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International Scientific Symposium In collaboration with the European Group for Research into Elderly and Physical Activity

"THE 3-DIMENSIONAL EFFECT OF PHYSICAL ACTIVITY IN OLD AGE – PHYSICAL, MENTAL & EMOTIONAL"

BOOK OF ABSTRACTS

12-13th NOVEMBER, 2015

LITHUANIAN SPORTS UNIVERSITY
Kaunas, Lithuania

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The research area of Physical Activity for the elderly is a rapidly growing field. International Scientific Symposium focus on the latest trends in research on active and successful aging. The aim of the Symposium is to bring together scientists who are interested in the field of physical activity, aging and health and to conduct an open dialogue that combines and connects research and practical issues in this field.

Organizers

Lithuanian Sports University (LSU), founded in 1934, is a specialised public higher education institution that has developed its unique traditions in sport, leisure and health sciences. With its mission to contribute to the sustainable development of society through international level research and academic excellence, LSU is known as a leading academic and research centre in sports science in the Baltic Sea region.
LSU is an important centre of Sports Science and a promoter of values and traditions of physical education and sport. It has trained 14.000 Physical Education teachers, highly qualified coaches of various sports, physical therapy professionals, tourism and sports managers, etc. A lot of famous scientists, world famous coaches and public figures graduated from the University. Moreover, a significant number of LSU students have become the winners of the Olympic Games, European and world champions and winners.
More information on the website: http://www.lsu.lt/en

EGREPA was born from the premise that the field of "Physical Activity and health for the older generation" is an interdisciplinary field of study which involves professionals and researchers from very diverse areas. These areas include Medicine, Biology, Education and Health Care Services. Among the diverse disciplines we could cite Epidemiology, Exercise Physiology, Geriatrics, Gerontology, Healthy Education, Nutrition, Physical Education, Physiotherapy, Psychology, Rehabilitation and Sociology.
The European Group for Research into Elderly and Physical Activity is a non-profit making non-governmental association (NGO) which aims to promote physical activity and health in the elderly through the carrying out and promotion of research and the collection and diffusion of information related to this field of interest.
EGREPA is a scientific organization that is opened to work and co-operate with other organizations with common interests. More information on the website: http://www.egrepa.org/

KEYNOTE SPEAKERS

Symposium presentation:
COGNITIVE AND EMOTIONAL FUNCTIONING IN ADVANCED AGE – THE EFFECT OF PHYSICAL ACTIVITY AND PHYSICAL FITNESS
Prof. Dr. Yael Netz, *Wingate College, Israel*
Is Professor of Gerontology at the Wingate College of Physical Education and Sports Sciences where she developed and instituted a program for physical activity in old age. Her areas of research are: Physical fitness and cognitive functioning in old age; the psychological effect of a single training session on the elderly; physical activity patterns among the elderly and other age groups in the population; physical activity and psychological variables in adult and old age. Prof. Y. Netz has recently been appointed President of the European Group for Research into Elderly and Physical Activity.

Symposium presentation:
AGING AND MOTOR INHIBITION: A CONVERGING PERSPECTIVE PROVIDED BY BRAIN STIMULATION AND IMAGING APPROACHES
Dr. Oron Levin, *KU Leuven Movement Control and Neuroplasticity Research Centre, Belgium*
Is a senior researcher at the KU Leuven Movement Control and Neuroplasticity Research Group and holds a PhD degree in Biomedical Engineering. His current research activities cover topics in movement neuroscience, aging, and developmental neuroscience. Within this framework he is interested in age-related changes in the function/structure of brain networks that support sensorimotor integration and inhibition. His work also examines the role of interventions with non-invasive brain stimulation techniques as therapeutic tools in neurodegenerative diseases as well as a means to affect performance and behavior. His current research focuses on the effects of healthy aging motor functions with special emphases on relationships between age-related declines in the ability to modulate inhibition and changes in structural and biochemical properties of the aging brain.

Symposium presentation:
SUCCESSFUL AGING, BRAIN AND NEUROPLASTICITY
Prof. Dr. Habil. Albertas Skurvydas, *Lithuanian Sports University, Lithuania*
Is Rector of Lithuanian Sports University, since 2000 Professor in the field of biomedical sciences, a well-known researcher in Lithuania. His research interests include motor control and learning, adaptation of skeletal muscles, neurorehabilitation, philosophy of science, neuromarketing and neuroeconomics. His current research activities include heading the research area "Brain and Skeletal Muscles". He supervised more than 15 doctoral dissertations and participated in the preparation of more than 34 dissertations. The study courses taught are Motor Control and Learning, Modern Rehabilitation and System Theory. Professor is the author of several monographies, research publications the majority of which are in peer-reviewed journals of ISI Web of Science database, member of the editorial boards of international research journals. He is also member of the European College of Sport Science, European Physiological Society, member of the board of Lithuanian Physiological Society and Biomedical Engineering Society.

Symposium presentation:
EVALUATION RESEARCH IN HEALTH-ORIENTED EXERCISE INTERVENTIONS
Priv.-Doz. Dr. Michael Brach, *University of Munster, Germany*
Is a Senior lecturer (Privatdozent) at the Institute of sport and exercise sciences of the University of Muenster, Germany. He holds a doctoral degree in human movement sciences from the University of Potsdam. His research addresses the implementation and evaluation of programmes on physical activity and exercise for older adults, including ambient assisted living and serious games. Dr. M. Brach is treasurer of the European Group for Research into Elderly and Physical Activity (EGREPA), and works for the European Commission as independent reviewer in research calls regarding health and technology.

Symposium presentation:
PHYSICAL ACTIVITY AND FITNESS COMPONENTS OF THE OLDER PEOPLE
Senior researcher Zoran Milanović, *University of Niš, Serbia*
Experience in working in the field of recreation, he gained as an assistant in teaching at the Faculty of Sport and Physical Education, University of Nis. He was also the coordinator of the "healthy lifestyle" which was supported by the Ministry of Youth and Sports of the Republic of Serbia as well as the "small courts, a great joy."
Also he is a member of the coaching staff of Serbian cadet football team, where he works as a fitness coach and analyst, then fitness trainer and analyst in the youth school FK "Radički" Niš and regional instructor Football Association of Serbia. Also, he has an UEFA "C" license and a certificate for analysts in sport – football issued by Middlesex University, London, England. Works as a scientific collaborator on the project financed by Ministry of Science and Technological Development titled "Physical activity and fitness components of the old men", project number OI179065.
So far he published more than 50 scientific papers in international journals, most of which were conducted on the topic of exercise and recreational soccer.

Symposium presentation:
WHAT WE CAN LEARN FROM MEASURING DAILY LIFE ACTIVITY OF OLDER PERSONS
Prof. Dr. Wiebren Zijlstra, *Cologne Sport University, Germany*
Is professor and head of the Institute of Movement and Sport Gerontology at the German Sport University Cologne. He graduated in Human Movement Sciences and received a PhD at the Medical Faculty of the University of Groningen, the Netherlands. His research and teaching focus on physical activity and its relationships with physical and cognitive functioning in older people. Special interests include mobility, neuro-mechanical adaptability, and exercise based interventions to improve health span. His scientific work includes the development and application of sensor based methods to study and to improve physical activity and mobility patterns in daily life of older people.

12th November, 2015	
OPENING OF THE SYMPOSIUM **Room 215, Central building, Sporto str. 6**	
8:30–9:30	**Registration**
9:30–9:45	**Welcome speech** Prof. Dr. Arvydas STASIULIS, *Lithuanian Sports University, Lithuania* Prof. Yael NETZ, *EGREPA President, Israel*
PLENARY SESSION **Room 215, Central building, Sporto str. 6** **Moderators:** **Dr. Michael Brach, *University of Munster, Germany*** **Prof. Dr. ArvydasStasiulis, *Lithuanian Sports University, Lithuania***	
9:45–10:15	Prof. Yael Netz, *Wingate College, Israel* **COGNITIVE AND EMOTIONAL FUNCTIONING IN ADVANCED AGE – THE EFFECT OF PHYSICAL ACTIVITY AND PHYSICAL FITNESS**
10:15–10:45	Prof. Habil. Dr. Albertas Skurvydas, *Lithuanian Sports University, Lithuania* **SUCCESSFUL AGING, BRAIN AND NEUROPLASTICITY**
10:45–11:15	Prof. Oron Levin, *KU Leuven Movement Control and Neuroplasticity Research Centre, Belgium* **AGING AND MOTOR INHIBITION: A CONVERGING PERSPECTIVE PROVIDED BY BRAIN STIMULATION AND IMAGING APPROACHES**
11:15–11:30	**COFFEE BREAK**
11:30–12:00	Dr. Michael Brach, *University of Munster, Germany* **EVALUATION RESEARCH IN HEALTH-ORIENTED EXERCISE INTERVENTIONS**
12:00–12:30	Senior researcher Zoran Milanovic, *University of Nis, Serbia* **PHYSICAL ACTIVITY AND FITNESS COMPONENTS OF THE OLDER PEOPLE**
12:30–13:00	Prof. Wiebren Zijlstra, *Cologne Sport University, Germany* **WHAT WE CAN LEARN FROM MEASURING DAILY LIFE ACTIVITY OF OLDER PERSONS**
13:00–14:30	**LUNCH BREAK**

ORAL PRESENTATIONS Room 215, Central building, Sporto str. 6 Moderators: Prof. Oron Levin, *KU Leuven Movement Control and Neuroplasticity Research Centre, Belgium* Dr. Vida Janina Cesnaitiene, *Lithuanian Sports University, Lithuania*	
14:30–14:45	**WHY AND HOW TO TRAIN AN AGED SKELETAL MUSCLE?** Tirpakova V., *Slovak Medical University in Bratislava, Slovakia*
14:45–15:00	**EFFECTS OF DANCE AND MULTIMODAL MOVEMENT TRAINING ON BRAIN PLASTICITY, COGNITIVE FUNCTIONS AND PHYSICAL FUNCTIONS IN THE ELDERLY** Hökelmann A.[2], Rehfeld K.[1, 2], Lüders A.[1], Kaufmann J.[3], Müller N. G.[1, 3], *[1]German Centre for Neurodegenerative Diseases (DZNE), Germany, [2]Institute for Sport Sciences, Otto-von-Guericke University, Germany, [3]University Clinic for Neurology, Germany*
15:00–15:15	**IMPLEMENTATION OF AN EVIDENCE-BASED, MULTIMODAL PHYSICAL ACTIVITY INTERVENTION FOR THE PREVENTION OF DEMENTIA IN LOCAL PRACTICE – GESTALT** Streber A., Rutten A., *Friedrich-Alexander-University Erlangen-Nuremberg, Institute of Sport Science and Sport, Germany*
15:15–15:30	**THE EFFECT OF NORDIC WALKING TRAINING ON MUSCLE STRENGTH OF POSTMENOPAUSAL WOMEN WITH LOW BONE MASS** Ossowski Z.[1], Skrobot W.[2], Cesnaitiene V.[3], *[1]Gdansk University of Physical Education and Sport, Poland, [2]Gdansk University of Physical Education and Sport, Poland, [3]Lithuanian Sports University, Lithuania*
15:30–15:45	**WHAT IS A PHYSIOLOGICALLY RELEVANT OUTCOME MEASURE AND EPOCH LENGTH IN OBJECTIVELY QUANTIFYING SEDENTARISM?** Wullems J. A.[1], Morse Ch. I.[1], Degens H.[1,2], Verschueren S. M. P.[3], Onambélé-Pearson G.[1], *[1]Manchester Metropolitan University, UK, [2]Lithuanian Sports University, Lithuania, [3]University of Leuven, Belgium*
15:45–16:00	**IS THE INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE LONG FORM (IPAQ) A RELIABLE MEASURE OF FREE-LIVING SEDENTARY BEHAVIOUR AND PHYSICAL ACTIVITY IN OLDER PERSONS? COMPARISONS WITH ACCELEROMETER MEASURES** Ryan D.[1], Wullems J. A.[1], Stebbings G.[1], Morse C.[1], Sewart C. E.[2], Onambele-Pearson G.[1], *[1]Manchester Metropolitan University, United Kingdom, [2]Liverpool John Moores University, United Kingdom*
16:00–16:15	**ECCENTRIC ENDURANCE EXERCISE TO ENHANCE FUNCTIONAL MOBILITY IN OLDER ADULTS** Mandy G., Mark W., *University of Chichester, United Kingdom*
16:15–16:30	**EFFECTS OF ELASTIC BAND RESISTANCE TRAINING VERSUS MULTI-SENSORY TRAINING ON THE POSTURAL CONTROL OF INSTITUTIONALIZED WOMEN** Naliato F. L., Mendes R. D., Abrantes C. I., Sousa N. J., *Research Center in SportSciences, Health Sciences and Human Development, University of Trás-os-Montes e Alto Douro, Portugal*
19:00–21:00	**WELCOME RECEPTION** **Hotel Perkuno namai, Perkuno ave. 61**

