INTERNATIONAL SCIENTIFIC SYMPOSIUM

CLIMBING THE LADDER OF LIFE, ACTIVE AND FIT

Abstract Book

5–7 October, 2017

Lithuanian Sports University, Kaunas, Lithuania

ACTIVE AGEING MAKES THE DIFFERENCE!

LITHUANIAN SPORTS UNIVERSITY

European Group for Research into Elderly and Physical Activity

Research Council of Lithuania

International Scientific-practical Symposium
In collaboration with the European Group for Research into Elderly and Physical Activity
"CLIMBING THE LADDER OF LIFE, ACTIVE AND FIT"

LITHUANIAN SPORTS UNIVERSITY

European Group for Research into Elderly and Physical Activity

Research Council of Lithuania

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While there is sufficient evidence to acknowledge the benefits of physical activity across the human lifespan, many questions regarding physical activity in old age remain unanswered. These questions encompass basic philosophical issues related to aging and/or movement, questions seeking to examine the underpinnings of movement, and specific questions related to unique aspects of physical activity and movement in advanced age.

Examples of these questions are:
Exercise and behaviour – what is the cause and what is the effect?
Physical activity in old age – a need or a challenge to human nature?
What are the dose-response relationships between physical activity and health?
What is the relationship between physical activity and chronic disease?
How is physical activity related to brain and cognition?
What are the key variables that should be investigated in the effort to maximize the anti-aging effects of exercise?
What is the effect of specific physical activity programs such as yoga or Pilates on health and cognition in old age?
What are the mediating mechanisms between physical activity, mobility, gait, and fall prevention?
How can new technology be used for improving the relationship between physical activity, physical functioning, and psychological functioning?

In order to answer the above questions and to enhance the value of research, there is a great need to promote young scholars in this area. It is vital to the growth and development of the scientific community. This symposium therefore welcomes young researchers – advanced students as well as post-docs. The young researchers are encouraged to present their research as well as to participate in the presentations of experienced researchers.

While the study of physical activity is an academic discipline, it is also a practical profession. This symposium will therefore include scientific and academic sessions as well as practical workshops. In this way we can encourage academicians as well as practitioners – physical activity teachers, physiotherapists, trainers and physicians – to participate in both the scientific sessions as well as the active/experimental sessions.

We look forward to your participation in the symposium.

Organizers:
Dr. Aivaras RATKEVIČIUS, Rector of Lithuanian Sports University
Prof. Dr. Yael NETZ, President of EGREPA (European Group for Research into Elderly and Physical Activity)

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.

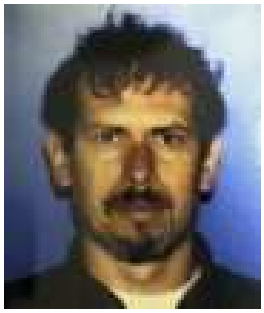
EGREPA is a scientific organization that is opened to work and co-operate with other organizations with common interests. More information on the website: http://www.egrepa.org/

KEYNOTE SPEAKERS

Symposium presentation:
EXERCISE MODE AND COGNITION IN HEALTHY OLDER ADULTS
Prof. Dr. Yael Netz, *Wingate College, Israel*

Symposium presentation:
PREPARE YOURSELF FOR THE WORLD: OIL YOUR MIND BECAUSE STRENGTH ALONE WILL NOT DO
Prof. Dr. Eling D. de Bruin, *Privatdozent Institute of Human Movement Sciences and Sport, ETH Zürich*

Symposium presentation:
DO EXERCISE INTERVENTIONS RESTORE OLD ADULTS' GAIT TO A YOUNG GAIT?
Prof. Dr. Tibor Hortobágyi, *University of Groningen, Groningen, The Netherlands*



Symposium presentation:
INDIVIDUAL DIFFERENCES IN BRAINSTEM AND BASAL GANGLIA STRUCTURE PREDICT POSTURAL CONTROL AND BALANCE LOSS IN YOUNG AND OLDER ADULTS
Dr. Oron Levin, *KU Leuven Movement Control and Neuroplasticity Research Centre, Belgium*

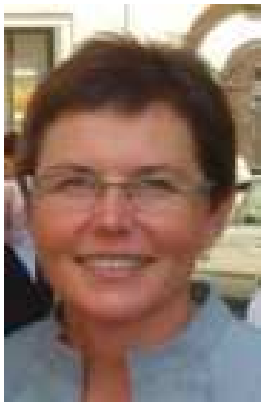
Symposium presentation:
THE ACTIVE AGEING CHALLENGE FOR EXERCISE PROFESSIONALS: HOW WE COULD SUPPORT INACTIVE AGEING POPULATIONS TO BECOME ACTIVE AND ENJOY A HEALTHY LIFESTYLE
Prof. Dr. Alfonso Jimenez, *Coventry University, UK*

Symposium presentation:
LOSS OF MUSCLE MASS AND THE CONTRIBUTION IT MAY MAKE TO THE AGE-RELATED LOSS OF MOBILITY
Prof. Dr. David A Jones, *Manchester Metropolitan University, UK*

Symposium presentation:
NEUROPLASTICITY IN AGING
Prof. Dr. Habil. Albertas Skurvydas, *Lithuanian Sports University, Lithuania*

Symposium presentation:
A GENERIC MOBILITY MODEL FOR STANDARDISATION OF MOBILITY-RELATED ASSISTED LIVING SOLUTIONS: A CONTRIBUTION FROM HUMAN MOVEMENT SCIENCE
Dr. Michael Brach, *University of Munster, Germany*

Symposium presentation:
VESTIBULAR EXERCISES FOR BALANCE CONTROL FOR ELDERLY (PRACTICE)
Dr. Aivars Kaupuzs, *Rezeknes Augstskola, Latvia*



Symposium presentation:
***AICHI* FOR SENIORS' HEALTH (WATER EXERCISES) (PRACTICE)**
Jolanta Grigonienė, *Lithuanian Sports University, Lithuania*

5th October, 2017	
OPENING OF THE SYMPOSIUM **Lithuanian Sports University, Sporto str. 6** **Central building, 215 auditorium**	
9:00–10:00	**Registration**
10:00–10:15	**Welcome speech** Prof. Dr. Aivaras RATKEVIČIUS, *Lithuanian Sports University, Lithuania* Prof. Dr. Yael NETZ, *EGREPA President, Israel*
PLENARY SESSION **Moderators: Prof. Dr. Arvydas STASIULIS, *Lithuanian Sports University, Lithuania*** **Dr. Michael BRACH, *University of Munster, Germany*** **Prof. Dr. Tibor HORTOBÁGYI, *University of Groningen, Groningen, The Netherlands*** **Lithuanian Sports University, Sporto str. 6** **Central building, 215 auditorium**	
10:15–10:45	Prof. Dr. Yael NETZ, *Wingate College, Israel* **EXERCISE MODE AND COGNITION IN HEALTHY OLDER ADULTS – INTENSITY VS COMPLEXITY**
10:45–11:15	Prof. Dr. Eling D. de BRUIN, *Privatdozent Institute of Human Movement Sciences and Sport, ETH Zürich* **PREPARE YOURSELF FOR THE WORLD: OIL YOUR MIND BECAUSE STRENGTH ALONE WILL NOT DO**
11:15–11:45	Prof. Dr. Tibor HORTOBÁGYI, *University of Groningen, Groningen, The Netherlands* **DO EXERCISE INTERVENTIONS RESTORE OLD ADULTS' GAIT TO A YOUNG GAIT?**
11:45–12:00	**COFFEE BREAK**
12:00–12:30	Senior researcher, Dr. Oron LEVIN, *KU Leuven Movement Control and Neuroplasticity Research Centre, Belgium* **INDIVIDUAL DIFFERENCES IN FRONTAL/BASAL-GANGLIA STRUCTURES AS PREDICTORS OF PERFORMANCE IN HEALTHY AGING: ON THE INTERPLAY BETWEEN MOTOR CONTROL AND COGNITION**
12:30–13:00	Prof. Dr. Alfonso JIMENEZ, *Coventry University, UK* **THE ACTIVE AGEING CHALLENGE FOR EXERCISE PROFESSIONALS: HOW WE COULD SUPPORT INACTIVE AGEING POPULATIONS TO BECOME ACTIVE AND ENJOY A HEALTHY LIFESTYLE**
13:00–13:30	Prof. Dr. David A JONES, Mathew PIASECKI, Hans DEGENS, Jamie MCPHEE, *School of Health Care Science, Manchester Metropolitan University, Manchester, UK* **LOSS OF MUSCLE MASS AND THE CONTRIBUTION IT MAY MAKE TO THE AGE-RELATED LOSS OF MOBILITY**
13:30–14:30	**LUNCH BREAK**
ORAL AND POSTER PRESENTATIONS * **Moderators: Prof. Dr. Saulius ŠUKYS, *Lithuanian Sports University, Lithuania*** **Prof. Dr. Yael NETZ, *Wingate College, Israel*** **Lithuanian Sports University, Sporto str. 6** **Central building, 215 auditorium** **14:30–16:35**	
14:30–14:45	Laimutė SAMSONIENĖ[1], Diana KARANAUSKIENĖ[2], Vilma STANKUTĖ[1] *Vilnius University, Vilnius[1]; Lithuanian Sports University, Kaunas[2]* **ENVIRONMENTAL ECOLOGY AND HEALTH OF ELDERLY PEOPLE**

