $p = 0.08$; 55.0 to 32.0, $p = 0.015$) Comparing the results of study groups before and after exercises, endurance results static significant different abdominal, back of the left and the right sides of the endurance results.

Conclusions. All tested athletes had back pain. The study used a specialized training program which has helped athletes to reduce a back pain restricted difficulties (Roland - Morris questionnaire to stand straight, the need to build a waist to more comfortable posture and so on). After the specialized training programme, there was a statistically significant improvement of muscle endurance. However, due to a small improvement of some of the parameters (e.g. left and right sides of participants, endurance median showed a change of a few seconds) it is recommended to continue doing exercises and carry on the experiment for a bigger positive practical improvement.

Reference list:

1. Black LI, Clarke TC, Barnes PM, Stussman BJ, Nahin RL. Use of complementary health approaches among children aged 4–17 years in the United States: National Health Interview Survey, 2007–2012. National health statistics reports. 2015 Feb 10(78):1.
2. Maher C, Underwood M, Buchbinder R. Non-specific low back pain. The Lancet. 2016 Oct 11.

Young and middle – aged women heart rate dynamics during group aerobic training

Ingrida Lileikyt , Alg Daunoravi ien , Margarita Radži nien
Lithuanian University of Health Sciences

Introduction. Effect of physical activity to people of various ages, proven by science research, leaves no doubt [1; 2]. Quite often too much desire to achieve expected result is observed. Overrating of physical capabilities not only gives no benefit but contrary – increases risk of injuries and health disorders [3]. The use of modern technology in order to record heart rate during physical activity allows to assess specifics of organism's adaptation and the intensity of physical activity.

Research aim. Determine young and middle – aged women heart rate dynamics during group aerobic training.

Research methods and organization. Our study involved 20 women. Women were divided into two groups: the group of young women (n=12), age 21.7±1.6 years, and the group of middle – aged women (n=8), age 50±6.3 years. Young women BMI was 23.1±2.3 kg/m^2, middle – aged women – 23.8±1.9 kg/m^2. The participants were selected according to the criteria: not diagnosed with heart problems, positively assesses the state of one's health and does not have serious complaints about their health, normal BMI (18.5- 24.9 kg/m^2), attended aerobic workouts at least 6 months, attended to physical activity training at least 10 times, Physical Activity Readiness Questionnaire (PAR-Q) responses all negative. If at least one question is answered "yes", it is recommended to consult a doctor.

Aerobic training were run two times a week, one hour each time. Training consisted of four phases: 1) the warm up (duration 10 min), 2) development of aerobic work (duration 30 min) 3) local individual muscle exercises (duration 10-15 min) 4) stretching, relaxation exercises (duration 5-10 min). During all workout, heart rate of each participant was measured using heart rate monitor "PolarH7", real-time data was being sent to software "Polar beat". Heart rate was being observed during 15 workouts. The statistical analysis was executed using "IBM SPSS Statistics 22.0","Microsoft Office Excel". Mann Whitney Wilcoxon test was used in order to compare two independent samples. Friedman test was used to compare two dependent samples. The difference was considered statistically significant at p <0.05. Data is presented as mean and standard deviation (on average ± SD).

Results. Heart rate in the beginning of workout was increasing exponentially. Heart rate of young women during warm up increased from the first (93 b/min) to sixth (135 b/min) minute, when the biggest significance of the warm up was registered. At the end of the warm up (during dynamic stretching (8-10min)) heart rate decreased.

Middle – aged women's heart rate during warm-up compared to heart rate during aerobics showed a statistically significant (p=0.028) difference. Heart rate during warm-up was 116±6 b/min, while 128±9 b/min heart rate was recorded during aerobics. In the group of young aged women a statistically significant (p=0.08) difference was also recorded between the warm-up heart rate (123±7 b/min) and heart rate during aerobics (146±8 b/min). In both age groups the biggest intensity and maximum value of heart beat were recorded in 6-7 min of the exercise. Comparing the middle – aged women's heart rate during aerobic and strength exercises (the exercises are performed lying down) a statistically important (p=0.018) difference was recorded. During aerobic exercises the heart rate was 128±9 b/min, while lying on the mats the heart rate was 99±4 b/min. In the age group of young women a statistically significant (p=0.08) difference was recorded between aerobic (146±8 b/min) and strength exercises (115±9 b/min). Comparing heart rate during aerobic and strength exercises between both groups, a statistically significant (p=0.01) difference was recorded. The maximum intensity of aerobic exercise and the maximum value of heart rate were achieved on 15th minute and remained relatively stable till 25th minute of aerobic exercise in both groups. We compared the heart rate indicators during the time of aerobic exercise, with individual HR 50% HR 70% and HR 80% of parameters. In the group of young-aged women, heart rate during the time of aerobic exercises reached 66% of aerobic efficiency while in the middle-aged women group the aerobic efficiency was HR 64%.

Conclusions. It was established that young-aged women's heart rate is significantly higher compared to middle - aged women. In both groups maximum intensity during warm-up and aerobics coincide in time. Comparing the maximum efficiency reached in both groups during aerobics, we can say that work capacity exceeds 70% of the heart rate. Based on the literature, we can conclude that both groups of women aerobic work capacity improves general body endurance.

Reference list:
1. Brymer E, Keith D. Designing Environments to Enhance Physical and Psychological Benefits of Physical Activity: A Multidisciplinary Perspective. Sports Medicine (2016) 46:925–926 DOI 10.1007/s40279-016-0535-8.
2. Cohen R, Gasca C. N, McClelland R. L, Alcántara C, Jacobs D. R, Roux A. D, et al. Effect of Physical Activity on the Relation Between Psychosocial Factors and Cardiovascular Events (from the Multi-Ethnic Study of Atherosclerosis). Elsevier (2016) Volume 117, Issue 10, Pages 1545–1551.
3. McMahon E.M, Corcoran P, O'Regan G, Keeley H, Cannon M, Carli V et. all. Physical activity in European adolescents and associations with anxiety, depression and well-being. European Child & Adolescent Psychiatry DOI 10.1007/s00787-016-0875-9.

Functional characteristics of upper extremities in male handball players associated with the increased risk of sports-related injuries of the shoulders

Greta Martirosianait , Laimonas Šiupšinskas
Lithuanian University of Health Sciences, Institute of Sports

Introduction. Handball is a sport which places large demands on players' shoulders due to a high volume of throwing. In addition, the large numbers of throws and passes, as well as hard body tackles, in many cases directly to the shoulder, make the shoulder region vulnerable for both acute and overuse injuries (1,2,3). Overuse problems can be perceived as pain, shoulder instability, and scapular dysfunction, which in many cases will influence an athlete's performance (4).

Research aim. To assess the functional characteristics of upper extremities in male handball players associated with the increased risk of sports-related musculoskeletal injuries of the shoulders.

Research methods and organization. 20 male elite team-handball players participated in the research. They were professional handball players and one of the best male team-handball in Lithuania. Average of age - 24 years, weight – 84 kg, height – 189 cm. Players reported that they had no complaints and symptoms of musculoskeletal disorders. Clinical orthopaedic diagnostic tests for shoulder were used in order to screen for hidden pathologies in upper extremities: Apley test was used for limitations in motions of the upper extremity, Neer test - for subacromial impingement, Empty can - for supraspinatus impingement or integrity of the supraspinatus muscle and tendon, Hawkins-Kennedy - for shoulder subacromial impingement. Shoulder external/internal rotation was done to provocate pain in rotator cuff tendons. Dynamic stability of the shoulder girdle was measured by Upper Quarter Y-Balance Test to identify movement limitations and asymmetries in athlete's shoulder function. Closed Kinetic Chain Upper Extremity Stability test was used to identify the stability of the shoulder girdle by doing as more touches as possible in 15 seconds period hand by hand from side-to-side in push-up possition (5). These tests are specific and sensitive to identify sports related musculskeletal injuries of overhead athletes such as handball, basketball or tennis players. Data was processed by using SPSS 22.0 program.

Results. Participants of the research had no complains of shoulder before testing. 90% had possitive orthopedic tests of the shoulders. The biggets number of players (55%) had possitive Hawkins – Kenedy for shoulder subacromial impingement. Upper Quarter Y-Balance Test was used to measure assymetries in upper extremities associated with dynamic stability of the shoulders. Difference between dominant and non-dominant arm was statistical significance (p=0.160). The cutpoint of composite score, associated with the higher risk of shoulder injuries was set as 96% of limb lenght according previous studies (6). 45% of players had increased risk of sport-related shoulder injuries according the cutpoint from other studies. 70% of players had more than 4 cm difference (more than 4 cm difference showed increased risk of injury (7)) between dominant and non-dominant arm. 87% players with positive povocative tests showed more than 4 cm difference between dominant and non-dominant arm. 13% players with negative provocative tests showed less than 4 cm difference. Closed

Kinetic Chain Upper Extremity Stability test showed that half of the handball players had low score. 65% players with negative provocative (orthopedic) tests performed about 33 thouches in 15 seconds. 35% players with positive provocative (orthopedic) tests performed 19 thouches/15 sec. A Pearson's correlation was run to determine the relationship between CKCUES test thouches averange and power. There was strong, positive correlation between thouches average and power (r=0.72, N=20. p<0.001). The cutpoint of thouches for male was set as 21 indicating decreased stability of the shoulder girdle (8).