13th November, 2015	
ROUND TABLE DISCUSSION / PROJECT PRESENTATIONS **Room, 218, Central building, Sporto str. 6** **Moderators:** **Dr. Michael Brach, *University of Munster, Germany*** **Prof. Saulius Sukys, *Lithuanian Sports University, Lithuania***	
9:30–11:00	**AGING INTERFACE WITH FATIGUE IN THE MOTOR AND COGNITIVE SYSTEMS AS WELL AS RESISTANCE TO HYPERTHERMIA** Senior researcher Marius Brazaitis, *Lithuanian Sports University, Lithuania* **ACTIVE-I – HEALTHY ACTIVE LIVING FOR SENIORS** Dr. Michael Brach, *University of Munster, Germany, EGREPA Secretary General* Prof. Yael Netz, *Wingate College, Wingate Institute, Israel, EGREPA President* **PHYSICAL ACTIVITY AND FITNESS COMPONENTS OF THE OLD MEN** Senior researcher Zoran Milanovic, *University of Nis, Serbia* **HEALTHY AND FIT IN LATER LIFE** AldonaCiutiene, *Aleksandras Stulginskis University, Lithuania*
11:00–11:30	**COFFEE BREAK**
ORAL PRESENTATIONS / PHYSICAL ACTIVITY1* **Room 215, Central building, Sporto str. 6** **Moderators:** **Prof. Yael Netz, *Wingate College, Israel*** **Prof. Saulius Sukys, *Lithuanian Sports University, Lithuania***	
11:30–11:45	**LAYING THE FOUNDATION TO BETTER BONE HEALTH IN OLDER AGE: EXERCISE IN WEIGHT-BEARING, HIGH-IMPACT ACTIVITIES DURING GROWING YEARS** Gruodyte-Raciene R.[1], Jurimae T.[2], Jurimae J.[2], Erlandson C. M.[3], Baxter-Jones D., Adam G.[3], *[1]Lithuanian Sports University, Lithuania, [2]University of Tartu, Estonia, [3]University of Saskatchewan, Canada*
11:45–12:00	**THE EFFECT OF PERCEIVED CONSTRAINTS ON EXERCISE ON DAILY PHYSICAL ACTIVITY IN ELDERLY** Baceviciene M., *Lithuanian Sports University, Lithuania*
12:00–12:15	**SUBJECTIVE WELL-BEING AND HEALTH FROM SPORT: INSIGHTS FOR AGEING** Downward P.[1], Rasciute S.[2], *[1]School of Sport, Exercise and Health Sciences, Loughborough University, UK, [2]School of Business and Economics, Loughborough University, UK*
12:15–12:30	**ESTABLISHING THE NET ATTAINABLE BENEFITS OF LONG-TERM EXERCISE – LATVIAN VERSION (ENABLE-LV)** Sneidere K., Harlamova J., Perepjolkina V., Arnis V., Martinsone K., Stepens A., *Riga Stradins University, Latvia*
12:30–12:45	**WALKING AS A MEDIATOR OF THE RELATIONSHIP OF SOCIAL SUPPORT WITH VITALITY AND PSYCHOLOGICAL DISTRESS IN OLDER ADULTS** Carrapatoso S.[1], Cardon G.[2], Van Dick D.[2], Mota J.[1], Carvalho J.[1], Gheysen J.[2], *[1]Research Centre in Physical Activity, Health and Leisure, University of Porto, Portugal, [2]Ghent University, Belgium*
12:45–13:00	**OXYGEN UPTAKE KINETICS IN PERSONS WITH SPINAL CORD INJURY INVOLVED AND NOT INVOLVED IN SPORT** Pokvytyte V., Skucas K., Stasiulis A., *Lithuanian Sports University, Lithuania*
13:00–13:15	**EFFECTS OF NORDIC WALKING ON GLYCEMIC CONTROL AND FUNCTIONAL CAPACITY IN OLDER WOMEN WITH TYPE 2 DIABETES MELLITUS. DATA FROM PILOT STUDY** Capkauskiene S.[1], Vizbaraite D.[1], Bagdoniene E.[1], Kadusevicius E.[2], *[1]Lithuanian Sports University, Kaunas, Lithuania, [2]Lithuanian University of Health Sciences, Kaunas, Lithuania*
13:15–14:30	**LUNCH BREAK**

POSTER PRESENTATIONS / PHYSICAL ACTIVITY2* 2nd floor, Central building, Sporto str.6 Moderators: Dr. Michael Brach, *University of Munster, Germany* Prof. Saulius Sukys, *Lithuanian Sports University, Lithuania*	
14:30–14:35	**ACTIVE AGING IN A CLOSE-KNIT COMMUNITY** Samsoniene L.[1], Stankute V.[1], Karanauskiene D.[2], Cesnaitiene V.[2], [1]*Sports and Health Centre, Vilnius University, Lithuania,* [2]*Lithuanian Sports University, Lithuania*
14:35–14:40	**IMPACT OF PHYSICAL ACTIVITY ON SOMATIC INDICATORS AND QUALITY OF LIFE IN ELDERLY WOMAN (CASE STUDY)** Polackova B., Halmova N., *Constantine the Philosopher University, Slovakia*
14:40–14:45	**THE KINETICS OF OXYGEN UPTAKE DURING WALKING IN ELDERLY WOMEN** Siline L., Stasiule L., Stasiulis A., *Lithuanian Sports University, Lithuania*
14:45–14:50	**SOME CHANGES IN THE INDEXES OF BLOOD AND BODY COMPOSITION, FUNCTIONAL BODY CAPACITY AND COGNITIVE FUNCTIONS AFTER TWO MONTHS OF EXERCISE PROGRAM IN ELDERLY WOMEN** Vizbaraite D., Virbalaite U., *Lithuanian Sports University, Lithuania*
14:50–14:55	**THE PSYCHOMETRIC PROPERTIES OF THE PHYSICAL ACTIVITY SELF-EFFICACY ASSESSMENT SCALE FOR SENIORS** Kaupuzs A., *Rezeknes Augstskola, Latvia*
14:55–15:00	**PHYSICAL AND EMOTIONAL HEALTH IN OLDER AGE AS A RESULT OF THE TRAUMATISM PREVENTION OF A BOXER DURING THE TRAINING PROCESS** Glazkovs J., Petlak V., *Latvian Academy of Sport Education, Baltic International Academy, Latvian Boxing Federation, Latvia*
15:00–15:05	**THE EFFECT OF ACTIVE VIDEO GAMES ON THE PARAMETERS OF BALANCE, COGNITIVE FUNCTION AND QUALITY OF LIFE IN ELDERLY: PILOT STUDY** Juodzbaliene V., Matukaitiene I., *Lithuanian Sports University, Lithuania*
15:05–15:10	**THE EFFECT OF PILATES EXERCISE ON THE PHYSICAL CAPABILITY AND QUALITY OF LIFE OF ELDERLY WOMEN** Zaicenkoviene K.[1], Garlaviciute J., Bulkeviciene L.[2], [1]*Lithuanian Sports University, Lithuania,* [2]*Kaunas Jesuit gymnasium, Lithuania*
15:10–15:15	**DIFFERENT ACUTE EXERCISE EFFECT ON COGNITIVE FUNCTIONS. THE FIRST PILOT STUDY** Skurvydas A., Masiulis N., Jurgelaitiene G., Drozdova-Statkeviciene M., *Lithuanian Sports University, Lithuania*
15:15–15:20	**EFFECT OF AEROBIC ACTIVITIES ON FUNCTIONAL STATUS AND COGNITIVE FUNCTIONS FOR OLDER PEOPLE** Mikalauskiene G., Cesnaitiene V., *Lithuanian Sports University, Lithuania*
15:20–15:25	**EFFECT OF TWO DIFFERENT TECHNIQUES FOR MATURE DEHYDRATED FACE SKIN** Guste D.[1], Vaiksnoriene V.[1], Mickiene Z.[1], Capkauskiene S.[2], [1]*Kaunas University of Applied Sciences,* [2]*Lithuanian Sports University, Lithuania*
15:25–15:30	**THE BODY COMPOSITION AND QUALITY OF LIFE IN OLD AGE: IS THIS RELATED?** Visagurskiene K.[1], Mockiene A.[2], [1]Lithuanian Sports University, Lithuania, [2]Vytautas Magnus University, Lithuania
15:30–15:35	**PREDICTING PHYSICAL ACTIVITY OF ELDERLY WHO SUFFERS FROM TYPE 2 DIABETES** Mieziene, B., Sinkariova, L., *Vytautas Magnus University, Lithuania*
15:35–15:40	**PHYSICAL, PHYSIOLOGICAL AND PSYCHOLOGICAL FITNESS OF FREE LIVING ACTIVE AND NON-ACTIVE OLDER FEMALE ADULTS** Prosoli R., Stefan L., Baric R., Sporis G., *University of Zagreb, Croatia*

INTERNATIONAL MASTER STUDIES – PERSPECTIVES AND REALITIES **Room 218, Central building, Sporto str. 6** **Moderator: Assoc. Prof. NerijusMasiulis,** ***Dean, Faculty of Sports Biomedicine, Lithuanian Sports University, Lithuania***	
16:00–16:30	**Master studies "Sport gerontology"** Prof. Dr. Wiebren Zijlstra, *Cologne Sport University, Germany*
BEST PRESENTATION AWARD. CLOSING CEREMONY **Room 215, Central building, Sporto str. 6** **Moderators:** **Prof. Yael Netz, *Wingate College, Israel*** **Dr. Vida Janina Cesnaitiene, *Lithuanian Sports University, Lithuania***	
16:30–17:00	**BEST PRESENTATION AWARD. CLOSING CEREMONY**
19:00–22:00	**CLOSING DINNER** **Hotel Kaunas, Laisves ave. 79**

13th November, 2015

PHYSICAL ACTIVITY1* **NEW BUILDING, Sporto str. 6, Lithuanian Sports University**	
11:30–12:15	**MOBILITY TRAINING IN AGEING** Dr. Veronika Tirpakova, *Slovak Medical University in Bratislava, Department of Sports Medicine*
12:15–13:00	**PILATES FOR ELDERLY** Dr. Kristina Zaicenkoviene, *Lithuanian Sports University, Lithuania*
13:00–14:30	**LUNCH BREAK**
PHYSICAL ACTIVITY2* **NEW BUILDING, Sporto str. 6, Lithuanian Sports University**	
14:30–15:15	**TRAINING WITH IPULSUS SYSTEM FOR OLDER PEOPLE** Dr. Simona Pajaujiene, *Lithuanian Sports University, Lithuania*
15:15–16:00	**POSTURE TRAINING FOR SENIORS** Dr. Kristina Visagurskiene, *Lithuanian Sports University, Lithuania*

*** For Practical activity1 and Practical activity2 sportswear needed**

Abstracts

CONTENTS

COGNITIVE AND EMOTIONAL FUNCTIONING IN ADVANCED AGE – THE EFFECT OF PHYSICAL ACTIVITY AND PHYSICAL FITNESS

Yael Netz
Wingate College, Israel

EGREPA

The importance of physical activity for the improvement and preservation of cognitive and emotional well-being in advanced age has been widely researched during recent decades. The aim of the present talk is to overview the existing literature, elaborating on selective issues. The overview will start with describing cognitive and emotional well-being in general, followed by a short history of the study in these areas. It will then discuss two meta-analyses – one on cognitive functioning and the other on well-being.

Cross-sectional and epidemiological studies will then be presented, elaborating on issues, such as the relationship between physical activity and cognitive or emotional well-being in old age as compared to other ages, fitness and cognition in the very old, the association between life-course physical activity and cognitive performance in old age, and differences between active and non-active individuals on behavioral and neurophysiological measures.

The effect of physical activity on behavioral measurements as well as brain functioning will then be reviewed in experimental studies comparing between various types of physical activity, such as aerobic exercise, coordination, or exergames. A comparison between the effects of physical vs. mental activity on cognitive functioning will also be examined.

Dose-response relationships between physical activity and cognitive functioning, as well as emotional well-being, will be investigated by reviewing large-scale epidemiological studies as well as experimental studies.

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SUCCESSFUL AGING, BRAIN AND NEUROPLASTICITY

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The presentation deals with various issues of successful aging, bad stress, neuroplasticity, brain aging, self-control, spontaneous physical activity, BDNF, brain vitality, skeletal muscle, BDNF and brain, intellectual activity/creativity, environmental enrichment, sensory stimulation, caloric restriction, mediation and good stress, affective aging, motivation, brain scaffolding, brain enhancement techniques, as well as their integrative effect.

AGING AND MOTOR INHIBITION: A CONVERGING PERSPECTIVE PROVIDED BY BRAIN STIMULATION AND IMAGING APPROACHES

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Age-related changes in brain function may be triggered by localized structural alterations that occur in brain grey and white matter structure characterized by neuronal atrophy, leading to impaired activation of several neurotransmitter systems such as gamma-aminobutyric acid (GABA), Glutamate and Dopamine; phenomena that held responsible for less effective inhibitory control. Evidence for linking poor intra- and inter-hemispheric inhibition with declined motor control has become available with the use of noninvasive neuroimaging and brain stimulation techniques. Specifically, observations suggest that successful performance of a motor task in older adults is related, partly, to the capacity to modulate inhibition through the GABAA and GABAB receptor-mediated neurotransmission systems. As a decline in the integrity of the GABAergic inhibitory processes may emerge due to age-related loss of white and gray matter, a promising direction for future research would be underscoring relationships between declines in the inhibitory control of movements and other biomarkers of aging which reflect changes in structural, biochemical and functional brain metrics.

For a brain to function optimally, it is not only required that each brain area fulfills its information processing role but also that information is exchanged between areas via short- and long-range white matter tracts that secure interregional interactions. Changes in brain structural and neurochemical properties are expected to interrupt functional communication between substructures of the brain's (inhibitory) network which ultimately give rise to age-related declines in (motor) behavior. Nonetheless, the boundaries and structure of the brain network that regulate inhibition are not fully acknowledged and some substructures of this network (e.g., the prefrontal network) are more prone to the aging process than others. In the present talk I aim, specifically, to point at the missing part of the puzzle and discuss a multimodal approach that could shed light on the neurological mechanisms underlying impaired inhibitory control in healthy aging.

EVALUATION RESEARCH IN HEALTH-ORIENTED EXERCISE INTERVENTIONS

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The goals of this talk are: a) to show problems of research in exercise interventions and b) to provide frameworks from evaluation science to overcome these problems.

In designing and evaluating exercise interventions, we: a) study human-made objects as our objects of research, b) include the practice of design and c) use functional or normative concepts in definitions and evaluations. This is what S. O. Hansson (2007) calls technological science, which is neither a branch nor application of natural science, but a type of its own.

The outcome of this kind of research should and usually is in fact assessed and rated (evaluation). Researchers, funders, representatives of the target group, and other individuals being affected by such a program (stakeholders) increasingly call for evaluation. Often, the term evaluation is used as a synonym for assessment of effectivity. However, this view neglects the design and implementation aspects of a programme.

As an alternative, frameworks such as theory-driven evaluation (Chen, 1990, 2005) and the guidance for developing and evaluating complex interventions, implemented by the UK Medical Research Council (Craig et al., 2008), are introduced using examples. These frameworks explicitely include planning and implementation of a program. Thus, the evaluation results yield important information whether, for instance, the implementation of an exercise programme or the exercises themselves should be revised in order to improve outcomes.

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PHYSICAL ACTIVITY AND FITNESS COMPONENTS OF THE OLDER PEOPLE

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Physical activity is one of the main public health problems in both developing and developed countries. Up to now we have strong evidence that physical activity is associated with aging process and level of physical activity decreases during lifespan. At the other side age related changes in neuromuscular and sensorimotor system negatively affect all health related physical fitness components (Milanovic et al., 2013). Low level of overall fitness represents high risk for many acute and chronicle diseases such as hypertension, diabetes mellitus, obesity, metabolic syndrome, cardiovascular diseases, etc. (Milanovic et al., 2015).