14:45–15:00	Kristina ZAIČENKOVIENĖ, Renata RAKOVAITĖ, Vida Janina ČESNAITIENĖ *Lithuanian Sports University, Kaunas* **INFLUENCE OF PILATES METHOD TRAINING ON THE BALANCE OF ELDERLY**
15:00–15:15	Margarita DROZDOVA-STATKEVIČIENĖ, Vida Janina ČESNAITIENĖ, Nerijus MASIULIS *Lithuanian Sports University, Kaunas* **DOES ACUTE STRENGTH TRAINING AFFECT MOTOR AND COGNITIVE FUNCTION INTERACTION IN OLD ADULTS?**
15:15–15:30	Kristīne ŠNEIDERE[1], Jeļena HARLAMOVA[1, 2], Voldemārs ARNIS[1], Zane ULMANE[1], Andra VANAGA[1], Ainārs STEPENS[1] *Riga Stradiņš University, Latvia, [2] Rīga East Clinical University Hospital, Latvia* **RELATIONSHIP BETWEEN INVOLVEMENT IN LONG-TERM REGULAR PHYSICAL ACTIVITY AND MEMORY: PRELIMINARY RESULTS**
15:30–15:45	Aivars KAUPUZS *Rezekne Academy of Technologies, Latvia* **A CROSS-SECTIONAL ANALYSIS OF PHYSICAL ACTIVITY, PSYCHOLOGICAL DETERMINANTS AND HEALTH RELATED VARIABLES OF LATVIAN OLDER ADULTS**
15:45–16:00	Raulas KRUŠNAUSKAS, Tomas VENCKŪNAS, Audrius SNIEČKUS, Nerijus EIMANTAS, Neringa BARANAUSKIENĖ, Sigitas KAMANDULIS *Lithuanian Sports University, Institute of Sports Science and Innovations, Kaunas* **VERY LOW VOLUME HIGH INTENSITY INTERVAL EXERCISE ACUTE EFFECTS ON PHYSIOLOGICAL AND PSYCHOLOGICAL STRESS IN YOUNG AND OLD WOMEN**
16:00–16:05	Mandy KNOLL *Institute for Sport Science at Otto-von-Guericke University in Magdeburg, Magdeburg* **BENEFITS OF LONG TERM DANCE TRAINING ON MOTOR/COGNITIVE ABILITIES AND BRAIN STRUCTURE IN OLD AGE**
16:05–16:10	Edita MACIULEVIČIENĖ, Renata RUTKAUSKAITĖ *Lithuanian Sports University, Kaunas* **MIDDLE-AGED POPULATION PHYSICAL ACTIVITY POSITION CHANGES: DOES KNOWING CHANGE SUBJECTS MIND?** (Poster)
16:10–16:15	Jolita VVEINHARDT, Regina ANDRIUKAITIENĖ *Lithuanian Sports University, Kaunas* **BULLYING AND SINGLE CASES OF HARASSMENT IN WOMEN'S BASKETBALL TEAMS** (Poster)
16:15–16:20	Kazys VADOPALAS *Lithuanian Sports University, Kaunas* **IMPACT OF PRE-EXERCISE REHYDRATION ON CENTRAL FATIGUE UNDER THE CONDITIONS OF HYPERTHERMIA** (Poster)
16:20–16:25	Jurgita NAUJOKAITĖ, Miglė BACEVIČIENĖ, Sandra KILIKEVIČIENĖ, Vida Janina ČESNAITIENĖ *Lithuanian Sports University, Kaunas* **PHYSICAL ACTIVITY, PHYSICAL CAPACITY AND SELF-RATED HEALTH IN ELDERLY WOMEN** (Poster)
16:25–16:30	Zbigniew Marcin OSSOWSKI[1], Sylwia NEUBAUER[2] *Gdansk University of Physical Education and Sport[1], Medical University of Gdansk[2], Poland* **ASSOCIATION OF FUNCTIONAL FITNESS WITH HEALTH-RELATED QUALITY OF LIFE IN POSTMENOPAUSAL WOMEN** (Poster)
16:30–16:35	Roberta BULOTAITĖ, Kristina VISAGURSKIENĖ *Lithuanian Sports University, Lithuania* **TRAMPOLINE EXERCISES FOR OLDER PERSONS TO IMPROVE HEALTH AND FITNESS** (Poster)
Round table discussion – IS RESEARCH ON AGING RELEVANT TO YOUNG SCIENTISTS? Moderator: Assoc. Prof. Nerijus MASIULIS Lithuanian Sports University, Sporto str. 6 Central building, 215 auditorium 16:35–18:00	
19:00–21:00	**WELCOME RECEPTION** Best Western Santakos Hotel, J. Gruodžio str. 21

6th October, 2017	
ROUND TABLE DISCUSSION **Moderators: Prof. Dr. Alfonso JIMENEZ, *Coventry University, UK*** **Dr. Simona PAJAUJIENĖ, *Lithuanian Sports University, Lithuania*** **Lithuanian Sports University, Sporto str. 6** **Central building, 215 auditorium**	
9:00–11:00	**EFFECTIVE EXERCISE COUNSELLING & EXERCISE PRESCRIPTION FOR ACTIVE AGEING: FROM SCIENCE TO PRACTICE (based on the PAHA project intervention model, starting with an introductory framework and moving into a practical exercise with participants to integrate science and practice)**
11:00–11:30	**COFFEE BREAK**
ORAL PRESENTATIONS / PRACTICAL SESSIONS * **Lithuanian Sports University, Sporto str. 6** **Central building, 215 auditorium**	
11:30–12:00	Prof. Dr. Habil. Albertas SKURVYDAS, *Lithuanian Sports University, Lithuania* **NEUROPLASTICITY IN AGING**
12:00–13:00	Prof. Dr. Yael NETZ, *Wingate College, Israel* **PHYSICAL ACTIVITY PROGRAM DEVELOPED FOR FRAIL ELDERLY AND THEIR CAREGIVERS** (Practice). **A project supported by the Erasmus+ programme of the European Union**
13:00–14:30	**LUNCH BREAK**
14:30–15:00	Dr. Michael BRACH, *University of Munster, Germany* **A GENERIC MOBILITY MODEL FOR STANDARDISATION OF MOBILITY-RELATED ASSISTED LIVING SOLUTIONS: A CONTRIBUTION FROM HUMAN MOVEMENT SCIENCE**
15:00–16:00	Dr. Aivars KAUPUZS, *Rezeknes Augstskola, Latvia* **VESTIBULAR EXERCISES FOR BALANCE CONTROL FOR ELDERLY** (Practice)
16:00–17:00	Jolanta GRIGONIENĖ, *Lithuanian Sports University, Lithuania* ***AICHI* FOR SENIORS' HEALTH (WATER EXERCISES)** (Practice) (LSU, Sporto str. 6; Central building, water pool)
17:00–17:30	**CLOSING CEREMONY** Lithuanian Sports University, Sporto str. 6 Central building, 215 auditorium

* For practical sessions, we recommend you to have sportswear and shoes, and for practical sessions in the swimming pool, we recommend you to have swimwear (swimsuit, swim cap, towel, slippers and personal hygiene kit).

7th October, 2017	
11:30–13:00	**Moderator: Prof. Dr. Yael NETZ** ***EGREPA* MEETING** Lithuanian Sports University, Sporto str. 6 Central building, 215 auditorium
13:00–16:00	**Social programme**

Abstracts

CONTENTS

EXERCISE MODE AND COGNITION IN HEALTHY OLDER ADULTS – INTENSITY VS COMPLEXITY

Yael Netz
Wingate College, Israel

The research on physical activity and cognition has experienced enormous growth in the last decade. There are specific aspects involved in the relationship between exercise and cognition – some of them are mediators explaining this relationship, while others are moderators influencing this relationship. Cardiovascular fitness is the most discussed mediator. More specifically, cardiovascular fitness affects cerebral circulation, neurotrophic stimulation, high functional connectivity in neural networks, and greater gray matter volume in the prefrontal cortex. The moderators are the dose of exercise, the cognitive variables assessed, and the exercise mode which is the main topic of this lecture.

While the exercise mode may include specific skills such as yoga, Tai Chi, dance or exergames, in this lecture exercise modes will relate primarily to the basic movement components recommended by the American College of Sports Medicine: aerobic activity, strength training, flexibility, balance, and coordination. These components will be further categorized into *physical training* (aerobics, strength, flexibility) and *motor training* (balance and coordination).

Selected studies will be presented in the lecture, representing various aspects as well as the developmental progress of the research on exercise mode and cognition. Chronologically, types of *physical training*, mainly aerobic and strength, were explored first as enhancersof cognition, while *motor training* came later. A group of studies relating to *aerobic* versus *light non-aerobic* exercise will be presented first. The earliest in this group will be the study by Kramer et al. (1999), which focused on specific aspects of cognition (executive functions) with no brain cognition inquiry, followed by a few others concentrating on specific aspects of cognition and brain mediators, followed by the most recent study – Jonasson et al. (2017), focusing on a global cognitive score as related to the cortical (dlPFC, vlPFC, ACC) and subcortical (hippocampus) segments of the brain. Some studies assessing the acute effect of aerobic exercise on specific aspects of cognition, such as cognitive flexibility (Netz et al., 2007) or attention inhibition (Netz et al., 2016), will also be presented. The effect of *strength training* on executive functions (Anderson-Hanley et al., 2010) will then be discussed, followed by *comparing aerobic exercise to strength training* in enhancing information processing and executive functions (Coetsee & Terblanche, 2017).

Two studies comparing a mode of *physical training* to a mode of *motor training* will then be presented. One compares the effect of *aerobic exercise* to that of *coordination training* on perceptual speed and executive functioning (Voelcker-Rehage et al., 2011) and the other compares the effect of *strength training* to that of *balance* and *coordination training* on executive function and on inhibition and cognitive flexibility (Forte et al., 2013). Interestingly both studies report improvements in cognitive functioning as a result of both the *physical training (aerobic or strength),* as well as the *motor training (coordination or balance and coordination),* albeit through different pathways. The first (Voelcker-Rehage et al., 2011) demonstrates that different parts of brain (cortical as well as subcortical) are affected by *aerobic exercise as compared to coordination training*. Furthermore, different directions of brain network activation (increase vs. decrease) are observed following *aerobic as compared to coordination training*. The other (Forte et al., 2013) argues that the *balance and coordination training* enhances cognition directly, independent of motor fitness improvement, while the *strength training* enhances cognition through improvement in strength as a mediating mechanism.

Once *motor training* – mainly *balance and coordination* – was established as an enhancer of cognition, two studies took the research further and explored the differences between *conventional motor training* and *motor training with an additional cognitive stimulator*. One study (Schättin et al., 2016) showed that both *balance exercises and exergames* improved executive functions, but EEG measurements showed that theta relative power significantly decreased in favor of the exergame group. The other study (Falbo et al., 2016) assessed the effect of *motor training (mainly balance and coordination)* versus *motor-cognitive (dual-task) training* on executive functions. The conclusion was that the *motor-cognitive training* was more efficient in

improving/preserving executive functions than the *motor training* alone. An additional study (Theill et al., 2013) showed that physical training (walking) performed simultaneously with cognitive training was, in a number of aspects, more beneficial in enhancing cognition than cognitive training by itself.

A systematic review of the beneficial effects of different types of exercise interventions on motor as well as cognitive functions (Levin et al., to be published), arguing that a combination of few exercise modes or a *combination of physical-cognitive training* is more efficient than a single mode of exercise in enhancing cognition, will also be presented.

