

Thursday 16th August 2012 Day Theme: Neurological and Musculoskeletal Conditions

Plenary Keynotes

PREVENTION AND MANAGEMENT OF NEUROLOGICAL CONDITIONS IN OLD AGE THROUGH PHYSICAL ACTIVITY AND EXERCISE

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Neurological impairments are a major contributor to problems of gait and balance in older people. Whether due to well-characterized conditions such as stroke or Parkinson's disease, or to more recently recognized conditions such as leukoencephalopathy or age related dopamine deficiency, there are numerous emerging opportunities to promote improved function through physical activity. The key to successful interventions may be to go beyond traditional exercise that focuses on endurance and strength, to exercise that incorporates principles of motor learning.

NEW TECHNOLOGIES TO ENGAGE OLDER ADULTS IN PHYSICAL ACTIVITY

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Over the past few decades, there has been a wealth of published scientific evidence for the physical, cognitive, and social health-related benefits of exercise and increasing physical activity (PA), especially in older adults. Strength, mobility, aerobic capacity, energy, anxiety, depression, and reduction in fall risk in older populations have been shown to improve following increased PA interventions. While numerous studies have demonstrated the health-related benefits of PA, adherence to PA programs is often disappointing. Barriers to adherence may include lack of interest in the program, low outcomes expectation, the weather, or even a fear of falling during exercise. In our group at Neuroscience Research Australia, we are examining how videogame technology can be used to increase compliance with exercise. In particular we are assessing the effects of exercise-based videogames to reduce the risk of falling, a major barrier to continued independence.

Symposia

NEW INSIGHTS INTO PREVENTION OF DISABILITY BY PHYSICAL ACTIVITY AND EXERCISE

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Aging is often accompanied by a decline in functional performance and disability as described in the disablement process model (Nagi, 1976; Verbrugge & Jette, 1994). Physical activity and exercise have been identified to influence the pathway from aging and disease to disability. Recent work in this area will be presented by researchers from the Body@Work Research center TNO VU university medical center (Leiden/Amsterdam, The Netherlands). This symposia will cover a short introduction, a review and meta-analysis of the relationship between physical activity and ADL disability in older adults, studies on preoperative physical activity and physical fitness predicting postoperative recovery, and whether major life events predict physical activity among older adults.

Review and meta-analysis of the relationship between physical activity and ADL disability in older adults

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Introduction: physical activity (PA) has been identified as an important behavior to prevent or slow down the disablement process caused by aging and chronic diseases. It is unclear whether PA can directly prevent or reduce ADL disability. We performed a systematically review and meta-analysis on the association between physical activity and the incidence and progression of disability in basic activities of daily living (BADL) in community dwelling older adults. **Methods:** electronic literature search in PubMed (until January 2012) and by cross-referencing; prospective longitudinal studies in community dwelling older adults (50+) with PA and BADL included at baseline and follow-up using multivariate analysis and reporting a point estimate for the association were included. Two reviewers independently scored all included articles on quality measure, study description, PA level (low, medium, high) and disability definition (incidence or progression), point estimates (Odds or risk ratio). **Results:** compared to low PA, a medium/high PA level reduces the risk on incident BADL with 0.51 (95%CI: 0.38, 0.68; $p < .001$) based on 9 included longitudinal studies covering over 17.000 participants followed 3 to 10 years. This result was not different for older (75+) or younger age groups, length of follow-up, study quality or for differences in demographics, health status, functional limitations, or lifestyle. The risk of progression of BADL for older adults with medium/high PA compared to low PA is 0.55 (95%CI: 0.42, 0.71; $p < .001$), based on 4 studies covering around 8.500 participants. **Discussion:** PA prevents and slows down the disablement process in aging or diseased populations, positioning PA promotion as a very effective strategy in preventing and reducing disability, and therefore enhancing future independence and reducing health care costs in aging societies.

The better the way in, the better the way out: Preoperative functional status as predictor and improvement factor of the postoperative course

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Objective: To determine whether preoperative physical activity (PA) and physical fitness (PF) can predict postoperative recovery in older patients. **Background:** A low PA and PF adversely affect how a patient responds, physically and mentally, to the challenge of hospitalization and surgery, which could result in increased mortality, postoperative complications, and loss of mobility. **Methods:** Prospective cohort study of 175 patients (mean age 72±7 years) scheduled for major oncological abdominal surgery. Conventional risk factors (age, metastatic cancer, diabetes, heart diseases, COPD, smoking, productive cough), PA factors (LASA Physical Activity Questionnaire [LAPAQ]), and PF factors (Timed Up and Go [TUG], Chair Rise Time [CRT], Maximal Inspiratory Pressure [MIP], Respiratory Cumulative Energy [RCE], Handgrip Strength [HGS]) were assessed preoperatively and in-hospital mortality, discharge destination, and length of stay [LOS] postoperatively. **Results:** Thirteen patients died in hospital, and in-hospital mortality was significantly correlated with age, LAPAQ, TUG, RCE, and HGS ($p < 0.05$); multivariate analysis identified LAPAQ (OR 5.5, 95%CI 1.4 – 21.9) and RCE (OR 5.2, 95%CI 1.4 – 19.1) as independent predictors. Sixteen patients were discharged to a nursing home, and this was correlated with age and all but one PA and PF factor ($p < 0.05$); multivariate analysis identified LAPAQ (OR 6.7, 95%CI 1.4 – 3.0) as independent predictor. LOS (median 12; IQR 12 days) was significantly correlated with diabetes, COPD, CRT, and MIP ($p < 0.05$); multivariate analysis identified COPD (B 0.5, 95%CI 0.2 – 0.9) and LAPAQ (B 0.3, 95%CI 0.1 – 0.5) as independent predictors. **Conclusion:** Preoperative indices of PA and PF were prognostic of postoperative recovery, additional to conventional predictors.

Do major life events influence physical activity among older adults: The Longitudinal Aging Study Amsterdam

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Background: Major life events are associated with a change in daily routine and could thus also affect habitual levels of physical activity. Major life events remain largely unexplored as determinants of older adults' participation in physical activity and sports. This study focused on two major life events, widowhood and retirement, and asked whether these major life events were associated with leisure time moderate to vigorous physical activity (MVPA) and

sports participation. **Methods:** Data from the first (1992-93) and second (1995-96) wave of the Longitudinal Aging Study Amsterdam (LASA), a prospective cohort study with a representative sample of the Dutch population aged 55 and older, were used. Change in marital status and employment status between baseline and follow-up was assessed by self-report. Time spent in MVPA (min/d) and sports participation (yes/no) was calculated based on the LASA Physical Activity Questionnaire. The association of retirement and widowhood with MVPA and sports participation was assessed in separate multivariate linear and logistic regression analyses, respectively. **Results:** Widowhood -N = 136 versus 1324 stable married- was not associated with MVPA ($B = 3.5$ [95%CI: -57.9 ; 64.9]) or sports participation ($OR = 0.8$ [95%CI: 0.5;1.3]). Retired participants ($N = 65$) significantly increased their time spent in MVPA ($B = 32.5$ [95% CI: 17.8;47.1]) compared to participants who continued to be employed ($N = 121$), but not their sports participation. Age was a significant effect modifier ($B = 7.5$ [90% CI: -1.1;13.8]), indicating a greater increase in MVPA in older retirees. **Discussion:** Our results suggest that the association between major life events and MVPA and sports participation varies by type of major life event and age group. MVPA increased after retirement, but no influence of widowhood was seen.

PHYSICAL ACTIVITY AFTER STROKE: CURRENT DEVELOPMENTS

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Introduction: Following a stroke, physical fitness is often considerably reduced, affecting muscle strength, muscle power, and aerobic capacity. We will start this symposium by highlighting the extent to which physical fitness is impaired after stroke (1), and explain the impact this may have on activities of daily living, independence, and community re-integration. Next, we will discuss the evidence base for exercise and fitness training after stroke, including its safety, feasibility, effectiveness (2), and psychosocial impact (3). This body of evidence has informed current clinical guidelines and government policies, which recommend physical activity as part of a more active lifestyle after stroke wherever possible (4). However, in order to successfully engage stroke survivors in physical activity, we need to understand the barriers and motivators they may perceive, and the psychosocial factors that influence their engagement with physical activity (5). We will present new findings from a programme of work in this relatively unexplored area, and discuss its possible implications. With more and more stroke survivors being referred for exercise and fitness training, it is important to establish the number and quality of available services. We will discuss the main findings from a recent survey of community-based exercise after stroke services in Scotland, which demonstrated a lack of service provision, as well as considerable variation in quality and governance (6). The findings from the survey informed the development of best practice guidance for exercise after stroke services (7), of which a brief overview will be presented. Key issues in relation to community-based exercise after stroke services will be discussed. The session will conclude with directions for further research, practice and service design. **References:** 1. Smith A, Saunders D, Mead G (in press). Cardiorespiratory fitness after stroke: a systematic review of the literature. *Int J Stroke*; 2. Brazzelli M, Saunders DH, Greig CA, Mead GE (2011). Physical fitness training for stroke patients. *Cochrane Database of Systematic Reviews* 2011, Issue 11. Art. No.: CD003316. DOI: 10.1002/14651858.CD003316.pub4; 3. Sharma H, Bulley C, van Wijk F (in press). Experiences of an exercise referral scheme from the perspective of people with chronic stroke: a qualitative study. *Physiotherapy*. doi. org/10.1016/j.physio.2011.05.004; 4. Scottish Intercollegiate Guidelines Network (2010).

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INCREASING WALKING PARTICIPATION THROUGH PRIMARY CARE: WEST END WALKERS

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¹*University of Strathclyde, UK;* ²*University of Glasgow, UK;* ³*Glasgow Caledonian University, UK.*

Primary care is a good setting for physical activity promotion since the majority of older adults visit their GP at least once each year. In the West End Walkers 65+ study [WEW 65+], we aimed to assess the feasibility of a pedometer-based walking programme in combination with physical activity consultations with patients aged over 65 years from primary care. The study was designed as a two-arm (intervention/control) 12-week randomised controlled trial with a 12-week follow up for the intervention group and with additional qualitative methods and was set in one general practice in Glasgow, UK. The intervention group received two 30-min physical activity consultations from a trained practice nurse, a pedometer, and a walking programme. The control group continued as normal for 12 weeks and then received the intervention. Both groups were followed up at 12 and 24 weeks. In this symposium, we will summarise the main findings in relations to physical activity and sedentary time, provide insight to the participants' experiences, and discuss the merits of providing a walking group and offer novel analysis of patterns of sedentary time recorded from the participants. Each speaker will talk for 10 min and then 5 min of question or discussion will follow. There will be time for an overall discussion at the end.

Study rationale and design

Mutrie, Nanette

University of Strathclyde, UK.

In the West End Walkers 65+ study [WEW 65+], we aimed to assess the feasibility of a pedometer-based walking programme in combination with physical activity consultations with patients aged over 65 years from primary care. We had evidence from previous work that adults could increase their step count by around 3,000 steps/day when guided by a pedometer based walking programme and a physical activity consultation [Baker et al., 2008]. However, such an approach had not been tried for older adults. Recruiting older adults from primary care was seen as a good approach since the majority of older adults visit their GP at least once per year. The feasibility element of this trial was needed to determine if older adults would respond to an invitation from their GP to take part in a walking study

and if they could be retained over 6 months. The pilot element was needed to determine if the instrumentation was appropriate and to guide sample sizes needed for a fully defined trial. The trial is registered [Trial registration number ISRCTN70658148] and the protocol has been published (McMillan et al., 2010).

Intervention effects for physical activity and for sedentary time

Fitzsimons, Claire

University of Strathclyde, UK.

The primary outcome was the average daily step count over one week, recorded with a sealed pedometer (NL-1000). The *activPAL* monitor (PAL Technologies Ltd) was also used to record step counts and quantify activity patterns. Psychosocial variables were assessed by self-report questionnaires: the Short-Form Health Survey version 2 (SF-36v2) to assess quality of life; the Positive and Negative Affect Schedule (PANAS) to assess mood; the Perceived Motor-Efficacy Scale for Older Adults (PMES-OA) to assess functional ability; and the UCLA Loneliness Scale (version 3) as a measure of emotional and social loneliness. Step counts, activity patterns and psychosocial variables were assessed at three time points; baseline, 12 weeks and 24 weeks. There was no evidence of changes in pedometer step counts in either group during the first 12 weeks of the study, and no difference between groups over this period. Between weeks 12 and 24, the control group increased their average daily walking by 1672 pedometer steps. There was strong evidence of an intervention effect with *activPAL* step counts, based on the between-group comparison of changes over the first 12 weeks of the study (2,119 steps/day, $P = 0.001$). During the walking intervention both study groups showed similar step count increases (1,907 for intervention and 1,908 for control when they received the intervention; standardised effect = 0.78). The increase in steps observed from baseline appears to have been maintained in the intervention group (mean step count week 12: 9,351; week 24: 9,161; $P = 0.65$). Both groups showed increases in walking time and decreases in sedentary time during the periods when they received the walking intervention. Whilst a pattern of improvement was seen across all subscales of the SF-36, the physical health dimension score was most sensitive to change during the intervention. Neither PANAS (both positive and negative) scores, the UCLA Loneliness Scale nor PMES-OA scores showed any evidence of within- or between-group effects during the study.

Exploring participant views and experiences

Shaw, Rebecca

University of Glasgow, UK.

The aim of the qualitative study was to explore participants' views and experiences of the intervention. Two focus groups were conducted; one with each study group (intervention and control) upon completion of the 12-week programme. The focus group schedule explored perceived benefits of increased walking, views on the pedometer and *activePAL*TM, the physical activity consultation and on-going support, problems encountered, future recommendations and reflections on participation. A thematic analysis of the data highlights a number of barriers and facilitators to increased walking. This data also provides insights into the underlying processes that determine the feasibility of implementing such an intervention in this setting and with this population group, for instance, what worked, what did not work, the perceived impact and why and how the intervention could be improved for future delivery.

Is a walking group a good idea?

McMillan, Freya

University of Strathclyde, UK.

We set up a twice-weekly optional walking group as part of the WEW65+ intervention. The group was poorly attended with only 9 participants taking part in at least one walk and only 5 regular attendees (who attended at least 6 walks). As the WEW65+ intervention successfully increased activPAL steps despite the poor attendance at the group, we conclude that the study walking group was not an essential element for our participants. However, during focus groups discussions several participants spoke positively about walking groups mentioning benefits such as the added safety of walking as a group. Others mentioned not being able to attend our walk as they were unavailable during the running times or because they preferred to walk alone. We suggest working closely with existing local walking groups to provide the option to attend a walking group for those that find group support important.

Patterns of sedentary time

Grant, Margaret

Glasgow Caledonian University, UK.

The primary results from this study showed that a pedometer-based walking programme, in combination with physical activity consultations, was effective in increasing the number of steps walked in a sample of older adults aged ≥ 65 years. To examine the effect of the walking intervention on other parameters of physical activity behaviour, the postural profiles of the participants were investigated. Using a single body-worn monitor, the postural behaviour of the participants was recorded continuously over the period of a week at baseline, 12 and 24 weeks. Using novel analysis techniques, this presentation will describe the changes in postural activity patterns over the course of the study.