Conclusions. Despite the fact that handball players had no complaints, almost all (90%) of them had positive orthopaedic provocation tests and more than half of the players had positive shoulder subacromial impingement test. The same amount of players had lack of dynamic stability in the upper extremities. About 90% of players with positive provocation tests had significant asymmetries in the dynamic stability in the dominant and non-dominant arm.

Reference list:

1. Vlak T, Privalica D. Handball: The Beauty or the Beast. Croation Medical Journal. 2004;45:526-530.
2. Wilk, KE, Meister K, Andrews JR. Current concepts in the rehabilitation of the overhead throwing athlete. American Journal of Sports Medicine. 2002;30:136–151.
3. Kelly BT, Barnes RP, Powell JW, Warren RF. Shoulder injuries to quarterbacks in the national football league. American Journal Sports Medicine. 2004;32:328–331.
4. Fleisig GS, Andrews JR, Dillman CJ, Escamilla RF. Kinetics of baseball pitching with implications about about injury mechanisms. American Journal of Sports Medicine. 1995;23:233-239.
5. Ellenbecker TS, Manske R, Davies GD. Closed kinetic chain testing techniques of the upper extremities. Orthopedic Physical Therapy Clinical North America. 2000;9(3):19-29.
6. Teyhen, Deydre S, Riebel, Mark A, McArthur, Derick R, et al. Normative data and the influence o age gender on power, balance, flexibility, and functional movement in healthy service members. Military Medicine. 2014;179(4):413-420.
7. Reiman MP, Manske RC. Functional testing in human performance. 2009;2:276-280.
8. Butler RJ, Lehr ME, Fink ML, et al. Dynamic balance performance and noncontact lower extremity injury in college football players. Sports Health. 2013;5(5):417-422.

Investigation of physical characteristics and flat feet coherence among ice skaters

Agn Oradauskait , Ernesta Gurskien
Lithuanian University of Health Sciences, Institute of Sports

Introduction. Previous surveys show that a good physical preparation is the right way to improve skating technique. However, such studies are rare around the world, and, in Lithuania, there is no one who analyses the physical characteristics among skaters, importance for improving skating strength in addition to reduce risk of injuries (1). The purpose of this study was to investigate physical characteristics among pre-elite skaters and the relationship of off-ice strength. According to Dong-chul Moon (2), flat feet have a big impact on vertical jump height and balance. Also, a research published

in International Journal of Integrated Health Sciences (3) showed that flat feet significantly correlate with balance.

Research aim. To evaluate physical characteristics and coherence between physical characteristics and flat feet among ice skaters.

Research methods and organization. 23 participants were invited to this study without distinguishing skating specialisation. The age ranged from 7-10 years (mean 7.86 ± 0.834 years). All children (10 boys and 13 girls) who participated in this study have been attending skating lessons for at least one year. First, participants had their feet scanned with RS (pedobarography) scan to detect for any feet deformities (4). Pedobarography is used to exam not only function of the foot or ankle, but also the posture or the gait. Each subject had to complete six different tests in a randomised order during their rest day from skating lessons. All participants performed in vertical jump test using "Just jump" platform, hand held computer displays height and hang time for one jump, ground contact time for one jump (5). Modified balance "Y" test was used to measure dynamic balance performance, motor skills and body symmetry. "Flamingo" balance test was used to measure static balance. 10 meters running and "Compass" drill (the cones are laid out with four-marker cones placed in a diamond shape and one in the middle, the outer cones are each placed 3 meters from the centre (6). These tests were used to evaluate speed, body control, explosion, agility, while plank test was used to assess core strength and stability. Ice skaters did not have ice skating class on testing day, boys and girls were tested on different days. Before test, skaters had a short warm up.

Results. Statistical analyses were conducted via IBM® SPSS® (Version 20.0) software and Microsoft Excel 2010. The sample was not large, so analysis was based on Mann-Whitney test. Mann-Whitney test was used to find out if there is difference in tests results based on arch condition. After examining feet arch with pedobarography test, 12 children had flat feet and 11 children's feet arch was normal. A difference in results was found after performing "Flamingo" test ($p<0.05$). Comparing the results of children, they were better of those with normal arch (1.75 ± 0.27 times/minute) than of those with flat feet ($7,00\pm0,67$ times/minute). "Y" balance test results differed in all three directions based on flat feet criteria ($p<0.05$), but did not differ between right and left feet ($p>0.05$). The results of left foot in all three directions were better of children with normal arch (anterior 58.42 ± 2.07 cm, posterolateral 83.17 ± 1.98 cm, posteromedial 80.67 ± 2.25 cm), comparing with those with flat feet (anterior $48.55\pm1,36$ cm, posterolateral 70.18 ± 3.27 cm, posteromedial 68.00 ± 2.70 cm). After examining children's right foot in all three directions, results were also better of those with normal arch (anterior 58.25 ± 1.89cm, posterolateral 84.33 ± 2.30 cm, posteromedial 80.08 ± 2.04 cm) comparing with children with flat feet (anterior 48.45 ± 2.72 cm, posterolateral 72.00 ± 3.24 cm, posteromedial 70.08 ± 2.05 cm). Results of skaters with flat feet and without them differed in vertical jump ($p<0.05$). Better results appeared among skaters with normal arch (41.65 ± 0.45 cm) than with flat feet (37.36 ± 1.16 cm). In other results, such as running 10 m and "Compass" agility test, difference was not found ($p>0,05$). It means that flat feet do not have impact on coordination and agility skills.

Conclusions. Therefore, the research showed that children who regularly attend ice skating lessons and have normal arch, indicate better physical characteristics, such as dynamic, static balance, speed and higher jump.

Reference list:
1. E. Gantiraga, E. Katartzi etc. Strenght and vertical jumping performance characteristics in school-aged boys and girls. Biology of Sport, 2006; Vol. 23 No 4.
2. Dong-chul Moon, Kyoung Kim, Su-kyoung Lee. Immediate Effect of Short-foot Exercise on Dynamic Balance of Subjects with Excessively Pronated Feet. The journal of physical therapy science 2014; 117-119.
3. Indri Listyorini. Effectiveness in Dynamic Balance: a Comparison between Foot Muscle Strengthening Using Elastic Band and without Elastic Band in Children Aged 8–12 with Flexible Flat feet. International Journal of Integrated Health Sciences 2015;3(1):26-32.
4. Eric Toullec. Pedobarography. [Geneva 2nd September 2010] 8th International Congress of EFAS
5. John S. Leard etc. Validity of two alternative systems for measuring vertical jump height. Journal of Strength and Conditioning Research 2007, 21(4), 1296–1299. 6. Sopa Ioan Sabin, Pomohaci Marcel. Testing agility skill at basketball team (10-12 years old). Series Physical Education & Sport/Science, Movement & Health 2016, Vol. 16 Issue 1, p103-109. 7p.

Peculiarities of serratus anterior muscle's electrical activity during different push up exercise variations

Guoda Prevelyt , Vilma Mauricien
Lithuanian University of Health Sciences, Medical Academy, Institute of Sports

Introduction. The serratus anterior muscle is one of the most important muscle responsible for scapular stabilization (1,2). One of the most studied exercise for the strengthening of scapular stabilizer muscles is a push-up exercise (2,3,4). Push up exercise "plus phase" is considered as one of the best exercise to strengthen those muscles (5). The strengthening of scapular stabilizers could be the one of conservative treatment's component, so it is important to know what exercise is appropriate for this muscle (1).

Research aim. To evaluate the peculiarities of serratus anterior muscle's electrical activity during different push up exercise variations.

Research methods and organization. A total of 31 healthy subjects volunteered for the study (15 men and 15 women). The average age of the participants was 23.3 years. Electromyography (EMG) method was used in this research to determine serratus anterior muscle electric activation during different surface push up exercise variations depending on the exercise phase. All volunteers performed four varations of push-up exercise (knee push up, knee push up with ball, wall push up and wall push up with ball). Push up exersice consists of three phases - the "down position" (scapular retraction) , "up position" (scapular protraction) and "plus position" (maximal protraction). Before exercise, maximal voluntary isometric contraction (MVIC) was measured. Results of muscle electrical activity were expressed as a percentage of the maximal voluntary muscle contraction (%). SPSS 21.0 for Windows and Microsoft Office Excel 2010 were used for data analysis. The data are presented as the mean value and standard deviation (SD). Statistical significance was accepted for values of $p<0.05$. Independent variables were compared with nonparametric Mann-Whitney (U) test.