In summary, while in the past only *physical training (aerobic and strength training)* were considered effective in enhancing cognition, later studies showed that *motor training (balance and coordination)* is no less efficient, and in some aspects is even more. However, the pattern of the mediating mechanisms of the effect of *physical training* and *motor training* is different. A model proposing the driving mechanism of each of the two types of training will be presented: in the physical training the driving mechanism is the movement intensity, while in the motor training it is the movement complexity. In the physical training, it is the improvement in cardiovascular fitness as a result of the training which affects functional connectivity in neural networks in a global manner. The motor training, on the other hand, directly affects specific networks that are related to specific motor tasks. Clearly, a *combination of exercise modes,* or *physical/motor along with cognitive training,* has been shown to be most efficient in improving or preserving cognition.

How does the information on exercise-cognition relationship affect the official recommendations for physical activity in old age? Fortunately, the implications are that if all training components traditionally recommended by official bodies – *physical as well as motor training* – are efficient in enhancing cognition, then we merely have to emphasize the inclusion of all exercise modes in our routine exercise regimen for physical as well as cognitive health. It is also recommended that more cognitive stimulations, such as dual-task activities involving both a movement-base as well as cognitive tasks, be implemented in the exercise routine.

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PREPARE YOURSELF FOR THE WORLD: OIL YOUR MIND BECAUSE STRENGTH ALONE WILL NOT DO

Eling D. de Bruin
Privatdozent Institute of Human Movement Sciences and Sport, ETH Zürich

The health and well-being of a person depends on the complex interactions in physical, cognitive and social domains [cf. International Classification of Functioning (ICF) by the World Health Organisation, Geneva (see http://www.who.int/classification/icf)]. Even in the absence of overt pathology, motor functioning can deteriorate, as evidenced by the incidence and impact of falls in aging populations. Falls are one of the most common reasons for medical intervention in older people and their occurrence might initiate a vicious cycle of decline leading to fear of falling, nursing home admittance and loss of independence. Falls among older adult populations often occur during walking, and gait dysfunction is included among the many risk factors for falls.

Although more traditional training programmes are able to increase muscle strength and improve balance and, therefore, positively influence some measures of gait, they often do not impact on spatial and temporal characteristics of gait that are associated with distinct brain networks. Because these gait characteristics are associated with distinct brain networks, it can be hypothesised that addressing neuronal losses in these networks may be an important strategy to prevent mobility disability in older adults.

A way to bring in a cognitive element into an exercise program is the use of virtual reality techniques. There are some reports on the use and effects of virtual reality exergaming-training in various populations. Methods using immersive computer technologies resulted in improved motor functions of upper extremities and a cortical activation after virtual reality intervention in patients with chronic stroke. Older adults benefited from training in terms of improved functional abilities, postural control and simple auditory reaction times under dual task conditions.

This talk will focus on the relation between the use of exergames and their influence on physical & cognitive functioning of elderly. As people age, a self-reinforcing, downwards spiral of reduced interaction with challenging environments and reduced brain health significantly contribute to cognitive decline. Furthermore, brain activity needs to be able to adapt to challenges posed from the environment. Novel training paradigms; e.g. virtual reality interaction exergaming, indicate they might be able to effect on brain functioning in elderly. This talk specifically discusses [1] the theoretical relevance of Exergaming training approaches and [2] presents research data suggesting that diagnostic systems and game-based brain exercise training that specifically focus on aspects of neuromuscular functioning in (frail) elderly are effective for ameliorating cognitive & physical function.

DO EXERCISE INTERVENTIONS RESTORE OLD ADULTS' GAIT TO A YOUNG GAIT?

Tibor Hortobágyi
University Medical Center, University of Groningen, Groningen, The Netherlands

Relevance. Walking ability is a cornerstone of quality of life and a disproportionately slow gait in midlife predicts numerous clinical conditions later in life (Abellan van Kan et al., 2009; Studenski et al., 2011). It is thus important to reduce gait speed loss in old adults. Biomechanical analyses of old adults' gait reveal an overreliance on hip muscle mechanical output, inconsistent changes in knee mechanics, and reductions in mechanical output at the ankle joint. Such a distal-to-proximal shift in mechanics, i.e., biomechanical plasticity of gait in old age, occurs independent of gender and speed (DeVita & Hortobágyi, 2000). It is however unknown if the exercise interventions-induced 0.1 m/s or 8.4 % increases in gait speed (Hortobágyi et al., 2015) are accompanied by a reconfiguration of old gait to young gait (Beijersbergen et al., 2013). The **aim** of this paper is to provide an overview on the effects of lower extremity power training on healthy old adults' gait biomechanics.

Methods. Healthy old adults completed a no-intervention control period (69.1 ± 4.4 y, $n = 14$) or a 10-week-long power training of lower extremity muscles, consisting of 30 sessions (72.9 ± 5.4 y, $n = 15$). Participants performed comprehensive lower extremity leg muscle power training at 40–60 % of the 3-repetition maximum and were instructed to move the weights as rapidly and explosively as possible during the concentric phase. We measured isokinetic knee extensor and plantarflexor power and hip, knee and ankle kinetics at habitual and fast walking speeds, using inverse dynamics analyses (Beijersbergen et al., 2016).

Results and discussion. Isokinetic knee extensor (25 %) and plantarflexor power (43 %), and fast gait velocity (5.9 %) increased after power training of leg muscles (all $p < .05$). Gait mechanics underlying the increases in fast gait velocity included increases in hip angular impulse (29 %) and hip extensor work (37 %) but no changes in knee and ankle positive (propulsive) muscle work. Thus, a specific form of exercise intervention did not convert healthy old adults' gait mechanics to a gait resembling young gait. Instead, it further increased the age-induced reliance on hip function and did not correct the age-associated reductions in ankle mechanical output (Beijersbergen et al., 2017). Ongoing work, however, does suggest that it may still be possible to improve the age-induced reductions in ankle function during gait because power training of leg muscles using leg press improved ankle muscle power measured during gait by inverse dynamics and these increases correlated with increases in habitual and fast gait velocity, respectively, $R^2 = 0.58$ and $R^2 = 0.67$ (both $p < .05$, $n = 15$, age 74.3) (Uematsu et al., 2017). In total, lower extremity power training increases healthy old adults' walking speed, but the mechanisms are still unclear and whether such increases are due to a reconfiguration of gait mechanics to a young gait.

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INDIVIDUAL DIFFERENCES IN FRONTAL/BASAL-GANGLIA STRUCTURES AS PREDICTORS OF PERFORMANCE IN HEALTHY AGING: ON THE INTERPLAY BETWEEN MOTOR CONTROL AND COGNITION

Oron Levin
Movement Control and Neuroplasticity Research Group, Department of Kinesiology, Group Biomedical Sciences, KU Leuven, Heverlee, Belgium

Abstract: The associations between age-related differences in motor performance and individual changes in brain's structural integrity were examine in healthy older adults. Structural MRI (T1-weighted images) were collected from 35 young and 30 older adults who underwent a battery of motor tests, including multilimb reaction time task (MULRT) and perturbed balance control tests.

With respect to performance on *MULRT* task (35 young, 30 old adults), observation revealed that: (*i*) inward deformation (i.e., local atrophy) of the nucleus accumbens and caudate were predictive of longer action selection times in complex conditions, but not in easy task conditions; but (*ii*) only local atrophy of the left nucleus accumbens predicted performance declines in elderly (Boisgontier et al., 2016).

With respect to *balance control* (30 young, 28 old adults), observations showed that structural changes in regions of the brainstem were the strongest predictor of postural stability: (*iii*) lower brainstem volume predicted larger center of pressure deviation and higher odds of balance loss. On the contrary (*iv*), greater basal ganglia volume was associated with more unstable posture (Boisgontier et al., 2017).

While the associations between morphological changes in basal ganglia and performance may not be generalized across all motor functions, results from the two studies suggest that the relevance of the nucleus accumbens for different aspects of motor control increases with age. It is proposed that damage to the bottleneck underlying interactions between different neurotransmitter systems in the nucleus accumbens seem to be a neurocorrelate of motor performance deficits in healthy aging. Finally, the observations from two studies raise a question about the role of dopaminergic circuitry in the interplay between cognition and motor control.

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THE ACTIVE AGEING CHALLENGE FOR EXERCISE PROFESSIONALS: HOW WE COULD SUPPORT INACTIVE AGEING POPULATIONS TO BECOME ACTIVE AND ENJOY A HEALTHY LIFESTYLE

Alfonso Jimenez
Coventry University, United Kingdom

This session is partially based on the results of an EU funded Erasmus+ project *"Physical Activity & Healthy Ageing"* (PAHA) led by *EuropeActive*[1]. As part of the dissemination strategy for the project we published a *Good Practice Guide* to support ageing inactive people starting an exercise intervention. This abstract contains some of the key information, resources and lessons learned during the development and implementation of the project. The full ***PAHA project Good Practice Guide*** can be downloaded in the following link: http://www.europeactive.eu/sites/europeactive.eu/files/projects/PAHA/EN_Good_Practice_Guide_WEB.pdf

The Good Practice Guide is based on the successful outcomes of the PAHA project and it is intended that the principles of the intervention can be used in many other recreational sporting settings.

How we could support inactive ageing populations to become active and enjoy a healthy lifestyle?