EFFECTS OF AGING AND EXERCISE ON PERSONS WITH SPINAL CORD INJURY

Dolbow, David; Gater, David

Hunter Holmes McGuire V.A. Medical Center, United States.

Spinal Cord Injury (SCI) has evolved from a condition of almost certain rapid death three quarters of a century ago to a chronic disability that is treated throughout life. Due to advances in medical and rehabilitational care, the life expectancy of those with SCI has dramatically increased and is nearing that of the able-bodied population. With increased longevity come many of the medical, physical, and psychological conditions that accompany aging and inactivity. However, these conditions appear more rapidly and to a greater extent in those with SCI. Whereas the causes of death in persons with SCI have changed along with medical advances, health conditions linked to aging and inactivity have increased. Cardiovascular disease and respiratory problems have emerged as the primary causes of death, while obesity, metabolic syndrome, diabetes and osteoporosis have become epidemic in the SCI population. Likewise, the psychological and quality of life issues that accompany aging and disability are found in those with SCI more frequently and much earlier in life causing depression to occur at a rate 2 to 3 times greater than with the able-bodied population. **Keywords:** Spinal Cord Injury; Aging; Physical Activity; Quality of Life; Depression.

Aging and metabolism after spinal cord injury

Gater, David R.

Hunter Holmes McGuire V.A. Medical Center, United States.

The spinal cord provides the conduit, figuratively and literally, for communication between the brain and the peripheral nervous system. Disruption of the cord profoundly impacts somatic as well as autonomic control, as well as reflex responses in both realms. Loss of motor control and sensory perception is dependent upon the level and completeness of a spinal cord injury (SCI), and diminishes an individual's independent mobility, as well as activities of daily living and ability to participate in vocational and community activities. Sympathetic nervous system disruption associated with higher levels of SCI further diminishes a person's responsiveness to internal and external cues required to maintain homeostasis. Cumulatively, these perturbations alter practically every organ system in a way that accelerates the usual aging process and places the individual with SCI at significantly greater risk for the complications of aging than his/her non-injured peers. This presentation will review SCI impact on each organ system and provide a foundation for understanding the potential benefits and limitations of exercise applications in this vulnerable population.

Keywords: Spinal Cord Injury; Metabolism; Autonomic Control; Aging.

Functional electrical stimulation cycling as a counter to accelerated aging after SCI

Dolbow, David R

Hunter Holmes McGuire V.A. Medical Center, United States.

Individuals with SCI undergo what is referred to as "Accelerated Aging Phenomena" during which most organ systems of the body deteriorate at an accelerated rate. This is especially true concerning body composition with rapid loss of muscle mass and bone mass and an increase in fat mass. This process is due in large part to denervated muscles and decreased overall physical activity. Due to advances in technology home-based functional electrical stimulation cycling is emerging as a viable counter to the accelerated aging process. Two case reports of older males with chronic SCI provide encouragement to this end. A 64-year-old male of age performed FES-LEC three sessions per week for 9 weeks in his own home while monitored by the research staff via internet connection. The participant completed 25 of 27 recommended exercise sessions for a 93% compliance rate. Cycling distance increased from 3.98 to 9.00 km (126%). Total body LM increased from 48.94 to 53.02 kg (8.3%). The %BF decreased from 29.6 to 28.4(-1.2%). Total body weight, FM and BMD remained unchanged. Average static seat pressure decreased from 55.5 to 52.59 mm Hg (5%), whereas maximum seat pressure decreased from 120.76 to 91.5 mm Hg (24%). The psychological domain (perception of body image, appearance, and self-esteem) of the QOL questionnaire improved from 12.67 to 14. A 53 year old male, 33 years post motor complete C4 SCI participated in functional electrical stimulation lower extremities cycling (FES-LEC) in his home 3 sessions per week for 24 weeks. The participant cycled 59 out of a recommended 72 sessions, which is an exercise adherence rate of 82%. Body composition displayed increases in total body lean mass (LM) with an increase of 3.3% and an increase in leg LM of 7.1%. Energy expenditure increased by 1.26 kcal/min or greater than 200%. The physical and psychological domain scores of QOL increased by 25% and 4.5% respectively. These case studies provide encouragement concerning the feasibility and practicality of a home based FES-LEC program for those with SCI. **Keywords:** Muscle and Bone Mass; Technology; Functional Electrical Stimulation Cycling.

Pelvic floor exercise for urinary continence in elderly spinal cord injured client: A case from Bangladesh perspective

Karim, Mohammad M

CRP, Bangladesh.

Introduction: Urinary incontinence in the elderly is a significant health problem fraught with isolation, depression, increased risk of institutionalization and medical complications. It is also very common in spinal cord injured (SCI) clients and Pelvic floor exercise is prescribed in urinary incontinence. Effectiveness of pelvic floor exercise in aged SCI patient is measured in a single case from Bangladesh. **Methods:** Pelvic floor exercise is applied on a 62-year-old SCI patient incomplete C in ASIA impairment scale. Slow contraction of pelvic floor muscles was applied for 10 times with interval. Every contraction last for 10 seconds each. Same protocol is also applied in fast contraction of pelvic floor muscles. Each slow and fast contraction was repeated actively 5/6 times every day while patient was in relaxed supine position for 6 weeks. After 6 weeks, the patient is evaluated by subjective questionnaire. **Results:** The initial complaint of the client was dripping of urine during supine to side lying, sit to stand to sit, during pumping tube well, early removal of urine during sitting to Asian toilet, during coughing, sneezing, and laughing. He also felt incomplete evacuation of urine after urination. After 6 weeks, he completely managed dripping during supine to side lying. Very rarely, he leaks urine during pumping tube well, sneezing, coughing, and laughing but still to improve in Asian toilet sitting. Now he is feeling more complete evacuation of urine after urinates. **Discussion:** Pelvic floor exercise helps the client to control the incontinence effectively. Less strength of pelvic floor muscles were making the incontinence which has been improved after exercise. Still it needs to be continued to get further improvement. It seems to be a vital way of reducing incontinence among spinal cord injured clients. More research is recommended with larger numbers of people. **Keywords:** Pelvic Floor Exercise; Spinal Cord Injury; Urinary Incontinence; Bangladesh.

REHABILITATIVE WAYOUT IN RESPONSIVE HOME ENVIRONMENTS (REWIRE): ISSUES AND POSSIBLE SOLUTIONS OF MOVING STROKE REHABILITATION AT PATIENT'S HOME

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Introduction: Rehabilitation after stroke is based on guiding the patient through a set of adequate exercises that are usually carried out in a one-to-one session with the therapist with high costs for the Health Providers and high stress and discomfort for the patients. **Aims:** REWIRE develops, integrates, and field tests an innovative virtual reality based rehabilitation platform, which allows patients, discharged from the hospital, to continue intensive rehabilitation at home under remote monitoring by the hospital itself. **Methods:** The platform is constituted of three hierarchical components: a patient station (PS), installed at home, a hospital station (HS) and a networking station (NS) at the health provider site. The PS is based on off the shelf components: video-based tracking, pressure measurement, and virtual reality. The patient sees himself or an avatar on the display moving and interacting in real-time with a virtual game with his movements tracked in real-time. A variety of game

scenarios and a balanced scoring system with quantitative exercise evaluation, together with audio-visual feedback aim at maximizing motivation. Patients' daily activity is monitored by Body Sensor Networks and his/her activity is profiled and used to tune the rehabilitation level, to assess potential risks and advice clinicians on the therapy. The HS has two main roles: defining and monitoring the rehabilitation carried on at home and to support a set-up for a community of patients to educate and motivate them. Data mining in the NS discovers common features and trends of rehabilitation treatment among hospitals and regions. **Results:** Preliminary results on the design and implementation of the PS and the HS will be reported and discussed along with the main issues and trade-offs that have to be considered for massive deployment. **Discussion:** These results show that assembling novel ICT technology a reliable platform can be assembled that makes rehabilitation at home possible. **Keywords:** Stroke; Rehabilitation; Home Treatment; Technology.

Rehabilitation at home: The Intelligent Game Engine for Rehabilitation (IGER system)

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Introduction: Videogames are becoming a valuable tool to guide patients through rehabilitation as they provide motivation as well as the possibility to monitor performance. **Methods:** The REWIRE platform is heavily based on games. These are implemented inside a Patient Station (PS) deployed at patient's home. The PS provides three major functionalities: support of a patient's virtual community, log of lifestyle data, and management of the communication with hospital. It also hosts the Intelligent Game Engine for Rehabilitation (IGER) containing a game engine, an input layer, and a game supervisor. The game engine provides the game scenarios to the patient on a home TV screen and monitors the interaction of the patient with them. Scenarios variety, balanced scoring system, quantitative exercise evaluation, audio-visual feedback aim all at maximum patient's motivation. An input abstraction layer allows the integration of several input devices for the same game depending on patient's disabilities and rehabilitation goals. Game play is controlled by the game supervisor that monitors the patient's performance and adapts the play in real-time. The supervisor is based on implicit intelligence that allows keeping the game at an adequate challenge level. An explicit intelligence module is also implemented inside the supervisor to monitor critical situations; e.g. tilting the trunk when moving a foot forward or laterally, or moving the shoulder forward instead of extending the arm when reaching for an object. In these cases, a virtual therapist appears on the screen to warn the patient and to give advice on how to improve performance. **Discussion:** Preliminary games aimed at posture and balance will be presented. These have been designed according to Gentile's taxonomy. Examples on the operation of implicit and explicit game intelligence will be shown to illustrate the potentiality of the IGER system. **Keywords:** Stroke; Rehabilitation; Home Treatment; Technology; Games.

Design of a theory based exergame program for chronic stroke survivors to enable continued rehabilitation at home

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Introduction: A challenge for health-care is an increased need for rehabilitation programs to enhance recovery and improve functional status of stroke survivors. Termination of motor rehabilitation is often recommended in those cases where stroke patients become more chronic and/or when they fail to respond positively to continued rehabilitation. It can be speculated, however, that when principles of exercise training are adhered to part of the impairments seen in stroke survivors will continue to recover. This indicates the need for continued training in the chronic stroke population with programs that are adapted to the needs of patients. **Aims:** To develop a theory-driven home based rehabilitation program where patients perform remotely supervised neuro-rehabilitative training in a virtual environment. Define appropriate physical exercises and training recommendations to optimally challenge patients' performance capabilities. **Methods:** Gentile's taxonomy [1] was adopted to design appropriate training exercises targeted to enhance and restore stroke patients' motor function. **Results:** Exercises were developed in which two general dimensions of an action are distinguished: (1) the environmental context and (2) the function of the action. These two dimensions were subdivided into four environmental context characteristics and four action function characteristics. The interaction of these characteristics resulted in a training program of sixteen different skill categories. The skill categories are used to design the exergames. **Discussion:** Using the taxonomy, long-term continuation and monitoring of stroke patients' rehabilitation process and associated functional progress might be possible in a rather simple way. The classification system provides the opportunity to gain exercise-based data over an individuals' continuous rehabilitation over longer time periods. **References:** [1] Magill RA. Motor learning and control: Concepts and applications. McGraw-Hill Boston, MA; 2007. **Keywords:** Training Exercises; Stroke; Home Rehabilitation; Technology.

Tuning up home rehabilitation therapy using lifestyle evaluation.

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Introduction: The REWIRE project aims at providing a virtual-reality (VR)-based home rehabilitation tool for patients discharged from hospital. Although the REWIRE rehabilitation platform allows patients to remain connected to their initial centre of care for remote therapy planning and performance assessment, VR-based home therapy encompasses several challenges due to the limited supervision during training. **Aims:** The purpose of the lifestyle evaluation module, in the framework of REWIRE, is to deliver a feedback to the therapy planning engine which enables automatic, fine-grain adaptation of the rehabilitation exercises based upon patient's short- and long-term physiological and physical functioning metrics. **Methods:** The lifestyle evaluation will be performed through a network of unobtrusive body-worn wireless sensors capable of both activity and physiological (heart-rate) monitoring. A multi-time scale assessment is envisioned to quantify patient's daily-life behaviour and will be provided as feedback information to the REWIRE therapy planning engine. On one hand, short-term (e.g. daylong) assessment, based on activity type and intensity as well as patient's current physiological state will reflect the current patient's fitness prior starting a rehabilitation session. On the other hand, advanced data mining techniques will provide a longer-term overview of the therapy progress through a longitudinal analysis of patient's lifestyle. **Discussion:** Unobtrusive and multi-scale lifestyle evaluation does not depend on the type of rehabilitation/clinical condition and can therefore become an effective assessment tool not only in home rehabilitation but also in "conventional" rehabilitation and/or different

conditions (e.g. elderly, orthopaedic surgery, post-traumatic conditions). **Keywords:** Virtual Reality; Stroke; Home Rehabilitation; Technology.

Designing a comprehensive system for home rehabilitation: Cooperative involvement of technicians, clinicians, therapists and end users

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Introduction: Home rehabilitation is a key issue in the reorganization of health and social systems. Demographical changes and new lifestyles ask for a new approach to long-term rehabilitation. **Aims:** The purpose of this study is to design an effective home rehabilitation system that will deliver suitable rehabilitation programs within the overall framework of the health and social system. The final aim is to move the point of care to the patient's home extending the hospital system to include it. **Methods:** The design of an effective home rehabilitation system needs a detailed investigation of different requirements: end users look for rehabilitating at home without losing connection with the clinical setting; therapists search for new working scenarios over the one to one session limit; clinicians ask for successful ways to evaluate therapy outcomes and health administrators aim at improving costs/benefits ratio for a more sustainable health care. To cope with this multifaceted environment, two complementary approaches have been combined. On one side a top-down methodology, based on the decomposition of the system complexity in its basic functions, has been performed by means of Unified Modeling Language and conceptual maps; on the other a bottom-up process has been applied by directly involving users through devoted surveys. **Results:** The resulting system builds around a kernel consisting in the rehabilitation design and performing. End users will interact with the system to exercise, connect to the hospital environment, and participate to a community of users. Therapists will design and monitor rehabilitation according to the single user needs. Clinicians will keep care of the individual assessment. Health administrator will manage the overall picture. **Discussion:** A prototype of the complete system is under development. A strict connection with users will be maintained all along the development phase by means of devoted small pilots in real life conditions. **Keywords:** Stroke; Rehabilitation; Home Treatment; Technology.

PHYSIOLOGICAL SOCIETY SPECIAL SYMPOSIA: THE INFLUENCE OF PHYSICAL ACTIVITY ON SARCOPENIA—RESEARCH UPDATE

Greig, Carolyn¹; Rennie, Michael J², Onambele-Pearson, Gladys³; Beyer, Nina⁴; Visser, Marjolein⁵

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Despite an increasing research effort utilising physical activity strategies to target sarcopenia, there remain several important gaps in our knowledge and understanding that hamper our efforts to ameliorate this condition. For example, we still know relatively little about the mechanisms influencing responsiveness to acute and chronic activity in old people, the constituents of the optimal training regime, the efficacy of multimodal interventions and the translational value of current basic and applied science physical activity approaches. There exist also important practical challenges inherent to the design and delivery of interventions, particularly for frail older people. This Symposium aims to review current physical activity/

sarcopenia research, highlight the knowledge gaps, discuss the practical challenges, and propose future research directions.

How do exercise and nutrition affect muscle mass with age and can we do anything about it?