Results. Electrical activity of serratus anterior muscle was analyzed in accordance with different variations of the exercise and in accordance with the exercise phase. The data obtained by analyzing muscle activity under different variations of the exercise showed that in all variations serratus anterior muscle was the most active in push up exercise „plus phase". The highest activity was recorded during knee push up with ball- men's 54,01±25,77 %, women's 47,26±22,91 %. Serratus anterior was the least active in push up exercise „down phase". The lowest activity was recorded during knee push up with ball – men's - 4,36 ±3,45 %, women's - 10,37 ±8,38 %. The data obtained by analyzing muscle activity under different phase of exercise showed that the highest activity of serratus anterior in push up „down phase" was performing knee push up – men's - 23,21 ±12,65 %, women's -38,60±17,24 %. The highest activity of serratus anterior in push up exercise „up phase" was performing wall push up with ball – men's - 31,59±13,85 %, women's - 35,48±19,59 %. The highest activity of serratus anterior in push up „plus phase" was also observed while performing wall push up with ball – men's - 5 4,01±25,77 %, women's - 47,26±22,91 %. A statistically significant difference was observed performing knee push up with ball in „down phase" (p=0.008) and in „up phase" (p=0.004) comparing by sex. There was no significant difference in other push up variations.

Conclusions. Serratus anterior muscle was the most active in push up exercise „plus phase". The greatest electrical activity was recorded in wall push up with ball exercise „plus phase". The study showed a statistically significant difference according to gender in knee push up with ball exercise „down phase", women's serratus anterion muscle was more active than men's.

Reference list:

1. Sung-Hwa Seo, In-Ho Jeon, Yong-Ho Cho, Hyun-Gi Lee et. al „Surface EMG during the Push-up plus Exercise on a Stable Support or Swiss Ball: Scapular Stabilizer Muscle Exercise", Journal of Physical Therapy Science, 2013 Jul; 25(7): 833–837.

2. Sangyong Lee,, Daehee Lee, JungSeo Park „Effect of the Shoulder Flexion Angle in the Sagittal Plane on the Muscle Activities of the Upper Extremities when Performing Push-up plus Exercises on an Unstable Surface" journal of Physical Therapy Science, 26: 1589–1591, 2014.

3.Byunggon Kim, Wontae Gong, Sangyeol Lee, „The Effect of Push-up Plus Exercise with Visual Biofeedback on The Activity of Shoulder Stabilizer Muscles for Winged Scapula", Journal of Physical Therapy Science 22: 355–358, 2010.

4. André Luiz Torres Pirauá, Ana Carolina Rodarti Pitangui, Juliana Pereira Silva et al „Electromyographic analysis of the serratus anterior and trapezius muscles during push-ups on stable and unstable bases in subjects with scapular dyskinesis", Journal of Electromyography and Kinesiology 24 (2014) 675–681.

5. Jun G San Juan, David N Suprak et al. „The effects of exercise type and elbow angle on vertical ground reaction force and muscle activity during a push-up plus exercise", BMC Musculoskeletal 2015 Feb 10;16:23.

Impact of different physiotherapy methods on the quality of life, anxiety and depression symptoms for women suffering from it

Kotryna Raudyt , Egl Lendraitien
Lithuanian University of Health Sciences

Introduction. The prevalence of depression is between 5-10% in adults and is the fourth most significant cause of disability in the world. (1, 2). It is proved that patients with depression reduces the level of serotonin in brains, leading to depression medications that increase serotonin levels. It has been observed that physical exercise can increase the amount of serotonin, which reduces anxiety and depressive symptoms and gives a positive effect to mental and physical health (3, 4).

Research aim. To evaluate impact of different physiotherapy methods on the quality of life, anxiety and depression symptoms for women suffering from it.

Research methods and organization. The study was carried out at Psychiatric Clinic of Kaunas University Hospital of Lithuanian University of Health Sciences. Forty six 30 – 55 year-old women with depression. In the hospital they have been applied with drug therapy. All groups were homogeneous by age. Women were given to fill HAD and SF - 36 questionnaires, performed 6-minutes walking test. Investigative women were divided into three random groups: The research group 1 – physiotherapy (physical exercise); the research group 2 – the physiotherapy with Tai chi elements; control group. Measurements were taken twice (once before the investigation, the second time after the study). Physiotherapy (physical exercises) and physiotherapy with Tai Chi elements was applied for 40-45 minutes, 5 times per week.

Physiotherapy program: breathing exercises, exercises for cardiovascular system - 10 – 15 minutes; moderate intensity aerobic and endurance training, flexibility, coordination and muscle strengthening exercises - 20 -25 minutes; breathing exercises 10 – 15 minutes.

Physiotherapy with Tai Chi program: breathing exercises, exercises for cardiovascular system - 10 – 15 minutes; 8 Tai Chi movements - 20 – 25 minutes; breathing exercises - 10 – 15 minutes.

Statistical methods: Kolmogorov-Smirnov, Student t, Mann Whitney U, Wilcoxon tests were used for statistical analysis. The mean ± standard deviation were used to submit the results. A 'p' value < 0.05 was considered significant.

Results. 1. A comparison of the results before and after the anxiety and depression symptoms in all three groups were statistically significant (research group 1- the anxiety symptoms 10, 44 ± 3.18 to 5.22 ± 2.49 and depression symptoms 8.78 ± 2.64 to 2.44 ± 2.28; research group 2 - anxiety symptoms 12.58 ± 4.01 to 8.25 ± 4.04 and depression 11.58 ± 3.70 to 7.66 ± 2.90; control group –anxiety symptoms 10.22 ± 3.41 to 8.22 ± 2.91 and depressive symptoms 9.00 ± 1.94 to 7.33 ± 1.73). Among the groups was not observed statistically significant ($p > 0.05$). 2. SF-36 questionnaire results were: 2.1. Research group1 was statistically significant ($p < 0.05$) the difference was in all categories (research group 1 - physical components of 43.28 ± 5.34 to 52.27 ± 5.05; psychological components - 37 37 ± 5.75 to 54.19 ± 5.64. 2.2. Group 2 the same results as in the research group 1 (physical

components 42.89 ± 5.32 to 46.92 ± 10.04; mental components - 35.44 ± 5.75 to 45.54 ± 9.07) 2.3. The control group had a statistically significantly different ($p < 0.05$) only in one component. 2.4. Compared the groups after study between the groups recorded a statistically significant ($p < 0.05$) difference. 3. 6 minutes walking test in all groups after the study and compared the groups between themselves were recorded in a statistically significant ($p < 0.05$) difference (the research group 1 - 372.09 ± 29.97 to 390.90 ± 33.52; the research group 2 - 357.66 ± 29.23 to 369.83 ± 27.88; control group - 376.36 ± 33.48 to 384.54 ± 37.00).

Conclusions. 1. Physiotherapy is an effective way to reduce anxiety and depression and to improve the quality of life. 2. The received results showed a statistically significant ($p < 0.05$) differences between the groups for anxiety and depressive symptoms and quality of life. 3. The most different was found in research group 1. It means that ordinary physiotherapy is better than physiotherapy with tai chi elements.

Reference list:
1. Butler, R., Hatcher, S., Price, J., & Von Korff, F. (2007). Depression in adults: Psychological treatments and care pathways. Clinical Evidence, 8, 1–22.
2. Cipriani, A., Barbui, C., Butler, R., Hatcher, S., Geddes, J. (2011). Depression in adults: drug and physical treatments. Clinical evidence: 1003.
3. Chaouloff, F. (2008). Physical exercise and brain monoamines: A review. Acta Physiologica Scandinavica.; 137(1): 1–13.
4. Canbeyli, R., (2013). Sensorimotor modulation of mood and depression: in search of an optimal mode of stimulation. Frontiers in human neuroscience. 10 3389.

Evaluation of shoulder complex function and body posture in racquet sports players

Jurgita Rupšyt , Ernesta Gurskien , Tomas Bardauskas
Lithuanian University of Health Sciences, Institute of Sports

Introduction. Tennis and badminton are popular racquet sports games worldwide. These sports games requires asymmetric movements. Racquet sports players subject their dominant upper extremity to high loads and forces during serving and smashing. An asymmetric playing techniques may lead to an asymmetric distribution of muscle mass, changes in range of motion and alterations in body posture. All these changes increase risk of pain and injuries so it is important to evaluate and define risk factors for injury.

Research aim. To evaluate shoulder complex function and body posture in racquet sports players.

Research methods and organization. Twenty nine students (13 male, 16 female; mean age 22±2 years) who play tennis and badminton volunteered to participate in this study. 13 were tennis players (5 males and 8 females), and 16 were badminton players (7 males, 9 females). Each player completed an enrollment questionnaire concerning age, hand dominance, time and frequency of training.