It is well known that improving or maintaining physical fitness reduces the risk of all-cause and cardiovascular diseases if general recommendations are implemented during training programme. However, conclusions from different studies have shown contradictory results regarding health-related physical fitness components in elderly population. Some of the studies confirmed positive effects of strength and resistance training on body composition and muscle fitness (Nader, 2006) with minimal effect on other components. In additional, moderate intensity continuous running, high-intensity interval running as well as brisk walking are efficient interventions for improving cardiorespiratory fitness and body composition regarding age, gender or training status (Milanović et al., 2015). Despite that, which training programme simultaneously improve all health-related physical fitness components is still unclear. Obviously we need more studies which will investigate complex training programme and its effect on body composition, muscle fitness, cardiorespiratory fitness and flexibility.

Effective approaches to help older people maintain a healthy and active life are urgently needed, as the elderly have twice as many disabilities and four times as many physical limitations as people less than 60 years of age (Milanovic et al., 2013). In respect to the implications for maintaining level of physical activity and independence, quality of life and functional fitness as a function of age should be investigated in more details (Jorgic et al., 2011). Z. Milanović et al. (2014) concluded that quality of life depend on physical activity level in both men and women. Also, quality of life is strongly associated with independence and non-assisted care which are determined by high level of overall fitness status.

The present findings provide strong evidence that chronic inactivity and degenerative changes could be prevented by regular physical activity in elderly population. In additional, even short term trainings lead to significant improvements but broad-spectrum effect of these interventions are limited to only few components. Obviously, complex training method may be suggested as activity which consisting of different movement patterns that stimulate both aerobic and strength performance. In that case we could expect broad spectrum effect and impact on all health-related physical fitness components.

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WHAT WE CAN LEARN FROM MEASURING DAILY LIFE ACTIVITY OF OLDER PERSONS

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Regular physical activity and tailored exercise programs are essential for preventing functional decline and frailty in older people and people with chronic diseases. To effectively offer individualised interventions requires appropriate assessment and monitoring procedures. Current clinical care routines for assessing mobility and fall risk in older people mostly make use of field tests which yield simple performance measures such as the time it takes to complete mobility related activities such as rising from a chair or short distance walks. These outcomes fall short of accurately assessing qualitative aspects of movement performance, and their suitability for risk assessment or detecting changes in functioning is limited. Motion sensor based methods, which allow for performance assessment and monitoring daily life mobility patterns over long time periods (varying from days to weeks), may be used to enhance the effectiveness of life-style interventions in older people. Based on results in different populations of community dwelling older adults, this contribution will report on sensor based assessments of mobility which can be used to objectify individual mobility profiles, and give input into exercise-based interventions which aim to enhance physical functioning. The results show that measuring daily life activity of older persons adds essential information which is different from the results of existing field tests.

EFFECTS OF DANCE AND MULTIMODAL MOVEMENT TRAINING ON BRAIN PLASTICITY, COGNITIVE FUNCTIONS AND PHYSICAL FUNCTIONS IN THE ELDERLY

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Dancing combines cognitive, motor and social skills and therefore can be assumed to have great potential in inducing neuronal plasticity in the grey and white matter of the aging brain.

We tested this assumption by comparing the effects on brain volumes of six months of dance training vs a repetitive training of physical endurance and strength. Subjects (n = 38, age range 64–79 y) were randomly assigned to the experimental and the control groups and were matched for age, mental and physical fitness. Magnetic resonance images were analysed at baseline and after intervention using a new method of voxel-based morphometry (VBM) especially designed for longitudinal studies.

The dance group showed a larger increase in grey matter volumes in multiple frontal and temporal regions dedicated to working memory, attention and multisensory integration. These regions are usually prone to atrophy and synaptic dysfunction in aging. Compared to dancers the sportspersons demonstrated grey matter increases only in occipital areas and the cerebellum, the latter presumably reflecting the repetitive nature of their motor exercises. The largest white matter volume change was observed in the corpus callosum of the dancers. This finding probably resulted from strengthened interhemispherical communication induced by the combination of different physical and cognitive challenges inherent in dancing.

The present results verify for the first time beneficial effects of dance training on seniors' brain volumes and recommend dancing as an effective measure in counteracting age-related brain volume losses. The effects on physical performance parameters of both intervention programs are nearly similar. No significant differences are found.

IMPLEMENTATION OF AN EVIDENCE-BASED, MULTIMODAL PHYSICAL ACTIVITY INTERVENTION FOR THE PREVENTION OF DEMENTIA IN LOCAL PRACTICE – GESTALT

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Relevance of the research. The promotion of physical activity is one of the key priorities of dementia prevention. Research results indicate that ongoing, lifelong, moderate-intensity physical exercise (Ahlskog et al., 2011) and varying leisure time activities (Podewils et al., 2005), as well as active and socially integrated lifestyles in late life (Fratiglioni et al., 2004), may have the potential to prevent dementia. The combination of physical with cognitive stimulation might provide complementary contributions necessary for improving brain functions (Hötting, Röder, 2013).

Based on these findings the program GESTALT – an evidence-based physical activity program for dementia prevention – aims at raising the quality and quantity of physical activities of participants (ages 65–75) at risk of dementia. The same-named project GESTALT aimed to investigate if, and under which circumstances the GESTALT program could be implemented into and sustained in the daily routines of prevention providers and reach relevant target groups for dementia prevention.

Research methods and organization. The GESTALT project used a cooperative planning process (Rütten, Gelius, 2013) as a participatory method to bring together scientists, local policy makers, preventive services providers and (later) members of the target group to plan and carry out the GESTALT program. I. a. cognitive functions and physical activity were measured in a pre-post design with a follow up measurement after six months (Streber et al., 2014).

The GESTALT program included two accompanying modules: 1) exercise program and 2) telephone support (Rütten, 2011). Qualified physical activity instructors were trained to implement GESTALT and were given a written instructors manual. The six-month exercise program (twice a week, 90 minutes) was divided into three areas: "dance & move to music", "sports & games" and "physical activity in daily routines – walking". All areas of the program systematically integrated cognitive aspects and emotional/social aspects into physical stimulation. The scientific project management implemented the telephone support. Coaching sessions occurred seven times. The focus of the coaching was to maintain physical activity after the completion of the intervention through supporting the integration of movement into the daily routines of participants as well as raising perceptions of possibilities to be physically active in their neighbourhoods.

Results and discussion. GESTALT was highly accepted by the participants (n = 75, 90 % had risk factors for dementia). 60 % of the participants were practicing additional physical activity at the time of follow-up (six months after the end of the intervention). There were improvements in cognitive performance with respect to short-term and working memory (Streber et al., 2014). With regard to the context, 14 local partners were recruited for cooperative planning. Out of those, 5 organizations implemented the GESTALT program and 4 providers decided to adapt and reoffer the program after the end of the 1st round of implementation. Due to participant request all 5 organizations implemented steady follow-up GESTALT offers. The cooperative planning group built partnerships that facilitated public relations activities and acquisition of political support, leading to sustainable funding under the responsibility of the municipality.

Conclusions. The GESTALT project – including the GESTALT program – was successfully piloted in Erlangen/Germany by FAU. The pilot study showed how systematically established cooperation between scientists and different stakeholders and institutions from prevention practice and policies (cooperative planning), lay the foundation for sustainable implementation of an evidence-based program for the prevention of dementia. Participants profited from the program through improvements in cognitive functions and physical activity levels.

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THE EFFECT OF NORDIC WALKING TRAINING ON MUSCLE STRENGTH OF POSTMENOPAUSAL WOMEN WITH LOW BONE MASS

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Relevance of the research. High muscle strength and lean mass were positively associated with BMDs. Sarcopenia is associated with low BMD and osteoporosis. Subjects with sarcopenia were two times more likely to have osteoporosis compared with normal subjects (He et al., 2015). The optimum level of muscle strength is also important predictor of functional performance in older adults (Martien et al., 2015).

The aim of the study was to determine the effect of Nordic Walking training on changes in muscle strength of postmenopausal women with low bone mass.

Research methods and organization. The subjects of this study were 17 postmenopausal women (M = 67.8 years, ± 4.8). Only non smoking women with osteopenia or osteoporosis were included in this study. Osteopenia and osteoporosis were defined according to standards of the World Health Organization (WHO) and the International Osteoporosis Foundation (Czerwinski et al., 2007). The study was conducted in two stages. In the first stage (3 months) recruited women did not participate in the intervention in the form of physical activities. In a second stage (next 3 months) women took part in Nordic Walking training with frequency – three times a week.

Handgrip strength was measured to estimate muscle strength and was performed with a Jamar hand dynamometer. Lower extremity muscle strength was measured with the sit to stand test.

Results and discussion. Nordic Walking training had a positive effect on improving lower muscle strength of the examined women. The difference in results was 14.2 %, which was statistically significant. Similar results were received in other studies were subjects were also postmenopausal women with obese (Trabka et al., 2014) and with systolic hypertensive (Latosik et al., 2014). In the conducted studies we also noted a positive trend for increasing handgrip strength in women with low bone mass. The improvement, was not statistically significant. However statistical significant improvement in the results were achieved by researchers from South Korea who have shown an increase in handgrip strength during the 12-week period Nordic Walking training in elderly women (Song et al., 2013).

Conclusions. The study showed that Nordic Walking training is effective in improving of the lower extremity muscle strength in women with low bone mass. The results may be important in the development of intervention programs based on physical activity in prevention of sarcopenia in women with osteopenia and osteoporosis.

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WHAT IS A PHYSIOLOGICALLY RELEVANT OUTCOME MEASURE AND EPOCH LENGTH IN OBJECTIVELY QUANTIFYING SEDENTARISM?

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Relevance of the research. Total daily activity can be classified in terms degree of sedentary behaviour (SB) or physical activity levels (PA). Both SB and low PA have distinct negative effects on health and it is therefore important to accurately monitor daily mobility behaviour to obtain insight into a person's long-term health prognosis (Lord et al., 2011; Gorman et al., 2014). Although accelerometry is preferred in most studies, there is no current consensus for a gold-standard device, or method of data analysis (Pedišić, Bauman, 2015). Indeed, use of inappropriate devices or data analysis has the potential danger of misinterpreting the true pattern of daily behaviour (Gorman et al., 2014). Accurate measurement of SB and PA is key to designing individualised lifestyle recommendations (Rezende et al., 2014). This is of importance in older adults (≥65 years of age) since they are the most sedentary and less physically active age group (Gennuso et al., 2013). We believe that using thigh-mounted triaxial accelerometry combined with an algorithm that includes a physiologically relevant outcome measure and epoch length can monitor objectively and accurately SB and PA. This objective approach will eventually help to understand how SB and PA are related to healthy ageing (Visser, Koster, 2013).

The aim of the research is to refine an algorithm to monitor objectively SB and PA in elderly, and *the objective* is to determine the physiologically relevant outcome measure and epoch length to be included.

Research methods and organization. Triaxial accelerometer data (thigh-mounted bilaterally; 60 Hz sampling rate) and expired gas were collected from six participants (algorithm-refining group: n = 5, aged 67–82 years; 2 women; body mass index (BMI) 21.6–35.8 $kg \cdot m^{-2}$ & algorithm validation group: n = 1, aged 72 years; female; BMI 23.8 $kg \cdot m^{-2}$) during a set of laboratory-based standardised activities of daily living (three minutes each) of different intensities; such as lying down, sitting, standing and walking. Expired gas was collected during the final minute of each activity. These samples were used to estimate energy expenditure (EE) and calculate the metabolic equivalent (MET) of the simulated activities of daily living. The accelerometer data acquired during the same minute was analysed using 18 different combinations of epoch lengths (1, 5, 10, 15, 30 and 60 seconds) and outcome measures (activity counts (AC; summed acceleration signals divided by device resolution), sum of vector magnitude (SVM) and total movement (TM). The outcome of each combination was plotted against EE to 1) explore correlations, and 2) calculate algorithm cut-off points according to 1.5 and 3.0 MET thresholds. For these purposes, data from the algorithm-refining group was used only. Next, all 18 algorithms (using both thigh orientation and cut-off points) were applied to the accelerometer data from the algorithm validation group only. The applied algorithms classified each epoch as either, SB, standing, light-intensity PA (LIPA) or moderate-to-vigorous PA (MVPA). To investigate which algorithm (and thus outcome measure and epoch length) was most valid, agreement with the actual performed activity per epoch was determined.

Results and discussion. Correlations coefficients found for SVM and TM were > 0.70 regardless of epoch length, whilst AC showed a correlation coefficient of 0.79 for the 1 second epoch length, but < 0.56 for the others. Excellent agreement (100 %) with the actual performed activity per epoch was shown when classifying SB, irrespective of outcome measure or epoch length. Standing was difficult to detect when using AC (highest agreement 7 %, while 100 % agreement was found for both SVM and TM regardless of epoch length, with the exception of using TM/30 seconds epoch (75 %). High agreement was found for classifying PA, independent of epoch length (AC: 75–86 %; SVM: 96–100 %; TM: all 100 %). When focusing on PA intensity, LIPA seems more difficult to correctly classify than MVPA, regardless of epoch length (AC: 0–34 % vs. 85–100 %; SVM: 37–75 % vs. all epochs 100 %; TM: 0–36 % vs. all epochs 100 %). Inferior results when using AC could be due to the lack of overall variation in outcome measure, resulting in overlapping activity type clusters. The fact that preliminary data were used might explain the under- and overestimation

of LIPA and MVPA respectively.

Conclusions. The preliminary results of this study suggest that the optimal epoch length for determining sedentarism is dependent on the eventual outcome measure.

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IS THE INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE LONG FORM (IPAQ) A RELIABLE MEASURE OF FREE-LIVING SEDENTARY BEHAVIOUR AND PHYSICAL ACTIVITY IN OLDER PERSONS? COMPARISONS WITH ACCELEROMETER MEASURES

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Relevance of the research. In recent years, accurate quantification of free-living sedentary behaviour (SB) and physical activity (PA) has moved towards objective measurement methods (Van Dyck et al., 2003). Although, deemed a more accurate determination of lifestyle patterns, objective measures can be costly in large epidemiological studies. Self-report data collection methods are useful as they can be widely distributed, generate large data sets and are relatively more cost effective. The International Physical Activity Questionnaire (IPAQ) is used worldwide (Craig et al., 2005), however, its application in persons older than 69 years of age, is limited (Van Holle et al., 2015).

The object of the research was to compare the results of the IPAQ to accelerometer measures of free-living lifestyle patterns. *The hypothesis* was that both measures would agree in determining SB and moderate to vigorous physical activity (MVPA) in older people. *The aim* was to provide a reliable record of the degree of sedentarism and PA in older persons.