Rennie, Michael J

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It is well established that human skeletal muscle mass declines with age at about 0.5-2% per year after the age of 50. The mechanisms of this decline are not well understood but obviously involve a failure of the balance between muscle protein synthesis and muscle protein breakdown. Some years ago it seemed to most workers in the field that there must be a deficit in the rates of basal muscle protein synthesis (MPS) or an elevation of muscle protein breakdown (MPB) but this was shown not to be the case and it now appears that the major driver for the loss of muscle protein is a failure of MPS in response to feeding and exercise. Hormonal effects on human MPS are slight, there being no influence of insulin or growth hormone on MPS, and no age related effects. However, MPB is inhibited by insulin and the effect is less in older subjects. Nevertheless, the major defect seems to be what we have termed "anabolic resistance" to the normal stimulatory effects of amino acids, particularly the essential amino acids leucine. Together with the effect of a lessening of the inhibitory effect of insulin on MPB, there is a deficit of the capture of amino acids in the diurnal period. There appear to be sex related effects with anabolic resistance being greater in postmenopausal women. Resistance exercise stimulates MPS in a dose related manner, with the slope and extent of the curve being less in older subjects. Exercise training increases the microvascular blood flow to skeletal muscle in a way that increases the delivery of nutrients and hormones in a manner likely to be beneficial. Increased intake of dietary protein per se is unlikely to stimulate muscle maintenance but addition of moderate amounts of fish oil appears to rejuvenate anabolic effects of amino acids in older subjects.

The efficacy of multimodal interventions to combat sarcopenia?

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Sarcopenia is one of the many chronic conditions the incidence of which increases even in healthy ageing. Our knowledge of sarcopenia in older persons suggests that changes are concurrent with increased production of catabolic cytokines, inadequate intake of dietary energy, declines in alpha-motor neurons, growth hormone production, sex steroid levels, and physical activity, culminating in increased fatty tissue content, decreased skeletal muscle (and satellite cells) content as well as decreased bone mineral density. Overall, the ensuing result is a decreased physical ability which has been proposed to be reversible with exercise training. The majority of the exercise training interventions have been with resistance modalities. Indeed many resistance training (RT) studies, utilising either one or a combination of concentric, eccentric, or inertial loading, demonstrate substantial (>50%) improvements in the maximum force capacity of older persons after 6 or more weeks of training. Similarly, muscle power, arguably the most important parameter of relevance to physical performance since it accounts for ~40% of the variance in functional status, is also shown to improve with RT. Moreover, the reports on the effectiveness of RT demonstrate that the amount

of skeletal muscle tissue, either directly seen through CT/MRI/DEXA/US scanning and anthropometry or indirectly as demonstrated through endocrinologic alterations such as IGF-1 and myosin levels, can also be improved in a similar time frame. RT and alternative interventions, including postural balance training, flexibility training, 'unstructured' group activities, and nutritional supplementation (e.g. protein, statins, dietary cholesterol, omega3, anti-oxidants, vitamin D), have recently been trialled in various combinations with variable degrees of success. The effectiveness of any intervention is limited by the fact that whilst mechanical loading (and/or adequate nutrition) can increase the cross-sectional area of the fibers that are present in the older persons muscle, these interventions tend not to restore the number of fibers that is characteristic of young muscle. A major challenge in preventing an epidemic of sarcopenia-induced frailty in the future is improving the understanding we have of the degree of responsiveness and/or the exact life style choices required to obtain/retain physical independence. Here, we explore the current status of the evidence for the efficacy of multimodal programs to reverse ageing-associated sarcopenia.

How can we optimise physical training regimes for older people?

Beyer, Nina

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Sarcopenia, i.e. low muscle mass and strength, is related to increased risk of falls, frailty, disability, and loss of functional independence with age. Lower body strength is needed for a variety of daily activities such as getting out of chair or bed, walking, and climbing stairs. Deficits in muscle strength appear to be most dominant in tasks where a certain amount of strength is necessary to succeed. The question is what type or types of training to choose if the goal is to improve muscle strength and function and increase reserve capacity. Few studies exist on the effect of endurance exercise in old people. High-intensity interval walking has been shown to improve fitness and muscle function but at present the potential benefits of this type of training are unclear. In frail older people, reduced muscle mass and strength may result in an inadequate cardiovascular load to stimulate increases in cardiac output and thus prevent an effect on fitness. In contrast, strength training appears to be feasible in healthy older people and people with co-morbidity from the young old to the oldest old. Particularly, higher intensity progressive resistance training is effective for improving muscle mass and strength among older adults indicating a dose-response relationship. In addition, high-intensity strength training and power training (where the concentric phase is performed with maximal speed) is more effective in improving stair climbing compared with low-intensity. In contrast, there appears to be no significant differences between the effect of resistance exercise and functional training for improving less demanding activities such as normal walking speed and Time-Up-and-Go performance. Although resistance exercise may improve balance training, regimes for older persons with balance problems should include balance training especially if the goal is to prevent falls. During the last decade, whole body vibration training has been promoted as a potentially safe, low impact alternative to improve muscle function in mobility-limited individuals. However, the published literature to date provides only weak support for the efficacy of whole body vibration training for muscle function. So, although a vast number of randomised studies exist on exercise in older people there is still need for high quality large scale studies to determine the optimal exercise regimes for different groups of older people.

The influence of physical activity on skeletal muscle frailty

Visser, Marjolein

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In 1994 a landmark study was published showing that exercise training increases muscle mass and muscle strength among frail older nursing home patients. These type of studies and the launching of the concept sarcopenia (defined as the age-related decline in muscle mass) have led to an sharp increase in the number of studies investigating the association between physical activity and muscle in older persons. This presentation will review some results of specific intervention studies aiming to increase muscle mass and/or strength by physical activity. The impact of the intervention on fat infiltration into the muscle will be discussed, as well as its impact on the prevention of muscle loss during energy restriction in older obese persons. Apart from intervention studies, data from observational studies among large cohorts of older persons will be presented to discuss the association between physical activity and muscle. Specific attention will be paid to prospective studies investigating age-related change in muscle over time, thereby showing the potential benefit of an active lifestyle for successful aging.

Oral Presentations

EXERCISE AND PHYSICAL ACTIVITY IN FRAILER OLDER PEOPLE

Changes in muscle thickness over 12 months in older frail women nursing home residents

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Introduction: The reduction of skeletal muscle mass that occurs with aging (sarcopenia) leads to disability in the elderly population. **Purpose:** To investigate the prevalence of sarcopenia among older frail nursing home residents and to examine the rate of change in muscle thickness (MT) over 12 months. **Methods:** B-scan ultrasound equipment with a 5MHz transducer was used to measure MT on 16 older frail women nursing home residents (age = 85.0 yr, height = 143.9 cm, mass 45.4kg) at six sites (triceps, biceps, subscapular, abdomen, quadriceps, and hamstrings). Sarcopenia was defined as 2 SD below the MT norm for Japanese young men and women (Abe and Fukunaga, 1995). **Results:** MT of quadriceps for all subjects was 2 SD below the normal MT of young adults at baseline. The prevalence of sarcopenia in triceps, biceps, abdomen, subscapular, and hamstrings was 25-93% at baseline. After 6 months of living in a nursing home, the prevalence of sarcopenia for the upper body and trunk increased ($p < 0.05$). Biceps and triceps MT decreased by 37% and 32%, respectively, after 12 months. Abdomen and subscapular MT decreased by 29% and 52%, respectively. Quadriceps and hamstrings MT decreased by 18% and 24%, respectively. **Conclusion:** Residing in a nursing home and maintaining an inactive lifestyle is associated with a decrease of upper limb and trunk MT that parallels the loss of muscle mass in the lower limbs. Future research should address interventions that attenuate this muscle loss. **Keywords:** Muscle Thickness; Nursing Home; Inactive Lifestyle; Sarcopenia.

Interventions for age-related visual problems in patients with stroke: A Cochrane systematic review

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Background: The prevalence of eye problems and visual impairment increases with age. As the incidence of stroke also increases with age, a significant proportion of stroke patients will have concurrent visual problems. The interaction between the sequelae from stroke, stroke related co-morbidities and age-related visual problems will be complex and the effect of interventions may differ, compared to the wider population. The nature and outcome of interventions for age-related visual problems may be different in patients with stroke. **Objectives:** The aim of this Cochrane systematic review is to determine if interventions for age-related visual problems improve functional ability following stroke. **Methods:** We searched the relevant Cochrane Trials Registers and nine electronic bibliographic databases including: MEDLINE, EMBASE, and CINAHL (1982 to December 2009). We also searched reference lists and trials registers, hand searched journals and conference proceedings and contacted experts. **Selection Criteria:** Randomised trials in adults after stroke, where the intervention is specifically targeted at assessing, treating or correcting age-related visual problems, or improving the ability of the patient to cope with visual impairment. Primary outcome was functional ability in activities of daily living and secondary outcomes included functional ability in extended activities of daily living, visual acuity, visual field, falls, depression, and discharge destination. **Results:** We considered 7357 titles, 460 abstracts, and 85 full papers. We identified no studies for inclusion in this review. **Conclusions:** There are no studies that can be used to direct practice in stroke patients with age-related visual problems. Evidence relating to the general population with age-related visual problems is available from other Cochrane reviews, but no subgroups of stroke patients are identified within them. The ways in which future trials and reviews address this complex issue will be discussed. **Keywords:** Vision; Stroke; Cochrane Review; Functional Ability.

Community public-private partnership program-physiotherapy rehabilitation corner for institutionalised elderly

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Introduction: Elderly living in old age homes frequently faced gradual decline in balance, functional mobility, and gait stability. It is not sure whether a collaboration of old age home (OAH) and community physiotherapy (CPT) in setting up of a rehabilitation venue to provide physical and mobility training can enhance functional outcomes of the institutionalised elderly. **Objectives:** A designated venue 'Physiotherapy Rehabilitation Corner' was established. CPT and OAH staff delivered physical and mobility training. The program was started from June to December of 2011. **Methods:** 3 old age homes participated as pilot to establish the rehabilitation Corner. The training program was designed by physiotherapist (PT). 8 sessions were led by PT and further 4 sessions were led by OAH staff alone and

supervised by PT. The rehabilitation program included mobilising/strengthening exercise for upper and lower limbs, functional and gait training which lasted for 60 min. The outcome measures of baseline and post- 12 sessions training which included modified functional ambulatory categories (MFAC), Berg Balance Scale (BBS), Modified Rivermead Mobility index (MRMI), Timed up and go test (TU&G) and 6 min walk test (6MWT) were recorded to monitor the progress of each elderly. **Results:** 22 elderly participated in the training program. After completing 12 sessions of physical training, a Wilcoxon Signed Rank test was conducted to evaluate five objective outcomes. The results indicated a statistically significant difference: Wilcoxon Signed Rank Test and Median-(Pre/Post) MFAC:Z = -4.11 T = 0.001 (4/5); BBS:Z = -4.11 T = 0.001 (15/36); MRMI:Z = -4.12 T = 0.001 (21/31); TU&G:Z = -4.01 T = 0.001 (74/45); 6MWT:Z = -4.1 T = 0.001 (31/54). **Conclusion:** The results of this pilot program organised by joint effort of CPT and OAH showed improvement in functional outcomes and gait stability of elderly. This pilot program could be a pioneer model for better continuation care for institutionalised elderly. **Keywords:** Care Homes; Mobility Training; Measurement of Activity; Rehabilitation.

Velocity of movement during ankle strength and power training with elastic resistance bands in older patients attending a day hospital program

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Power training may be more beneficial for older adults than strength training, because many daily activities are more affected by power losses with age than strength losses. However, most power training programs do not actually measure the velocity of training so it is unclear how fast the training is. This could explain why some studies have not shown additional benefits with power training as compared to strength training. Additionally, very little research has been done on power training using elastic resistance bands. Because they are portable and inexpensive they could provide a desirable means of conducting power training programs, particularly for de-conditioned older adults. The purpose of this study was to determine the velocity during strength and power training, with elastic resistance bands, in older adults attending a day hospital rehabilitation program. Nine older patients were trained for power and strength of the ankle (plantar flexor and dorsiflexor) muscles using elastic resistance bands for 4 to 6 weeks. Training sessions were filmed to assess the velocity of training using Proanalyst software. Power training occurred at faster peak velocities as compared to strength training ($p < 0.001$) for both muscle groups. However, there were significant differences for average velocity only during training of the plantar flexors ($p < 0.001$). Overall, there was a wide variability observed between subjects in velocities at which they trained, and overlap was found between velocities for strength and power training across individuals. The results of this study suggest that researchers should monitor velocity during different types of training in older adults, particularly when examining the differences between training that is expected to have different velocities. Also, future studies could examine the benefits of strength and power training, based on the actual velocities that are attained by participants during their training sessions. **Keywords:** Power Training; Resistance Bands; Rehabilitation; Hospital.

An augmented exercise programme in the acute setting can improve mobility and quality of life in frail hospitalised older patients: A pilot trial

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Objective: Functional decline is experienced by up to 50% of older hospitalised patients. Frailty may influence this decline. A pilot trial was conducted to determine the levels of frailty in our older hospitalised population and the effects of augmented exercise on length of stay, function, and quality of life. **Methods:** A controlled pilot trial was conducted over an eight-week period in an acute setting involving medical in-patients over 65. Patients referred for physiotherapy were screened and if eligible for participation, were alternately allocated to the usual care group (three times weekly physiotherapy) and the intervention group (usual care augmented with two half-hour exercise sessions daily, five times weekly). Differences from baseline within and between groups were compared for the following parameters: frailty (handgrip strength); physical ability (Short Physical Performance Battery; Barthel Index); falls (number of falls, MFES); Depression (ABC Depression Screen); and Quality of Life (EuroQol-5). **Results:** Of the 185 older patients admitted during the trial, 55 were screened. Forty-two (76.4%) of the patients were categorised as frail. Forty of these were eligible for the trial; 20 patients to each group. Groups were comparable at baseline. On discharge, the intervention group showed better physical ability (SPPB: $p = 0.03$) and quality of life (EQ-Act: $p = 0.02$, EQ-VAS: $p = 0.001$) than the control group with their median length of stay 2 days less than the control group. The cost of running the service for eight weeks was approximately €778. **Conclusion:** These results are encouraging and support the value of a large randomised controlled trial. **Keywords:** Mobility; Quality of Life; Frailty; Intervention; Physical Ability; Costs.

Chair based exercise in frail older people: A systematic review

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Introduction: Frail older people are usually unable to undertake high intensity exercises with proven benefit. Consequently lower intensity chair based exercises (CBEs) are provided despite uncertainty over their effectiveness. We undertook a systematic review to examine the effects of CBEs in frail older people. **Method:** A systematic search was performed for CBE studies in populations who were frail and aged over 65 years published 1990-2010 in electronic databases supplemented by other sources. Quality of papers and reporting were performed by using the Jadad and PRISMA methods respectively. **Results:** The search identified 164 references: 42 duplicates were removed, and the papers/abstracts of the remaining 122 were reviewed, 116 of which were excluded leaving 6 for analysis. Number of participants in the 6 studies ranged from 20 to 82. Two studies showed no obvious benefit from CBE (Nicholson 1997, Thomas 2003). The others showed some evidence of benefit in the domains: Mobility and Postural Stability (Baum 2003, Hrudá 2003,); Cardio-respiratory Fitness (Witham 2005); Mental Health (Hrudá 2003, Van de Winckel 2004). No harmful effects were reported in any of the studies and compliance with CBEs was generally good in the populations studied. 26 different outcome measures were used, grouped in 3 domains: A) Mobility and Postural Stability (including timed up and go, timed walk, Berg balance, chair stand, , physiological profile, grip strength); B) Cardio-respiratory fitness (including respiratory fitness, heart rate, Guyatt chronic heart failure, accelerometry); C) Mental Health (including Becks depression inventory, Amsterdam dementia screening, falls efficacy confidence measure). All 6 studies were of low methodological quality (Jadad score up to

2, range 0-5). **Conclusion:** The quality of the evidence base for CBEs is low. Large well designed randomised controlled trials to test the effectiveness / cost-effectiveness of CBE's required. **Keywords:** Frailty; Chair Based Exercises; Review.