Active range of motion of the shoulder joint was measured using goniometer, bilateral isometric shoulder muscle strength was assessed using a handheld dynamometer „Lafayette", scapular asymmetry was assessed using „Lateral scapular slide test" (the distance between the inferior angle of the scapula and the closest spinous process in the same horizontal plane was measured bilaterally with a tape measure in three positions.). For evaluation of body posture we used Contemplas Templo 2D posture analysis softwere (during this procedure participants stand in the area of analysis while several photos are taken of them standing in different positions. After each photo, specific anatomical body points are clicked using special program. We used 2D posture analysis protocol for posture evaluation in frontal plane). Wilcoxon's rank-sum test was used for statistical analysis on paired (dominant side vs nondominant side). The statistical analysis was performed using the statistical software IBM SPSS 22.0. The level of significance was set at 0.05. All data are presented as mean±SD.

Results. Shoulder range of motion. The demands of the overhead tennis and badminton serve motion result in adaptive changes in shoulder internal and external rotation ROM. For all the subjects, shoulder external rotation ROM was significantly greater in dominant side (98.55±7.1°) compared with nondominant side (88.1±4.5°). ($p<0.001$) Shoulder internal rotation ROM was significantly greater in nondominant side (69.38±5.8°) compared with dominant side (61.97±5.8°). ($p<0.001$). Muscle strength. The dominant shoulder was significantly stronger than the nondominant shoulder for shoulder internal rotators (3.0±0.83kg in dominant and 2.5±0.85kg in nondominant side) ($p<0.001$) and upper trapezius muscles (3.4±0.61kg in dominant and 3.3±0.78kg in nondominant side) ($p=0.042$). But nondominant shoulder had significantly higher shoulder external rotators muscle strength (2.4±0.66kg) than dominant shoulder (1.9±0.62kg) ($p<0.001$). Scapular asymmetry. Five of the 29 (17%) subjects were found to have a difference equal to or greater than 1.5 cm between the left and right scapular position in test position 1; 3(10%) subjects in test position 2 and 8 (27.5%) subjects in test position 3. Body posture. The analysis of posture in a frontal plane shows that the dominant shoulder was >5mm lower than nondominant shoulder in 23 (79%) of 29 racquet sports players. Also we find that 8 (27.5%) of 29 racquet sports players had pelvic disposition, when one of the side is lower >5mm; and 13(48%) had asymmetries in waist triangles, which might indicate lateral curvatures of the spine.

Conclusions. Racquet sports players had increased external rotation and limited internal rotation range of motion, higher internal rotators and reduced external rotators muscles strength in the dominant side compared with the nondominant side. Sixteen (55%) of 29 subjects displayed abnormal scapular asymmetry in at least 1 of the 3 test positions. Body posture analysis revealed body posture alterations in racquet sports players and the most frequently was shoulder displacement.

Reference list:
1. Kovacs M.S. Applied physiology of tennis performance. Br J Sports Med 2006;40:381–386
2. Shimpi A.P., Bhakti S., Roshni K., Rairikar S.A., Shyam A., Sancheti P.K. Scapular resting position and gleno-humeral movement dysfunction in asymptomatic racquet players: a case-control study. Asian J Sports Med. 2015 December; 6(4): e24053
3. Borsa P.A., Laudner K.G., Sauers E.L. Mobility and stability adaptations in the shoulder of the overhead athlete. Sports Med 2008; 38 (1): 17-36.

4. Cools A.M., Johannson F.R., Borms D., Maenhout A. Prevention of shoulder injuries in overhead athletes: a science-based approach. Braz J Phys Ther. 2015; 19(5):331-339.
5. Ellenbecker T.S., Pluim B., Vivier S., Sniteman C. Common injuries in tennis players: exercises to adress muscular imbalances and reduce injury risk. Strenght and conditioning journal 2009; 31: 50-58.

Individual occupational therapy needs at home after stroke: two case studies

Giedr Stankut , Daiva Petruševi ien , Daiva Baltaduonien
Lithuanian University of Health Sciences, Rehabilitation department

Introduction. Stroke is the third most common cause of death, with over 67,000 deaths each year, the significant impact of stroke is long term disability [2]. Stroke survivors are able to return home and continue many activities they did [3]. They experience many challenges: fear of having another stroke, loss of confidence, it's major negative factors in regaining independence [4]. Rehabilitation can help prepare a person to go home, but cannot fully trained to live in the house [1].

Research aim. Examine the need of occupational therapy at home and reintegration into the community after stroke.

Research methods and organization. The study was designed as a qualitative method, two most similar cases analyses. First, two similar participants were found in Kaunas Clinical hospital, Rehabilitation department, according to selection criterias: MMSE (21 and more) and Barthel index evaluation (35-45 score, by Lithuania order Nr. V-50 a person after stroke gets 40 days of rehabilitation), also ischemic stroke type. At the begining of rehabilitation program both was not able to eat, dress or walk, they had left side paresis. During rehabilitation respondents participated in four interviews and observed during occupational therapy intervention, after that it was continued at home, also four interviews (1 interview per 10 days), observations and goal aiming. Overall, the research was conducted for 80 days. Activities of daily living scale (ADL) was used to find the problems at home for persons after stroke and Goal Attainment Scaling to achieve goals with 2 older women. Both cases was independed before the stroke. After rehabilitation first case was able to walk with a stick and eat, but needed help while dressing and showering, case number 2 was able to walk again, dress upper body and eat. The findings suggest that the approach has the potential to successfully help clients with stroke achieve their everyday occupational goals, for example, making a sandwich while one side of the body is paralysed. Data analysis was performed using observation and information form the participants.

Results. The results of the research have revealed that persons after stroke face the task to make changes in a living place, ability to be independent, financial situation and participation in the community. The research has showed that having a family member involved in rehabilitation program has positive impact in daily living. Both participants were unable to perform all daily living skills independently. The results of research revealed that motivation, family support and hard work are the main recovery reasons for a person after stroke, who wants to be independent. Research has also revealed the needs of individual occupational therapy at home for people who suffered stroke.

Occupational therapist can help focus on personal activities of daily living following stroke and improve recovery, also may benefit stroke survivors from re – stroke and home accidents, falling, injuries.

Conclusions. Individual occupational therapy at home for people after stroke improving independence in stroke survivors ability to perform personal activities of daily living. However, the exact nature of the occupational therapy intervention to achieve maximum benefit needs should be defined.

Reference list:

1. Alaszewski H., Alaszewski A., Potter J., Penhale B., Billings J., Life After Stroke: Reconstructing Everyday Life, 2003 p. 9-11, University of Kent;
2. Edmans J. Occupational Therapy and Stroke, 2010 p. 1-24: ISBN 978-1-4051-9266-8;
3. Robert G., Cumming M., Thomas G., Szonyi G., Frampton G., Salkeld L., Adherence to Occupational Therapist Recommendations for Home Modifications for Falls Prevention, American Journal of Occupational Therapy, November/December 2001, Vol. 55, 641-648. doi:10.5014/ajot.55.6.641;
4. Thomas J. Kiresuk A., Smith J., Cardillo E., Goal Attainment Scaling – Applications, Theory, and Measurement, 2014 p. 15-60, ISBN 13: 978-0-898-59889-6

The effect of specialized exercise program on the lower back's functional state of nurses

Ringail Tarnauskait , Vytautas Poškaitis

Lithuanian University of Health Sciences, Medical Academy, Institute of Sports

Introduction. Various scientific studies have suggested that general practice nursing is an occupation that has a high risk for musculoskeletal disorders [1]. Lower back pain (LBP) is the most common complaint amongst nurses, often leading to a reduced work capacity [2]. The most common reason for LBP is physically intense work. Performing physiotherapy exercises and learning correct movements to increase LB mobility and stability play important roles in improving LB function [3].

Research aim. To evaluate the efficiency of a specialized exercise program for compromised LB function recovery in nurses.

Research methods and organization. This trial was conducted at the physical medicine and rehabilitation department at the hospital of Šakiai, after being approved by the bioethics committee of Lithuanian university of health science (Nr. BEC-SR(M)-189). A total of 54 female nurses, all of whom were employed at the hospital of Šakiai, were included. After selection, 46 subjects were divided into two groups: experimental and control. The first group consisted of 25 subjects (average age = 47.4±7.3 years; average work experience = 20±6.5 years) who experienced LBP. The second group consisted of 21 subjects (average age = 44.8±5.6 years; average work experience = 14.9±5.9 years) who had LB dysfunction without pain. During the three month-long experiment, twelve biweekly 45 minute-long physiotherapy sessions were attended by the participating nurses. The experimental group received individualized exercise program, whereas the control group received a

standardized exercise program. The evaluation of patients with LB dysfunction was conducted before and after the exercise program using the following methods:

1. Numeric pain rating scale (NPRS) and Oswestry questionnaire
2. Static endurance tests for the trunk muscles
3. A pressure measuring device "Stabilizer" for activation of deep trunk muscles
4. An inclinometer for measuring the amplitude of active trunk movements
5. Schober's test for evaluating lumbar mobility
6. H. Luomajoki tests for evaluating movement control of the waist-pelvic region.