Research methods and organization. 44 older participants (74.1 ± 6.1 yrs, 57 % female) wore a thigh-mounted (anterior aspect, at 50 % of greater trochanter to femoral condyle distance) triaxial accelerometer (GENEActiv Original, Activinsights Ltd, Kimbolton, UK), for seven consecutive free-living days. Residual G (G), adapted from Onambele et al. (2006) was the chosen accelerometer output for the study. SB was identified from the accelerometer output using 10 s epoch axis orientation and a 1.50 Metabolic Equivalent Task (MET; where 1 MET = resting metabolic rate) cut-off point (0.057 G). MVPA was identified using a 3.00 MET cut-off point (0.216 G). Sleeping time was identified using a sleep diary. After seven days, 39 participants (48 % female), successfully, completed the IPAQ Long Form (English) (*IPAQ Research Committee*, 2002). Association between IPAQ and accelerometer measures of SB and MVPA were performed using a Spearman rho. Any sex differences were compared with independent samples *t*-tests. Significance was set at a *p* value of 0.05. Data presented as Mean ± SD.

Results and discussion. For MVPA (total hours over seven days), no association ($r = 0.07$; $p = 0.84$,) between IPAQ (45.5 ± 34.5 hrs) and accelerometer (19.3 ± 7.0 hrs) measures was present. For SB (mean hours per 24 h day), a moderate association ($r = 0.34$, $p = 0.03$) between IPAQ (5.5 ± 2.2 hrs) and accelerometer (9.2 ± 2.2 hrs) measures was found. It is notable, no sex differences were found in IPAQ or accelerometer assessed lifestyle patterns ($p > 0.05$).

Conclusions. The use of IPAQ with older participants does not appear to reflect objective measures of free-living lifestyle patterns as the IPAQ underestimates SB and overestimates MVPA. Thus, where possible, we would recommend the use of accelerometry to capture SB and/or PA.

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ECCENTRIC ENDURANCE EXERCISE TO ENHANCE FUNCTIONAL MOBILITY IN OLDER ADULTS

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Relevance of the research. Ageing is a multi-factorial process that ultimately induces a decline in physiological functioning, causing a decreased health-span, functional mobility and quality of life (Capodaglio et al., 2005). Exercise participation is recommended to reduce the impact of ageing through maintenance of physiological parameters (Gault, Willems, 2013). Eccentric endurance exercise in the form of downhill treadmill walking (DTW) at a self-selected speed produces a lower cardiovascular stress for older adults in comparison to level treadmill walking (LTW) (Gault et al., 2013).This is because the muscles produce a force whilst lengthening during DTW, which also causes muscle injury when unaccustomed (Gault et al., 2011). Such an exercise model could be ideal for improving functional mobility of older adults, due to the muscles ability to combine high muscle force production with a lower energy cost.

The object of the research was to examine the adaptations of older adults to a novel endurance exercise model, *the aim* was to assess functional adaptations to a concentric (LTW) and eccentric endurance exercise (DTW) programme at a self-selected intensity.

Research methods and organization. Twenty-four older adults (67 ± 4 years) were randomly assigned to complete 3 x 30-minute treadmill walks per week for 12-weeks on a level (n = 11, LTW) 0 %) or downhill (n = 13, DTW – 10 %) treadmill gradient at self-selected walking speed (SSWS). Performance in functional tasks (5-repetition sit-to-stand (5-RSTS), maximal walking speed (MWS), timed up-and-go(TUG)), aerobic capacity (Rockport fitness walking test) and maximal strength (dynamic and isometric) and steadiness (isometric) of the knee extensors and flexors was assessed before, during (4-, 8-weeks) and after the intervention.

Results and discussion. Both LTW and DTW improved performance in functional tasks by up to 34 % for all older adults (5-RSTS: +34 %; MWS: +23 %; TUG: 22 %). There was however no improvement in peak concentric or eccentric torque of the knee extensors or flexors, but an improvement in maximal voluntary isometric force (MVIF) and 5 % of MVIF steadiness. The increase in MVIF for LTW was the result of a 38 % increase in EMG rms of the *m. vastus lateralis*, with no changes in EMG observed for the DTW group, suggesting a different adaptation. As a result of both LTW and DTW, older adults also improved their aerobic capacity with up to a 23 % improvement in predicted $\dot{V}O_2$max.

Conclusions. Regular LTW and DTW by older adults at a SSWS results in an improved functional mobility, isometric strength and steadiness, and aerobic capacity. The potential implications for an exercise modality such as DTW, with a lower oxygen demand, to improve muscle strength and aerobic capacity could serve as a rehabilitative countermeasure for older adults.

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EFFECTS OF ELASTIC BAND RESISTANCE TRAINING VERSUS MULTI-SENSORY TRAINING ON THE POSTURAL CONTROL OF INSTITUTIONALIZED WOMEN

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Relevance of the research. Falls are a major public health problem among older adults, causing high healthcare demand and expenses (Stevens et al., 2006). It is estimated that each year approximately 30 % (of people aged 65 years and older will fall and this incidence increases in institutionalized people Rubenstein, Josephson, 2002). The age-related decreases in postural control, walking performance and muscle strength have been identified as major risk factors for falls (Rubenstein et al., 1994). Therefore, reducing fall risk in older adults is an important public health issue.

Resistance training is considered to be the best training method to increase muscle strength and also has showed effectiveness in preventing falls (Sousa, Sampaio, 2005). However, due to its characteristics, typically performed using training machines or free weight exercises, elastic resistance bands might potentially be a simple, low cost and portable alternative. According to the literature, multi-sensory exercises involving gait, balance, coordination, strength training and stretching can also enhance muscle strength, balance, and mobility in the elderly (Alfieri et al., 2010). Multi-sensory exercises can stimulate all three afferent systems (vestibular, visual and proprioception) and therefore could be an important instrument to improve postural control (Rogers et al., 2003).

The objective of this study was to analyze the efficacy of multi-sensory training versus elastic resistance bands training to improve postural control in institutionalized elderly women.

Research methods and organization. Fourty-five institutionalized elderly women (aged 72.6 ± 2.6 years) were randomly assigned into an elastic bands training group (EBT, n = 15), a multi-sensory training group (MST, n = 15), or a control group (CON, n = 15). Both training programs consisted of two weekly sessions during 12 weeks (moderate intensity, perceived exertion of 12–13 points on Borg scale). Postural control for each participant was measured before and after training by the Timed Up & Go (TUG), the Berg Balance Scale (BBS) and the Timed One-Leg Stance (OLS) tests. Two-way ANOVA with repeated measures was used to examine the effects of training programs.

Results and discussion. ANOVA indicated a significant main effect of group ($p < 0.05$) for TUG, BBS and OLS, with significant differences between both training groups and CON after the 12 weeks intervention. There were no differences between EBT and MST. Significant differences were observed between pre- to post-test in the performance of the TUG ($p = 0.02$) but only for the MST group.

Conclusions. Both training programs were effective in increasing postural control in institutionalized elderly women. However, only MST significantly improved agility and dynamic balance after 12 weeks of training, by improving the TUG performance.

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LAYING THE FOUNDATION TO BETTER BONE HEALTH IN OLDER AGE: EXERCISE IN WEIGHT-BEARING, HIGH-IMPACT ACTIVITIES DURING GROWING YEARS

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Relevance of the research. Osteoporosis is traditionally considered to be a disease affecting the elderly. One of the most effective osteoporosis prevention strategies may be maximizing bone mineral content (BMC) during growing years by adopting weight-bearing physical activity (PA) in childhood and adolescence (French et al., 2000). Regular high-impact PA (such as ball games, racket sports, gymnastics, dance, running, or jumping exercises) during growth may play an important role in maximizing bone mineral mass gain, which may reduce the incidence of fractures in the elderly as well as in children and adolescents (Janz et al., 2010; Misra, 2008; Rizzoli et al., 2010).

Bone is a unique, metabolically active tissue that undergoes a continuous remodeling throughout its life cycle. The skeleton grows as the body grows, in length, breadth, mass, and volumetric density (Javaid, Cooper, 2002). There are two functionally distinct phases of bone development: 1) the skeletal patterning during the embryonic period; and 2) the mineralization, the location of which is influenced by mechanical strain (Davies et al., 2005). Bone mass increases substantially during the first two decades, reaching a plateau (i.e. peak bone mass) in the late teen or young adult years, remaining relatively stable throughout the early- to mid-adult years until the onset of the naturally progressive bone loss that accompanies ageing occurs (Faulkner, Bailey, 2007). Early puberty is a period of increased bone adaptation to mechanical loading due to the velocity of bone growth and endocrine changes at this time (Hind, Burrows, 2007).

The aim of the research is to investigate the effect of exercising gymnastics on bone parameters in children and adolescents.

Research methods and organization. Two studies were conducted to reveal the research aim: 1) a longitudinal (2006–2012) study of Canadian children (4–6 years of age at baseline; n = 165; males n = 81) involved in either recreational gymnastics (gymnasts) or other recreational sports (non-gymnasts) (Gruodyte-Raciene et al., 2013; Jackowski et al., 2015); and 2) a cross-sectional study of healthy adolescent (13–15-year-old) girls from different schools and sport clubs in Estonia (n = 202), comprising six groups, i.e. controls and those who for at least two recent years trained in sport games (basketball, volleyball, badminton), track sprint, rhythmic gymnastics, swimming, or cross-country skiing (Gruodyte, 2010). A dual-energy X-ray absorptiometry (DXA) method was used in both studies: to obtain the image of each child hip (study 1), and to measure the bone mineral density (BMD; g/cm^2) and BMC (g) of the whole-body, femoral neck (FN) and lumbar spine (LS) of adolescent girls (study 2). Values of cross-sectional area (CSA), section modulus (Z), and cortical thickness (CT) at the narrow neck (NN), intertrochanter (IT), and shaft (S) of children's hip were estimated using the hip structural analysis (HSA) program. In addition, peripheral quantitative computed tomography (pQCT) scans of their distal and shaft sites of the forearm and leg were obtained. Estradiol, insulin-like growth factor-1 (IGF-1), IGF-binding protein-3 (IGFBP-3), visfatin, adiponectin, leptin, insulin and glucose were measured in pubertal girls (study 2). Multilevel random effects models were constructed and used to develop bone structural strength development trajectories (estimate ± SEE) (study 1).

Results and discussion. Once the confounders of body size and lifestyle of children (study 1) were controlled, it was found that gymnasts had 6 % greater NN CSA than nongymnast controls (0.09 ± 0.03 cm^2, $p < 0.05$), 7 % greater NN Z (0.04 ± 0.01 cm^3, $p < 0.05$), 5 % greater IT CSA (0.11 ± 0.04 cm^3, $p < 0.05$), 6 % greater IT Z (0.07 ± 0.03 cm^3, $p < 0.05$), and 3 % greater S CSA (0.06 ± 0.03 cm^3, $p < 0.05$). Also, individuals exposed to recreational gymnastics had significantly greater total bone area (ToA; 18.0 ± 7.5 mm^2) and total bone content (ToC; 6.0 ± 3.0 mg/mm) at the distal radius ($p < 0.05$). This represents an 8–21 % benefit in ToA and 8–15 % benefit to ToC from 4 to 12 years of age. Exposure to recreational gymnastics had no significant effect on bone measures at the radius shaft or at the tibia ($p > 0.05$).

After adjusting for age, body height, and body mass, the significant correlations were found between

BMD values (at both FN & LS) and the levels of estradiol, IGF-1, and IGF-1/IGFBP-3 molar ratio (r = 0.46–0.60) only in rhythmic gymnasts' group. Similarly, only in this group the adjusted significant correlations of FN BMC with IGF-1 and IGF-1/IGFBP-3 molar ratio were found. Stepwise multiple regression analysis indicated that IGF-1 and estradiol together explained 42.6 % (R^2 x 100) of the total variance at the FN BMD, and IGF-1 alone 35.4 % (R^2 x 100) of the total variance at FN BMC in rhythmic gymnasts group only. Leptin concentrations correlated positively with FN & LS BMD and FN BMC in the rhythmic gymnasts' group only, even after adjustment for age, body height, and body mass (r = 0.41–0.63).

Conclusions. These results suggest that early exposure to low level gymnastics participation confers benefits related to geometric and bone architecture properties during childhood, and if maintained may improve bone health in adolescence and adulthood. Continuous high-impact PA, especially rhythmic gymnastics, has beneficial effects on the development of various bone parameters as it was revealed in our cross-sectional study of pubertal girls with different training patterns.

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THE EFFECT OF PERCEIVED CONSTRAINTS ON EXERCISE ON DAILY PHYSICAL ACTIVITY IN ELDERLY

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Relevance of the research. The evidence of health benefits is the strongest in older adults because the outcomes related to inactivity (obesity, chronic diseases, depression, and smaller muscle strength) are more common in elderly population. However, with increasing age the number of perceived constraints and barriers on physical activity (PA) increases as well. Reasons that restrict the elderly from active lifestyle may be classified into internal (personal) and external (environmental) whereas the most common personal barriers for exercise are chronic health problems, obesity, pain, tiredness, lack of knowledge and skills, and psychological aspects like fear of falling, mood disorders.

The aim of this study was to indicate the most important perceived constrains that restrict the elderly from daily physical exercise.

Research methods and organization. The study was conducted in 2012 August – November in Kaunas city. During the testing of physical fitness 160 volunteers completed additional questionnaire about perceived constraints on exercise (62 men and 98 women). The information about PA, health aspects, body weight and height and perceived constraints on exercise was collected using the interview method for each participant. The average age of the respondents was 70.6 ± 7.5 years. PA was assessed using a short version of the International Physical Activity Questionnaire. Four days a week and more of moderate and/or vigorous PA for at least 30 minutes was considered as adequate.

Results and discussion. PA in 51.9 % of the responders was inadequate. 58.2 % of women and 41.9 % of men were insufficiently physically active ($\chi2 = 4.0$, $p < 0.05$). Physical inactivity was found in 65.1 % of the responders aged ≥70 years and in 37.7 % of the study participants aged <70 ($\chi2 = 12.0$, $p < 0.01$). 41.9 % of men and 46.9 % of women were overweight, 17.7 % of men and 22.4 % of women were obese ($\chi2 = 1.7$, $p > 0.05$). Perceived constraints such as not used to exercise (63.9 %), no skills for exercising (56.6 %), don't like exercising alone (55.4 %), feelings of discomfort during exercise (32.5 %) and insecure when exercising outdoors (30.1 %) were strongly associated with insufficient PA in the elderly ($p < 0.0001$).