Experiences of a high-intensity functional exercise programme among older people dependent in activities of daily living

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The purpose of this qualitative study was to describe the experience of participating in a high-intensity functional exercise programme among older people dependent in activities of daily living and living in residential care facilities. The informants had participated in an exercise intervention based on the High Intensity Exercise Program (HIFE) including exercises with the purpose to improve lower limb strength, balance, and gait ability. The training was individualized and intended to be performed at high intensity, i.e. to fully challenge the individual's capacity. The exercise took place in the facilities, in small groups supervised by physiotherapists. The sessions lasted 45 min and there were 29 sessions during 13 weeks of intervention. Nine exercise participants, six women and three men, aged 73-91 were selected for interviews about their experience of participating in the exercise programme. Qualitative content analysis was used in analysing the interviews. The findings show that the informants, despite extensive physical impairments, advanced age, and multiple diagnoses displayed a belief in positive effects of the programme, a strong desire to be active, and the will to strive to avoid further loss of capacity. They were struggling with failing bodies that constituted barriers to exercise. Support from the supervisors and belief in personal success facilitated performance of the exercise. The informants told of physical and mental improvements that affected their daily life positively and that exercising in a group was stimulating and created a sense of togetherness. The effort was seen as worthwhile because participating in strenuous exercise could imply that they might overcome bodily limitations to achieve increased vitality and improved quality of life. **Keywords:** High Intensity Exercise Program; Strength; Balance; Gait.

Supervised balance and strength training predictors of participation among the population 75 years and older

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Introduction: Despite the recognized health benefits, relatively few older adults participate in strength training. **Objectives:** To define the characteristics of older adults that are associated with non-participation in supervised balance and strength training after comprehensive geriatric assessment. **Methods:** The data of this study is part of the Geriatric Multidisciplinary Strategy for the Good Care of the Elderly (GeMS), a population-based intervention study. Participants (n = 339) were home-dwelling persons of the intervention group. They got individually tailored counselling by physiotherapist and an opportunity to participate in supervised, group-based strength and balance training at the gym once a week. Data collection included self rated health, co-morbidities, sedative load of drugs, cognition (Mini Mental State Examination), physical activity (Grimby), functioning in instrumental activities of daily living (IADL, Lawton & Brody), grip strength and balance by Berg Balance Scale (BBS) and Timed up and Go (TUG) test. **Results:** Of the 339 participants (75 to 98 years old, 72%

female) 157 (46%) did not initiate the training. The non-participants were older ($p < 0.001$), physically less active ($p < 0.009$), had shorter education ($p < 0.001$), more co-morbidities ($p < 0.011$), more often sedative drugs ($p < 0.001$), more difficulties in IADLs ($p < 0.001$), lower grip strength ($p < 0.001$) and more balance problems by the BBS ($p < 0.001$) and TUG ($p < 0.001$) compared to persons who participated in the training. In multivariate logistic regression analysis, impaired cognition and lower grip strength were independently associated with non-participation. **Conclusions:** In community-dwelling older adults, cognitive impairment and weak grip strength predicted independently non-participation in balance and strength training. In the future, more emphasis should be placed to lower participation threshold of those older people with more cognitive limitations and less strength. **Keywords:** Strength Training; Balance; Physical Activity; Cognitive Impairment.

WORKING WITH PARKINSON'S AND POST POLIO PATIENTS

Invited lecture: Assessing exercise capacity and interpreting outcomes for people with Parkinson's in the real world

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There remains controversy and confusion for exercise professionals between what we are told we should assess in people with long-term conditions (often older adults with multiple-pathologies), how this is measured in research articles and what is actually achievable for the professional working in clinical practice or in the fitness industries (Nieman 2011, Kaminsky 2010, Durstein 2009). This issue is further complicated now health and the benefits of socialisation are being driven through group-work in preference to cost-prohibitive individualised interventions. Using Parkinson's as an exemplar, the session will start by providing a research evidence-informed overview of the value of exercise for people with the condition. This will include a multitude of assessments recommended to monitor fitness components of cardio-respiratory factors, power, flexibility, muscular strength and endurance, comparing these 'gold-standard' assessments to field-tests and practice. Information will be presented on interpretation of outcomes along the continuum of individualised, single-pathology health-research measures to those of group-work for people with multiple-pathology who participate in activity for social benefits as much as physical benefits. **References:** Durstein L Ed. (2009). ACSM's exercise management for persons with chronic diseases and disabilities. American College of Sports Medicine 3rd Edition. Champaign, IL, Human Kinetics; Kaminsky L Ed. (2012). ACSM's health-related physical fitness assessment manual 3rd Edition. Philadelphia, Wolters Kluwer, Lippincott Williams and Wilkins; Nieman D (2011). Exercise testing and prescription: A health-related approach 7th Edition. New York, McGraw Hill

Adapting postural responses on the basis of constraints imposed by a voluntary task in Parkinson's disease patients

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Objective: This study assessed the effects of stability constraints of a voluntary task on postural responses to an external perturbation in subjects with Parkinson's disease (PD) and

healthy elderly participants. **Methods:** Eleven subjects with PD and 12 control subjects were perturbed with backward surface translations during standing and performing two versions of a voluntary task: holding a tray with a cylinder placed with the flat side down (low constraint - LC) or with the rolling, round side down (high constraint - HC). Participants performed alternating blocks of low and high constraint trials. **Results:** PD participants accomplished the voluntary task as well as controls, showing slower tray velocity in the high, compared with the low, constraint condition. However, the latency of postural responses was longer in the high constraint condition only for control subjects. Control subjects presented different patterns of hip-shoulder coordination as a function of task constraint whereas PD subjects had a relatively invariable pattern. Initiating the experiment with the high constraint task led to (a) decreased postural stability in PD subjects only, and (b) reduced peak hip flexion in control subjects only. **Conclusion:** These results suggest that Parkinson's disease impairs the capacity to adapt postural responses to constraints imposed by a voluntary task. **Keywords:** Parkinson's; Voluntary Task; Posture; Stability.

Leisure activity among people with Parkinson's disease: Preferences, perceived benefits and reasons for abandonment

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Background: People with Parkinson's disease (PwPD) reduce their activity levels post-diagnosis but the reasons for this are unclear. **Aim:** To ascertain specific information about leisure activity among PwPD (preferences, benefits, and reasons for abandonment) generating ideas for promoting continuity and positive change and avoiding unnecessary dropping out. **Method:** Questionnaires were distributed via 30 branches of Parkinson's UK branches across central southern England. **Results:** 223 PwPD returned questionnaires: 194 answered questions about their leisure preferences and 185 answered questions about abandoned activities. Among an extensive and diverse range of activities listed (covering outdoor activity, exercise, sport, relaxation, intellectual pursuit, creativity, group activity and travel), the most frequent (along with their most frequently perceived benefits) were: walking (for keeping active and being outdoors), gardening (outdoors, active and relaxing), swimming (active and relaxing), bowling (company and activity) and socialising (company and enjoyment). Key reasons for abandoning activities included fear of falling or other danger, fatigue outweighing benefits; performance limitation; and practical and emotional (partially PD-specific) issues of access, symptoms and disease management. **Conclusion:** This PD-specific information about the pursuit and benefits of, and barriers to, leisure forms an original data set that will challenge many preconceptions about how this group of people makes choices about continuing or abandoning activity. The responses raise questions about the degree to which general advice about staying active as part of healthy ageing is applicable to people with PD. The major themes highlight a) avenues for better tailored health promotion and b) the potential improvements in participation that relatively minor changes in leisure provision could bring for this and other groups of elderly people. **Keywords:** Parkinson's; Health Promotion; Motivation and Behaviour Changes.

Ability of Parkinson's disease patients improve with multimodal exercise program

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Objectives: This study aimed to evaluate the effect of a long-period multimodal exercise program on balance, mobility, and clinical status of Parkinson's disease (PD) patients.

Methods: Thirty-three PD patients were assigned into two groups: a training group (TG – n = 22; aged 67.23±8.39 years) and a control group (CG – n = 9; aged 71.56±8.50 years). The TG patients were enrolled in a 6-month multimodal exercise program. This program was designed to improve physical capacity components and to reduce PD impairments. Balance and mobility were assessed immediately before and after the training protocol using the Berg Balance Scale (BBS), the Time to up and go test (TUG) and the Posture Locomotion Test (PLM). Also, clinical variables were assessed (disease stage and impairments). **Results:** The TG showed an improvement in the TUG (p = 0.006) and PLM (p = 0.048) tests, while CG were not influenced by the 6-months period (p = 0.88 and p = 0.67). Both groups showed no differences for BBS (TG: p = 0.15; CG: p = 0.27) and for their disease impairments – assessed through the Unified Parkinson's disease Scale (p > 0.27). **Conclusions:** Long-term multimodal exercise programs are able to improve mobility of Parkinson's disease patients and therefore should be used on clinical day-life. **Acknowledgements:** Brazilian Funding Agencies (CAPES, FAPESP, CNPq, FUNDUNESP, PROEX-UNESP). **Keywords:** Balance; Mobility; Parkinson's; Multimodal Exercise Programme.

Adherence to physical activity through the development of a physiotherapy-led 'exercise community'

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Public Health policy seeks to maintain health and delay disability in older adults using partnerships with providers of exercise programmes sustainable into the longer term (DH 2011a & b). Awareness of physical and psychological benefits of activity alone does not ensure exercise programme adherence (Bailey & McLaren 2005). Concepts exploring persistence in exercise participation (Deci & Ryan's 1985 self-determination theory; Prochaska & Marcus 1994 transtheoretical model) mandate social interaction (Pentecost & Taket 2011); this aspect will be considered in this presentation. In 2000, a physiotherapy-led community class for people with Parkinson's was established with an evidence based rationale to improve posture and balance through exercise (Webber & Ramaswamy 2003); the ethos of social benefits from exercising with peers fitted the criteria of funding organisations (Parkinson's UK [Sheffield], and local Council Grants). The successful initial 12-week trial has evolved into the Full Monty Club, the exercise arm of the Sheffield Branch of Parkinson's UK and runs independently of National Health Service classes (education and activity promotion courses for recently diagnosed people). Following small-scale independent research projects completed by undergraduate and postgraduate local university students over the past two years, the Club now offers long-term posture and balance classes thrice weekly, circuit classes for strength and flexibility, hydrotherapy for 1: 1 on specific issues plus aquarobic sessions to music, building fitness and endurance. Later in 2012, a walking group is to be added to the Club facility. Evolution has occurred through a combination of participant enjoyment, promotion of fun, support through additional social activities with family and friends creating a sense of community and belonging for participants; this has positively influenced willingness to attend. Future research should examine mechanisms that promote community in exercise. **Keywords:** Adherence; Physical Activity; Motivation and Behaviour Changes; Physiotherapy.

Lifestyle physical activity in people aging with a disability: A study of persons with post-polio syndrome

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Being active in all parts of life is defined as 'lifestyle physical activity' (LPA), and is important for our physical as well as mental health. However, persons with neurological disabilities are not engaged in LPA as much as nondisabled persons. Post-polio syndrome (PPS) is a disabling condition that appears in those with an acute poliomyelitis infection after decades of stability. Persons with PPS are advised to be physically active according to their individual needs and preferences, but there is very limited information about their engagement in LPA. The purpose of this study was to describe the amount of LPA and the type of activities that older persons (age > 50 years) with PPS are engaged in. **Participants:** A total of 34 men and 27 women (mean age 66 years) with verified PPS. **Main outcome measures:** Physical Activity and Disability survey (PADS) is a semi-structured interview developed at the National Center on Physical Activity and Disability in Chicago, USA. The survey consists of six subscales: leisure; exercise; household activities; work/school; therapy; and wheelchair users. The original PADS has good validity and reliability in populations with disability and chronic health conditions. The instrument was translated and adapted into Swedish. Life satisfaction was assessed with the Life Satisfaction Questionnaire (LiSat-11). **Results:** Preliminary results indicate a mean total activity level of 148 min/day (SD 88, range 54-539). The major part of the activities was household activities (mean 88 min/day). The total activity level was not related to the participants' sex, age, use of assistive devices or living conditions. Persons with a higher level of activity were significantly more satisfied with their life as a whole. **Conclusion:** Persons with PPS are physically active to a large extent. Much of their time is spent in household activities, which may be a target for future health promotion. **Keywords:** Post-polio syndrome; Home Exercise; Lifestyle Physical Activity; Quality of Life.

THE USE OF PEDOMETERS AND STEPS/CADENCE SYMPOSIA

Invited lecture: Behaviour change plus pedometer in increasing physical activity in sedentary older women

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Practical and effective interventions are needed to increase activity in sedentary older populations. A brief behavioural change intervention consisting of goal setting, planning, self-monitoring delivered with or without a pedometer was compared with no treatment in a prospective study of 204 sedentary community dwelling women aged ≥ 70 years (average age 77 years). The primary outcome was daily activity counts assessed by accelerometer over 7 days prior to treatment, at 3 months and at 6 months. Secondary outcomes included lower limb function, health related quality of life, anxiety, depression and falls. The psychological mediators of behaviour change assessed included intention, perceived behaviour control, action, and coping planning. 179 women completed the trial with most dropouts from the behaviour change alone condition (15/68). Over the first 3 months, activity increased reliably more in the intervention groups than the control (which did not change). Pedometers did not add to the effects of the behaviour change techniques. The increase in activity was

not maintained at the 6-month assessment. The psychological and behavioural processes mediating the change in activity, and the failure to sustain it, will be discussed. **Keywords:** Sedentary; Behaviour Change; Measurement of Activity; Accelerometers.

Increasing awareness for physical activity of older adults with diabetes

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Background: Type 2 Diabetes Mellitus (T2DM) is an increasing prevalent chronic condition amongst the older population, with high levels of morbidity and mortality. **Aim:** To increase the awareness of low literate older adults, in a rural setting, with T2DM, for the importance of physical activity and exercise (PA&E). **Method:** A health promotion program of 7 weeks was implemented. The outcomes assessed were knowledge about PA&E, adherence to daily steps register (pedometer), and changes in PA levels. **Results:** Most participants increased their knowledge on physical activity practice, namely about the minimum exercise levels recommended to obtain health benefits (68.4% participants); the difference between physical activity and exercise and the number of daily steps recommended for their age and health benefits of walking (32% participants). Attendance rate for the exercise session was 63.6%, of which 80% felt at least confident during the session; 100% felt autonomous in performing global exercise and 50% concerning local exercise. No one felt that the session was difficult and 91.6% referred no fear of falling or of movement. As for the diary, the number of registrations varied between everyday and 19 days (76%), and 45% increased their daily steps. The daily physical activity level varied greatly consisting mainly of household work, and exercise was focused on walking between 180 and 21.25 min/day. **Conclusion:** This program was implemented in a rural setting with older diabetic adults, with low educational levels (max. 4 years). Overall, the program was effective in increasing participant's knowledge concerning the importance of physical activity and exercise and physical activity level through daily steps. There was a very positive response, with a request for the continuity of the exercise sessions. Long-term follow up is recommended to assess the maintenance of the changes obtained. **Keywords:** Diabetes Mellitus; Health Promotion; Physical Activity; Exercise; Awareness.