The statistical data was analysed using SPSS 22.0 program. The data was presented as a mean ± standard deviation. Mann–Whitney U test was used to compare two independent group samples. The Wilcoxon signed-rank test was used to compare two related group samples. For dependent samples, the McNemar test was used to calculate the significance of differences in qualitative indicators, whereas for independent samples, the chi square (2) test was used. The difference in results was considered statistically significant when $p < 0.05$.

Results. The results from the Oswestry questionnaire and the NPRS showed a statistically significant ($p < 0.05$) decrease in pain in the experimental group when comparing the data before and after the specialized exercise program. The results for static endurance of the trunk muscles, the amplitude of active trunk movements and lumbar mobility showed a statistically significant ($p < 0.05$) improvement in the experimental group when comparing the data before and after the specialized exercise program. The results for activation of deep trunk muscles showed a statistically significant ($p < 0.05$) improvement in the experimental group when comparing the data before and after the specialized exercise program. The results for movement control of the waist-pelvic region showed a statistically significant ($p < 0.05$) improvement in 2 out of 3 tests of the experimental group. The static endurance of the trunk muscles, the amplitude of active trunk movements and lumbar mobility showed statistically significant ($p < 0.05$) improvement in the control group, when compared before and after the standardized exercise program. When comparing results for static endurance of the back muscles, the amplitude of trunk flexion and lumbar mobility between the experimental and control groups, a more statistically significant difference was achieved by the experimental group ($p < 0.05$). The results of activation of the isolated transverse abdominal muscle showed a more statistically significant ($p < 0.05$) improvement in the experimental group as well. However, there was no statistically significant difference ($p > 0.05$) between the two groups when comparing the results for movement control of the waist-pelvic region.

Conclusions. 1. The effects of the specialized exercise program were statistically significant in decreasing pain, increasing static endurance, amplitude of movements, normalizing lumbar mobility, improving functional state, muscles activation and movement control. 2. Comparison of differences in results in the experimental and control groups shows that the specialized exercise program has a greater positive impact on recovery of lower back function of nurses than standardized exercise program.

Reference list:
1. D'Agostin F, Negro C. Symptoms and musculoskeletal diseases in hospital nurses and in a group of university employees: a cross-sectional study. Int J Occup Saf Ergon. 2016 Jul 8:1-11.

2. Gamperien M. „Darbas ir kaul   – raumen   sistemos sutrikimai" 1996, Vilnius.
3. Moreira RFC, Sato TO, Foltran FA, Silva LCCB, Coury HJCG. Prevalence of musculoskeletal symptoms in hospital nurse technicians and licensed practical nurses: associations with demographic factors. Braz J Phys Ther. 2014 Jul-Aug; 18(4): 323–333.

The effect of field turfs on physical properties of female football players

Indr Venskevi i t , Alma Kaj nien
Lithuanian University of Health Sciences, Medical Academy, Institute of Sports

Introduction. João Brito and his colleagues (2012) have obtained that age and bad physical preparation have an impact on footballers getting injured. Meyers (2013) has conducted a research and compared the possibility of injuries received by footballers during the games on artificial turf and on natural turf. Due to physical properties being one of the main reasons why footballers are getting injured, it was decided to run some tests to see how they differ throughout the games on artificial turf and on natural turf.

Research aim. Evaluate the change of physical properties during the training on artificial turf and on natural turf.

Research methods and organization. The experiment was carried out with 30 „Gintra – Universitetas" female football players. All participants were introduced with aims, methods, procedures and inconveniences. The tests were run for 3 times: At the beginning of inside training season and at the end of inside training season, and at the beginning of outside training season and at the end of outside training season. Methods used: for establishing muscle power – standing vertical jump with and without arm swing. For speed test – 10 meters sprint. For balance test – Balance error scoring system (BESS) test. For core stability - side plank test was used. For leg strengh – 60 seconds squatting test was used. Results were analysed using SPSS 22.0 program. To compare the obtained results for indoor and outdoor seasons Mann - Whitney-Wilcoxon (Mann–Whitney U test) rank sum test was used. It was considered that the difference between the averages differ when $p < 0.05$.

Results. The results showed that 10meters sprint during indoor season has changed on average by 0.18 ± 0,56 sec., and during outdoor season - 0,60 ± 2,01 sec., meaning the average difference between changes was insignificant (p=0,073>0,05). Leg strengh testing when using a 60s squatting test has increased during the time of indoor training - 7,20 ± 3,56 sec, whereas during the outdoor training – -1,85 ± 3,57 sec. This shows a reduction, however, there was no reliable change obtained (p=0,413>0,05). There was no reliable change obtained (p=0,341>0,05) in a test for muscle power, where standing vertical jump test was used throughout indoor training (8,25 ± 9,73 sec.) and throughout outdoor training (2,03 ± 4,66 sec.). Also, there was no registered reliable change between running vertical jump with arms swing during indoor season 7,35 ± 2,87 sec. The same indicator change in outdoor season - 1,28 ± 2,38 sec. (p=0,720>0,05). Balance test was carried out using "BESS ". During this test, completed indoor and outdoor, all participants managed to stay with both feet for 20

seconds like the test required (p=1,000>0,05). When completing the test with left leg, during the indoor season, an average change of standing was 3,59 ± 1,89 sec, and during the outdoor season - 7,20 ± 1,43 sec, meaning the results did not differ (p=0,276>0,05). Carrying out the test with right leg, during an indoor season, a change was 0,21 ± 2,81 sec, and during an outdoor season - 1,06 ± 2,82 sec, showing, the results did not have a reliable change (p=0,252>0,05). During core stability testing, using side planking on the left side a change of results on average during an indoor season was 12,37 ± 14,12 sec, and during an outdoor season - 4,23 ± 3,24 sec, the difference was not reliable (p=0,148>0,05). Results of the side planking test on the right side were significant different (p=0,005<0,05) - a change of results on average during an indoor season was 8,26 ± 9,73 sec, and during an outdoor season - 2,04 ± 4,66 sec 4,23 ± 3,24 sec.

Conclusions. 1. The field turfs doesn't influence changes of female football players leg muscle power, strengh and balance. 2. The field turfs influence changes of female football players core stability.

Reference list:

1. Meyers MC. (2013). Incidence, mechanisms and severity of match related injuries on FieldTurf and Natural Grass. A 5-year prospective study. American Journal of Sports Medicine, 2013 doi:10.1177/0363546513498994.

2. João Brito, Robert M. Malina, André Seabra, José L. Masada, José M. Soares, Peter Krustrup, António Rebelo. (2012). Injuries in Portuguese Youth Soccer Players During Training and Match Play. 47(2):191–197.

Special exercise warm-up program's impact on professional basketball players' balance and the risk of lower extremities injuries

Gabriel Viliokaityt , Rimgail Viliokaityt , Vilma Mauricien

Lithuanian University of Health Sciences, Medical Academy, Institute of Sports

Introduction. Basketball is one of the most popular game in the world and about 60% of injuries affect the lower extremities (Aerts et al., 2013). It is generally considered that balance is an important part of athlete activity and maintaining athlete compliance in injury prevention program can be challenging if the focus is solely on injury prevention (Valovich McLeod et al., 2009). A multi-intervention programmes may reduce lower limb, acute knee and ankle injuries (Herman et al., 2012). Many researchers have show an increase in explosive athlete performance after general or specific or combined general and specific warm-up program (Andrade et al., 2015).

Research aim. To evalute special exercise warm up program's impact on balance and risk of lower extremities injuries in young basketball players.

Research methods and organization. Study included 26 young age professional basketball players who play in the National Men's Basketball League. The control group consisted of 14 players (age 24.5 ± 1.13 years), and the study group - of 12 players (age 25.2 ± 4.2 years). Static and dynamic balance was measured before and after special warm-up exercise program, which was applied for 6 weeks. Program consisted of proprioception training on stable and unstable surface, strength exercises,

stretching, „Nordic hamstring exercise program" that were included into normal warm-up program and were applied 4 times in a week in the study group. The control group performed regular warm-up program. Static balance was evaluted with Eurofit „Flamingo Balance" test and dynamic balance was assessed by the Y balance test. The calculated values of Composite Score and each distances differences were used for possible risk of lower extremities injury evaluation. Statistical analysis was conducted using SPSS 22.0. The non-parametric Wilcoxon's test for two-related samples was used. The degree of statistical significance was set at $p<0.05$. The results are presented as mean ± standard deviation.