Conclusions. Perceived constrains that most restrict elderly people from exercise were lack of time and interest (OR = 7.2, $p < 0.0001$) and fear of falling and injuries (OR = 3.3, $p < 0.05$) outlining the importance of these aspects as part of PA promotion in the elderly. Definitely, in the future population-based researches in large elderly samples are needed.

SUBJECTIVE WELL-BEING AND HEALTH FROM SPORT: INSIGHTS FOR AGEING

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Relevance of the research. There have been an increasing number of studies that have analysed the factors associated with well-being and health; and this trend has been evident in both public policy and academic research. Current research has analysed the impact on well-being of individual and socio-economic factors such as ethnicity and levels of education (Shields, Wheatley Price, 2005), age (Blanchflower, Oswald, 2008), marital status (Oswald, Powdthavee, 2007), household composition (Stutzer, Frey, 2006), income and income aspirations (Clarke et al., 2005; Bruni, Stanca, 2006) and unemployment and self- employment (Winkelmann, Winkelmann, 1998; Andersson, 2008), among others.

More recently, the impact of sport and physical activity on well-being and health has been investigated (Rasciute, Downward, 2010). Encouraging participation in sports activity is now an important public policy issue, as it is argued that there are benefits in terms of health and well-being to individuals as well as to society through externalities. Sport, as a form of physical activity, can help to reduce the physiological health costs to the individual emanating from obesity, cardiovascular diseases, high blood pressure, hypertension, diabetes, strokes, heart disease, osteoarthritis and osteoporosis. Moreover, participation in sport can also help to promote psychological benefits by reducing anxiety and depression (Department of Health, 2004; WHO World Health Day, 2002; DCMS/Strategy Unit, 2002; Scully et al., 1999).

Although sports participation and engagement in physical activity has been shown to have a strong age-specific profile (Breuer et al., 2010; Mechling, Netz, 2009), there is a lack of detailed analysis whether the magnitude of this impact is age-specific. Consequently, *the objective* of this paper is to explore the age-specific effects of sport as physical activity on subjective well-being (SWB) and health in the UK and *the aim* is to identify if sport, as currently organised in the UK can contribute to the health and well-being of an ageing population

Research method and organisation. The data employed is this analysis draws on the Taking Part Survey, which is commissioned by the Department of Culture Media and Sport and is conducted by TNS BMRB. A linear regression on the subjective well-being of individuals is employed for age group cohorts with SWB included as a dependent variable. Sports participation is captured by two separate variables, indicating any minutes of sport participation in the last four weeks and sports participation of at least a moderate intensity and contributing to meeting World Health Organisation Guidelines (WHO, 2010) over the last four weeks.

Results and discussion. Overall, the results suggest that engagement in sport generally, and that of moderate intensity for health contributes to the SWB of individuals but that significant age-specific differences exist. Sports participation has a statistically significant positive effect on SWB up to about the age of 50, with the effect being stronger for the older cohorts. There is no a statistically significant effect for the older age groups. To further explore the data the interaction between sports participation and age are investigated. Joint significance is detected for the measures of sports participation and the interaction effects with age. The latter has a negative sign.

Conclusions. The results of the analysis suggests that sport as an option for promoting subjective well-being and health for ageing individuals has limitations beyond middle age. The fact that the results also show a negative impact between sport and SWB for less intense activity suggests that this is not necessarily linked to physical capability but maybe more with its context and practice. Further research into this reduction in connection with ageing is needed to better inform policy.

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ESTABLISHING THE NET ATTAINABLE BENEFITS OF LONG-TERM EXERCISE – LATVIAN VERSION (ENABLE-LV)

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Relevance of the research. An increasing number of studies indicate a positive relationship between cognition and physical activities, particularly those involving aerobic fitness (Bunce, Murdon, 2005; Colcombe, Kramer, 2003). Research confirms that short-medium term ("acute") exercise not only improves such cognitive functions as attention, processing speed, executive function as well as memory in cognitively-intact healthy older adults (Smith et al., 2009), but there is growing evidence on changes in brain structures induced by such exercise as well (Erickson et al., 2011; Voss et al., 2010). Current study focuses on a question on the net attainable gain that can be achieved from long-term exercise regimes sustained into older adulthood: how much benefit can regular exercise produce and how does this benefit manifest over the years when age-related decline is the norm?

Research methods and organization. To assess the relevance of long-term aerobic exercise on healthy aging 100 volunteers, aged > 65, will be engaged in the study. The participants will include older adults that have been doing aerobic exercises for at least 20 years daily and older adults that choose to do aerobic exercises in their leisure time. The research will consist of two parts – firstly, a detailed psychological testing will be conducted in order to evaluate cognitive functioning and document the life-style and habits of the participants. Secondly, an analysis of body composition, determination of aerobic capacity and an examination of brain structure with MRI will be conducted. A cardiac examination will be conducted before determining the aerobic capacity.

Results and discussion. The research results will provide additional arguments for policy-makers and practitioners, in order to successfully implement healthy aging strategies.

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WALKING AS A MEDIATOR OF THE RELATIONSHIP OF SOCIAL SUPPORT WITH VITALITY AND PSYCHOLOGICAL DISTRESS IN OLDER ADULTS

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Objectives. This study examined the mediating effect of walking on the relationship of social support with vitality and psychological distress.

Methods. Data from a sample of 2.859 older adults (1.057 men and 1.802 women, aged between 65 and 100 years old) which participated in the Belgian Health Survey of 2008 were used. The older adults completed the SF-36 vitality scale, the Global Health Questionnaire, the International Physical Activity Questionnaire and a questionnaire on socio-demographic and social support attributes. The mediation role of walking on the association of social support with vitality and psychological distress was calculated using the MacKinnon product-of-coefficients.

Results. All social support variables were positively associated with vitality and negatively associated with psychological distress. Walking mediated the associations of appreciation of social contacts (3 %), frequency of social contacts (8 %), participation in group activities (19 %), closeness from family and friends (8 %), concern and interest from people around (6 %) with vitality. Walking also mediated 33 % of the association between participation in group activities and psychological distress.

Conclusions. The main findings of the current study suggest that participation in group activities in later life is beneficial to improve vitality and reduce psychological distress of the older adults, with walking being a strong mediator of this relationship.

OXYGEN UPTAKE KINETICS IN PERSONS WITH SPINAL CORD INJURY INVOLVED AND NOT INVOLVED IN SPORT

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Relevance of the research. Aging is a multidimensional process and alteration in the aging trajectory caused by characteristics associated with spinal cord injury. Despite initial impressions and claims to the contrary, there has been remarkably little progress in improving longevity for people with spinal cord injuries (Groah et al., 2012). Low volume, high intensity interval training improve health and functional performance in the general population and in many chronic disease states (Gibala et al., 2012). Wheelchair basketball is an effective and suitable sport to enhance physical performance and to induce positive physiological adaptations (Schmid et al., 1998). The acceleration of oxygen uptake (Vo_2) kinetics at the onset of exercise has been observed over a short term of wheelchair-training program (Fukuoka et al., 2006). Oxygen uptake kinetics in people with spinal cord injury is still unclear.

The object of the research oxygen kinetics of persons with spinal cord injury, and *the aim of the study* is to analyze the oxygen uptake kinetics in persons with spinal cord injury involved and not involved in sport.

Research methods and organization. We analyzed data from 11 individuals, divided in two groups: 6 wheelchair basketball players with a spinal cord injury and 5 non-athletes with a spinal cord injury. Individuals performed incremental and constant work rate exercise with the arms. Pulmonary gas exchange data collection was made and analyses of cardiorespiratory parameters kinetics. In order to estimate the kinetics of cardiorespiratory parameter (Vo_2) during and after exercise that intensity was lower than lactate threshold responses during on-transition period was analyzed by adopting mono-exponential function: $y(t) = y(b) \pm A(1 - e^{-t/\tau})$, where y (b) is the baseline value (Vo_2) through the last 30 s of work or rest; A is the amplitude and τ is the time constant of the response. Statistical analysis was done using Mann-Whitney Test.

Results and discussion. Significant difference among groups was obtained for Vo_2 kinetics $p < 0.05$. Time constant (τ (tau)) was higher in non-athletic persons with spinal cord injury than in wheelchair basketball players group (29.3 ±9 sec. VS 12.3 ± 4 sec). And there were significant difference in amplitude response of Vo_2 kinetics phase II between the groups (1125.6 ± 262 ml/min in non-athletic persons and 1593.4 ± 210 ml/min in wheelchair basketball payers).

Conclusions. The longer time constants in non-athletic persons with spinal cord injury indicated a slower period of adaptation to an exercise workload. Non-athletic persons with the spinal cord injury showed lower system ability to adapt to energy demands associated with the exercise load. These findings suggested that sports activities may be appropriate target for the interventions in improving longevity for people with spinal cord injuries.

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EFFECTS OF NORDIC WALKING ON GLYCEMIC CONTROL AND FUNCTIONAL CAPACITY IN OLDER WOMEN WITH TYPE 2 DIABETES MELLITUS. DATA FROM PILOT STUDY

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Relevance of the research. Increasingly growing prevalence of type 2 diabetes mellitus (T2DM) is the leading cause of mortality, long-term disability as well as long-term loss of working capacity in the XXI century (American Diabetes Association, 2010). The cause of T2DM is a progressive insulin resistance and relative lack of insulin leading to hyperglycaemia (Cohen et al., 2006). Most commonly, the disease is associated with middle or older age and sedentary lifestyle.

Persons suffering from T2DM, are recommended for moderate intensity physical activity at least for 150 minutes a week (Sigal et al., 2004). Daily exercising is a cornerstone of diabetes control. Regular physical activity has proved to have a beneficial effect on reduced mortality and prevention of cardiovascular diseases independently of diabetic status (Cauza et al., 2005; Marcus et al., 2008; Sigal, Kenny, 2010). Walking on regular basis is an important prevention for persons who have impaired glucose tolerance (Tuomilehto et al., 2001; Goodwin, 2010; Chudyk, Petrella, 2011). Physical activity not only prevents obesity and associated diseases in diabetic patients, but also it has been shown to reduce the risk of cardiovascular diseases; it also improves sensitivity to insulin, decreases insulin resistance, maintains blood pressure, improves mood and vitality (Helmrich et al., 1994; Canadian Diabetes Association, 2003; Zinman et al., 2004; Sigal et al., 2007). Regular exercises or moderate intensity physical activity may prevent complications and improve the quality of life as well as increase life expectancy (Wei et al., 2000). We propose that long-term aerobic exercise programme – Nordic walking, will improve functional capacity and glycemic control in older persons with type 2 diabetes mellitus.

The object of the research is the effect of Nordic walking and *the aim* was to assess the effects of Nordic walking on glycemic control and functional capacity in older persons with type 2 diabetes mellitus.

Research methods and organization. Long-term exercise programme, which duration was 12-weeks, consisted of moderate-intensity Nordic walking 3 times a week, outside, in the afternoon, 60 minutes duration, walking 5000 steps. We assessed body weight (kg), body mass index (BMI), the haemoglobin A_{1c} (HbA1c) level, and cardiovascular functional capacity before and after 12-weeks aerobic exercises programme. Capillary blood glucose concentration, systolic blood pressure (SBP) and heart rate (HR) were measured before and after each workout.

Results and discussion. Body weight ($p < 0.001$), BMI ($p < 0.001$), HbA1c level ($p < 0.05$), SBP ($p < 0.001$) and HR ($p < 0.001$) significantly decreased after long-term aerobic exercise programme. Functional capacity ($p < 0.05$) increased and glycemic control ($p < 0.001$) improved for all diabetic women after 12-weeks duration Nordic walking programme. The American Diabetes Association (2010) recommends regular moderate intensity exercise between 40 % and 60 % VO_{2max} for 150 minutes a week spread out at least 3 times during the week. Regular activity has been shown to improve insulin resistance for 72 hours after the last session. Our proposed hypothesis that a dosed long-term aerobic exercises improved diabetic control in older people with type 2 diabetes, was confirmed.

Conclusions. Body weight, body mass index, haemoglobin A1c level, systolic blood pressure and heart rate significantly decreased, while walking distance increased and glycemic control significantly improved after long-term aerobic exercise programme in older women having type 2 diabetes mellitus.

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ACTIVE AGING IN A CLOSE-KNIT COMMUNITY

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Relevance of the research. Healthy aging is an optimization process of ensuring physical, social and mental health and it aims at enabling elderly people to actively participate in social life without discrimination and to enjoy autonomy. The process of successful aging is defined by physical, psychological, social and recreational activities factors (Lee et al., 2011).

Aims. According to Social cognitive theory (Bandura, 1989), research aim was raised to assess the development of psychomotor skills for elderly persons as well as promotion of their self-actualization and active aging through physical activity.

Research methods and organization. The study included 35 respondents aged 60 to 92 years: 15 of them lived independently (in an integrated environment) and 20 – nursing home (in a segregated environment). The study employed biomedical and social research methods.

Results and discussion. Forms of adapted physical activity were applied for 8 weeks. We established that in the navigation test most of the subjects improved from 3.5 min to 2.3 min; balance improved from less than 10 s to satisfactory (10–24 s), average (25–39 s) and for 6 persons to good (40–50 s) values. For persons whose daily physical activity was low intensity, the heart rate after 8 weeks of physical activity approached the normal rate (128 ± 7).

Conclusions. Given the constant recurrence of biological degenerative changes, all respondents' attitudes towards physical activity results were positive regardless of the environmental conditions (integrated or segregated), and their physical performance improved as well. For segregated community members, physical activity mobilized them for motivated communion and strengthened their mental health.

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IMPACT OF PHYSICAL ACTIVITY ON SOMATIC INDICATORS AND QUALITY OF LIFE IN ELDERLY WOMAN (CASE STUDY)

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Relevance of the research. The ageing is an irreversible and natural biological process which is in progress throughout our life. This process has significant influence on human organs (Alfieri et al., 2010). Furthermore, it is affected by the lifestyle and the environment in which we live. The signs of ageing are often visible on the whole locomotor system (Tlučáková, 2012).

In these days the active ageing is really important for increasing a life quality by keeping the highest level of physical, social and mental comfort (Čelko, 2014).

A subject in this study was an overweight senior woman with age over 65. She was suffering from back and knee pain. *The aim of the case study* was to demonstrate a positive effect of physical activity on the somatic parameters and the quality of life in elderly.