Educating People + Understanding and Translating Research Evidences + Facilitating Behavioural Change + Supporting + Empowering + Engaging + Informing Policy + Advancing Current Practice

Our Challenging Context

Physical activity is one of the most basic human functions. It is an important foundation of health throughout life. Its known health benefits include a reduced risk of cardiovascular disease, hypertension, diabetes and certain forms of cancer; it also has an important role in the management of certain chronic conditions. In addition, it has positive effects on mental health by reducing stress reactions, anxiety and depression and by possibly delaying the effects of Alzheimer's disease and other forms of dementia. Furthermore, physical activity is a key determinant of energy expenditure and is therefore fundamental to achieving energy balance and weight control. Throughout childhood and adolescence, physical activity is necessary for the development of basic motor skills, as well as musculoskeletal development. Furthermore, physical activity is also embedded in the *United Nations Convention on the Rights of the Child*. In adults, physical activity maintains muscle strength and increases cardiorespiratory fitness and bone health. *Among **older people,** physical activity helps to maintain health, agility and functional independence and to enhance social participation and quality of life. It may also help to prevent falls and assists in chronic disease*

[1] ***The PAHA Project***
Erasmus+ Collaborative Partnership Promoting Physical Activity and Health in Ageing (PAHA)
Number 557041-EPP-1-2014-1-BE-SPO-SCP 3
The Promoting **P**hysical **A**ctivity and **H**ealth in **A**geing (PAHA) project was a tailored intervention for older adults with different functional capacities, but who were classified as being "inactive" when using World Health Organisation guidelines. Through supervised and structured exercise programmes for selected senior citizens (55–65 years old), the PAHA project set about to convert currently inactive people into regular exercisers at a level that was beneficial to their health, and which would support the EU Guidelines on Physical Activity. There were 7 project partner countries – Finland, Germany, Greece, Hungary, Ireland, Portugal and the United Kingdom – and by special arrangement in Denmark. In each country 3 fitness centres ran specially designed trial sessions of supervised exercise programmes of 6 weeks duration. The personal trainers who supervised the delivery of the exercise sessions went through some additional technical training (in active ageing) and also in behavioural and motivational techniques so that they could close adapt the programmes to suit each of the new clients taking part in the trial sessions. Participation in the trial periods was offered free of charge, and the older adults who took part were then re-assessed at 3 months and 6 months intervals to determine if the programme had been an effective intervention, and that they had maintained activity levels which were beneficial to their health. The focus of the project was to make sure that within the 6 week trials the individuals would experience the positive benefits of regular exercise so that they would voluntarily maintain a healthy lifestyle. The considerations of the benefits and motivation for older adults to exercise can include: Sleeping better; Having more energy; Reducing the symptoms of disease; Maintaining an independent lifestyle; Keeping up with the grandchildren; Extending a working life.

rehabilitation, becoming a critical component of a healthy life.

Despite the known benefits of physical activity, there is a worldwide trend towards less total daily physical activity. Globally, one third of adults do not achieve the recommended levels of physical activity. In Europe, estimates indicate that more than one third of adults are insufficiently active (Hallal et al., 2012). While there are some continuing challenges in terms of the validity and comparability of data on levels of physical activity across Europe, recent figures from member States of the European Union (EU) indicate that six in every 10 people above 15 years of age never or seldom exercise or play a sport and more than half never or seldom engage in other kinds of physical activity, such as cycling, dancing or gardening. At the same time, a high proportion of adults in Europe spend more than four hours a day sitting, which could be a contributing factor to sedentary lifestyles.

As a consequence, physical inactivity has become a leading risk factor for health chronic disorders: 1 million deaths (about 10 % of the total) and 8.3 million disability-adjusted life years lost per year in the WHO European Region are attributable to physical inactivity. It is estimated to cause 5 % of the burden of coronary heart disease, 7 % of type 2 diabetes, 9 % of breast cancer and 10 % of colon cancer (Lee et al., 2012). Rising rates of overweight and obesity have also been reported in many countries in the Region during the past few decades. The statistics are disturbing: in 46 countries (accounting for 87 % of the Region), more than 50 % of adults are overweight or obese; in several of those countries the rate is close to 70 % of the adult population. Overweight and obesity are also highly prevalent among children and adolescents, particularly in Southern European countries.

Physical inactivity has been identified as contributing to the energy imbalance that leads to weight gain. Collectively, physical inactivity not only has substantial consequences for direct health-care costs but also causes high indirect costs due to increased periods of sick leave, work disabilities and premature deaths. For a population of 10 million people, where half the population is insufficiently active, the overall cost is estimated to be €910 million per year (WHO, 2007).

Participation in physical activity and exercise can result in desirable health outcomes in terms of both acute and chronic adaptations in the physiological and psychological domains. Physical activity, exercise, health and the quality of life are closely interconnected, as the human body was designed to move and therefore needs regular physical activity in order to function optimally and to avoid illness.

There are numerous key concepts, elements, factors and theories regarding motivation and behavioural change, and it is important to offer an evidence-based and practical approach to exercise and sport professionals in helping their clients and customers to deal with a significant challenge to become more active. Understanding behavioural and motivational change is essential to help people to change their lives by being more active and especially more often (as frequency of activity will be the real and critical key factor to improve health status in inactive population). The PAHA project included specific additional training for the fitness instructors in active ageing and motivational change for this reason.

The available evidence from observational studies support the conclusion that physical activity and exercise, ***performed on a regular basis*** (as a behaviour), will have protective benefits for several aspects of physical, mental health and general wellbeing. There is strong evidence for their protection against all the chronic pathologies, as well as for symptoms of the major mental disorders such as depression and cognitive decline, anxiety and poor sleep, feelings of distress and fatigue. Thus, current evidence supports the conclusion that regular participation in moderate-to vigorous physical activity and/or exercise, consistent with current public health guidelines, confers physical and mental health benefits when compared to participation in low levels of activity or a sedentary lifestyle.

The best element linked into the health benefits is the fact that *exercise means regular practice, a systematic, progressive and tailored stimulus that will improve health status of anyone as a result of frequency of practice*. The most updated evidence-based guidelines for exercise from the American College of Sport Medicine employs the frequency (how often), intensity (how hard), time (duration or how long), and type (mode or what kind), with the addition of total volume (amount) and progression (advancement), formulated as the FITT-VP principle for exercise prescription. ***Exercise, health or sport professionals play a critical role in addressing specific needs of individuals – and in this case, older adults – to offer safe and***

effective exercise programmes.

Behaviour change is critical to the prevention, management, and treatment of many important health conditions. However, the initiation and maintenance of behaviour change can be very difficult, and even those interventions that succeed in controlled clinical trials do not always scale well. It is not enough for behavioural and social scientists to do rigorous research and develop effective interventions; ***there must also be delivery channels and systems in place to disseminate these interventions to the public, policymakers, and other decision makers to ensure that they are implemented, adopted, and maintained.***

From a behavioural change perspective, it will be easier and more rewarding for an individual to incorporate new behaviour instead of removing existing ones. This is one of the key positive messages to work on with inactive people, adding exercise as a positive behaviour will provide always positive outcomes (if the dose is appropriate to the capacity level of the person and the program allows a progressive increase of the challenge).

Exercise, health and sport professionals have a relevant role to play, and should be ready to meet individual people's expectations.

Understanding the implications of health behaviours in the overall exercise intervention will be a key asset to effectively produce significant and sustainable health changes in inactive populations. Specific, tailored, and very simple and applied approaches to modify behaviours should be integrated in health behaviour programmes, for example in exercise interventions.

A positive combination of physical activity (i.e. as a mean of transportation) and individualised exercise doses, addressing specific needs and limitations of the individuals, will provide the kind of engaging and positive stimulus to help inactive population to change behaviour.

Getting and staying fit is the result of the integration of both physical activity and exercise in a person's lifestyle and the application of solid evidence-based interventions will guarantee effective positive results achieved safely and progressively. Science and applied research are progressing faster than ever, and we, **exercise professionals, should be able to build the bridge between theory and practice.** Exercise professionals should be upskilled based on the current evidences allowing the public to achieve their exercise goals easier, faster and safer (Jimenez, Pajaujiene, 2017).

The physical activity sector, including the health and fitness industry, have been actively involved in projects and activities in partnership with Governments across Europe to promote an active and healthy behaviour, and significant funding support has been received from the European Commission in that regard (EHFA, 2011).

In fact, the overall physical activity and sports sector recognizes its responsibility to work with partners at all levels across the European Union to create a healthier society, where living an active lifestyle is the social norm, rather than an exception, and where daily physical activity and exercise is seen as part of the routine part of the prevention and management of disease (Matheson et al., 2013).

But despite the obvious capacity of sports and physical activity sector across Europe, its willingness to contribute to increased levels of physical activity, and its track record of positive performance, **the sector is rarely recognized in national governments' physical activity promotion programmes and campaigns.**

Exercise professionals should become the main source to convey exercise-related information for the general public. They should provide information and implement exercise counselling, exercise prescription, individual's fitness assessment and guidance (Jimenez, Pajaujiene, 2017).

Unfortunately, there is a lack of review studies on the analysis of their education and professional competencies (Stacey et al., 2010), it is unclear how they obtain evidence-based information and other issues associated with their education and lifelong learning (Stacey et al., 2010; Waryasz et al., 2016). However, it is revealed that exercise professionals with higher level of education (e.g., graduate degrees) are more likely to use scholarly sources of evidence compared to those with lower levels of education who are more likely to rely on mass media, including the internet [Hare et al., 2000; Forsyth et al., 2005). Therefore, given exercise professional's role in advising the general public, their accessibility, and the emerging evidence-based guidelines on the best practices related to the use of exercise and nutrition interventions, further research, education and support are needed to ensure that exercise professionals,

working with the public, integrate new applied research knowledge into their fitness assessment and exercise guidance to facilitate a sustainable behavioural change in inactive populations, specially in ageing people (Stacey et al., 2010).

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LOSS OF MUSCLE MASS AND THE CONTRIBUTION IT MAY MAKE TO THE AGE-RELATED LOSS OF MOBILITY

David A Jones, Mathew Piasecki, Hans Degens, Jamie McPhee
School of Health Care Science, Manchester Metropolitan University, Manchester, United Kingdom

Loss of mobility has a major impact on the quality of life for older people, not only does it reduce the person's ability to look after themselves but slow and hesitant movements also make a person more liable to trips and falls that can have life-threatening consequences. Muscle wasting and loss of strength are well documented features of ageing and there are arguments for various activities that may improve strength, or at least slow the decline. It is, however, important to understand the reasons for the loss before putting limited resources into rehabilitation programmes.

Muscle mass declines by about 30 % by the 8th decade and muscle fibre atrophy, predominantly of the type 2 fibres, contributes about half of this loss, the other half appears to be to loss of fibres, the number in the vastus lateralis decreasing from 1.22 x 10^6 to 1.03 x 10^6. This loss of fibres is the result of motor unit loss due to motor neuron death. Recent estimates suggest that around 50 % of motor units are lost by the 8th decade although the impact on muscle fibre number is lessened by axons of surviving motor neurons reinnervating denervated fibres, resulting in a smaller number of larger motor units. This helps to preserve strength but may have implications for fine motor control. The loss of motor units is not prevented by life-long physical activity as master athletes show the same pattern of motor unit loss. At the moment we know of no way of preventing, reversing or even slowing this process.

There is then the question of whether the 30 % loss of strength is the cause of the decrease in mobility and while, for instance, there is a strong relationship between muscle strength and walking speed if the whole range from young to old is considered, within an age cohort (either young or old) there is little or no relationship. Elderly men have very similar strength to young women, yet young women walk faster and are more agile and mobile than old men.