Results. In the control group before regular warm – up program „Flamingo" test result was 6.4 ±2.1 times/min, after 6 weeks test result was 5.8 ±1.9 times/min. In the study group before program „Flamingo" test result was 6.33±1.7 times/min, after 6 weeks – 4.67±1.1 times/min. It was found that static balance, statistically significant improved only in the study group after 6 weeks ($p<0.05$), no statistically significant results were found in the control group (p 0.05). Evaluating risk of lower extremities, it was estimated that 57% of basketball players in the control group and 75% players in the study group had a risk of lower extremities injuries before program. After 6 weeks the risk of lower extremities injury was established in 42% basketball players in the control group and in 66% players in the study group. We found no significant changes of dynamic balance and the risk of lower extremities injury in the control group players after 6 weeks (p 0.05). In the study group it was found that dynamic balance statistically significant improved (the risk of lower extrimities injury decreased) only in posterolateral direction of test performance ($p<0.05$).

Conclusions. Special 6 weeks exercise warm up program improved static balance, reduced risk of lower extremities injuries and improved dynamic balance in posterolateral direction for young basketball players.

Reference list:
1. Aerts I, Cumps E, Verhagen E, Mathieu N, Van Schuerbeeck V, Meeusen R. A 3-month jump-landing training program: a feasibility study using the RE-AIM framework. Journal of Athletic Training; 2013; 48(3):296–305.
2. Andrade H, Beltrán R, Labarca C, Álvarez R. Effects of general, specific and combined warm-up on explosive muscular performance. Biology of Sport; 2015; Vol. 32 No2.
3. Valovich McLeod T.C, Armstrong T, Miller M, Sauers J.L. Balance improvements in female high school basketball players after a 6-week neuromuscular-training program. Journal of Sport Rehabilitation; 2009; 18, 1-17.
4. Herman K, Barton C, Malliaras P, Morrissey D. The effectiveness of neuromuscular warm-up strategies, that require no additional equipment, for preventing lower limb injuries during sports participation: a systematic review. BMC Medicine; 2012; 10:75.

Analysis of physical therapy impact for pain, functional movement, trunk stability and mobility for person with herniated intervertebral lumbar disc

Marius Zaveckas

Lithuanian University of Health Sciences

Introduction. The lower back pain is one of the most common skeletal-muscle system problems. About 70 percent of population experience an episode of low back pain at least once in their life [1]. About 50 percent of persons who experience acute low back pain, the pain becomes chronic[1]. It is important to lower the likelihood of pain recurrence if the future. Patients who continues physical therapy after rehabilitation have lower recurrence of the pain rate than those who stopped physical therapy after rehabilitation[2].

Research aim. To determine the long-term effects of physical therapy for functional movements, pain, trunk stability and mobility for person with herniated intervertebral lumbar disc.

Research methods and organization. Study involved 35 subjects with herniated intervertebral lumbar disc, in outpatient rehabilitation. Physical therapy program for functional movement, trunk mobility and stability improvement was applied for 14 working days. Subjects were divided into 2 groups: patients who agreed and ensured home execution of the program at home belonged to the first group, while patients who did not carry the program at home - the second group. In group 1 there were 8 women and 10 men, in group 2 – 9 women and 8 men. The averege age in group 1 was 49(±2,787) years, in group 2 – 50,82(±3,107) year. The study lasted 3 months and 3 weeks. Pain, functional movements, trunk stability and mobility were evaluated at the beginning and at the end of rehabilitation, and 3 months after rehabilitation. Lower back pain intensity was assessed using a number analog scale (SAS), transverse abdominal muscle activity and static trunk endurance was assessed with Stabilizer Pressure Biofeedback Unit and side torso muscles and back extensor muscle endurance was assessed by the McGill tests. Trunk mobility was assessed using Schober test and lateral bending test. Lumbar-pelvic rhythm was assessed with the lumbar-pelvic rhythm assessment in standing position and in position while on hands and knees. The study results were processed using SPSS 22.0 for Windows. Statistical significance was defined as a p-value <0.05. Nonparamteric independent sample mean value difference significance was calculated using Mann-Whitney test and dependent sample mean value difference significance – Wicoxon's test. Qualitative indicators difference significance in dependent samples was calculated using McNemar test, and independent sample difference significance was calculated using 2 test.

Results. There was significant decrease in pain levels in both groups after rehabilitation (p<0,05). After 3 months in group 1 pain levels unchanged (p 0,05) in comparison with pain levels after rehabilitation. After 3 months in Group 2 pain increased (p 0,05) compared with pain levels after rehabilitation. Transverse abdominal muscle activity improved (p<0,05) in both groups after rehabilitation. After 3 months transverse abdominal muscle activity between the two groups did not differ (p 0,05) compared with the transversus abdominis muscle activity evaluation after

rehabilitation. Transverse abdominal muscle endurance after rehabilitation has improved in both groups (p<0,05). After 3 months transverse abdominal muscle endurance in both groups did not differ (p 0,05) compared with the transversus abdominis muscle endurance assessment after rehabilitation. The side trunk muscle and the back extensor muscle endurance after rehabilitation has improved in both groups(p<0,05). After 3 months in group 1 the side trunk muscle and the back extensor muscle endurance unchanged (p 0,05) in comparison with indicators of performance evaluation after rehabilitation, in group 2 the side trunk muscle and the back extensor muscle endurance decreased (p 0,05) compared with rates after rehabilitation. Schober test results after rehabilitation improved significantly in both groups (p<0.05). After 3 months Schober test result improvement was not significant in both groups (p 0,05). Lateral side bending test results improved significantly after rehabilitation in both groups (p<0.05). After 3 months lateral bending test results improvement was not significant in both groups (p 0,05). Lumbar-pelvic rhythm disruption after rehabilitation insignificantly decreased in both groups (p 0,05). After 3 months decrease of lumbar-pelvic rhythm disruption was not observed in both groups (p 0,05).

Conclusions. Results of this study suggest that subjects who continue physical therapy after rehabilitation retains lower levels of pain, increased transverse muscle endurance after 3 months comparing with subject who stopped physical therapy after rehabilitation.

Reference list:

1. Franca F.R., Burke T.N., Caffaro R.R., Ramos L.A., Marques A.P. Effects of muscular streching and segmental stabilization on functional disability and pain in patients with chronic low back pain: a randomized controled trial. Journal of Manipulative and Physiological Therapeutics Vol 35 Nr.4. 2012. 279-285.
2. Maul I, Labuli T, Oliveri M. Long-term effects of supervised physical training in secondary prevention of low back pain. Spine 2005. 2-16.

Changes of trunk stability and mobility training programs in reducing pain and improving functional state for masseurs with low back pain

R ta Zaveckien
Lithuanian University of Health Sciences

Introduction. Low back pain is a multifactorial disorder with a high prevalence, most people experience back pain at some point in their life [1]. Although, there are many studies about reducing low back pain and improving functional state, but there are not enough studies about masseurs, with low back pain, including their specifics of work.

Research aim. To determine changes of trunk stability and mobility training programs in reducing pain and improving functional state for masseurs with low back pain.

Research methods and organization. Study involved 22 masseuse with low back pain. Subject's age was between 25 and 40 years. Subjects included in this study had chronic low back pain longer than 3 months. The study included 15 women and 7 men. Subjects were randomly divided into two groups.

In first group there were 7 women and 4 men, and the second group was 8 women and 3 men. Both groups consisted of 11 persons. The average age in first was 29.91 (±3.75). In the second group average age was 31.55 (±4.18). The first group was assigned stability training program. The second group was assigned mobility training program. Each group separately attended procedures for 8 weeks. Exercises were performed in group sessions. One procedure lasted about 1 hour. Pain, trunk stability and mobility were evaluated at the start of procedures and after 8 weeks. Lower back pain intensity was assessed using a number analog scale (NAS), transverse abdominal muscle activity and static trunk endurance was assessed with Stabilizer Pressure Biofeedback Unit and side trunk muscles and back extensor muscle endurance was assessed by the McGill tests. Trunk mobility was assessed using Schober's test, lateral bending test and standing functional reaching test. The study results were processed using SPSS 22.0 for Windows. Statistical significance was defined as a p-value <0.05. Nonparametric independent sample mean value difference significance was calculated using Mann-Whitney test and dependent sample mean value difference significance – Wilcoxon's test. Qualitative indicators difference significance in dependent samples was calculated using McNemar test, and independent sample difference significance was calculated using 2 test.