Research methods and organization. In this case study we described our approach to the senior woman, whose goal was to improve and strengthen her health and motoric abilities. She exercised For 18 weeks according to an individualized exercise program. The exercise program was designed with consideration of her health specifications and Mobility limitations (Cadore, Izquierdo, 2012). She exercised 60 minutes 3 times per week. The exercise program was divided into three 6 weeks phases. The first phase consisted of activation of a deep stabilization system (Smíšek et al., 2011). In the second phase we aimed our effort to improve a fitness level and the third phase was a maintaining phase (Uhlíř, 2008).

Measurements were realised by In Body 230 device. In our case study we analysed somatic parameters such as Body mass index, Body fat percentage, Waist-hip ratio, body weight, body size, visceral fat area, body fat mass and active muscle mass (Uher, 2014). The analysed data was collected twice – at the beginning and after 18 weeks. We evaluated the life quality with WHOQOL questionnaire before and after training programme.

Results and discussion. The subject lost 9 kilograms of fat mass after 18 weeks, while the active muscular mass remained on the same level. According to age now is the Body Mass Index in the physiological scope (Uher, 2014). The highest decrease of centimetres was from waist circumference (-32 cm). Body Fat Percentage was still slightly increased, especially in the waist area, which was also proved by Waist Hip Ratio. In an upcoming cooperation the waist circumference should be more reduced, WHR is predictor of the risk of type 2 diabetes, cardiovascular disease and hypertension (Uher, 2014).

The back and knee pain were reduced by application of rehabilitation exercises. We noticed evident Realtion between the WHOQOL questionnaire collected before exercise program and after 18 weeks, particularly in a domain of physical health and a satisfaction with health. With the physical activity performed 3 times per week, we improved the physical and psychic wellbeing of subject.

Conclusions. Our research supported an evidence for importance of a physical activity for seniors mobility improving, their health condition and the life quality in general (Orr et al., 2006). According to results we strengthened the assumption that regular physical activity has a positive impact on a reducing of weight, maintenance or even increase of a muscular mass, improvement of joints locomotion and elimination of a muscular disbalance even in ageing. Though, it is important to consider the level of physical fitness and health. Based on the results, we suggest implementing exercise activities in seniors´ life.

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THE KINETICS OF OXYGEN UPTAKE DURING WALKING IN ELDERLY WOMEN

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Relevance of the research. The aerobic capacity usually decreases during aging (Cunha et al., 2010). Several studies have shown that cardiovascular and respiratory parameters demonstrate slower kinetics at the start or after exercise in old persons as compared to young ones (Murias et al., 2011; Gravelle et al., 2012). However it has been not evaluated if there are differences between middle aged and elderly women.

The object of the research is the kinetics of oxygen uptake in elderly women, and *the aim* is to assess the kinetics of oxygen uptake (VO_2) during walking in elderly women.

Research methods and organization. 23 healthy, inactive female participated in this study. The participants were divided by age into two groups: 9 middle age women (47.3 ± 5.2 years) and 14 elderly (65.4 ± 4.1 years). During visit to laboratory total and segmental body composition assessment was carried out and each woman performed standard 6 minute walk test (speed – 6 km/h, inclination – 4 %) on treadmill. Three minutes before test participants walked at 3 km/h. Five minutes post-test participants lied in supine position. Each subject performed the same test twice with hour of rest between sessions. Respiratory gas exchange values were measured breath by breath using a portable system. VO_2 response was applying a mono-exponential equation: VO_2 (t) = VO_2 baseline ± Amplitude ($1–e^{-t/\tau}$), where τ is time constant of response.

Results and discussion. The absolute VO_2 was lower in elderly women (1070.4 ± 8.3 ml/min) as compared with middle age ones (1130.0 ± 7.3 ml/min) ($p < 0.05$), but there was no difference between groups in the relative VO_2, which was 16.5 ± 1.3 ml/min/kg and 15.6 ± 3 ml/min/kg respectively ($p > 0.05$). The amplitude of the pulmonary VO_2 response above the pre-exercise baseline is considered to closely reflect the increase in muscle VO_2 (Krustup et al., 2009). Older age is associated with a decline in maximum metabolic and force producing capacities, thus, older adults complete activities of daily living at higher relative intensities than young adults (Peterson, Martin, 2010). Aging is also associated with declines in both the capacity and efficiency of energy supply in muscle (Coen et al., 2012).

The slow component of VO_2 kinetics was higher in elderly group (47.5 ± 59.0 ml/min) than in middle age (3.8 ± 14.4 ml/min) ($p < 0.05$). The pulmonary VO_2 slow component closely corresponds to metabolic changes occurring within the contracting skeletal muscle fibres (Krustup et al., 2009). It reflects an increased muscle energy turnover and is associated with a concomitant depletion of the finite PCr stores and greater glycogen utilization. Lower VO_2 slow-component amplitude is associated with better exercise tolerance (Bailey et al., 2010).

The kinetics of VO_2 during recovery was slower in elderly group (82.6 ± 11.6 s) than in middle age group (71.7 ± 5.8 s) ($p < 0.05$). Aging associated with bigger body fat mass and lower lean mass. Body fat impedes HRR and delays recovery of oxygen consumption. The post-exercise oxygen consumption response to exercise is influenced by body core temperature and the intensity and duration of exercise. Also, individuals with higher maximal oxygen consumption (VO_{2max}) and greater muscle mass had a faster recovery (Campos et al., 2012).

Conclusions. The older women demonstrated greater amplitude of the slow component of oxygen uptake kinetics during exercise and slower time course of oxygen uptake during recovery. The time constant of oxygen uptake response at the onset of walking was similar in middle aged and elderly women.

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SOME CHANGES IN THE INDEXES OF BLOOD AND BODY COMPOSITION, FUNCTIONAL BODY CAPACITY AND COGNITIVE FUNCTIONS AFTER TWO MONTHS OF EXERCISE PROGRAM IN ELDERLY WOMEN

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Relevance of the research. With age, the aging body experiences various types of changes – metabolism and peripheral nerve regeneration become slower as well as the recovery of neuromuscular connections and transmission of electrical signals through axons (which results in decreased cognitive functions) (Manini et al., 2013). Also, older people have a higher risk of respiratory failure due to decreased pulmonary physiological capacity (Vaz Fragoso, Gill, 2012). Aging causes increased blood pressure, during exercise it increases more and returns to normal no longer as fast as in young people (Oakley, Tharakan, 2014).

The structure of mortality of the Lithuanian population according to the main causes of deaths remains the same for many years – circulatory system diseases are still leading. In 2013, the majority (86.1 per cent) of deaths from cardiovascular diseases was among persons 65 years old and older (Gaidelytė et al., 2014). Also, obesity is a rapidly growing health problem in the world and it is one of the major risk factors for many chronic diseases (Bowen et al., 2015). At the moment, the "global" problem is revealed by the fact that on average, one out of seven people are overweight, two are obese and one suffers from inadequate nutrition (Lorenzini, 2014).

The object of the research was the effect of physical activity on blood glucose and cholesterol concentration, body composition index, functional body capacity and cognitive functions in elderly women, and *the aim* was to measure blood glucose and cholesterol concentration, body composition index, identify functional body capacity and cognitive functions in elderly women after two months of physical activity.

Research methods and organization. The study involved 40 women not engaged in sport from 60 to 74 years of age. Subjects were asked to register their diet three days before the study and honestly answer the questions in the questionnaire about their physical activity, health and lifestyle. When all nutrition registration forms were collected, we estimated the energy intake obtained from dietary carbohydrates, proteins and fats in kilocalories and the percentages. We also calculated daily energy demand, the interface between the carbohydrates and fat and the percentage fat body mass. Subsequent anthropometric measurements were those of height, weight as well as four fatty skin folds (biceps, triceps, subscapular and iliac); body fat percentage and body mass index (BMI) were computed. Total cholesterol and glucose levels in the blood were established. The subjects underwent cardiovascular functional capacity assessment Rufje test, respiratory functional capacity assessment by maximum oxygen consumption Bench Step Test and cognitive skills assessment "Navigation Test".

The study lasted for 2 months; the practice sessions were attended 2 times a week. The 60-minute combined workout was applied – aerobic exercise (60 to 70 per cent of HRmax) and strength exercises with exercise machines, weights, and rubbers (75 to 85 per cent of the HRmax). The women were tested 2 times: before and after the study.

Results and discussion. The investigation established that all of the subjects were overweight. Before the study BMI was 29.33 ± 3.64 kg/m², and after the two-month training program it was 28.94 ± 3.65 kg/m². BMI decreased by 0.39 kg/m² (1.33 per cent) ($p < 0.05$). Subjects' glucose and total cholesterol levels decreased significantly after the exercise program ($p < 0.05$). Before testing, glucose was 4.07 ± 0.99 mmol/l, after the investigation – 3.80 ± 1.08 mmol/l. Total cholesterol in the blood before the study was 6.47 ± 1.00 mmol /l, after it – 5.61 ± 1.35 mmol/l. Fat percentage of subjects before the two month training program was 37.30 ± 3.54 per cent, after it 35.47 ± 3.40 per cent. Fat percentage decreased significantly (by 1.43 per cent) ($p < 0.05$). After measuring the sum of subjects' four fatty skin wrinkles (biceps, triceps, and subscapular and iliac) we found that before the study it was 69.83 ± 17.70 mm, after it 64.88 ± 15.80 mm. Sebaceous skin wrinkles decreased significantly (by 4.95 mm) ($p < 0.05$). The evaluation of subjects'

efficiency of the respiratory system showed that women's VO2max, before testing was 36.72 ± 3.60 ml/kg/min, after it 37.30 ± 3.53 ml/kg/min. After the two month training program VO_{2max} improved by 0.58 ml/kg/min (1.57 per cent) ($p < 0.05$). Rufje test for the evaluation of cardiovascular capacity before the study was 4.9 ± 2.97 points, after it – 2.7 ± 1.92 points. After the two month training program Rufje index improved by 2.2 points (44.89 percent) ($p < 0.05$). Cognitive skills were assessed using the "Navigation Test"; before the study the difference between A and B parts was 77.18 ± 37.77 s, after the study 71.83 ± 30.88 s. After the two month training program the Navigation Test" results were better, but not significantly ($p > 0.05$). After analysing the diets of subjects we estimated the distribution of dietary intake of essential food components in percentage per day: carbohydrates – 44 per cent, proteins – 18 per cent, fats – 38 per cent. According to WHO recommendations, subjects consumed carbohydrates 16 % less than recommended, proteins – 3 % more, and fats significantly exceeded the norms – even by 13 %. We also tested the subjects' links between dietary intake of carbohydrates and fat in grams and the percentage body fat mass before and after the two month training program. We found that the correlation was very weak ($p > 0.05$).

Conclusions. Participants' blood glucose level was within the recommended norms before the research, although blood cholesterol level was higher than the recommended norms. After two months of physical activity these levels decreased significantly. Before the research the women's body mass index and the percentage body fat was greater than the recommended norms. After two months of physical activity these levels decreased significantly. Before the physical activity program participants showed a good aerobic capacity and cardiovascular system's efficiency. Women's energy that was obtained from food (carbohydrates, proteins, fat) did not comply with the recommended norms since participants consumed too many kilocalories per day. Correlation between participants' percentage body mass fat and the intake of carbohydrates and fat that were measured in grams per day was week. Correlation was not statistically significant.

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THE PSYCHOMETRIC PROPERTIES OF THE PHYSICAL ACTIVITY SELF-EFFICACY ASSESSMENT SCALE FOR SENIORS

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One of the most important achievements of modern society is the increase of prospective population lifespan. The increase of population lifespan also includes a lot of challenge. Becoming older, physical, sensory and cognitive abilities of the body diminishes and it could be the reason for functional restrictions. Along with weakening abilities of an organism, the risk of health disturbance increases, and it affects human working abilities and social welfare essentially. In later years aging indications appear which influence the human's physical and psycho-emotional state. The reduction in the functional state also produces certain restrictions of activities, which bother daily actions. The social cognitive theory was chosen as the basis for developing of the of the Physical Activity Self-efficacy Assessment Scale for seniors (PASAS). This theory based on the recognition that direct interaction links exist between behaviour, environment and personal psycho-somatic conditions. There is mutual interaction between these factors: on the one hand, the environment determines human behaviour, on the other hand, human behaviour changes environment. A person operates in continuous behaviour, cognition and environmental interaction. Special attention is drawn to self-efficacy reflecting individual beliefs in one's capabilities to successfully execute a task and it correlates with a person's physical activity. Physical activity self-efficacy is one of the most important psychological factors that influence older person's health related behaviour.

The object of the research is physical activity self-efficacy. *The aim of this study* was to develop an appropriate instrument and examine the psychometric properties of the PASAS.

Research methods and organization. The scale development process included identifying the physical activity self-efficacy concept by literature reviewing, generating the items from semi-structured interviews and testing of validity and reliability. The inclusion criteria for recruitment of the sample were seniors aged from 60–75 years and being willing to participate in this study during cardiovascular health assessment in Heart Health consulting rooms across five Latvia regions. The study samples consisted of 359 respondents 60–75 years old. The mean age ± SD of the participants was 67.3 ± 7.1 years. 228 were female (63.5 %) and 131 male (36.5 %), the proportion of genders and number of samples are representative for population of Latvia at this age group.

Results and discussion. The first step of the research was the review of scientific literature for constructing of content of PASAS and generating of the items pool.

The next phase was the qualitative study of the main barriers and motives of engaging in regular physical activities for seniors. There were performed 20 semi-structured interviews among 13 females and 7 males aged from 62 to 74 years. As random samples are not imperative for basic interpretive research where the goal is to obtain rich description of unique human experience from any accessible informants it was chosen a non-probability sample from Heart Health consulting room visitors. Summing up the content units that equal describe the experience of different people the subthemes were defined. The main factors that obstruct the participation in regular physical activities were identifying: health limitation, internal factors, social attitude, lack of recourses and environment.

The scale with fourteen items was developed based on the results from the interviews and literature review. Example of the item "I am able to perform daily tasks and activities that require physical effort even I have the time restrictions". The Likert ranging from "1 = fully disagree" to "5 = fully agree" was applied for this scale. A higher score indicates a greater degree of confidence among seniors to engage in physical activities. The final PASAS items were tested in survey of 359 respondents.