Examining objective and perceived distance to neighbourhood destinations and associations with walking for transport

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While studies on built environment correlates of walking among seniors are increasing, there is a need to understand how perceptions and objective measures of the same built environment features work together to influence walking. Our aim was to examine differences in perceived and objective distance for older adults who walk to destinations, and to explore the mediating effect of perceived distance on objective distance and walking. Study participants (n = 325) were residents of 32 retirement villages in Perth, Australia. They reported perceived walking time (five-point scale) to 10 destination types outside but nearest their village: local shops; supermarkets; general services; health services; hairdresser/beauty salon; fast-food/takeaway; eating/entertainment facilities; public transport; recreational facilities; and public recreation areas. If used within the previous month, residents

indicated whether they had walked there. Various sources were used to obtain objective data which were used to calculate road network distance (in kilometres) from the village to the same destinations. On average, residents were aged 76.8 years (SD = 7.4) and 68% were female. Correlation coefficients for perceived and objective distances ranged from 0.147 to 0.532. For most destinations, perceived and objective distances were significantly shorter for residents who walked compared with others. For example, perceived ($M = 2.24$, $SD = 1.22$) and objective ($M = 0.63$, $SD = 0.56$) distance was shorter for residents who walked to local shops compared with perceived ($M = 3.55$, $SD = 1.26$) and objective ($M = 1.17$, $SD = 0.77$) distance for others. Objective distance to local shops, supermarkets, general services, health services, and public transport were negatively associated with walking and perceived distance mediated 11-53% of these relationships. This has implications for creating supportive built environments with proximate destinations and the interventions required to encourage more walking among seniors. **Keywords:** Walking; Physical Activity; Perceived and Objective Distance; Transport.

Cadence of older women walking at self-selected and music guided pace

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Introduction: Despite guidelines for moderate intensity health-enhancing physical activity, older adults' walking intensity is rarely monitored or regulated in walking interventions. Consequently, we determined self-selected walking cadence (steps/min) and intensity (METs) in older women and investigated their ability to match walking cadence to music tempo (beats/min). **Methods:** Older women ($N = 30$; age = 71 ± 7 yr; height = 1.58 ± 0.08 m; weight = 63.64 ± 11.54 kg; BMI = 25.52 ± 4.31 kg/m²) completed three 4-min treadmill walking trials at self-selected slow, moderate and fast speeds during which cadence and energy expenditure were measured. Three overground trials of at least 5 min were then completed using music tempo matched to the three treadmill cadences, played through a portable music player. Data were analyzed using one-sample t-tests, Cohen's d, and Bland-Altman plots. **Results:** Mean energy expenditure and cadence during the three treadmill trials were 3.52 ± 0.88 METs and 112 ± 12 steps/min (slow), 3.99 ± 1.05 METs and 118 ± 11 steps/min (moderate), and 4.58 ± 1.02 METs and 124 ± 12 steps/min (fast), which were all significantly ($p < .005$) and meaningfully ($d = 0.58$ - 2.09) higher than moderate intensity energy expenditure (3 METs) and cadence (100 steps/min; Tudor-Locke & Rowe, in press). During overground walking trials, most participants maintained a cadence within 3 steps/min of the prescribed music tempo, and the trivial ($d = 0.08$ - 0.11) mean differences were due mainly to one outlier walking considerably faster than her prescribed music tempo. **Conclusions:** During self-selected slow, moderate, and fast walking, older women walk at above-moderate intensity. At a variety of music tempi between 86 and 158 beats/min, older women are able to match walking cadence to music tempo. Music therefore has promise for regulating walking pace in older women, and they are able to maintain above-moderate intensity walking for a series of short continuous bouts accumulating to approximately 30 min. **Keywords:** Walking Cadence; Music Tempo; Self-Selected Pace.

Walking in the cement forest: A health enhancement and pedometer-determined ambulatory (HEPA) program in Hong Kong

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Background: Due to lack of infrastructures in the public estates, many older adults were sedentary. A capacity building project named 'Health enhancement and pedometer-determined ambulatory (HEPA) program' was developed to assist home-dwelling older adults develop walking exercise habits in their own neighborhood and built up social support for regular physical activity. **Objectives:** This study aims to describe the intervention used to motivate the sedentary older adults and report the change of their walking capacity and body strength after the 10-week walking. **Method:** A pre-and-post intervention design was used. Number of steps taken per day, upper and lower body strength, lower body flexibility, and quality of life were measured. **Results:** A total of 1,408 older adults participated in various activities in the HEPA program. Among these, 205 completed the 10-week walking and all health assessments. After the 10-week walking, participants' average number of steps per day increased from 6591 (Week 1) to 8934 (Week 10) (increased by 36%). Their lower body strength (mean difference, m.d. = 1.71, $p < 0.001$), upper body strength (m.d. = 1.29, $p < 0.001$), aerobic fitness (m.d. = 20.74, $p < 0.001$) significantly increased after 10 weeks. Their quality of life in physical health (m.d. = 2.86, $p < 0.001$) and mental health (m.d. = 2.11, $p < 0.01$) was significantly improved. **Conclusion and Discussion:** The HEPA program successfully increased participants' walking level and improved their body strength and quality of life. Social network support was built and local environment was utilized to make walking possible and enjoyable. **Keywords:** Walking; Body Strength; Quality of Life; Social Network, Environment.

INSIGHTS IN FRAILTY ASSESSMENT

Invited lecture: From muscle activity to physical performance—Insights in frailty assessment

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Frailty is a geriatric syndrome that is often easily recognized but difficult to diagnose. Characteristics of frailty include a mix of physiological, psychological, social, and environmental factors that initiate a state of vulnerability leading to eventual adverse health outcomes. These characteristics are uniquely expressed within each individual depending upon their available assets (i.e. health, muscle strength, family support) and deficits (i.e. neurological disease, disability) making it a challenging syndrome to diagnose. Clinicians and researchers consider frailty as a spectrum of phenotypes (non-frail, pre-frail, and frail) or indexed by an accumulation of age-associated symptoms. Frailty identification is often missed in its early stages (prefrailty) when interventions could be most productive. However, to-date there is no agreement on how to screen for frailty. Recent evidence from our laboratory has demonstrated that daily muscle activity (electromyography) recorded over 8-hours of a typical day differs between males and females, young and old, and might be used as a tool to identify changes in frailty earlier than current assessment means. In addition, the evaluation of physical activity using a combination of measurements (accelerometers, global positioning systems, and questionnaire) provides important information about when older adults transition across frailty thresholds. Older adults living with neurological disorders such as Parkinson's disease (PD) provide a unique model to explore frailty, especially females who are at greatest risk of becoming frail following PD diagnosis. This symposium provides

insight into how various physical activity assessment tools used in combination with EMG can effectively diagnose frailty before it manifests into functional dependence and death. Understanding the many faces of frailty is crucial to improve the lives of our aging population. **Keywords:** Frailty; Muscle Activity; Physical Performance; Quality of Life.

Invited lecture: Age-related changes in muscle architecture—A signature of sarcopenia

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Sarcopenia is a main cause of frailty in old age (Narici & Maffulli, 2010), affecting about 50% of individuals over 70 years of age (Janssen et al. 2000). Early detection of sarcopenia is thus of primary importance for the introduction of countermeasures against musculoskeletal frailty. So far, diagnosis of sarcopenia has been based on appendicular skeletal muscle mass (ASM) assessed either by DEXA, bioelectrical impedance analysis, MRI or CT. Although the use of these indexes may be practical for clinical purposes, their accuracy and/or cost, have been questioned (Pahor et al. 2009). The present study investigated whether these structural changes could be used as biomarkers of sarcopenia. The investigation was performed on 24 active young (AY) aged 18-35 yr, 27 active older (AO) aged 67-82 yr, 24 master athletes (MA) aged 67-96 yr and 31 frail older (FO) individuals aged 65-94 yr. Fascicle length (L_f) and muscle thickness (t) of the vastus lateralis muscle were measured using ultrasonography and the ratio of L_f to t was calculated for each participant. Statistical significance of differences was assessed with a one-way ANOVA followed by a Tukey post-hoc test. The L_f/t ratio was 3.92 ± 0.67 in AY, 4.58 ± 0.64 in AO, 4.38 ± 0.63 in MA and 5.8 ± 1.27 in FO. This ratio was 17% higher in AO than in AY ($P < 0.01$) and 47.7% higher in FO ($P < 0.001$). Instead, no significant differences between AY and MA were found. The observed increase in the L_f/t ratio suggests that the larger is the degree of sarcopenia, the greater is the disproportion between the loss sarcomeres in parallel and those in series. Instead, the unchanged L_f/t ratio in MA, suggests that regular high-intensity physical activity preserves muscle geometric proportionality. A change in the L_f/t ratio may thus be regarded as a specific ‘signature’ of sarcopenia; this could be useful for diagnosing this condition. Supported by EU FP7 grant No 223576, project MYOAGE. **References:** Janssen I, Heymsfield SB, Wang ZM et al. (2000) Skeletal muscle mass and distribution in 468 men and women aged 18–88 yr. *J Appl Physiol* 89:81–8; Narici MV, Maffulli N. Sarcopenia: characteristics, mechanisms and functional significance. *Br Med Bull.* 2010;95:139-59; Pahor M, Manini T and Cisari M. (2009) Sarcopenia: clinical evaluation, biological markers and other evaluation tools. *J Nutr, Health & Aging*, 13, 724-728. **Keywords:** Frailty; Markers; Muscle architecture.

Socio-demographic determinants of worsening in frailty among community dwelling elderly in 11 European countries

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Background: The rapid increase of frail elderly worldwide will have a substantial impact on healthcare systems. The frailty process may be delayed, or even reversed, which makes it

attractive for early interventions. However, little is known about the determinants of frailty state changes. The aim of this study is to compare socio-demographic determinants of worsening in frailty state in 11 European countries. **Methods:** Data of 14,424 community-dwelling persons aged >55 years, enrolled in 2004 in the Survey of Health, Ageing and Retirement in Europe (SHARE), were analyzed. Three frailty states were identified (non-frail, pre-frail, and frail) using Fried's criteria, and frailty state changes over a two-year period were determined. Multinomial regression analyses adjusted for baseline frailty state were conducted to investigate whether sex, age, marital status, and level of education determined a worsening in frailty state in the total and country-specific European population. **Results:** Of all individuals, 22.1% worsened, 61.8% showed no change and 16.1% improved in frailty state. Women, those aged ≥ 65 years, and lower educated persons showed an increased risk of worsening in frailty state. In Southern European countries, there was an earlier and larger increase in risk of worsening in frailty state in life which was more pronounced in women compared to men. **Conclusion:** In Europe, persons aged 65 years, women, and lower educated persons are at increased risk of worsening in frailty state. Differences between countries indicate that interventions aimed at delaying the frailty process in Southern European countries should start earlier with more attention towards women. **Keywords:** Socio-Demographic; Frailty; Europe.

HEALTH PROMOTION AND MOTIVATION TO EXERCISE

Interventions in community settings that prevent or delay disablement in later life: An overview of the evidence

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Background: The population of older people in the UK is expected to rise rapidly over the next 20 years and identification of effective interventions, that prevent functional decline, is a public health priority. **Aims:** The aim of the review is to summarise the evidence for interventions in community settings that prevent or delay disablement in later life. **Methods:** A search of review-level literature was conducted for the period September 1999 and 2010 of Ovid MEDLINE, EMBASE and CINAHL databases. It included interventions that aimed to prevent disablement of community dwelling older people (50+ years old). It excluded interventions carried out in institutional care and those focused on specific disease. The reviews were screened using the AMSTAR assessment tool. **Results:** The search identified 62 reviews of complex interventions (comprehensive geriatric assessment $n = 3$, preventive home visits $n = 9$, falls prevention $n = 17$, case management $n = 3$) and specific interventions (exercise $n = 15$, nutritional interventions $n = 3$, information communication technology $n = 5$, social integration $n = 3$, vision screening $n = 2$, medication review $n = 2$). **Conclusion:** Overall, the evidence-base is limited by unstandardised use of outcome measures that, in some cases, are not robust. The most promising complex interventions include: assessment of risk factors; and direct referral to an easily accessible, comprehensive range of interventions that are tailored to need and include long-term follow up. There is consistent evidence that exercise can be beneficial, particularly in preventing falls. Exercise programmes for older people can improve strength, aerobic capacity, balance, and function. However, there is a lack of evidence to link gains in impairment and function with reduction of disability. The magnitude of effects of exercise interventions range from small to large, reduce with age and are smallest for the older age group (80+) and those with pre-existing disability. **Keywords:** Intervention; Vision; Technology; Medication; Falls Prevention.

Physical activity behaviour in community dwelling older Brazilian adults

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Introduction: Physical Inactivity is a public health concern worldwide. Older adults exhibit the highest prevalence of physical inactivity compared to other age groups. **Objective:** To explore physical activity (PA) behavior of older Brazilians using the “stages of change” theoretical perspective. **Methods:** A stratified and randomized sample of 359 males and female from Rio Claro, Sao Paulo, Brazil older adults was interviewed. The participants were requested to answer the following question: “Do you perform moderate intensity PA in your free time, five or more days per week, for at least 30 min each day?” If the answer was yes, the interviewer asked whether the behavior had been performed for more (maintenance) or less (action) than six months. If the answer was no, three possible answers were possible: (1) I do not intend to start in the next six months (pre-contemplation); (2) I intend to start in the next six months (contemplation) and; (3) I intend to start in the next 30 days (preparation). **Results:** A total 134 men (71 ± 2.39 years) and 225 women (73 ± 3.25 years) were interviewed. Eighty-two% of men and 78% of women reported their health as good. The proportion of men and women in each behavior stage were not present significantly difference (chi-square; $p > 0.05$). Approximately 40% of men or women were in the pre-contemplation stage, and less than 20% in the contemplation and preparation stages. Additionally, less than 10% of men or women were in the maintenance stage, and less than 30% in the action stage. **Conclusion:** The highest prevalence was observed in the pre-contemplation stage. Less than 30% of men or women reported being regularly physically active (action stage) during the free time. These findings suggest that physical inactivity among Brazilian older adults continues to be a major public health concern. **Keywords:** Physical Inactivity; Health Promotion; Measurement of Activity; Brazil.