Results. After procedures low back pain was significantly decreased in both groups (p<0,05). However, pain (NAS) results difference in group 1 was significantly higher (p <0,05) compared with group 2. Transverse abdominal muscle activity significantly improved (p<0,05) in both groups. Transverse abdominal muscle activity evaluation results difference in group 1 was significantly higher (p <0,05) compared with group 2. Transverse abdominal muscle and internal oblique abdominal muscle endurance improved significantly only in group 1 (p<0,05). Transverse abdominal muscle and internal oblique abdominal muscle endurance test results difference in group 1 was significantly higher (p <0,05) compared with group 2. Transverse abdominal muscle endurance during test while lying on the back significantly improvement only in the first group (p<0,05). Transverse abdominal muscle endurance test results difference in group 1 was significantly higher (p<0,05) compared with group 2. The side trunk muscle endurance and back extensor muscle endurance improved significantly in the first group (p<0,05). The side trunk muscle endurance and back extensor muscle endurance test results difference in group 1 was significantly higher (p<0,05) compared with group 2. Schober's test results after procedures significantly improved in both groups (p<0,05). Schober's test results difference after procedures in group 2 were significantly higher (p<0,05) compared with group 1. Lateral bending test and standing functional reaching test results significantly improved in group 2 after procedures (p<0,05). Lateral bending test and standing functional reaching test results difference after procedures in group 2 were significantly higher (p<0,05) compared with group 1.

Conclusions. Results of this study suggests that both mobility and stability training programs reduced pain for masseurs with low back pain. Stability training program improved transverse abdominal muscle activity, transverse and oblique internal abdominal muscle endurance more compared with mobility training program. Mobility training program improved results of mobility evaluating tests more compared with stability training program.

Reference list:

1. Gomes-Neto M., Lopes J. M., Conceicao C. S., Araujo A., Brasileiro A., Sousa C., Carvalho V. O., Arcanjo F. L. Stabilization exercise compared to general exercises or manual therapy for the management of low back pain: A systematic review and meta-analysis. Physical therapy in Sport 1-7 (2016).

The effects of individualized aerobic exercise programs for patients after a heart valve replacement surgery, during the second rehabilitation phase

Šar nas Zub , Lina Leimonien
Lithuanian University of Health Sciences

Introduction. Valvular heart diseases are one of the most frequent causes of death amongst all heart defects. When diagnosed, a 5 year survivability rate is only 15-50 perc. (1). Because of the advances in surgical techniques and a general decrease in hospital days, patients are redirected early to the 2'nd rehabilitation phase. Since one of the most common method of rehabilitation for these types of patient's is aerobic exercise, it's important to know, what other variations of these programs are applicable.

Research aim. To evaluate what effect do individualized aerobic training programs have on the patient's respiratory system, exercise tolerance and quality of life, after heart valve surgery, during the 2'nd rehabilitation phase.

Research methods and organization. This randomized trial was conducted in the new rehabilitation center of Kulautuva. A total of 18 male patients participated in this trial with their age varying from 63 to 88. Each patient underwent some type of heart valve surgery: aortic or mitral valve replacement. All of the patients were separated in two groups: continuous (AC – aerobic continuous; N–9, average age – 68) and interval (AI – aerobic interval; N–9, average age – 69). Patients in the first group received continuous aerobic training program, while the patients in the second group received interval aerobic training program. The continuous training program consisted of 5 – 30 min. of cycling on the new Ergoline ergometers. The intensity was individualized depending on the patient's level of risk: exercise intensity for an average risk patient was 50 – 60 perc. max heart rate (HR), and for the high risk patient's - 20 – 30 perc. max HR. There were no intervals for resting. The interval training program consisted of three sets of 2 – 6 min of cycling with 1 – 3 min. rest intervals. The intensity was personalized depending on the patients risk level: exercise intensity for an average risk patient was 50 – 70 perc. max HR, and for the high risk patient's it was 20 – 40 perc. max HR. The programs were supervised by a physiotherapist; there were 10 – 12 sessions in total. The quality of life (EQ– 5D questionnaire), exercise tolerance (6 min. walk test) and respiratory system function (Stange-Hench test) were evaluated before starting the programs and the changes were recorded before their discharge. The EQ– 5D questionnaire is made out of 5 categories: movement, self-care, leisure activities, pain and anxiety/depression. At the end of the questionnaire, the patient was asked to grade his condition from 1 to 10 by putting an "X" on a graded ruler, printed in the questionnaire. Data was processed by using the SPSS 22.0 program; the results were presented as mean and standard deviation.

Results. Patient in the AC group increased their Hench scores from the baseline of 15.03 ± 1.53 sec. to 20.22 ± 1.24 sec. Patient in the AI group increased their Hench scores from the baseline of 14.43 ± 2.23 sec. to 21.22 ± 2.78 sec. Results achieved by both groups were statistically significant (p<0, 05), but there was no statistical significance when comparing the two groups with each other. Patient in the AC group increased their Stange scores from the baseline of 28.95 ± 0.61 sec. to 33.87 ± 0.67 sec. Patient in the AI group increased their Stange scores from the baseline of 26.33 ± 2.23 sec. to 32.35 ± 2.45 sec. Results achieved by both groups were statistically significant (p<0, 05), but there was no statistical significance when comparing the two groups with each other. Patient in the AC group increased their 6 min. walk test scores from the baseline of 175.89 ± 24.57 to 363.33 ± 17.32 meters. Patient in the AI group increased their 6 min walk test scores from baseline of 127.78 ± 13.83 to 401.00 ± 15.29 meters. Results achieved by both groups were statistically significant (p<0, 05), but there was no statistical significance when comparing the two groups with each other. The score, graded by the patients of their condition, in the AC group increased from the baseline of 4.11 ± 0.26 to 7.22 ± 0.32. The score, graded by the patients of their condition, in the AI group increased from the baseline of 4.05 ± 0.22 sec. to 8.84 ± 0.24 sec. Results of both groups were statistically significant. There was a statistical significance in the result difference between the two groups (p<0, 05). The quality of life results showed that there was a statistical significance in both groups in each of the categories. However, when comparing the two groups there was only one category which the difference in results was statistically significant: anxiety/depression (p<0, 05). According to data, none of the patients in the AI group experienced any anxiety or depression after the program.

Conclusions. 1. Continuous and interval aerobic exercise programs had a positive effect on patients respiratory system, exercise tolerance and quality of life scores, after heart valve surgery during the 2'nd rehabilitation phase. 2. Patients who participated in the interval aerobic exercise program scored significantly better in the anxiety/depression category and the patient's condition scoring part of the quality of life questionnaire than patients in the continuous aerobic exercise program.

Reference list:

1. Iung B. Vahanian A. Epidemiology of Acquired Valvular Heart Disease. Canadian Journal of Cardiology 30, 2014. Available from: http://www.onlinecjc.ca/article/S0828-282X(14)00168-8/abstract

Associations between sleep duration, chronic health conditions and physical activity of 7-8 year old children. Cross sectional results from the Lithuanian COSI study

Vilma Žaltausk , Aušra Petrauskien

Department of Preventive Medicine, Academy of Medicine, Lithuanian University of Health Sciences

Introduction. Research show that regular engagement in physical activity in childhood is associated with multiple physical and psychosocial health benefits [1-4]. Sleep duration is recognized as one of the most common issues in modern society [5]. Achieving recommended levels of physical activity and sleep should be considered central components to maintaining a healthy lifestyle in children and

youth [6]. In Lithuania the data on children physical activity and associations with sleep duration, chronic health conditions are limited.

The aim. to evaluate associations between physical activities and sleep duration, chronic health conditions among 7-8 years old children in Lithuania.

Research methods and organization. Data were obtained participating in the WHO European Childhood Obesity Surveillance Initiative (COSI), which was performed in all ten districts of Lithuania. The study was carried out in 2013. A cross-sectional survey was performed using the protocol and methodology prepared by the experts from the WHO and countries participating in the Initiative. The study protocol was granted ethical approval from Lithuanian Bioethics Committee. Parents/guardians provided written informed consent. A multilevel sampling method (district, school and class) was employed for composing a national representative sample. The data were collected by means of standardized questionnaires, which were filled out by 3802 parents of selected first-formers. A part of questions regarding children's physical activity, sleep duration and chronic health conditions (heart disease, asthma, epilepsy, cerebral palsy, diabetes and etc.) were analyzed. Index of physically active time of children (sum of minutes per day) was calculated. It consisted of time spent playing outside, at home or somewhere else on weekdays and weekends; frequency of attendance of sport or dancing club(s); time each week child spent in physical education lessons. This index was calculated assuming that 60 or more minutes of physical activity can be accumulated throughout the day at school, during physical education and recess, during intramural sports, before and after school programs [7-9]. Descriptive data of main characteristics of children were reported as percentages, means and SD. A chi-square and Z tests with Bonferroni correction were used to compare children's physical activity and chronic health conditions by age and gender. The linear logistic regression analysis was used to predict daily physical activity of children depending on sleep duration and chronic health conditions. For all tests $p < 0.05$ was considered significant.