The criterion-related validity of PASAS was verified by a significant positive correlation (ρ = 0.47–0.741, $p < 0.01$) between the developed scale items and the scores of International Physical Activity Questionnaire. The internal consistency reliability was supported by coefficient Cronbach's alpha of total scale of 0.966; the item – total correlation for each item was from 0.457 to 0.892. The construct validity

was determined by exploratory factor analysis with principle component method and varimax rotation. The final PASAS consists of 14 items with 4 components: internal motivation, lack of support, health limitations and lack of recourses.

Conclusions. The scale developed in this study can be used as research tools to measure PA self-efficacy of seniors. Before the PASAS is used in other groups of population, the content validity and construct validity is recommended to be tested. As well, the more study of health related behavior will help to reinsure the criterion related validity of PASAS.

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PHYSICAL AND EMOTIONAL HEALTH IN OLDER AGE AS A RESULT OF THE TRAUMATISM PREVENTION OF A BOXER DURING THE TRAINING PROCESS

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Relevance of the research. Boxing is a popular kind of sports, which is related to a single combat group. Athletes, who go in for boxing have a good physical condition, a quick response, endurance, static and dynamic strained attention which is directed to master opposition of an opponent during the exchange of punches in single combat's time. The level of especially composed training should be higher nowadays in order to be able to promote the development of boxing. There should be more supplies of the equipment to decrease injuries. The training process should be used more effectively to give maximum results from a boxer. Boxers should understand that systematic exercising, increase of the training load, and wide spectrum of technique may cause the risk of getting injuries. Emotional health is the second important aspect for boxer training. Moreover, emotional stability could be considered as essential part in the process of boxer preparation. It should be stated, that emotional stability is resulted from ability of emotional self-regulation and emotional intelligence.

The object of the research is strength developing of upper extremities of boxers during the training process. The research hypothesis is that the exercises developed to increase the strength of the muscles of upper extremities, and lower extremities will lead to smaller number of injuries. *The research aim* is the improvement of the training process of Latvian boxers including a routine of especially composed exercises, based on injury research.

Research methods and organization. The first stage of the research. The subjects of the research are 10 boxers (age: 15–16 years, height: 156–183 cm, weight: 49–91 kg; experience in sports: 2–3 years). Main methods and organization of research are analysis of the literature sources, radiology, computer tomography conclusions, testing, mathematical statistics. The next stage of the research: experimental study of the effect of emotional self-regulation program for developing emotional stability among boxers.

Results and discussion. The results of radiology we stated, that it is typical for our experimental group of boxers to get injuries in upper extremities fracture and it reaches 20 % of overall injury variety. Bruises take the second place 15 %. Scratches and ligaments damages make a smaller percentage 12 % each. Rarely boxers of this age can have muscle injuries; it makes 5 % each of overall injury variety. The average result of the left arm power in the beginning is 49.00 kg, right arm power 51.50 and in the end of experiment 51.50 and 54.00. The average result of the bench press test in the experimental group in the beginning is 72.10 kg, and in the end of experiment 78.20 kg. Average growth is 6.10 kg. The average result of rope jumping test in the beginning is 165 times per 1 min, and 185 times per 1 min in the end. The average growth is 20 times. The test results make evident that the worked-out routine includes exercises for forearms, upper arm muscles, legs, foots and it is effective as these exercises are closely related to boxing. All these indices reflect positively and effectively because they are aimed to develop the muscles of upper and lower extremities.

Conclusions. Having investigated the results of radiology we stated, that it is typical for our experimental group of boxers to get injuries in upper extremities fracture and it reaches 20 % of overall injury variety. It gives evidence that it is a serious problem. Bruises take the second place 15 %. Scratches and ligaments damages make a smaller percentage 12 % each. Rarely boxers of this age can have muscle injuries. The average result of the bench press test in the experimental group in the beginning is 72.10 kg, and in the end of experiment 78.20 kg. Average growth is 6.10 kg. The test results make evident that the worked-out routine includes exercises for forearms, upper arm muscles and shoulders girdle and it is effective as these exercises are closely related to boxing. All these indices reflect positively and effectively because they are aimed to develop the muscles of upper and lower extremities. As a result of the experiment we conclude that the worked-out programme is suitable to the group of muscles mentioned above, as well as it is effective in the prevention of injuries. Physical traumatization can be resulted in

serious psychological problems, such as psychsomatization, stress. Promotion of special psychological program, that are directed to developing emotional intelligence, would be the next step of the research.

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THE EFFECT OF ACTIVE VIDEO GAMES ON THE PARAMETERS OF BALANCE, COGNITIVE FUNCTION AND QUALITY OF LIFE IN ELDERLY: PILOT STUDY

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Relevance of the research. Aging has the negative effect on the structure and functions of central nervous system. It directly affects balance and gait (Granacher et al., 2012). Changes of the cognitive function are related to depression, low self-esteem and poor quality of life (Torres, 2008).

Interactive gaming systems have the potential to help rehabilitate patients with musculoskeletal conditions (Wikstrom, 2012). Though certain systems (Wii Fit balance) could not be used for balance progress measuring, but could be the useful tool for rehabilitation. It is stated that ICT application for elderly could improve social activity, quality of life and reduce symptoms of depression. Some scientific studies claim that active video games improve reaction time, cognitive function, visual-motor coordination, attention, concentration and self-esteem in elderly (Torres, 2008; Chao et al., 2014). However the further studies are needed to analyze the effect, duration, type of video games applied in rehabilitation.

The aim of the research was the effect of active video games on the parameters of balance, cognitive function and quality of life in elderly.

We hypothesized that physiotherapy programme including active video games will be more effective than conventional physiotherapy programme.

Research methods and organization. 16 elderly (4 male, 12 female) subjects volunteered in the study. Subjects were randomly assigned into PTVG group (n = 14; age 70 ± 5.1 years) which received conventional physiotherapy programme and active video games and PT group (n = 14; age 69.13 ± 5.9 years) which received only conventional physiotherapy programme. Subjects exclusion criteria were: stroke, Parkinson's disease, multiple sclerosis, Alzheimer's disease, acute inflammation, endoprosthesis of the knee or hip joint, heeling fracture, insufficiency of cardiopulmonary system.

Balance (Berg scale, Up and Go test) cognitive function (MMSE) and quality of life (WHOQOL-100) were assessed before and after the intervention. Intervention for PTVG and PT group lasted for 4 weeks, 3 times/week, 35 min each procedure. PT group exercise programme consisted of low intensity strengthening, ROM, stretching exercises for upper and lower extremities, balance and breathing exercises also relaxation. PTVG group exercise programme was analogous and additional active video games were applied using Wii Nintendo with balance board. PTVG group subjects standing in 3 m distance from the screen had to perform different movements with visual feedback. Statistical analysis was performed using SPSS/PC+ version 17.0, a statistical package for Windows. The results were analyzed and data are reported as means (x) and standard deviations (σ). Pre-post intervention scores were compared by paired t-tests. In addition, effect sizes were calculated to examine clinically significant changes. The significance level was set at an alpha level of 0.05.

Results and discussion. Active video games had a tendency to improve dynamic balance in elderly. However there were no statistically significant improvements of static and dynamic balance, cognitive function and quality of life in elderly after 4 weeks of physiotherapy with active video games. Pre-post intervention scores: Berg scale PTVG group 54.93 ± 1.3 and 53.64 ± 0.9, $P > 0.05$, PT group 52.88 ± 2.2 and 53.81 ± 1.9, $P > 0.05$; Up and Go test PTVG group 8.42 ± 1.71 sec. and 7.47 ± 1.78 sec., $P > 0.05$, PT group 8.63 ± 2.24 sec. and 7.78 ± 2.06 sec., $P > 0.05$; MMSE PTVG group 28.88 ± 0.9 and 28.53 ± 1.3, $P > 0.05$, PT group 26.25 ± 2.8 and 26.56 ± 2.4, $P > 0.05$; WHOQOL-100 PTVG group 90.88 ± 9.3 and 90.50 ± 8.8, $P > 0.05$, PT group 83.75 ± 6.1 and 86.38 ± 7.5, $P > 0.05$.

Conclusions. This study provided a proof that 4 weeks of active video games have no greater effect on the balance, cognitive function and quality of life of elderly than conventional physiotherapy programme. Active video games had a tendency to improve the dynamic balance in elderly. Further studies are needed to establish the optimal duration of intervention which could have the greatest effect on above mentioned parameters.

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THE EFFECT OF PILATES EXERCISE ON THE PHYSICAL CAPABILITY AND QUALITY OF LIFE OF ELDERLY WOMEN

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The relevance of the study. The world community is constantly getting older and less focusing on maintaining physical capability, this makes deterioration of quality of life inevitable. Sarcopenia and the consequent loss of muscle strength and endurance that can occur in older adults potentiates the risk of falls, as postural balance and functional mobility are also affected (Scott, 2014). Pilates has recently gained in popularity (Di Lorenzo, 2011) and seems to be an efficient manner of strengthening the muscles of the trunk (core training) (Granacher et al., 2013), postural balance (Hyun et al., 2014) and aspects of quality of life (Rodrigues 2010).

The aim of the present study was to determine the effect of Pilates exercise on physical capability and quality of life of elderly women.

Methods. Subjects were thirty-three older adults with age 72.5 (4.7) years, height 166.3 (6.6) cm and weight 71.9 (5.8) kg which performed two sessions of Pilates per week for 12 weeks. The following evaluations were performed before and after the Pilates exercises: the Berg Balance Scale, the test sit and reach, the body mass index (BMI), shoulder flexion, 30 sec. chair stand and sit sit and reach tests and Short Form 36 Medical Outcomes Study questionnaire.

Results. Elderly women demonstrated significant improvement in most variables: the BMI changed from 26.0 (2.2) before Pilates exercise to 25.3 (2.6) after Pilates exercise, Berg balance scale from 39.6 ±5.0 to 46.9 ±5.5 scores, shoulder flexion from 0.7 (0.7) to 1.1 (0.6) scores, 30 sec. chair stand and sit from 15.3 (3.2) to 19.5 (4.1) stands and sit and reach tests from −5.5 (4.6) cm to −3.7 (6.6) cm. The quality of life of elderly women also improved significanly after the 12 weeks Pilates exercise course.

Conclusions. 12 weeks of Pilates exercise led to significant improvement in physical capability and quality of life of elderly women.

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DIFFERENT ACUTE EXERCISE EFFECT ON COGNITIVE FUNCTIONS. THE FIRST PILOT STUDY

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Relevance of the research. More than 70 years ago, it was already concluded that muscular contraction has an effect on mental processes (Lorist et al., 2002). However, little is known about the effects of increasing demands on central mechanisms induced by motor fatigue on cognitive task performance. This area is important both for young and elderly people, given a growing proportion of elderly people in the total population of developed countries, which results in age-related cognitive decline emerging as a major concern. (Vidal-Pineiro et al., 2014). In addition, physical activity is positively related not only with overall physical functions, but also with cognitive functions. Hence, strength training can be applied in order to improve muscle strength, functional capacity (Andersen et al., 2014) and cognitive functions (Voss et al., 2011). Various findings suggest that improved cognitive function during an exercise may be ascribed to the cerebral neural activation associated with the exercise (Ogoh et al., 2014). Other studies have demonstrated direct correlations between increased levels of physical activity, increased hippocampal volume, and enhanced spatial memory (Philips et al., 2014). Animal models of exercise effects on brain physiology and structure have indicated several pathways through which resistance training may enhance brain function. These pathways include improvement in the structural integrity of the brain (growth of new neurons and blood vessels) and increased production of neurochemicals promoting growth, differentiation, survival, and repair of brain cells (Voss et al., 2011).

The object of the research is changes of the cognitive functions after various acute physical exercises, whilst *the aim of our pilot study* was to identify type and load of physical activity that have the greatest impact on cognitive functions.

Research methods and organization. The inclussion criteria were: age up 20 to 30 years, physical inactive, free of neurologic, physical, psychiatric illness. The final sample included 11 participants (mean age 21.7 ± 1.5 years). They were random divided into 4 groups. In the 1, 2, 4 groups were performed squats with a barbell using Smith Weightlifting Machine (1 gr. 2 sets x 10 rep.; 2 gr. 6 sets x 10 rep.; 4 gr. 3 rep. 75 % 1 RM), in the 3 group – a traditional strength training. For cognitive assessment was used Automated Neuropsychological Assessment Metrics version 4 (ANAM 4) and created a battery of cognitive tests. Subjects were tested before and after training. For the analysis, the throughput (TP) variable was selected. We calculate related samples Wilcoxon signed rank test, significance level was set to $p < 0.05$.

Results and discussion. No significant differences were observed in reaction time (RT), memory and mathematical processing testing before and after training in all four groups ($p > 0.05$). At baseline TP scores for all tests was lower in all groups compared with post-training scores. But in the group 2 was a tendency ($p = 0.06$) of the RT to improve after training. Testing mathematical processing there was also observed, that in the group 2 was a tendency ($p = 0.06$) of the mathematical processing to improve after training.

Conclusions. 1. We found that aplying exercise intensity of 6 sets x 10 repetitions (like in group 2), we obtain the greatest impact on cognitive functions, which we assess (reaction time, memory and mathematical processing).

2. We calculate that we need to evaluate 16 participants for significant results, when significance level $p < 0.05$.

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EFFECT OF AEROBIC ACTIVITY ON FUNCTIONAL STATUS AND COGNITIVE FUNCTIONS FOR OLDER PEOPLE

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Relevance of the research. Previous studies have shown that Nordic walking is an appropriate exercise method for older people and has favourable cardio respiratory effects. Nordic walking contributes to positive changes in functional capacity after only 9 weeks (Parkatti et al., 2012). Earlier studies have consistently shown a small but positive relationship between greater physical activity and lower risk of cognitive decline in older people (Miller et al., 2012). Cardio respiratory fitness is associated with more efficient cognitive functions. Physical activity is a significant moderator of age-related cognitive decline (Bherer et al., 2013).

The aim of study was to evaluate the effect aerobic activity on functional status and cognitive functions for older people.

Research methods and organization. The survey involved 8 women whose average age was 70 years. The subjects did not participate in any regular physical activity. Exclusion criterion was any disease manifestation known to prevent or limit exercise performance. The subjects participated in Nordic walking for two months, three times a week. The duration of training was 1 hour. The tests battery was used to evaluate the effect of aerobic activity on functional status and cognitive functions: anthropometry – height, weight measurement; 2 minute Step in Place test – to evaluate aerobic endurance; dynamometry – to evaluate handgrip strength; lower extremities muscles endurance test; back reach test – shoulder flexibility testing; functional reach test – stability assessment; the Trail Making Test (Reitan, Wolfson, 1985). Measurements were carried out before training, after two months of training and more than two months after training.