Active or sedentary? The perceived implications of a lifestyle

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Background: Regular physical activity offers a range of physical, psychological, and social benefits which may ultimately enable maintained independence and quality of life. However, many older adults in the Western world are insufficiently active. **Aim:** To gain a better insight into the influencing factors of regular participation in physical activity this comparative qualitative study considered both the experiences of sedentary older adults and master athletes. **Methods:** Participants were 10 master athletes and 10 community dwelling sedentary adults (age range 60-80 yrs). Semi-structured interviews were conducted in accordance with the tenets of Interpretative Phenomenological Analysis. **Results:** The narratives of older adults were markedly different regarding their “way of life.” Master athletes relinquished their active experiences by grabbing life and making the most of it regardless of age. They actively and vigorously challenged themselves both physically and mentally. They live their lives with vigour and pushed the boundaries of ageing. They were able to persevere, plan, and pace themselves in their active lives. Being active provided invaluable personal, social, physical, and mental challenges. The sedentary older adults had a ‘fearful’

approach to ageing. They remembered negative past sport and activity experiences, feared further injury, and cited lack of time or physical ill health and pain as a reason for their inactivity. Sedentary older adults did not connect tiredness or a decline in function with their lifestyle. **Conclusion:** It appears that being active throughout one's life is associated with self-regulatory skills, such as ability to plan, find solutions to physical, mental, and social problems. Interventions teaching self-regulatory skills may help sedentary individuals overcome potential barriers and cope more successfully with ageing. **Keywords:** Sedentary; Athletic; Physical Activity; Lifestyle.

Physical activity in inactive and insufficiently active older Australians: Why, how, with whom and where?

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Background: Despite the benefits of regular physical activity (PA) for physical and psychological health, the proportion of people doing sufficient PA for health benefits decreases with age. The aim of this study was to examine PA motivators and context preferences in Australians not engaging in sufficient PA for health benefits. **Methods:** Data were used from the 2009 HABITAT mail survey in Brisbane. Participants reported time spent in walking, moderate and vigorous activity, as well as their agreement with seven PA motivators ('why') and 14 activity context preferences ('how, with whom, where'). Data were analyzed using descriptive statistics and Chi square tests. **Results:** Of the 2,041 respondents aged 60+ years, 472 (23%) were insufficiently active and 256 (13%) reported no PA. Mean age of these 728 participants was 63 years (SD 2.2) and 62% were female. Both groups ranked the PA motivators in the same order. The most common endorsed motivators were preventing health problems (95% insufficient PA vs 87% no PA; $p < 0.05$) and feeling good (92% vs 85% respectively; $p < .05$). PA context preferences were also ranked in the same order. More than 75% of participants in each group preferred activities close to home, involving little/no costs, and activities done alone. However, insufficiently active participants were more likely than participants reporting no PA to have a preference for activities done outdoors (61% vs 54%; $p < 0.05$) and against vigorous activities (57% vs 47%; $p < 0.05$). They also tended to prefer PA with people of the same age (55% vs 46%; $p = 0.06$). **Conclusion:** Activity motivators and context preferences were largely similar for inactive and insufficiently active Australians aged 60-67 years. These results are useful for informing the promotion, design, and implementation of PA programs for this population. **Keywords:** Health Promotion; Motivation; Physical Activity; Health Benefits.

An investigation into whether the sports and fitness industry in Taiwan caters to senior citizens

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Recent years, Taiwan's demographic profile has aged rapidly because of the low birth rate and increased lifespan among the population. Currently, senior citizens account for over 10% of the population. Due to the fact that physical activity is crucial to senior citizens' health, recreation and sports service providers should reposition themselves as health promotion advocates. However, the membership of gyms, sports, and fitness facility held by senior citizens in Taiwan is considerably low. To encourage the sports and fitness industry to target senior citizens, this study investigates the needs, motives, perceptions, and obstacles into

senior citizens obtaining gym memberships along with the attitudes the non-membership people hold toward the sports and fitness industry. This study explore seniors' demands on fitness center and problems they have encountered as well as asses the reasons seniors who do or do not apply for gym membership. Results were obtained from 14 senior members and 54 senior non-members with semi-structure interview. For members, "commuting distance (64.3%)," "applicable fitness equipment (64.3%)," and "accompany (50%)" are important factors. Non-members report the main factors when they consider being memberships are "commuting distance (87.5%)," "cost (87.5%)," "comfort and safety (68.8%)", and "applicable fitness equipment (66.7%). Moreover, senior citizens with gym memberships report a strong preference for aquatic activities and flexibility training classes. Senior citizens without gym memberships report that the main barriers to enrolment are "indoor environment" and "costly." The results of this study have implications for the sports and fitness industry and are useful for sport and fitness industry to better cater and satisfy senior citizens' needs. **Keywords:** Demographics; Taiwan; Gym Membership; Costs; Fitness Industry.

Prevalence and factors associated with physical inactivity in the elderly in Spain

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The aim of this study was to determine the prevalence and factors associated with physical inactivity among the elderly in Spain. This cross-sectional study used data from The Survey of Older Adults by "the Institute Of Aging And Social Services" (IMSERSO) in 2010. 2,535 individuals, 50.5% men and 49.5% women, aged >65 years, distributed in 17 regions of Spain, were interviewed by telephone. The physical activity was measured by the question "practice a sport or physical activity?" It was then categorized in a dichotomous yes (every day or once a week) and no (does not perform any activity). The independent variables were divided into two levels: socio-demographic characteristics (age, marital status, educational level, income, size of municipality) and social relations (satisfaction with relationships with family and friends). Data analysis was performed by binary logistic regression to calculate odds ratios and significance level of $p < 0.05$. The prevalence of physical inactivity was 70.1% ($n = 1767$). When held in the adjusted analysis, physical inactivity was significantly associated with increasing age (70-74 years, OR = 2.1, CI 95% = 1.7-2.7 and 75 years or older OR = 7.4, CI 95% = 5.7-9.4), municipality size ($m > 10\,000$ inhabitants OR = 1.8, CI 95% = 1.4-2.4), marital status (single OR = 2.3, CI 95% = 1.4-3.7 and OR = 2.6 widower, CI 95% = 2.0-3.4), compared friends after retirement (OR = 2.4 equal; CI 95% = 1.4-4.1 and decreased OR = 2.4, CI 95% = 1.3-4.2). It is concluded that there is a high prevalence of physical inactivity among the elderly Spanish. Interventionist measures are needed to change this behaviour. Among the strategies to be adopted for this population group, there is high recommendation for additional incentives for physical activity groups and activities that enhance social relationships. **Keywords:** Physical Inactivity; Prevalence; Spain; Intervention; Measurement of Activity.

Denton County Age Well – Live well

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Objective: The Age Well - Live Well initiative was designed to unite existing organizations and businesses in a vibrant community to improve health and wellness for all ages in Denton

County, Texas. The initiative is a grass roots community effort to encourage participants to achieve sustainable lifestyle changes. **Goals:** The goals of Age Well - Live Well are to enhance health and wellness by improving physical, social, emotional, occupational, spiritual, and intellectual health. Healthy lifestyles will be promoted by engaging the community in collaborative partnerships and volunteer efforts, creating an evidence-based, sustainable model. Denton's Age Well - Live Well initiative can become a blueprint for creating sustainable partnerships in other communities to improve the overall health of their residents. **Strategies:** Age Well - Live Well will be a resource for the residents of Denton County by connecting, disseminating, and promoting community resources and programs that benefit all. Using evidence-based measures, existing programs will be brought together under a common umbrella. The objectives for the first year are to implement the existing fitness and nutrition programs: A Matter of Balance and exercise, partnering with the University of North Texas Wellbeing Initiative and Texas Woman's University Institute for Women's Health. The talent of older adults will be marshalled through the Emeritus College, Seniors in Motion, Senior Living Communities, and churches. To promote awareness of Age Well - Live Well, a current internet platform of an Aging and Disability Resource Center will be used, involving participant community, business, and, government organizations. The mayor of Denton issued a challenge to have 100 businesses become Age Well - Live Well organizations by the end of the first year, implementing initiative goals. **Background:** Denton County has a population of 663,000, is the 9th largest county in Texas, and has been ranked as the 3rd healthiest. **Keywords:** Health Promotion; Wellbeing; Motivation and Behaviour Change; Balance.

EFFECTS OF AGE AND SEDENTARY BEHAVIOUR ON FUNCTION

Effects of ageing on viscoelastic properties of the rectus femoris muscle in adult males

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Introduction: Myotonometry offers an objective, portable, non-invasive way of testing viscoelastic properties (VP), such as tone and stiffness, of skeletal muscles. The present study examined the differences between VP of healthy young and older males. **Methods:** Forty-two healthy men were studied; 21 young and 21 older, mean and standard deviation (SD) for age and body mass index were 25.9 (4.4) years, 23.9 (2.5) kg/m² and 72.1 (4.9) years, 25.2 (3.4) kg/m² respectively. Participants were tested in supine lying with the leg extended and the muscle in a relaxed state. Viscoelastic properties of rectus femoris (RF) including decrement (elasticity), frequency (tone) and stiffness were measured using the MyotonPro (Muometria AS, Estonia). Damped oscillations of the muscle were recorded in response to a brief (15 milliseconds) mechanical tap applied by the probe with the device held perpendicular to the muscle surface. Two sets of 10 taps were taken and mean of the two used for analysis (t-tests). **Results:** The means and standard deviations for young and older males were: decrement 1.4 (0.2) and 1.8 (0.3), frequency 16.1 (1.1) and 16.3 (1.7) Hz, stiffness 288 (22.5) and 322.2 (27.9) N/m respectively. Differences for decrement and stiffness between the groups were statistically significant ($p < 0.001$) for both. **Conclusions:** The MyotonPro enables rapid, objective assessment of viscoelastic properties, suitable for clinical/community settings. Age-related differences between the groups were greater decrement (lower elasticity) and stiffness of RF with ageing. The quadriceps muscles are important for mobility and the MyotonPro is potentially useful as a simple non-invasive device to detect decline in muscle characteristics with ageing and monitor effects of exercise

interventions. Further studies of healthy females, other age ranges, and people with different levels of habitual activity are needed to provide reference data for assessing patients.

Keywords: MyotonPro; Viscoelastic; Skeletal; Muscles; Mobility.

Do grip strength and bone mass depend on adults' past or present physical activity?

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Long-term exposure to healthy life styles during the life course, such as always being physically active according to recommended levels, is expected to be associated with better health at older age. Data from long-term cohort studies are increasingly becoming available to study such hypotheses. In the 5th measuring round (2008-2013) of the Doetinchem Cohort Study we measured grip strength and bone mass for the first time. We studied whether grip strength and bone mass were associated with any past physical activity (5 or 10 years earlier) and/or present physical activity. Being physically active was defined as spending 3.5 hours or more per week on physical activities of at least moderate intensity. Handgrip strength (HGS, in kg) was assessed three times in the preferred hand using a hand-held dynamometer (Jamar) in sitting position. Bone mass was assessed with quantitative ultrasound measurements of the calcaneus, using a Hologic Sahara bone densitometer (Hologic Inc., USA) of which the quantitative ultrasound index (QUI) is used. Preliminary analyses of two-fifth (n = 1587, aged 40-80 years, 52% women) of the total cohort showed that past and present physical activity were independent associated with bone mass ($QUI_{actpast} = 100.4$, $QUI_{inactpast} = 97.9$, $P_{dif} < .05$; $QUI_{actpresent} = 100.4$, $QUI_{inactpresent} = 97.9$, $P_{dif} < .03$), adjusted for age, sex, body weight and smoking. For grip strength only present physical activity was associated ($HGS_{actpresent} = 38.4$, $HGS_{inactpresent} = 36.9$, $P_{dif} < .001$), after adjustment for age, sex and length. This study indicates that whether long-term exposure to a physical activity lifestyle affects health later in life may depend on the health outcome under study. **Keywords:** Grip Strength; Bone Mass; Physical Activity.

Mechanical muscle power in women and men aged 18-81 years: Influence of age and gender

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Introduction: Muscle power is an important factor for activities of daily living and for managing acute situations such as stumbling. **Purpose:** This study explored the age-related deterioration in stretch-shortening cycle (SSC) muscle power and concurrent force-velocity properties in healthy women and men. **Method:** One hundred and eighty-eight women and 127 men (18-81 yrs) performed maximal vertical countermovement jumps and instantaneous vertical power (P) production was calculated throughout the entire movement by means of force plate analysis (1000 Hz). **Results:** Maximal SSC leg extension power expressed per kg body mass was greater for men compared to women ($p < 0.001$). As a novel finding, this gender difference progressively got smaller with increasing age. Further, the age-related decline rate in SSC power (W/kg per year) was ~50% greater in males compared to females. Peak power determinant velocity (VP_{peak}) was greater in men than women ($p < 0.001$) and

declined at a greater rate in men than women (-0.02 vs. -0.01 m/s per year) ($p = 0.002$). Vertical ground reaction force at peak power (FP_{peak}) was higher in men than women in younger adults only (18-34 yrs) ($p < 0.001$) and showed a steeper age-related decline in men than women (0.07 vs. 0.04 N/kg per year). **Conclusion:** Maximal leg extension power evaluated with a stretch-shortening cycle (SSC) movement is greater in men than women throughout life, but declines at a greater rate in men leading to a diminished difference between women and men at old age. **Keywords:** Muscle Power; Gender; Force Plate; Stumbling.

Adopting an active lifestyle during adulthood is associated with a better health-related quality of life: The Doetinchem cohort study

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Background: A lifelong healthy lifestyle is assumed to be most favorable for old-age health. Whether adopting a healthy lifestyle during adulthood is as good for health is unknown. **Objective:** The objective of this study was to examine health-related quality of life in adults who became physically active at recommended levels over a period of ten years compared to that in adults who remained persistently inactive or active in that period. **Methods:** Men and women aged 26-70 years in the prospective Doetinchem Cohort Study were examined every five years, with three examinations between 1995 and 2009. Being physically active was defined as spending 3.5 hours or more per week on physical activities of at least moderate intensity. Participants were categorized into those who became active ($N = 618$), remained persistently active ($N = 1286$), or persistently inactive ($N = 727$) over ten years. Health-related quality of life (SF-36) was measured at the 10-year follow-up. **Results:** Adults becoming physically active reported better physical functioning (1.7 points higher (95% CI 0.2 3.3), vitality (1.7 points higher (95% CI 0.2 3.3), and general health (2.7 points higher (95% CI 1.2 4.2) after ten years compared to persistently inactive adults, after adjusting for baseline quality of life and other confounders. The differences were more pronounced in women. No differences were found in health-related quality of life between adults becoming active and adults remaining active over ten years. **Conclusions:** These results suggest that adopting an active lifestyle according to recommendations result in a better health-related quality of life, nearly as good as that of adults who remained physically active over ten years. **Keywords:** Quality of Life; Physical Activity; Lifestyle.

Eccentric strength preservation with aging can be angle dependent?