Other factors that affect walking speed are balance, which is severely affected by age, eyesight, and probably cognitive function and the ability to dual task. People of all ages tend to pace themselves at around 70 % of their maximum heart rate and, since the maximum decreases with age, older people inevitably choose to walk more slowly than the young.

There is, unfortunately, no easy answer to maintaining mobility in old age and we need to explore not only physiological interventions but also social and psychological barriers to mobility that would benefit not only older people but the whole of society.

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ENVIRONMENTAL ECOLOGY AND HEALTH OF ELDERLY PEOPLE

Laimutė Samsonienė[1], Diana Karanauskienė[2], Vilma Stankutė[1]
Vilnius University, Vilnius[1]; Lithuanian Sports University, Kaunas[2]

Background. The aging of the population, emigration, low birth rates and a changing family model result in the fact that families in Lithuania are less able to properly take care of the well-being of the elderly. Research focuses on physical and emotional health of the elderly. The **aim** and **object** of the study was the effect of the adapted physical activity program on the emotional and physical health of elderly people living in different ecological environments. *Research participants* were 32 elderly persons (aged 68 ± 8 years) living in an inclusive (family) and structured (care institution) environments.

Methods. We chose sequential mixed methods research design. Emotional health was assessed applying the structured interview method. Physical health was assessed as follows: physical activity was evaluated by a questionnaire survey method, and physical characteristics – using Up and Go, Pathway search and Stork tests.

Results. Regardless of the living environment, respondents do not develop their physical skills characteristic of their biological age such as strength and/or flexibility, and physical activity is aerobic in nature. Most (80 %) of the subjects living in families are little active, regularly engaged in low intensity physical activity (slow walking, easy housework or vacuum-cleaning, etc.). In a structured environment, 34 % of research participants never exercise; 46 % are rated as inadequately active; 20 % are active and perform some physical activity several times a week. Regardless of the living environment, the same program of physical activity applied for 5 months significantly ($p < .05$) improved respondents' coordination and ability to focus, improved their emotional health, increased motivation for exercise, e.g. *"I like to do sports", "I like to exercise", "I want to lose weight"*.

Conclusion. Adapted physical activity program applied for five months had a positive impact on physical and emotional health of respondents regardless of their living environment. Motivation of the elderly to exercise depends on the ecology of the living environment: in the structured environment research participants linked their expectations with health, and in the inclusive environment – with meaningful and enjoyable leisure time.

INFLUENCE OF PILATES METHOD TRAINING ON THE BALANCE OF ELDERLY

Kristina Zaičenkovienė, Renata Rakovaitė, Vida Janina Česnaitienė
Lithuanian Sports University, Kaunas

Relevance of the research. Falling is one of the most important problems in the elderly's mobility disorder, which is most often affected by the loss of balance and postural instability (Johansson et al., 2017). Postural control is a crucial factor in maintaining balance during standing, walking, and task performance in everyday life (Westcott et al., 1997). It is known that Pilates exercises could help to increase the deep muscles strength, to improve posture and proprioception, which affects the improvement of the balance (Cruz-Diaz et al., 2015).

The **object** of the research was the influence of Pilates method on the balance of elderly and the **aim** was to evaluate the effect of six weeks of Pilates exercises on the elderly's static and dynamic balance.

Research methods and organization. The study population consisted of 20 volunteers – men and women. They were divided into those involved in Pilates exercises (n = 10, age 65.1 ± 2.6) and control (n = 10, age 68.6 ± 4.9) groups. The study group participated in Pilates classes 2 times per week for six weeks (session duration 60 minutes). The control group did not participated in any physical activity, but they were physically active as usual in their daily life. Main outcome measures were assessed before and after the intervention. The static balance was assessed by measuring posturographic parameters using the force platform (Kistler Bioware, Kristal Systems Inc. 1996–1998) and dynamic balance – with the Timed up and Go Test (TUG) and the Four Square Step Test (FSST).

Results and discussion. The results showed significant improvement of the experimental group static balance after the Pilates exercises during standing tests when the feet were apart with eyes opened (before Pilates 15.44 ± 4.45 mm/s, after 13.06 ± 1.34 mm/s (p = .01)) and eyes closed (before Pilates 16.63 ± 3.14; after 14.62 ± 1.24 mm/s (p = .03) with feet together with eyes opened (before Pilates 18.21 ± 3.71; after 16.92 ± 2.17 mm/s, p = .04)) and standing on one foot in front of the other foot with closed eyes (before Pilates 48.81 ± 11.58; after 40.39 ± 7.02 mm/s (p = .04)). The static balance tests results of both groups did not differ before and after the study, but after Pilates exercises, the study group showed significantly better balance (13.06 ± 1.34 mm/s) than control group (16.34 ± 1.64 mm/s) (p = .00)) in the test when the feet were in shoulder line with opened eyes. The results of the dynamic balance after the Pilates exercises significantly improved in both tests in the study group (TUG test: before Pilates 5.53 ± 0.49 mm/s, after 5.24 ± 0.42 mm/s (p = .02); FSST test: before Pilates 9.01 ± 1.91 mm/s, after 7.88 ± 1.46 mm/s (p = .01)). Before the study, there were no statistically differences in the dynamic balance results between groups, but the study group showed significantly better results after the Pilates exercises.

Conclusion: Six-week Pilates exercises had a positive effect on the elderly's static and dynamic balance.

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DOES ACUTE STRENGTH TRAINING AFFECT MOTOR AND COGNITIVE FUNCTION INTERACTION IN OLD ADULTS?

Margarita Drozdova-Statkevičienė, Vida Janina Česnaitienė, Nerijus Masiulis
Lithuanian Sports University, Kaunas

Relevance of the research. Balance stability becomes increasingly critical with aging. Age effect on balance stability is attributed primarily to sensorimotor dysfunctions (Boisgontier et al., 2014), muscle weakness (Morse et al., 2004), and structural changes in brain grey and white matter (Boisgontier et al., 2008). Evidence from other studies suggests that, despite the above mentioned neural deficits, older adults may recruit additional neural resources to reach sufficient level of sensorimotor control by increasing attention to the task in head (Heuninckx et al., 2008). Since availability of attentional resources and the ability to allocate attention efficiently is declining with aging (Heuninckx et al., 2008), allocation of attentional resources toward a secondary cognitive task is expected to have a larger interference effect on balance in older adults than in young adults (Ruffieux et al., 2015).

Ageing affect and cognitive functions. About 20 % of adults above the age of 65 diagnosed with mild cognitive impairment (Kirova et al., 2015). Most aspects of cognitive function become less effective, the most noticeable working memory, inhibition and long-term memory impairment (Di et al., 2014). Neuropsychological assessments suggest that physical exercise attenuates cognitive declines accompanying aging (Kimura et al., 2010). Many studies give priority to aerobic exercise, but some studies found positive effect of resistance exercise on cognition (Chang et al., 2014). Resistance exercise also could be effective to posture control, because increases knee isokinetic, 1 RM, strength of older men (Wolfson et al., 1996). But we didn't found any study, where the direct effect of strength exercise on postural control would be considered. Therefore we decide to assess acute strength training effect on postural control and cognitive function in dual tasking.

The **object** of the research is the effect of strength training on interaction of motor and cognitive function in old adults. The **aim** is to assess the effect of acute strength training on postural control and cognitive function during dual tasking.

Research methods and organization. The sample included 30 participants, they were random divided into 2 groups: control (67.5 ± 5.3 years) and experiment (67.3 ± 5.0 years). In both groups was measured posturography with a single piezoelectric force plate (KISTLER, Switzerland, Slimline System 9286). Recordings were made under these conditions: (i) single task (ST) of posturography in 3 positions (double stance eyes open/closed; Romberg stance eyes open) and cognitive task separately, (ii) dual task (DT) – posturography in 3 positions while performing a Mathematical Counting task. In the experiment group were performed squats with a barbell using Smith Weightlifting Machine (3 x 90 % 1 RM; 3 x 95 % 1 RM; 3 x 100 % 1 RM) meanwhile control group had rest break. Related samples we calculate with Wilcoxon signed rank test, independent samples – with Mann Whitney U test. Significance level was set to $p < .05$.

Results and discussion. No significant differences were observed in postural control and cognitive task between groups at baseline measurements during ST and DT in all positions ($p > .05$). We found, that posture control declined performing DT in REO position ($p < .05$) in experimental and control groups, but cognitive task performance declined only in experimental group ($p = .02$). Postural control improved in REO position in both groups ($p = .02$) performing DT after intervention. Therefore, cognitive task results did not differ in both groups performing DT after intervention.

Conclusions. Acute strength training had no effect on interaction of motor and cognitive function in old adult men. We found only tendencies that strength-training intervention might improve cognitive performance, but this needs further studies.

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RELATIONSHIP BETWEEN INVOLVEMENT IN LONG-TERM REGULAR PHYSICAL ACTIVITY AND MEMORY: PRELIMINARY RESULTS

Kristīne Šneidere[1], Jeļena Harlamova[1, 2], Voldemārs Arnis[1], Zane Ulmane[1], Andra Vanaga[1], Ainārs Stepens[1]
Riga Stradiņš University[1], Rīga East Clinical University Hospital[2], Latvia

Relevance of the research. Ageing of the Western Society has become both – economic and social concern. According to the Central Statistical Bureau of Latvia, there were 506 217 inhabitants aged over 60 in Latvia in 2015 (CSBL, 2015). Meanwhile, World Health Organisation (WHO) prognosis is that by the year 2050 22 % of the population will be aged over 60 (WHO, 2015). Ageing has both – biological and psychological consequences, and, with changes in the brain due to ageing (e.g. decline in the brain volume in frontal, parietal and temporal areas, as well as hippocampus (Erickson et al., 2010; Colcombe et al., 2003)), there are changes in cognitive functioning.

Memory can be defined as the ability to encode, process, store and retrieve information, and it can be categorized based on temporality (short and long-term memory), deliberateness of retrieval (declarative and procedural memory), as well as the memory contents (semantic and episodic memory) (Fietta, 2011). For the past years, research has indicated a relationship between aerobic activity interventions and increase in episodic memory (Ruscheweyh et al., 2011), face recognition associative memory (Hayes et al., 2015) and working memory (Erickson et al., 2010).

The **object** of the research was the impact of the long-term involvement in aerobic activity on cognitive processes, the **aim** of the study was to examine the relationship between involvement in aerobic physical activities and memory.