Results. The average age of children was 7.3 yr. (SD 0.5). Distribution of children by gender was equal. More than half of first-formers played active games 2-3 hours per day on weekdays and weekends and half (51.8 %) of them attended sport or dancing clubs. Parents reported that children walked or biked from school more frequently than to school (58.7 % and 45.5 % respectively). While analyzing the way first-formers commuting to/from school by age and gender no significant differences were found. Mean time of sleep duration was 565 minutes (SD 0.9), this indicated that 89 % of children were getting adequate sleep duration at night. Parents reported that 11.7 % of children suffered from chronic diseases, boys significantly more often than girls. The average time of physical activity of first-formers per day was 141.7 minutes (SD 49.81). Calculated Index indicated that 93.6 % of first-formers were physically active 60 minutes or more per day and no significant differences by gander were observed. The results of linear logistic analysis revealed that longer sleep duration was associated with longer time spent in physical activity among 7-8 years old children, while chronic health conditions were related to shorter physical activity time per day.

Conclusions. Results from the national survey reveal that the majority of 7-8 years old children were sufficiently physically active. Sleep duration was positive and health condition was negative significant predictors of children's daily physical activity.

Reference list:
1. Warburton DER, Nicol CW, Bredin SSD. Health benefits of physical activity: the evidence. Can Med Assoc J. 2006; 174(6):801–9.
2. Biddle SJ, Gorely T, Stensel DJ. Health-enhancing physical activity and sedentary behaviour in children and adolescents. J Sports Sci. 2004; 22(8):679–701.
3. Loprinzi PD, Cardinal BJ, Loprinzi KL, Lee H. Benefits and environmental determinants of physical activity in children and adolescents. Obes Facts. 2012; 5(4):597–610.
4. Timmons BW, Leblanc AG, Carson V, Connor Gorber S, Dillman C, Janssen I, et al. Systematic review of physical activity and health in the early years (aged 0-4 years). Appl Physiol Nutr Metab Physiol Appliquée Nutr Métabolisme. 2012; 37(4):773–92.
5. Jean-Philippe Chaput, Caroline Dutil. Lack of sleep as a contributor to obesity in adolescents: impacts on eating and activity behaviors. International Journal of Behavioral Nutrition and Physical Activity. 2016; 13:103.
6. M. Mendelson, A. Borowik, A.-S. Michallet, C. Perrin, D. Monneret, P. Faure, P. Levy, J.-L. Pépin, B. Wuyam, P. Flore. Sleep quality, sleep duration and physical activity in obese adolescents: effects of exercise training. Pediatric Obesity. 2015 (11); 26-32.
7. Strong WB, Malina RM, Blimkie CJR, Daniels SR, Dishman RK, Gutin B, et al. Evidence Based Physical Activity for School-age Youth. J Pediatr. 2005; 146(6):732–7.
8. Physical Activity for Everyone: Guidelines: Children | DNPAO | CDC Available at: http://www.cdc.gov/physicalactivity/everyone/guidelines/children.html.
9. WHO | Physical Activity and Young People. WHO. Available at: http://www.who.int/dietphysicalactivity/factsheet_young_people/en/.

Exercises using different kinetic chains after reconstruction operation of anterior cruciate ligament

Kristina Žukien , Asta Markauskien , Migl Lozaraityt
Vilniaus Kolegija / University of Applied Science

Introduction. Anterior cruciate ligament (ACL) injury results in 70% of all knee injuries. Daily activities are carried out in the various movements, which take place in closed and open kinetic chains. During rehabilitation it's appropriate to apply exercises in different chains. To reach more effective impact, it is necessary to figure out, what is the impact of the closed and open kinetic chains exercises and what exercises should be dominant during physiotherapy procedure for regaining leg function.

Research aim. The aim of the research - to evaluate the impact of the exercises of different kinetic chains after reconstruction operation of ACL.

Research methods and organization. The research included patients after ACL reconstruction in second stage of rehabilitation, the same knee of patients was with healthy meniscus and cartilage, age between 20-43 years old. Reconstructive surgery was performed for all patients after 5 weeks in average. The study comprised the selection of 62 criteria after primary ACL reconstructive surgery. The study was carried out Respublican Vilnius university hospital outpatient rehabilitation department in 2015-2016.

The study was carried out for 14 days for patients, which were divided in two groups. During the study following measurements were taken: the knee joint range of motion (ROM) (2) using goniometer; knee flexor and extensor muscles strength (Medical Research Council scale MTTS)–(5); VAS pain intensity scale (3); static balance (equilibrium error calculation system) (6); knee functional status (Lysholm Scale) (1). The study comprised 8 physiotherapy (PT), 6 aqua therapy, 8 massages and 8 electro stimulations. The patients in the study, were randomly divided into two groups. The introductory parts of the PT and the final parts of the PT programs were the same for both groups. In the main part for the first 20 minutes all patients were subjected to the passive and active open and closed kinetic chains exercises, isometric exercises, exercises with resistance for improvement of knee joint mobility and muscle strength. For development of balance and coordination the exercises on unstable surfaces were used. The correction exercises of procession have been carried out in front of a mirror for the self-correction of the patients. Patients have been trained to perform the exercises correctly at home, to apply cold applications to prevent swelling and pain, to prevent any unnecessary movements and to use compensatory tools. For the remaining 15 minutes the open kinetic chain exercise program was used for group I and closed kinetic chain exercise program was used for group II. Statistical analysis of the results was performed using Microsoft Office Excel 2003 statistical packages.

Results. During the research process the knee joint ROM was measured two times: before and after rehabilitation. It was noted that after the program, in which dominated open kinetic chain exercises (group I), the traumatized knee flexion ROM of patients increased to 39.17 degrees in average, and for the patients, who were after closed kinetic chain exercises (group II) - the knee flexion ROM increased to 46.67 degrees in average. A comparison test results of the two groups of patients showed, that the knee flexion amplitude of group II increased by more than 10 degrees compared to the group I. The knee extension ROM increased to 6 degrees in average for the patients in group I and for the patients, who were performing mainly closed kinetic chain exercises (group II) – increase was to 6.5 degrees in average. A comparison of test results of the two groups showed that group II patient's knee extension amplitude increased by 0.5 degrees over the group I. The patients who performed the program, which was dominated by open kinetin chain exercises (group I), the traumatized knee flexion muscle strength increased by 1 point in average, and for the patients, who performed mainly closed kinetic chain exercises (group II) the result was 1.32 points. A comparison test results of two groups showed that for patients of group II knee flexion muscle strength increased by 0.32 points in average over the group I. The patients who performed the program, which was dominated by open kinetic chain exercises (group I), the traumatized knee extension muscle strength increased by 0.67 points in average. For the patients, who were mainly performing closed kinetic chain exercises (group II) the results was 1.16 points in average. A comparison of the test results of two groups showed that group II patients' knee extension muscle strength increased by 0.49 points in average of over the group I. The analysis of the results showed for the patients, who performed the program, which was dominated by open kinetic chain exercises (group I), the traumatized patients' leg pain decreased by 3.83 points in average, and for the patients, who performed the program, which was dominated by closed kinetic chain exercises (group II) –the result was 4.17 points in average. Participants were tested for static equilibrium under

balancing error calculation. Evaluation and comparison of static equilibrium before and after applied PT for group I and group II showed, that both PT programs were effective. However, it was found that better results were achieved by group II. Knee functional status before and after PT for group I and group II showed effectiveness of both PT programs. The higher effects improvements obtained in group II: crouching by 1.5 point, stairs climbing by 4 points, swelling decrease by 2 points, pain decrease by 5.84 points, decrease of knee instability feeling by 8.66 points, decrease of knee locking feeling by 7.33 points, use of compensatory tools reduced by 3.17 points and lameness decreased by 2 points.

Conclusions. Evaluation of different kinetic chains exercises after ACL reconstruction theoretical aspect showed that closed kinetic chain exercises are safer, has less strain on the ligaments reconstructed. It can be introduced at an early stage of rehabilitation. Open kinetic chain isolated exercises fits for strengthening. When preparing physiotherapy programs the attention shall be paid more to the closed kinetic chain exercises because in the research it shown better results after ALC reconstruction.

Reference list:

1. Bell D., Guskiewicz K., Clark M., Padua D. Systematic Review of the Balance Error Scoring System. National Academy of Sports Medicine. Vol 3(3); 2011.

2. Cynthia C. Norkin, D. Joyce White F. Measurement of Joint Motion: A Guide to Goniometry. Cynthia C. Norkin, D. Joyce White F.A. Davis; 2009.

3. Hamilton R. T., Shultz S. J., Schmitz R. J., Perrin D. H. Triple- Hop Distance as a Valid Predictor of Lower Limb Strength and Power. Journal of Athletic Training, 2008.

4. Kocher M.S., Steadman J.R., Briggs K.K., Sterett W.I., Hawkins R.J. Reliability, validity, and responsiveness of the Lysholm knee scale for various chondral disorders of the knee:J Bone Joint Surg Am. 2004 Jun;86-A(6):1139-45.

5. Kriš i nas A. editor. Kineziterapija: Kaunas; 2009.

6. Prentice W.E., Voight M. L. Techniques in Musculoskeletal Rehabilitation. 2001.