The significance of the research results was evaluated by nonparametric analysis; the data was analyzed using Wilcokson criteria.

Results and discussion. The study results showed, that aerobic activity performed for two months statistically significantly improved muscle strength, flexibility, aerobic endurance and cognitive functions. The 2 minute Step in Place test results after two months training increased from 79 until 87 steps per 2 minutes. The Trail Making Test performance time improved from 33 until 30 seconds. Therefore the aerobic endurance and cognitive functions decreased after two months of inactivity.

Conclusions. Two-month aerobic activity can improve older people's physical condition and cognitive functions, but aerobic physical activity must continue without interruption.

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EFFECT OF TWO DIFFERENT TECHNIQUES FOR MATURE DEHYDRATED FACE SKIN

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Relevance of the research. Water balance in our body is extremely important to maintain homeostasis. The most important function of the skin – to form an effective barrier between the organism and the environment preventing invasion of pathogens and fending off chemical and physical assaults, as well as the unregulated loss of water and solutes. The epidermis comprises the physical, the chemical/ biochemical (antimicrobial, innate immunity) and the adaptive immunological barriers (Proksch et al., 2008). Lack of the humidity, water and other microelemnts transdermal transportation disruption reduces the skin tone of the cheeks, lips, eyebrow areas, causes the lost elasticity of the upper layer, affects pigmentation, wrinkles appearing. These structural changes of the skin gets an aging apperance (Papakonstantinou et al., 2012). The functional manifestations of extrinsic aging are due to epidermal damage and remodeling of the dermal collagens and extracellular matrix proteins (Naylor et al., 2011). Facial aging is an integrated process, and the changes that occur in individual tissues, including skin, muscle, fat, and bone, are interrelated. Interactions between the different components results in an overall alteration in facial appearance as one ages (Vleggaar, Fitzgerald, 2008). Each of these changes in the epidermis, dermis, fat, muscle, and bone is addressed in an aesthetic practice in different ways. (Murina et al., 2012). Non-invasive transdermal active substances entering deeply into the skin is a very important question of aesthetic cosmetology nowdays (Araviskaya, Sokolovski, 2008).

The object of the research is the effect of two different techniques and *the aim* is to evaluate the impact of electroporation and iontophoresis techniques for mature dehydrated face skin.

Research methods and organization. Two different techniques – iontophoresis and electroporation – have been applied for 10 middle age women. Electroporation method have been used for the right side of the face and iontophoresis method have been used for the left side of the face for all subjects. All the experiment consisted of 5 procedures course (1 time/week) and mature skin humidity measurement indicators have been done before every procedure, and the 2nd and the 4th week after the experiment.

Results and discussion. The study showed that different sides of the face – forehead and cheeks – humidity indexes differed significantly ($p < 0.05$) after iontophoresis and electroporation procedures course. Electroporation technique had a significantly greater ($p < 0.05$) effect on the forehead and cheek skin humidity than iontophoresis had. The humidity level of the right side of the face have remained higher after the second and the 4th week after the application of electroporation technique comparing with the iontophoresis ($p < 0.05$). So, electroporation helps nutrients, materials, including the cosmetic, pass through the skin to the cell more easier. Because the access to the skin is mainly restricted by the skin barrier properties: a small bandwidth, and the lipophilic nature (Davalos et al., 2000).

Conclusions. Two different techniques increased mature face skin humidity level for all the subjects. But humidity level of the mature skin increased more after the electroporation course than after iontophoresis procedures. Face skin diagnostic the second and the fourth week after the experiment showed, that the mature facial humidity level remained higher after electroporation procedure.

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THE BODY COMPOSITION AND QUALITY OF LIFE IN OLD AGE: IS THIS RELATED?

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Relevance of the research. The demographic landscape of the world is rapidly changing, with older adults representing the fastest growing segment of the populations in many areas in the world. Normal aging is associated with changes in body composition which may result in age-related functional deterioration. Functional deterioration may lead to loss of independence with a significant personal and economic cost. The following changes are relate to health status changes and quality of life (QoL) in older age. Due of growing size of elderly population, it is critical to develop interventional strategies that may promote health and limit disability in later life. The investigation of the factor that interfere in the well-being of the elderly and their QoL provides theoretical and methodological subsidies in structuring actions and policies in the health area, in order to fulfill the needs of that population (Fleck et al., 2003).

The objective of the research was to evaluate the interrelationships among body composition and quality of life in older persons.

Research methods and organization. The study included 104 students of the U3A in Lithuania, located in the city of Kaunas. The study group consisted of 68 women (65.4 %) and 36 men (34.6 %). The mean age of the respondents was 63.07 ± 9.96. The short form (SF)-36 questionnaire recorded general well being during the previous 36 days. The items are formulated as statements or questions to assess eight health concepts: limitations in physical activities because of health problems (physical functioning); limitations of social activities because of physical or emotional problems (role limitations due to emotional problems); limitations of usual role activities because of physical health problems (role limitations due to physical health); bodily pain; general mental health; social functioning, vitality and general health perceptions and changes in health. Higher scores are associated with a better quality of life. Body composition was evaluated using the Tanita body-fat analyser (BMI, FFM, BFM, WHR). All analyses were done by using the SPSS/PC statistical program. The respondents were grouped according to BMI. Evaluation of the observed relationships was conducted with $\chi 2$ test, and the Spearman correlation analysis was used to verify the association among studies variables.

Results and discussion. There were 11.5 % normal weight, 61.5 % overweight and 26.9 % obese person. Physical function, vitality and mental health were lower in overweight and obese subjects. In this study no significant difference ($p \leq 0.05$) was found among the BMI groups in health perception domains. The higher negative correlation was found between body fat mass (%) and vitality. Knowing the anthropometric characteristics, body composition, and aspects of the QoL of the elderly can aid the understanding of the aging process and in the creation of strategies of health improvement (Sonati et al., 2011).

Conclusions. Our data demonstrated that obesity was associated with significant impairment of QoL in later life. Either we found that body fat mass influence negative mental health and vitality.

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PREDICTING PHYSICAL ACTIVITY OF ELDERLY WHO SUFFERS FROM TYPE 2 DIABETES

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Relevance to the research. Studies indicated that physical activity (PA) increases glucose disposal (Sigal et al., 2004) and is related to better psychological health (Ahola et al., 2012; Chyun, 2006) in patients with type 2 diabetes. American Diabetes Association recommends to be physically active at least 0.5h/5 days per week. Nevertheless, patients usually do not achieve the recommended level (Resnick et al., 2006).

The object of the study is the relationship between socio-cognitive determinants and physical activity in elderly patients with type 2 diabetes. *The aim* is to indicate socio-cognitive determinants of physical activity in patients with type 2 diabetes applying Theory of Planned Behavior (TPB).

Research methods. One hundred twenty five patients with type 2 diabetes participated in the study. The mean age was 69.39 ± 5.49 years. Among them 70.2 percent were women. PA was measured twice: at baseline and after 4 weeks using PA scale from SDSCA measure (Toobert et al., 2000). The scale consisted of two items (On how many of the last seven days did you participate in at least 30 minutes of physical activity? (Total minutes of continuous activity, including walking) and On how many of the last seven days did you participate in a specific exercise sessions (such as swimming, walking, biking) other than what you do around the house or as part of your work?). Participants had to indicate the number of days from 0 to 7. The internal consistency of the scale Cronbach alpha .62. Variables within TPB were developed based on the recommendations made by I. Ajzen (2006). *Intentions* to exercise were assessed from responses to 3-item statements (e.g. In the following month I plan to be physically active 30 min every day or engage in more vigorous physical activity three times a week). Responses were on 7-point semantic differential scales anchored by the "totally disagree – totally agree" at alternate ends of the scale. Internal consistency of the scale was very good (Cronbach alpha .87). *Attitudes* were measured by question which was worded "By your opinion to be physically active 30 min every day or engage in more vigorous physical activity three times a week is…" and a semantic differential scale was used where answers (6 items) were constructed using bipolar adjective pairs, three of them measured affective attitude (Cronbach alpha .75) (boring – exciting, stressful – not stressful, unpleasant – fun) and another three – cognitive (Cronbach alpha .63) (bad – good, damaging health – healthful, harmful – useful). *Subjective norms* were measured averaging two items (e.g. Most of people whose opinion I respect think I should be physically active every day for 30 min or engage in more vigorous physical activity three times a week) (Cronbach alpha .84). Specialist's subjective norm was measured by one item "My doctor thinks I should be physically active every day for 30 min. or engage in more vigorous physical activity three times a week". *Personal norm* was measured by one item "Most people with diabetes are physically active every day for 30 min or engage in more vigorous physical activity three times a week ". Items were evaluated on a scale using the "totally disagree – totally agree" word pair. *Perceived behavioural control* (PBC) was averaged from three items (e.g. I am sure that it's up to me that I can to be physically active 30 min every day or engage in more vigorous physical activity three times a week) and assessed participants' perception of their ability to meet the exercise criteria. PBC was evaluated on a scale using the "totally disagree – totally agree" word pair (Cronbach alpha .74).

Results and discussion. Patients with type 2 diabetes are physically active at the recommended level about 2.88 ± 2.13 days per week. Only 10.2 percent of patients are following the recommendations to be physically active at least 0.5 hour/ five days per week. This is in line with other research (Plotnikoff et al., 2006; Resnick et al., 2006).

Results of hierarchical regression analysis indicated that intentions to be physically active were predicted by perceived behavior control, general subjective norms, specialist's subjective norms, personal norms. These variables together explained uniquely for 54.2 percent of intentions variance. Anticipated regret in the next step added for 6.9 percent and was also significant in predicting intentions. The strongest predictor of intentions to be physically active was perceived behavior control, followed by the anticipated regret. Many other empirical research, review and meta-analysis found that PBC, which refers to people's

perceptions of their ability to perform a given behavior, is the strongest predictor of intentions (Muzaffar et al., 2014; Sniehotta et al., 2005; McGuckin et al., 2012; Blue, 2007; Boudreau, Godin, 2014; Boudreau, Godin, 2009; Plotnikoff et al., 2010). Construct of anticipated regret, recently added to the TPB, reflects beliefs about whether or not regret will follow from performing or not performing a certain behavior (Rivis et al., 2009), showed significant increase explaining variance of intentions in many studies (Abraham, Sheeran, 2004; Rivis et al., 2009). Neither emotional attitude, which reflects feelings towards the behavior, nor cognitive attitude, which reflects beliefs about the value of the behavior, was significant predicting intentions in the current study. Keeping in mind that the population under study was clinical patients, the personal values may play the weaker role in forming their intentions than the values of important others, especially practitioners, whose opinion regarding treatment supposed to be considered. Results of the current study along with others in clinical population (Blue, 2007) highlight the importance of specialist's subjective norms as well as norms of important others (both reflect personal perception of the social expectations to adopt a given behavior) and personal norms (reflects the belief that important others also perform a given behavior themselves). On the contrary, in the non-clinical population subjective norms are less important or not significant at all (Carter-Parker et al., 2012; Plotnikoff et al., 2011).

Another hierarchical regression indicated that physical activity was predicted by intentions. This is in line with theoretical premises (Ajzen, 1991) and many empirical studies (McEachan et al., 2011) indicating intentions as the most proximal predictor of behavior. Studies with patients with diabetes confirmed our findings as well (Plotnikoff et al., 2010). In the third step, baseline physical activity added additional 31.4 percent to the variance explained, i.e. those who were more active at baseline were also more active later in a month. Previous physical activity was the strongest predictor of physical activity behavior in a month. That means that routine and habit are important determinants of the behavior (McEachan et al., 2011) as it could affect beliefs and attitude towards the behavior in target (Romano, Netland, 2008) which are further related to behavioral performance. Results were controlled by demographic and clinical characteristics. So, it was also indicated that patients who have higher level of education are more physically active than less educated patients.

Conclusions. 1. Elderly patients with type 2 diabetes are insufficiently physically active. 2. Perceived behavior control, subjective norm, specialist's subjective norm, personal norm and anticipated regret are important determinants of intentions to be physically active. 3. Intentions and previous physical activity are important determinants of later physical activity behavior.

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PHYSICAL, PHYSIOLOGICAL AND PSYCHOLOGICAL FITNESS OF FREE LIVING ACTIVE AND NON-ACTIVE OLDER FEMALE ADULTS

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Relevance of the research. Aging represents period of life, where human body comes under the great changes, affecting people's condition and overall health.

The aim of the research was to determine anthropological profile and to determine differences within the profile between active and non-active free-living elderly adults.

Research methods and procedure. Twenty-one elderly female adults were classified in two groups: thirteen active (mean age: 66.54 ± 4.59 years; mean height: 158.08 ± 5.35 cm; mean weight: 75.47 ± 13.52 kg; mean BMI: 30.,18 ± 0.49 kg/m^2) and eight non-active (mean age: 71.81 ± 7.15 years; mean height: 160.55 ± 6.34 cm; mean weight: 74.40 ± 14.06 kg; mean BMI: 28.84 ± 0.35 kg/m^2) free-living female adults. Active elderly adults were those who participate in regular organised physical activity at least twice a week and non-active elderly adults did not participate in any kind of regular organised physical activity. For the purpose of this study, all participants were asked to complete senior fitness test protocol prescribed by Rikli and Jones (2013), which was consisted of eight tests: 30-second chair stand test, 30-second arm curl test, 2-minute step test, chair sit-and-reach test, back scratch test, 8-foot up-and-go test, height and weight. Along with that, participants fullfilled Croatian version of WHOQOL-BREF questionnaire (Pibernik-Okanović, 2001) composed of four domains (physical health, psychological health, social environment and environment) with two addition questions about their satisfaction with health and their quality of life on the Likert scale from 1-5. The differences between active and non-active group were examined with one-way analysis of variance (ANOVA).

Results and discussion. Results showed significant differences in four fitness tests: 30-second arm curl test (F-value = 5.34; p = 0.03), 2-minute step test (F-value = 26.60; p = 0.00), chair sit-and-reach test (F-value = 5.85; p = 0.02), 8-foot up-and-go test (F-value = 8.48; p = 0.01) and two questionnaire domains: psychological health (F-value = 4.96; p = 0.04) and environment (F = 9.26; p = 0.01). No statistical differences were found among perception of quality of life and health satisfaction between non-active and active participants (p > 0.05). This study showed that free-living older female adults had better achievements in motor and psychological tests opposed to non-active group.

Conclussion. This research showed the importance of exercising in older age, but further studies on bigger samples need to be performed for better understanding of aging and differences in level of fitness.