Research methods and organization. Forty three seniors aged from 65 to 85 (M = 71.86, SD = 5.09, 23 % male) were included in the data analysis. Based on their physical activity experience, participants were divided into three groups – seniors with long-term aerobic physical activity experience (n = 16), seniors that had recently taken up aerobic physical activities (n = 19) and seniors not involved in physical activities (n = 8). We measured the overall cognitive functioning with Montreal Cognitive Assessment (MoCA, Nasredine et al., 2015), working memory and long-term associative memory were measured with two subtests from Woodcock-Johnson Test of Cognitive Abilities (accordingly – The Numbers Reverse test and Memory of Names test) (Woodcock, McGrew, & Mather, 2001) and short and long-term memory with Memory Ten Word test (Luria, 1976). Data were obtained in two stages.

Results and discussion. Results indicated statistically significant correlations between long-term involvement and working memory (r = .34, p < .05) and lack of involvement and MoCA test (r = -.32, p < .05), while there were no significant correlations with long and short-term memory, as well as associative memory results. These results are partially consistent with short-term aerobic activity intervention research results, as working memory has been found to correlate with involvement in aerobic activity (e.g. Boucard et al., 2013).

Conclusions. The preliminary data indicated relationship between long-term involvement in physical activities and working memory, as well as negative relationship between sedentary lifestyle and overall cognitive abilities. As this is still a work in progress, one of the limitations being the small sample, these results can be considered only as a tendency. Another limitation is the unequal gender distribution. This study was funded by the Latvian National Research Programme BIOMEDICINE 2014–2017.

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A CROSS-SECTIONAL ANALYSIS OF PHYSICAL ACTIVITY, PSYCHOLOGICAL DETERMINANTS AND HEALTH RELATED VARIABLES OF LATVIAN OLDER ADULTS

Aivars Kaupuzs
Rezekne Academy of Technologies, Latvia

Relevance of the research. The aging of society will bring social and economic implications affecting most nations across Europe and the world. Physical activity (PA) as a low-cost nonpharmacological intervention could be one of the means to prevent frailty and morbidity in older adults. PA both reduces heart disease risk and enhances health related quality of life (HRQOL) that provides "successful aging". The solution of this problem requires scientific based information about variables that influence a level of physical activity. Information about people's attitude and believes about physical activities is important for complex problem solving. Only scientifically based data of motivating or impeding factors shows opportunities how to use available resources reasonably. There are still incomplete data of these determinants in Latvia population, particularly in older adults.

The **object** of the research are health related variables of Latvian older adults and the **aim** is to provide the initial data from older adult population and examines the relationships between self-rated PA, health related subjective and objective variables and psychological determinants derived from the Transtheoretical and Social Cognitive theories.

Research methods and organization. The study population consisted of 359 respondents (63.5 % female and 36.5 % male) aged 60–75 who visited the Heart Health Cabinets across 5 Latvia regions. The mean age was 67.6 ± 5.1 years. For the assessment of the physical activity we used interviewer-administered the International Physical Activity Questionnaire (IPAQ) short version. To measure outcome expectations we asked to complete the Multidimensional Outcome Exercise Expectation Scale (MOEES). To detect the involvement in regular PA we used Exercise Stages of Change (ESC) – short form. As subjective measure of health status it was used The Short Form Health Survey (SF-36v2). For the measuring of subjective health determinants we used the Heart Health Cabinet cardiovascular risk factors assessment data aggregated as SCORE index.

Results and discussion. The results of the study shows that 20.6 % of the respondents have "low" PA level, 30.4 % are "moderately" and 49.0 % are "highly" physically active. Nevertheless, only 19.7 % exercise regularly more than 6 months and 49.9 % do not even plan to engage regular activities in the next 6 months. MOEES data shows that outcome expectations decrease with age the same as PA. At the age group 60–65 MOESS mean result is a 3.5 ± 0.69 point of Likert scale and at the age group 70–75 it is only 2.9 ± 0.96 point. These results reflected on subjective health assessment, because more than half of respondents are rated below the General Population Norm of SF-36v2 survey. Moreover, poor adherence to exercise is closely related to higher cardiovascular illness risk. Although within the study a sufficient level of physical activity was identified among almost a half of the respondents, health-enhancing activities were regularly performed only by every fourth respondent. It is reflected in the main health indicators, which are evaluated as being below the norm. It is traced that people having a lower level of activity have the worst objective and subjective health parameters. This study revealed a tendency that along with years physical activity and confidence about its possible benefits reduce. The obtained results let conclude that in the age group from 60 to 75 years confidence about possible benefits of doing exercises is reflected in daily activity and self-evaluation of life quality.

Conclusions. At this study we established statistically significant relationship between PA and subjective and objective health variables. Adherence to regular PA is related to outcome expectations although it mutually decreases with age. This research has provided important background for effective intervention program development based on increasing of confidence thereby help to move people through the stage of change.

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VERY LOW VOLUME HIGH INTENSITY INTERVAL EXERCISE: ACUTE EFFECTS ON PHYSIOLOGICAL AND PSYCHOLOGICAL STRESS IN YOUNG AND OLD WOMEN

Raulas Krušnauskas, Tomas Venckūnas, Audrius Snieckus, Nerijus Eimantas, Neringa Baranauskienė, Sigitas Kamandulis
Lithuanian Sports University, Institute of Sports Science and Innovations, Kaunas

Introduction. High intensity interval training (HIIT) has been proposed as effective means to increase aerobic capacity and insulin sensitivity in adults of different age (Gibala et al., 2012). The main aim of this study was to investigate acute physiological and psychological stress in response to three types of very low volume HIIT session in young (19.5 ± 1.3 years) and old (65.7 ± 2.8 years) women.

Methods. Isometric maximal voluntary contraction (MVC) and 20 (P20) and 100 (P100) Hz electrical with stimulation induced knee extension peak torques were measured at baseline, and then immediately, 1 and 24 h after stationary cycling (either 6 × 5 or 3 × 30 all-out, or 3 × 60 sec submaximal efforts, each performed 5 weeks apart in the randomized order). In addition, lactate, IGF-1 and TNFα response was measured, and perceived exertion and preference for exercise type were assessed.

Results. Peak and average power were larger in young compared to old women and were largest during 6 × 5 strategy in both groups ($p < 0.05$). Both groups ranked 6 × 5 cycling as the most preferable for further training (90 %, $p < 0.05$). There was significant strategy and time interaction for P20 and P100 ($p < 0.05$). Strategy 6 × 5 did not change P100 in young, whereas in older group P100 was reduced only by 24 hours after 3 × 60 cycling ($p < 0.05$). P20/P100 ratio decline representing low frequency fatigue was more evident after 3 × 30 and 3 × 60 compared to 6 × 5 in both groups and was larger in young compared to old women ($p < 0.05$). Serum TNFα and IGF1 levels remained largely unchanged in both groups in response to any type of the three HIIT sessions.

Conclusions. Very low volume (6 × 5 s) all-out exercise induced long lasting (>24 h) low frequency force depression in young women. For aged women, longer exercise bouts (3 × 60 s) were more physiology stressful but still tolerable psychologically. These age related exercise strategy differences should be taken into account by practitioners when planning training program.

BENEFITS OF LONG TERM DANCE TRAINING ON MOTOR/COGNITIVE ABILITIES AND BRAIN STRUCTURE IN OLD AGE

Mandy Knoll
Institute for Sport Science at Otto-von-Guericke University in Magdeburg, Germany

Physical activity and cognitive training have proved to be encouraging methods to affect positively age-related structural and functional brain changes. A combination of physical and cognitive strains seems to be the most effective method. Dancing conforms to this method because it combines motor and cognitive strains. In this way, it plays an important role for prevention of age-related degenerative changes in motor, neurophysiological as well as neuropsychological parameters in older people.

The abstract represents a review of benefits of different physical exercises in contrast to physical inactivity on specific parameters in old age. The object of the research is to compare the effects of dancing with endurance and strength training and physical inactivity on motor functions, such as endurance and balance abilities, on cognitive functions, such as memory, processing speed, concentration, attention, intelligence and spatial navigation, as well as on neurophysiological parameters, such as brain volumes and BDNF factor. Another aim is to investigate different effects of short term and long term physical exercise on these parameters.

Using different scientific databases, relevant studies that fulfil certain inclusion criteria will be involved. The selected studies which deal with effects of dancing or endurance and strength training or physical inactivity on motor functions, cognitive functions and neurophysiological parameters will be analyzed.

Physical activity in the form of endurance and strength training, leading to a high level of cardio-respiratory fitness, represents an important non-pharmacological preventive method against cognitive decline and consequently the occurrence of neuro-degenerative diseases in the third age (Gregory et al., 2012). A few studies showed even greater effects if physical exercises included both, conditional and coordinative strains, which contains a motor and an additional cognitive task, such as dance training (Shatil, 2013). Unfortunately, positive tendencies in brain volumes for dancers could not be transferred to significant benefits in cognitive functions (Rehfeld et al., 2014; Rehfeld et al., 2017). Further research is needed, to show coherences between benefits in motor abilities, neurophysiological parameters and cognitive functions.

To reveal those coherences and to differentiate effects of long term dance training and long term endurance or strength training in comparison to physical inactivity, we will conduct a long term study, that will compare 30 long term dancers with 30 long term active controls and 30 inactive controls at a specific point of time as well as in a temporal progress of five years according to motor and cognitive parameters and with regard to neurophysiological changes.

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MIDDLE-AGED POPULATION PHYSICAL ACTIVITY POSITION CHANGES: DOES KNOWING CHANGE SUBJECTS' MIND?

Edita Maciulevičienė, Renata Rutkauskaitė
Lithuanian Sports University, Kaunas

Relevance of the research. In the aging society, life quality is important for an individual because of its direct effect on their working capacity and productivity, since most of working days are lost due to chronic non-communicable diseases (Jankauskienė, 2008). This suggests that in order for people to be physically active and physically independent, it is necessary to take care of their health promotion through various measures (Weiler et al., 2010). Of course, focusing on enhancing people's health should be imposed on various health promotion (wellness) programmes. The main aim of these programmes should be to change the person's behaviour by using the impact of the media and the individual measures (Rise, 2004; Roux et al., 2008). Some authors believe that public awareness of an active lifestyle principles promoting and encouraging the continuous realization of it and developing physical fitness, can improve people's quality of life (Kallings, 2008; Miller & Miller, 2010). Thus, the relevance of the chosen topic is associated with the problem of low physical activity among adult population, which is widely discussed in the scientific literature. It should be noted that there are only few works in which the educational effect would be applied to an individual aiming at changing his/her approach to leisure time physical activity and healthy lifestyle. It would allow evaluating the factors that may influence the effectiveness of their impact. The establishment of such factors and the assessment of their interaction with physical activity is an important scientific problem.