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Background: Besides a progressive decline in muscle strength, the capacity to generate eccentric force seems to be preserved in older adults. However, descending stairs is a challenging task in old age, which contradicts the evidence that eccentric strength is preserved with aging. This study investigates the effects of age on isokinetic performance and relative force production over a functional range of motion. **Methods:** 11 younger (24.2 ± 2.9 years) and 17 older men (62.6 ± 2.7 years) were submitted to concentric and eccentric isokinetic

knee extension/flexion at 60°/s and 120°/s over a functional range of motion (90° to 30° of knee flexion). Age, contraction type, and angular velocity effects on isokinetic parameters were assessed by three-way ANOVA. Age differences on relative force production were then assessed by repeated measures ANOVA followed by Tukey's post hoc test. The level of significance was set at $p > 0.05$. **Results:** The older group presented lower peak torque (Nm and Nm/Kg) than the younger group for both isokinetic contraction types (aging effect, $p < 0.05$). Maximal concentric and eccentric strength deficits in the older group ranged from 29-32% and 26-31%, respectively. Concentric peak torque was lower at 120°/sec than at 60°/sec for both groups (contraction and velocity interaction, $p < 0.05$). At the end of the range of motion, the older group could not maintain relative eccentric knee extension force (only at 60°/sec), which resulted in a torque deficit of 41-55% at the end of movement (80-85°). **Conclusion:** In older healthy subjects, the production of eccentric knee extension force seems to be angle dependent. At the end of knee flexion, older subjects lose the capacity to generate eccentric quadriceps force, which may have a great impact on activities of daily living such as descending stairs. More studies, especially with the frail elderly, are needed to assess the mechanisms involved in eccentric force preservation with aging. **Keywords:** Muscle Strength; Knee Extension; Isokinetic Performance.

Interaction of brain derived neurotrophic factor gene and physical activity on cognitive functions in older people

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Introduction: Higher concentrations of brain derived neurotrophic factor (BDNF) were observed in physically active individuals. A single nucleotide polymorphism at codon 66 of the BDNF val66met gene has been associated with a poor cognitive performance as a result of the impairment on the BDNF secretion and intracellular trafficking. BDNF met-allele carriers have a significant lower activity-dependent expression of BDNF and this may reflect on impairments on cognition. **Objective:** To analyse whether physical activity can protect older people with BDNF met allele on the performance of cognitive functions between different genotypes of BDNF gene. **Methods:** twenty-five physically active older participants (67.6±5.7 years) and nineteen sedentary ones (65.3±8.2 years) completed clinical assessments and provided blood samples for genotyping. The Montreal Cognitive Assessment was applied to assess cognitive functions, and the level of physical activity was assessed by an appropriate questionnaire. One-way ANOVA and Scheffé's post hoc test ($p < .05$) were applied for statistical analysis. **Results:** Cognitive performance by MoCa scores founded was: a) BDNF-val allele active group 24.2±3.4; b) BDNF-met allele active group 21.2±3.9; c) BDNF-val allele sedentary group: 22.0±4.0; d) BDNFmet allele active group 20.8±4.0*. The BDNF genotype with a met allele was found to be moderator on the relation between performance of physical activity and cognitive functions. Physically active individuals with a BDNF-met allele showed similar scores compared to non-carriers BDNF-met allele ($p = .66$) on cognitive tests. Sedentary participants BDNF-met allele carriers showed significant lower levels of cognitive functions compared to non-carriers physically active ones ($p = .02$). **Conclusion:** BDNF-met polymorphism seems to be associated with poorer cognitive functions performance in sedentary older people individuals but not for those active ones. **Keywords:** Cognitive Function; Physical Activity; Neurotrophic Gene Factor; Sedentary.

The influence of age and practice on hemispheric asymmetry of isometric pinch force control

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Introduction: Just as lateralized cognitive functions have been shown to become less asymmetrical with aging (HAROLD model, Cabeza et al. 2002), Przybyla et al. (2011) have shown that this model extends to the neural control of trajectories and accuracies of reaching movements. We questioned whether the HAROLD model might also be applied to the reduction of asymmetry in isometric pinch force control in older adults. Further, we questioned whether five days of practice on an isometric control task might reduce any difference in asymmetries observed in young and old adults. **Methods:** Ten right-handed adults 18 to 25 and 60 to 74 were tested on their ability to coordinate the force produced by their thumb and index finger to trace a 45 degree line template from 0.98N force level to 3.43N (<5% of their maximum force) and to return by releasing force from that peak level to return to the start position. The thumb controlled horizontal movement and the index finger controlled vertical movement of a computer screen cursor. A perfect trial required equal forces applied by both thumb and index finger for both increasing and decreasing force. Participants completed 10 trials each with their right hand and left hand on each of 5 consecutive days. **Results:** Asymmetry indices of log time and RMSE of the young group were not different from those of olds, either on the first day of testing or throughout the practice sessions. The asymmetry indices of log time were significantly different for segment and indicated that participants displayed more asymmetry on segments approaching a target and reversing directions. **Conclusions:** These results may suggest that the age-related reduction of asymmetry (HAROLD model) applies primarily to tasks that require processing sensory information during the ongoing control of movement and not to tasks that require the initiation and organization of coordinated isometric contractions. **Keywords:** Isometric Control; Sensory Information; Cognition; Asymmetry.

SOCIAL GRADIENT AND PHYSICAL FUNCTIONING DECLINE ASSOCIATED WITH AGEING IN LARGE POPULATION-BASED STUDY IN THE CZECH REPUBLIC: THE HAPIEE STUDY

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Muscle strength is an important marker of ageing and helps to preserve self-efficiency and quality of life in social as well as physical domain. It has been also shown that there are large social differences in physical functioning, namely in Grip strength, Chair rise and Walk speed. There is limited evidence of these differences and ageing decline originating in countries of Central and Eastern Europe (CEE). In this study, we aimed to assess physical functioning decline associated with ageing as well as to evaluate social gradient in large population-based study in the Czech Republic. The random sample (men and women 45–69 years) was selected from population registers in 6 towns in the Czech Republic. The data were collected as a part of the HAPIEE (Health and Psychosocial Factors in Eastern Europe) study, an international project based in 4 post-communist countries of CEE; and is available for 4488 people for Grip strength and Chair and for 3004 individuals aged 60+ for Walk speed. Range of covariates (education, material circumstances, health behaviours,

and psychosocial factors) were also collected. The association between socioeconomic and physical functioning indicators as well as age decline were evaluated by regression modelling. All 3 indicators of physical functioning were associated, after controlling for age and town and other covariates, with education and material circumstances. The study results suggest stronger educational than material circumstances gradient (especially in women). Our study showed that more educated individuals (both men and women) had particularly higher values of Grip strength. In terms of ageing, Chair rise decline was much steeper in those with lower education in both men and women, however, the statistically significant decline in performance associated with material circumstances was found only in men. This study provides the evidence for social inequalities and ageing decline in physical functioning in large CEE population.

IT AND GAMES HEALTH: EXERGAMES AND E-HEALTH

Computer game dance training-induced effect on attention networks of elderly

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Introduction: It is suggested that one of the reasons for the lack of effect in fall prevention programs is insufficient attention given to cognitive functions in interventions [1]. Dual task costs of gait are associated with attention [2] and with walking while visually observing [3]. It can be assumed that interventions should, thus, focus on combinations of physical activity, attention, and visual observation. Action video game play of children improves attention resources and allows better allocating attention across space and time [4]. This study evaluated whether computer game dance training is able to improve attention networks in elderly. **Methods:** Twenty elderly [17M/3F, 74.4 ± 6.6 [range 63-85] yrs] naive to computer games danced 24 sessions performing six-to-nine dances during 10 weeks. The Attention Network Test (ANT), a neurocognitive test providing separate measures for the alerting network, the orienting network, and the executive control network of visual attention, was recorded pre- and post-training. **Results:** Eighteen individuals [16M/2F] adhered to 24 scheduled trainings. Paired t-tests showed significant improvements in the executive control network: reaction time in ms pre/post = $113.2/79.4$, $t(17) 2.437$, $p = .026$, $r = .51$. No improvements were seen in alerting [ms pre/post = $44.5/52.9$ $t(17) -.708$, $p = .488$, $r = .17$] and orienting networks [ms pre/post = $11.5/22.1$, $t(17) -.52$, $p = .147$, $r = .35$]. **Conclusions:** The findings provide support for the proposition that computer game dancing affects dual task costs of walking related brain function; e.g. the executive control network [1]. This study encourages the further development of this intervention. **References:** [1]. Herman et al. Journal of Gerontology: Medical Sciences 2010; [2]. de Bruin & Schmidt. Behav Brain Funct. 6:59, 2010; [3]. Bock. Journal of NeuroEngineering and Rehabilitation 2008, 5:27; [4]. Dye et al. Neuropsychologia 47(8-9), 2009. **Keywords:** Technology; Games; Dancing; Attention; Networks.

Gaming for health: A systematic review of the physical and cognitive effects of interactive computer games (ICG) in older adults

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Background: Few older adults engage sufficiently in Physical Activity (PA). Developing methods to overcome barriers to PA and promote adherence is an increasing challenge for public health. Interactive computer games (ICG) are increasingly used to promote PA and rehabilitation. This systematic review examined the physical and cognitive effects of using ICG in older adults. **Methods:** Computerized literature searching, citation tracking, and hand searching were carried out up to June 2011. Eligible studies were trials involving older adults (>65 yrs) describing the effects of ICG on physical or cognitive outcomes. Secondary outcomes included adverse effects, compliance, and enjoyment. Two authors independently selected trials for inclusion. Disagreement between authors was resolved by consensus, or third party adjudication. Effect sizes were calculated using RevMan software. **Results:** Thirteen trials met the inclusion criteria, of which three used participants with a mean age of >80 years. Meta-analyses were not undertaken due to study heterogeneity. The majority of participants were living in the community, senior living or retirement centres. ICG interventions varied in terms of software, game type, and nature of computer interaction; the majority incorporated postural stability training. In two studies, the primary focus was to challenge aspects of cognitive functioning. There were trends from both observational and randomised controlled studies that ICG improves postural stability. A small number of studies also reported positive changes in muscle strength and cognitive function. No major adverse effects were reported and two studies found a small number of minor events. **Conclusion:** There is preliminary evidence that ICG is a safe and effective form of exercise for older adults. ICG could be improved further by tailoring interventions for older adults; this should include optimising participant safety, motivation, and enjoyment for this population. **Keywords:** Physical Activity; Games; Technology; Cognition; Postural Stability.

Exergames as a practical implementation for nursing home residents in order to enhance self-efficacy and self-concept

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The purpose of the practical implementation is to evaluate whether exergames can be applied in nursing homes and to declare why they could be helpful for a positive self-concept and self-efficacy. The demographic trend results in a greater number of people in need of care. For these nursing home residents the measures of activity are unfortunately mostly limited to only singing, gaming or deficit-orientated fall prevention or gymnastics programs. In the last years the trend of serious games involving whole-body movements has finally reached the nursing homes, but focused mainly still on the aspect of entertainment. These so-called exergames reduce the complexity of the actual sport into a digital situation, achieving a challenging game flow, by using a simplified type of control system. This can be positive for senior people with limited mobility that arises by the reason of miscellaneous multimorbidity. It gives them the opportunity to join in familiar activities, which they otherwise couldn't deal with due to their limitations. Exergames could be a potential source of self-concept because they offer the possibility to experience self-evaluation, direct and indirect feedback, and social comparison. Furthermore, they allow conclusions on self-efficacy by its sources experienced effort and achievements, social persuasions and vicarious experiences. Self-concept and self-efficacy could contribute to better functional health, which would in turn lead to more successful coping with daily activities, and therefore achieving a better quality of life. Sports and activities such as cycling, hula-hoop and bowls are well

known and practical for nursing-home residents, even wheelchair-users can be included. In order to evaluate the practical implementation, it'll be evaluated in a qualitative way, using problem-focused interviews combined with quantitative methods like the motor self-efficacy inventory and the self-concept questionnaire in a pre-/post-test design. **Keywords:** Exergames; Nursing Homes; Technology; Quality of Life.

Aging and the quantified self: Technology, adherence and physical activity

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The 'Quantified Self' approach refers to the trend among adults to monitor and share their behaviors, thoughts, and moods using a variety of technologies. An increasing number of middle-aged and older adults are actively engaged in such monitoring, and the numbers are expected to increase. Wolf (2011) lists three reasons people track themselves: to establish a baseline against which to assess future behavior change, to monitor progress toward a specific goal, and to satisfy curiosity and maintain self-awareness. One broad class of methods which enables people to monitor themselves is known as Experience Sampling Methods / Ecological Momentary Analysis. Using empirical data from projects in the Patrick Healthy Aging Lab at West Virginia University (USA), this paper illustrates middle-aged and older adults' physical activity behaviors using experience sampling approaches. These studies share a similar protocol in which adults monitored behaviors up to five times a day for 6 to 10 days using palmtop computers. Among two samples of older adults (Steele, N = 42, M age = 71 yrs; Stahl & Patrick, N = 10, M age = 64 yrs), issues of accuracy and adherence to the activity regimen are examined. In a sample of middle-aged adults (Goedereis, N = 35, M age = 49 yrs), progress toward weight-loss goals are examined. All three studies contribute to our understanding of how self-monitoring may lead to behaviour changes. **Keywords:** Technology; Adherence; Physical Activity; Self-Monitoring.

3rD Life 3D virtual environment for social interaction of elderly people

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3rD LIFE is a project funded by the AAL Joint Programme with the main aim to promote the active aging conceptualized as the process of optimizing opportunities for health, participation and security in order to enhance quality of life as people age (WHO, 2002). Active aging will be altered by the development of a tool consisting of a 3D virtual environment, especially adapted to ageing people. With only a computer and an internet connection, it will be possible to communicate with other users, make audio and video calls and have a more joyful and active life thanks to e-learning tools, cognitive games and other applications. 3rD LIFE will improve active ageing since: Will increase older people's interactions with friends, family and the establishment of new contacts with other persons, old and young. This aspect is especially important for preventing loneliness and favoring opportunities to extend the social network and social support; Will assure that the users remain cognitively active as it promotes education and learning opportunities, which is a psychological factor related to active aging; Will allow the users to take part in the development of the tool since 3rD LIFE follows a User Centered Design approach. This implies taking into account users' wishes,

needs, and specifications regarding the tool and the virtual system. They will decide not only the appearance of the tool but the applications and the way in which they will interact with the tool. This aspect is a factor that enhances the social participation of the old people and allows them to participate in some way in the technological development; Will encourage the users to take part in their social context in a more active way. 3rD LIFE will allow the users to find the social events that are taking place in their cities and will give them the possibility to assist via Internet. 3rD LIFE will increase the interaction between older people and new technologies and will promote an active ageing. **Keywords:** Virtual Environment; Technology; Quality of Life; Cognitive Games; Active Ageing.

E-Diet services and nutraceuticals for an active and successful ageing, contrasting risk factor in EU population: Ristomed trial

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In literature, some of the main factors defining the quality of aging are related to the inflammatory status (IS), oxidative stress (OX) and gut microbiota (GM) alterations. These elements may increase prevalence of age-related anorexia associated to a reduction of food intakes and a decrease of physical activity too. RISTOMED held under the EU-7FP, aimed at the evaluation of the effects on IS-OX-GM in the presence of an (e)-diet in an Elderly Population (65-80yrs). The study was aimed to compare a e-diet elaborated with a new web platform, alone or implemented by 3 different nutraceutic components: Argan oil, probiotic VSL#3 and the AISA 5203-L extract. In order to evaluate the effects of the intervention, the following measurements and questionnaires have been considered within the protocol: Anthropometric data, handgrip, and Short Physical Performance Battery (SPPB), International Physical Activity Questionnaires (IPAQ), SF-36v2(PCS-MCS), Food Frequency Questionnaire (FFQ), among others. All the data and the results of this panel of questionnaires in Bordeaux, Berlin and Rome showed that in all the 4 arms of the 139 men and women enrolled there was an improvement in terms of quality of life. In a cluster of 44 subjects characterized by a low-grade inflammation with higher levels of CRP, ESR, fibrinogen, IL-6 and TNF- α , the e-diet induced a decrease of CRP in the group with the higher inflammation values, whereby AISA 5203-L amplified this protective effect. The e-diet alone decreased the oxidative stress with no further effect of the products. Cholesterol, triglycerides and glucose parameters were also improved by e-diet with a further effect of Argan oil was associated with a progress of these parameters when they were altered at the baseline. VSL#3 decreased homocysteine level, a vascular risk factor. On the basis of the results an improvement of mood was observed in all groups and an improvement of mental component SF36 was observed following the diet and the diet implemented by AISA 5203-L. **Keywords:** E-Diet; Physical Activity; Nutraceutical; Quality of Life.