The **object** of the research was the position of Kaunas city middle-aged population regarding their leisure time physical activity. The **aim** was to assess the changes in the position of Kaunas city middle-aged population regarding their leisure time physical activity.

Research methods and organization. The first (random) sample, which was based on the study participants' position regarding their physical activity, subjective assessment of their health and health risk factors, included 916 Kaunas city inhabitants aged 35–64 years (394 men and 522 women). The dependent sample consisted of 100 survey participants from 35 to 44 years of age who participated in the impact programme (Faith in Health Model) focused on physical activity promotion and who were observed during the investigation period, i.e. they were re-tested. An interview in writing answering the questions in the questionnaire made up by ourselves was planned in for the research. The questionnaire consisted of 16 questions divided into separate blocks. Studying the health risk factors we assessed in total cholesterol concentrations in serum, arterial blood pressure (ABP), waist circumference, height, weight, and we calculated body mass index (BMI). All objective health indicators were taken together with Institute of Cardiology.

Results and discussion. According to the frequency and duration of exercising in their leisure time, 26.5 per cent of subjects were physically active. Men compared to women were more physically active, in the age groups the lowest levels of physical activity was observed among 35–44-year-old research participants. According to the research participants, the main reason for low physical activity was the lack of time (it was more common among women and 35–44-year-old persons). After applying Faith in Health Model as a factor of preventive health behaviour, it was found that during the period of observation there was an increase in the number of physically active (according to frequency and duration) individuals and the number of people who subjectively evaluated their health as good and very good. More significant changes in physical activity and health evaluation were observed among the subjects with the higher education and social status.

Conclusions. During the period of observation there was an increase in the number of physically active individuals and the number of people who subjectively evaluated their health as good and very good. More pronounced changes in physical activity and health evaluation were observed among the subjects with the higher education and social status. The comparison of the changes in physical activity in the

normative groups of cholesterol levels in the blood showed that physical activity increased for those persons whose cholesterol levels complied with the norm or were elevated. More significant changes in physical activity (the ascending direction) were identified for those research participants who had the health hazards of low-density lipoprotein cholesterol levels in the blood.

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BULLYING AND SINGLE CASES OF HARASSMENT IN WOMEN'S BASKETBALL TEAMS

Jolita Vveinhardt, Regina Andriukaitienė
Lithuanian Sports University, Kaunas

Relevance of the research. Despite the well-recognised benefits of sport, there are also negative influences on athlete health, well-being and integrity caused by non-accidental violence through harassment and abuse. All athletes have a right to engage in safe sport, defined as an athletic environment that is respectful, equitable and free from all forms of non-accidental violence (Mountjoy et al., 2016). Specificity of team sports is in the fact that synergy of the team members is very important in this sport. Therefore, such phenomen as harassment, or even bullying should not be recorded there at all. However, in the scientific sources (Tofler, 2016) the signals are being detected that even in the teams that strive for a common result a negative behaviour is not an exception. However, more attention is being focused towards interrelationship between children and teenagers as well as contemporaries and a coach. Although, according to Evans et al. (2016), bullying is a specific pattern of repeated victimization explored with great frequency in school-based environment, but still receiving little attention within the sport. However, the relevance of this research is supported not only by the fact that negative behaviour is being analysed in team sport, but also that a topic of gender is especially important (Kirby, 2004; Marks et al., 2012). On the 50th anniversary of the ISSA and IRSS, with a key foundational scholar on gender and sport, Fasting (2015), assesses sociological inquiry about sexual harassment in sport and its relation to the development of the policy. The trajectory of this research on gender, sexual harassment and abuse (GSHA) in sport lies in feminist politics and advocacy. According to Fathynah and Syahirah (2015) in sports, sexual harassment does happen but limited studies have been conducted. Sports related institutions need to introduce a code of conduct to eliminate any forms of sexual harassment in a sports environment.

The **object** of the research is bullying and single cases of harassment, and the **aim** is to determine the extent of prevalence of bullying and single cases of harassment in women's basketball teams.

Research methods and organization. The research was organized by combining team participation in the survey with coaches of the teams. Having received coaches' permission, six women teams were interviewed with a total 72 players. The survey was used the questionnaire "Bullying and single cases of harassment in sport (BSCH-S)" validated by J. Vveinhardt. Since representatives from different countries play in the teams, the questionnaires were in three languages, i.e. Lithuanian, English and Russian. The survey was executed via internet, and separate references to the questionnaire were created for every team.

Results and discussion. It was determined that between the basketball women players, harassment was experienced by 32.9 % of women; 11.4 % of them stated that they experienced bullying, when duration of harassment was longer than 6 months, and frequency of actions was not less than once a week. Players who aggrieved from such negative behaviour shared their hard feelings with family members (12.6 %) and close friends (9 %), and only 6.3 % with a coach. Negative behaviour of the coach himself/herself, which was ascribed by the players to harassment and bullying, was experienced by 12.8 % of players; therefore, even 5.4 % of basketball players stated that they had intentions to leave the team. However, basketball players received the most help from other members of the team (13.9 %), friends who did not belong to the team (13.9 %) and family members (15.8 %). It was determined that sexual harassment was claimed to be experienced by 1.4 % of the basketball team players.

Conclusions. Having analysed the results of the research, it should be stated that coaches often know what is going on in their teams, but avoid taking measures to stop harassment till it has not turned into bullying. It should be emphasized that in the sample of this research no player of the team mentioned violence actions committed by the team players in their club, organized trainings, seminars that explain how to avoid psychological, physical violence and/or how to behave in such case.

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IMPACT OF PRE-EXERCISE REHYDRATION ON CENTRAL FATIGUE UNDER THE CONDITIONS OF HYPERTHERMIA

Kazys Vadopalas
Lithuanian Sports University, Kaunas

Relevance of the research. Human exercise performance depends on the body temperature. The results of numerous experiments have proved that work output decreases when the core temperature increases up to a critical point (in the case of persons of average physical activity – 38.7 ± 0.2°C and in high-performance athletes – 39.2 ± 0.1°C), especially when the intensive activation of the thermoregulatory and cardiovascular systems takes place. Hyperthermia can have a direct effect on voluntary activation of skeletal muscles as the temperature affects motor unit (MU) firing rate that is necessary for contraction summation in tetanic contraction. Dehydration might be factor acting in addition to overheating to impair exercise performance during hyperthermia. The maximum volume of liquid that is possible to be assimilated by physically active individuals is about 0.8–1.2 l / h. In sports training sessions and competitions we often come across the phenomena of hyperthermia and dehydration which interfere in achieving high sports results. It is not clear yet what is the effect of pre-exercise rehydration on central fatigue under conditions of hyperthermia.

Research **aim** was to investigate effects of hyperthermia with and without dehydration on central fatigue during continuous high intensity exercise.

Research methods and organization. Ten males (medium distance runners) performed a maximal voluntary isometric contraction (MVC) of the knee extensors for 2 min (MVC – 2 min) under control conditions, after passive body heating (HT) and after (HT) plus rehydration (RH). During MVC – 2 min, at the 3rd, 14th, 29th, 44th, 59th, 74th, 89th, 104th and 119th seconds superimposed electrical stimulation (TT-100 Hz) was performed. In HT and HT + RH experiments subjects sat immersed up to the waist in hot water (44 ± 1°C) bath for 45 min (air t 22°C, rh 40 %). During HT + RH experiment subjects slowly drank 1000 ml (100 ml every 6 min) the saline solution of 37°C in the course of 60 min (15 min before and during passive body heating). Rectal (T_{re}), skin and inner muscle temperatures were measured before and after both experiments. Heart rate (HR) was recorded every 5 s during passive body heating. Physiological heat stress index (PSI) was calculated as follows: $PSI = 5(T_{ret} - T_{re0}) \times (39.5 - T_{re0})^{-1} + (HR_t - HR_0) \times (180 - HR_0)$.

Results and discussion. Applying the modified methods of passive body heating, we evoked hyperthermia coupled with 1 % dehydration (rectal temperature was higher than 39°C, the subjects lost 1–1.5 % of their body weight). We found that hyperthermia increased MVC fatigue and reduced voluntary activation of skeletal muscles compared to the control conditions. Rehydration did not influence the decrease of MVC during 2 min exercise, but after performing pre-exercise rehydration under the conditions of hyperthermia central fatigue decreased.

Conclusions. Our results suggest that pre-exercise rehydration might have an immediate positive effect in reducing thermal stress and thus reducing central fatigue even when exercise is performed during hyperthermia induced by passive warming of the body. The decrease of central fatigue is influenced by the changes in rectal temperature and cardiovascular system.

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PHYSICAL ACTIVITY, PHYSICAL CAPACITY AND SELF-RATED HEALTH IN ELDERLY WOMEN

Jurgita Naujokaitė, Miglė Bacevičienė, Sandra Kilikevičienė, Vida Janina Česnaitienė
Lithuanian Sports University, Kaunas

Purpose of the research – to assess the relations between physical activity, physical capacity and self-rated health in elderly women.

Research methods. The study was carried out in Lithuanian Sports University in 2016–2017. Twenty-three volunteers physically active women from Kaunas city were involved in the study. The average age of the study participants was 66.0 ± 8.1 years. All the participants were free from any chronic cardiovascular, respiratory and muscle-bone-joints disease.

All study participants filled in the questionnaire to determine the level of physical activity and performed tests to assess physical capacity. Aerobic capacity was assessed using 2-minute walk test. Hand static muscle strength was determined by dynamometry and body balance test was performed counting the times of body balance loss during 30 seconds. Anthropometric indicators such as body mass index, ratio of body fat, skin folds and blood pressure were measured. Objectification of physical activity was performed by accelerometry method. Accelerometer was placed on the waist and one week's physical activity was assessed recording the number of steps and energy expenditures. Statistical analysis was performed using *Microsoft Excel* and *SPSS* statistical software.

Results. The average of steps made during 1 week was 54,078.5 ± 17,625.7. Mean energy expenditures during 1 week was also sufficient (2916.4 ± 880.2 kcal and 2289 ± 775.1 METs). Physical activity score assessed by questionnaire method was 5.0 ± 1.2. Very strong statistical correlation was found between steps maid during 1 week and energy expenditures measured in kcals and METs (r = .9). Also strong statistical correlation was detected between body mass index and body fat (r = .9). Inverse statistically significant correlation was detected between body mass index and number of steps maid during 1 week (r = -.7). No significant correlations were found between physical activity and physical capacity indicators. Higher physical activity was correlated with better self-rated health (r = .6). Better aerobic physical capacity was significantly associated with higher muscle strength, better body balance and with higher blood pressure and higher rest heart rate.

Conclusion. Physical activity had positive impact on older women's body composition whereas better aerobic physical capacity was associated with higher muscle strength and higher blood pressure.

ASSOCIATION OF FUNCTIONAL FITNESS WITH HEALTH-RELATED QUALITY OF LIFE IN POSTMENOPAUSAL WOMEN

Zbigniew Marcin Ossowski[1], Sylwia Neubauer[2]
Gdansk University of Physical Education and Sport[1], Medical University of Gdansk[2], Gdansk, Poland

Relevance of the research. Ageing is a process which brings along a decline of cognitive performance, intellectual functions and functional efficiency (Ostrzyżek & Marcinkowski, 2009). These adverse changes can directly impact the decrease in the quality of life for the elderly. Physical activity that is right programmed can be crucial in the prevention of these changes (Moilanen et al., 2012). The **aim** of the study was to determine the association of different components of physical fitness with HRQoL in postmenopausal women.

Research methods and organization. The final sample comprised 90 postmenopausal women (M = 67.8 ± 4.5 years) from the University of the Third Age. Physical fitness was assessed with the Senior Fitness Test battery, and HRQoL was evaluated with the Long Form 36 Health Survey (SF-36) – Polish version (Tylka & Piotrowicz, 2009). The statistical analysis was carried out with a level of significance of $p < .05$.

Results and discussion. Flexibility of trunk, dynamic balance and endurance were positively correlated with the overall HRQoL in women ($r = .36$, $p < .00$; $r = -.37$, $p < .00$; $r = .26$, $p = .04$, respectively). Moratalla et al. (2015) have shown that higher physical fitness is associated with better HRQoL in early postmenopause. Lower-body flexibility and upper-body muscle strength were the most important independent fitness indicators, explaining ~30 % of HRQoL. However, our study shows significant correlation between strength and HRQoL. Moving on to interpretation of the results, it is essential to mention that menopause causes a decrease in the quality of life, which is independent from age, vasomotor symptoms and other sociodemographic variables (Blumel et al., 2000; Mohammadalizadeh Charandabi et al., 2015). We consider that differences on the field of age, functional fitness and education background that were observed between groups can be the reason of discrepancy between achieved results.

Conclusions. The study suggests paying special attention to flexibility, balance and endurance when programming activity programs aimed at improving life standard for women in postmenopausal age.

The study was conducted within the framework of the EU project entitled "Active lifestyles and predictors of risk for incapacity in senior population: RISINC2013-FRAILTY and RISINC2013-FALLS".

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TRAMPOLINE EXERCISES FOR OLDER PERSONS TO IMPROVE HEALTH AND FITNESS

Roberta Bulotaitė, Kristina Visagurskienė
Lithuanian Sports University, Kaunas

Relevance of the research. Nowadays various forms of physical activity are offered to older persons to improve their physical and emotional condition. Mini trampoline exercises are one of them. Trampoline exercises are seen as an effective intervention to improve the functional conditions of the ageing body (Giagazoglou et al., 2015). This form of physical activity for seniors is rather new and needs deeper investigation. The review of research on the development of physical activity results has revealed that there are few papers analysing the effect of mini trampoline exercises on the physical and emotional condition. The scientific publications found prove the positive effect of mini trampoline exercises on improving balance, coordination, adaptation and readjustment in the environment, the strength of leg muscles and mobility, for reducing limb muscle imbalance, and increasing joint range of motion (Hanachi, Kaviansi, 2010; Aragão et al., 2011; Miklitsch et al., 2013; Atilgan, 2013). These exercises can be recommended as an alternative physical activity to improve balance and motor coordination. The improvement in balance performance, which is especially relevant for fall prevention, can be explained by the changes caused by the complex sensorimotor stimulation when exercising subjects try to adapt to the unsteady trampoline base and maintain their balance (Giagazoglou et al., 2015).

The **aim** of the research is to evaluate the effect of mini trampoline exercises on health and physical capacity in older adults.

Research methods and organization. Two groups of older women, the experimental group (n = 18, age average 68 ± 8.5 years) and the control group (n = 18, age average 71 ± 7.6 years) were involved in the study. Physical capacity of both groups was tested (fall risk screening; age-related changes in balance performance; gait speed, leg muscle strength, mobility and coordination) (Sigmorile, 2011) before and after the intervention. The experimental group was asked to fill in the self-assessment questionnaire by observing the changes in sleep, appetite, general well-being, emotional control, arterial blood pressure. Women of the experimental group had low and average intensity workouts on mini trampolines twice a week for one month. Women of the control group were not involved in exercising. Tests and exercises were conducted in Lithuanian Sports University where exercising safety and workout intensity was ensured.

Results and discussion. The study results showed a statistically reliable improvement of physical performance, namely balance, coordination, leg muscle strength and mobility, in the experimental group ($p < 0.05$) after the intervention. In the control group the physical capacity test results have not changed or slightly deteriorated ($p < 0.05$). The comparison of physical capacity test results between the study groups showed that the results of women in the experimental group were almost twice better than the results in the control group. The reliable difference between certain tests results was even three times. The self-assessment results among the experimental group subjects were positive and indicated the trend of improvement in emotional and physical condition after each workout. The review of available papers reporting research into different age groups and the comparison of their findings with the findings of our study lead to the conclusion that mini trampoline exercises involve more muscle groups. Compared to exercises done on the stable surface, the same exercises done on the trampoline cause the change of muscle reaction to instability and subsequently improve not only the indicators of adaptation, readjustment and coordination, but also the results of balance, aerobic capacity, strength, the feeling of rhythm and time (Heitkamp et al., 2001; Crowther et al., 2007; Angelov, 2016).

Conclusions. Evaluation of the effect of mini trampoline exercises on the physical capacity in older adults and the comparison of test results before and after the intervention showed a statistically significant positive change in women of the experimental group ($p < 0.05$). The summary of self-assessment results after 8 workouts leads to the conclusion that the well-being, emotional and physical condition after one-month intervention significantly improved, i.e. the self-assessment scores after one month were much higher compared to the scores at the start of the intervention. Mini trampoline exercises is an appropriate

measure to improve age-related balance impairments, to strengthen muscles, to improve the functioning of cardiovascular system, to improve emotional control and thus have an overall positive effect on older women's health. It should be noted that although one-month intervention of mini trampoline exercises caused positive changes in physical capacity indicators and well-being of the subjects, a longer intervention and the testing of a greater number of physical capacity and health indicators would be beneficial and appropriate.

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LIFE-STYLE MEDICINE, HEALTHY AGING, BRAIN

Albertas Skurvydas
Lithuanian Sports University, Kaunas

1. Bad Stress and Aging.
2. Mental Capital, Well-being, Cognitive and Brain reserve.
3. Brain Aging, Executive function, Self-control.
4. Spontaneous Physical Activity/exercise and BDNF.
5. Physical activity and cognitive vitality.
6. Intellectual Activity and Creativity.
7. Sensory stimulation and Brain Aging.
8. Caloric Restriction.
9. Meditation, Good stress, Protective Immunity.
10. Aging, Brain Scaffolding and Compensation.
11. Future: Good vs Bad plasticity; Good vs Bad stress; Brain Enhancement; Brain Rejuvenation; Relation among brain reserve;Cognitive reserve and brain maintenance, Brain localization vs Interaction.

MOBILITY-RELATED ASSISTED LIVING SOLUTIONS: CONTRIBUTIONS FROM HUMAN MOVEMENT SCIENCE

Michael Brach
University of Münster, Germany

Introduction. Assisted living solutions (AAL) utilise technical knowledge to support maintaining independence, one of the most im-portant wishes of ageing or impaired individuals. This often includes mobility, i.e. the capability, opportunity and per-formance of changing body positions and of locomotion. This talk deals with needs and challenges in order to support the development and interoperability of related AAL technology.

Example 1: Implementing principles of modern exercise physiology into a "serious game" approach

Computer-animated games are ascribed a potential in motivating home-based exercise in order to support mobility. The development of such a combination of sport exercises and gaming – also called "exergame" – is reported.

• From a sport science point of view, three main tasks are identified and performed. First, a training target and physical exercises must be conceptualised, suitable for preventive training, for home-based execution and for integration into computer-animated games. Second, volume and intensity of the training have to be determined, including adaptations for different fitness levels and progression rules for continuous training. Third, criteria of movement quality should be defined for monitoring by technical sensors, recognising beginning and end of series and decision-making on changes of training configuration on different time scales.

• From a computer science point of view, Natural Interaction (NI) based on motion recognition and analysis and an adapted HAAT-model (Human Activity Assistive Technology Model) allow for real-time scaling of the exer-game's difficulty to adjust to the user's individual fitness level and thus keep motivation up.

• Data from a pilot study are presented. 19 players aged 60–93 (mean 76) years were offered to play the exergame for 7 days. 11 players (58 %) played 6 of 7 days. Score analysis shows that progression in the game (and thus in the exercises) took place.

Example 2: Using action theory and resource view for a generic mobility model in standardisation

DKE, the German Commission for Electrical, Electronic & Information Technologies of DIN and VDE, established an AAL standardisation roadmap. An application guide on mobility has been developed by a working group from transpor-tation science and technology, human movement science, telecommunication, building industry, computer science and electrical engineering.

• The needs analyses yielded the following requirements: (a) the individual need for support changes on different time scales, due to daily fitness, health or ageing processes, (b) the usage of assisted living (or conventional) utilities itself can modify the user's mobility in a good or harmful way, (c) a barrier (process interruption) between indoor and outdoor mobility can arise when devices and utilities have to be changed.

• The resulting mobility model combined action theory and a resource-based view is considered useful for identi-fying and discussing mobility aspects. Its main terms are (a) a situation, which comprises (b) a person with cer-tain internal resources (abilities and skills), facing (c) a task with requirements and affordances, embedded in (d) an environment with external resources. Using this specific language scheme, the terms distinguish mobility as (e) room for action.

Discussion

Assisted Living System often includes movement of users and stakeholders. Human movement science offers useful theories and practical solutions for complex approaches.

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CLIMBING THE LADDER OF LIFE, ACTIVE AND FIT

Book of Abstracts

Compilers Vida Janina Česnaitienė and Kristina Visagurskienė
Language editor Diana Karanauskienė
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Lithuanian Sports University, Sporto str. 6, LT-44221 Kaunas
www.lsu.lt