NANA: A holistic approach to assessing nutrition, cognition, mood, and physical activity

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NANA is a three-year research project funded by the ESRC through the New Dynamics of Ageing programme to develop novel technology to improve data collection from older adults about nutritional status and integrate this with current information about physical function, cognitive function, and mood. The aim is to identify individuals at risk of under-nourishment and frailty and improve targeting of interventions by taking a holistic view of the person and the context in which they live. This multi-disciplinary program brings together skills and expertise in Psychology, Nutrition, and Engineering and Human Computer interaction to improve measurement tools across nutrition, cognition, physical and mental health and increase understanding of the way these domains interact. Forty older adults aged between 65 and 88 (mean age 72.3) participated in the NANA toolkit validation between July and November 2011. The NANA data are being validated against gold standard measures in nutrition, cognition, mood, and physical activity and preliminary analysis suggests that the NANA data are satisfactory. Once the validation is complete it is hoped that the NANA toolkit will be useful for informing strategies to prevent physical and mental decline in ageing and improve medical treatment and social provision for older people. NANA also has potential for commercial development primarily for use with older people but also for use with other groups in the population that would benefit from comprehensive holistic assessment. **Keywords:** Technology; Nutrition; Physical Function; Cognitive Function; Intervention.

Increasing mobility in older adults: Early findings from the 'Devices for Assisted Living' Europe-wide project

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The number of over 65s in the European Union (EU) is predicted to almost double by 2060. Those over 80 will be almost triple 2008 figures (European Commission, 2009). Mobility per se, but particularly physical activity, is related to independent living, wellbeing and reduced mortality (Mänty et al., 2007). Shopping is a useful way for individuals to stay mobile. It encourages physical activity and reduces social isolation (Kim, Kang, & Kim, 2005). However increased risk (and experience) of falls, and reduced muscle control can result in older adults feeling less confident in their ability to go out independently especially in unfamiliar and crowded spaces. In the EU-funded DALi (Devices for Assisted Living) project, we pursue autonomous mobility through the development of the 'c-walker'. This mobility aid supports navigation in crowded and unstructured spaces. The device will anticipate the intent of the individual and determine the path that poses minimal risk of accident. The c-walker will recommend a course of action to the user through visual, acoustic, and/or haptic interfaces. As this is an assistive technology, the user remains in charge of ultimate decision making. The expected benefits include reducing the anxiety of navigating such environments, increased likelihood of continued autonomous use of such environments, and increased or maintained personal independence. In this paper we present the initial requirements gathering research. Utilising a mixed methods approach (naturalistic observations, focus groups, interviews, surveys and experimentation) we discuss how older users engage with the shopping environment, the perceived benefits of shopping and, more generally, thought, cognition and decision making processes during shared space navigation. **References:** European Commission, 2009 Ageing Report; Kim, Kang & Kim (2005) Psychology and Marketing, 22, 995-1015; Mänty,

Heinonen & Leinonen et al. (2007) Arch Phys Med & Rehab, 88, 1108-111. **Keywords:** Mortality; Physical Activity; Independence; Mobility; Cognition.

OBJECTIVE PHYSICAL ACTIVITY MEASUREMENT IN OLDER PEOPLE

Invited lecture: Can we quantify behaviour of the older adult from the analysis of free-living activities?

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The quantification of free-living physical activities (PA) is important in understanding how physical activity and sedentary behaviour impact on health and how interventions might modify free-living behaviour to enhance health. Quantification, and the terminology used, has often been determined by the choice of measurement technique. Many systems use cumulated acceleration over fixed epochs resulting in outcomes of counts can be difficult to interpret. A terminology and a systematic approach for the analysis of free-living activity information based on event-based activity data using a flexible hierarchical classification of events were developed. In the older adult population, we have used this approach to understand differences in sub-populations that illuminate fundamental differences in the way in which both sedentary and upright time are accumulated. Here, although there were volumetric differences in the data, there was also a fundamental difference in the pattern of these events providing evidence of differences in behaviour. It is proposed that by understanding this behaviour we can better target PA guidelines to the older adult population and also, in this population, we can produce more relevant outcome measures to understand the effectiveness of interventions.

Invited lecture: Assessing physical activity in daily life, can we add quality to quantity?

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In the last decennia, a number of approaches have been developed for assessing quantitative aspects of physical activity (PA) in daily life. For example; step counts, activity counts, frequency and durations of specific postures and activities. Such methods have now been applied in many studies aiming to assess PA levels in different populations. With recent advances in wearable technology, such as new hybrid motion sensors and new algorithms, it is possible to also assess spatiotemporal parameters of postures and activities, and hence assess quantitative as well as qualitative parameters. This contribution will present and discuss examples of such combined assessments of mobility in older people by focusing on gait and sit-to-stand performance in daily life.

Total daily physical activity and health benefits in older adults

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Few studies have examined objective measures of physical activity in older adults or the contribution of non-exercise physical activity and health benefits in old age. We tested the hypothesis that an objective measure of total daily activity, including both exercise and non-exercise physical activity, is associated with decreased risk of death, Alzheimer's disease and

disability in community-dwelling older persons. We used clinical data from more than 850 participants of the Memory and Aging Project, a longitudinal cohort study of aging. Total daily physical activity (exercise and non-exercise physical activity) was measured at baseline for up to 10 days with ActiGraphs (Actical®; Philips Healthcare, Bend, OR) worn on the wrist 24 hours/day for up to 10 days, providing an objective measure of total daily physical activity which circumvents recall bias. In a Cox proportional hazards models adjusting for age, sex and education, a higher level of total daily physical activity was associated with a decreased risk of death (hazard ratio = 0.71; 95% CI:0.63,0.79); disability (HR = 0.75, 95%CI 0.66, 0.84) and Alzheimer's disease (HR = 0.48; 95% CI:0.27,0.83). These results were unchanged after controlling for self-report physical activity and chronic health conditions. These data support a link between a more active lifestyle with survival and well-being in old age. Thus, older persons may benefit not only from various exercise regimens, but may also accrue health benefits from a much wider spectrum of non-exercise, movement-based activities including habitual daily physical activity, leisure-time physical and social activities. **Funding:** The study was supported by NIA grants R01AG17917 and R01AG24480. **Keywords:** Alzheimer's; Physical Activity; Health; Social Activities; Benefits.

Association of actual physical activity and affective states in older people: An interactive ambulatory assessment study

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Physical activity influences affective states. However, this association was rarely studied in ongoing real-life situations. Also, the impact of motivational states in situ has hardly been analyzed. The degree to which active episodes are regulated autonomously might moderate the effect of physical activity. Using an interactive ambulatory assessment approach, we assessed autonomous regulation mode (AR), affective states, and actual physical activity (aPA) during every day life situations in older people. The assessment interactively linked event based assessments of AR and affective states to certain episodes of aPA. These episodes were detected by a 3-axial accelerometer. In a randomized sample of 22 women and 21 men (Mage = 61; SD = 6.5) we assessed aPA in daily life situations continuously over three consecutive days (Thursday to Saturday). The accelerometer gave an acoustic signal when predefined intensity thresholds were surpassed. This signal prompted the subjects to complete an electronic diary in order to assess AR and the basic dimensions of affective states. We assessed AR with four questions (Reis & Sheldon, 1999). A six-item mood scale (Wilhelm & Schoebi, 2007) was used to measure mood. We controlled for the general psychological need for autonomy (Gagné, 2003) and the volume of physical activity via cross level interaction. Both aPA and AR significantly influenced affective states in real life situations. The interaction was significant for valence and energetic arousal. The higher the volume of physical activity episodes and the more these situations were autonomously regulated, the more our participants felt well ($t(841) = 2.1, p = .037$) and energized ($t(841) = 3.5, p = .001$). The significant interactions underline that the impact of aPA in everyday life on affective states is moderated by the degree to which such activity episodes are regulated autonomously. **Keywords:** Physical Activity; Accelerometer; Ambulatory Assessment.

Invited lecture: Relevance of monitoring physical activity in daily life

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At present, many different approaches exist to monitoring aspects of physical activity (PA) based on the use of on-body motion sensors. The extent to which these new methods actually contribute to furthering physical functioning as well as promoting an active life style in older people is somewhat unclear, since the current literature does not yet present an abundance of evidence-based studies which underline clinical relevance of monitoring PA. This contribution will critically address existing possibilities and future potential of monitoring methods.

UK STROKE AND EXERCISE FORUM

Exercise for Stroke survivors: A synthesis of evidence-based guidelines

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Background: Exercise programmes for stroke survivors are recommended in clinical guidelines. However, comprehensive descriptions of what these interventions include are often lacking. **Aims:** To undertake a structured synthesis of evidence-based guidelines describing key components of exercise programmes for stroke survivors to aid planning, evaluation and replication. **Method:** Fifteen international stroke guidelines were identified. Recommendations relating to exercise after stroke were synthesised using the framework provided by the International Classification of Functioning, Disability and Health (ICF), which enabled their coverage of key domains to be assessed. **Results:** Our synthesis provides a comprehensive inventory of key components of exercise programmes after stroke. These include the frequency, duration and type of exercises, support mechanisms, setting, and delivery. Most exercise recommendations relate to the 'Body Structures' and 'Functions and Activity' domains of the ICF framework. Few guidelines explicitly address the 'Participation' domain, which concerns work, leisure, social and family roles. 'Environmental' and 'Personal Factors' are addressed through a number of recommendations relating to programme structure and delivery. Whilst all/most guidelines advocate the promotion of lifelong commitment to physical exercise, few provide few recommendations about how to achieve this. Greater specification of recommended behaviour change techniques and delivery modes is achieved by this review. **Conclusions:** This synthesis provides a framework that, according to the type of exercise programme that is required, can support the planning and evaluation of exercise programmes after stroke. Evidence on key aspects of programmes is often lacking and, therefore, more detailed recommendations should be provided in future guidelines. **Keywords:** Exercise Programmes, Stroke; Natural and Built Environment; Guidelines.

Exercise and fitness intervention after stroke (EfS)

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Objectives: To explore the feasibility of incorporating an EfS pathway into the existing Clinical Referral for Physical Activity programme in Camden, guided by the evidence base established in the STARTER trial (Mead, et al. 2007). **Design:** Mixed cardiovascular endurance and muscular strength training circuit based on STARTER Trial. **Setting:** Physiotherapy gym at St Pancras Hospital. Once a week for 1 hour for 12 weeks, taught by 2 NVQ level 4 EfS instructors. **Participants:** Originally 10 independently ambulatory patients were referred from Joint Therapy and Stroke REDS Teams; 6 male and 4 female; Age range (36 – 82yrs); 3

did not start due to transport issues and other commitments; 1 dropped out due to ill health; 6 completed the study; All had suffered Partial Anterior Circulation Stroke within the last 3 years; 8 had right sided Middle Cerebral Artery infarcts and 2 patients had left sided. The inclusion and exclusion criteria are as set out by the Camden Active Health Team and NHS partnership. **Outcome measures:** Timed Up and Go (TUAG) and 10m walk at baseline (1) then at 12 weeks (2). Patients had 2 attempts at each measure and the average recorded. **Results:** Average attendance 9 sessions out of 12. Average percentage improvement TUAG = 25.76% (Range 9.57 – 53.16%). Average percentage improvement 10m walk = 18.74% (Range 2.24 -33.89%). Raw data is available on request. **Discussion:** In keeping with the findings of Mead, et al. 2007, our results show that all participants made significant improvements and suggest that targeted exercise for Strokes should be included as an integral part of a referral programme. **Conclusion:** All participants that took part made significant improvements in both TUAG and 10m walk. One participant improved his TUAG by over 50% -he is able to now walk faster without his walking stick than he did before the trial with his walking stick. **Keywords:** Exercise Programmes, Stroke; Guidelines; Walking; Intervention.

DELIVERY AND ADHERENCE TO GUIDELINES

An evaluation of instructor fidelity in an evidence-based community-delivered exercise program in older adults with arthritis

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Introduction: Enhance Fitness® (EF) is an evidence-based, community-delivered exercise program with fidelity guidelines, however, observer-rated fidelity of instructors to its core components has not been reported. This study evaluated EF instructor fidelity during a 12-week intervention in older adults with arthritis. **Methods:** There were 323 participants and 10 instructors at 16 community sites. A trained observer visited 1 class per instructor at baseline and 12 weeks to complete an EF fidelity checklist. The checklist rated (pass, needs improvement, fails) the physical setup; instruction safety; and duration, intensity, music, verbal cueing, and content of each core component (warm-up, aerobics, cool-down, strengthening, balance, stretching). **Results:** Instructors were 30 to 69 years old with varying experience (4 experienced, 4 intermediate, 2 beginners). At baseline, pass-needs improvement-fail rates for physical setup and instruction safety were 91%-9%-0% and 93%-7%-0%, respectively. Items needing improvement were mostly due to physical environment constraints (e.g., noisy, busy, hot). Across core areas, ratings were: pass, 64% to 89%; needs improvement, 0% to 18%; and fail, 0% to 33%. Common errors were performing a too intense warm-up, too few balance exercises, and beginning weights sooner than recommended by EF. Several instructors required coaching to perform exercises correctly. One instructor was resent for EF training. At 12 weeks, physical setup and instruction safety rates improved to 92%-8%-0% and 100%-0%-0%, respectively. Core areas also improved to: pass, 88% to 100%; needs improvement, 5% to 10%; and fails, 0% to 5%. **Conclusion:** Although fidelity was good, undergoing standardized instructor training was not enough to ensure that EF was implemented as intended. The addition of class observations may have improved fidelity over time. Programs planning classes may wish to budget for observational visits and instructor retraining session. **Keywords:** Fidelity; Instructors; Arthritis; Safety; Exercise Programme.

Effects of a hydrotherapy program on flexibility and muscular strength in elderly men

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Introduction: Hydrotherapy is used to treat rheumatic, orthopedic, and neurological disorders. It has been the subject of investigations regarding balance recovery in elderly people. Aim to evaluate the effect of a hydrotherapy program on flexibility and muscle strength among sedentary elderly men. **Method:** The participants were 28 healthy sedentary elderly men aged between 64 and 84 years (14 in the experimental group and 14 in the control group). Muscle strength before and after the program was assessed by means test 30-Second Chair stand and Flexibility assessed by means chair sit-and-reach test (Rikli & Jones 2001). The program consisted of 36 one-hour sessions over a consecutive 12-week period. The physical exercises were organized in seven levels of difficulty that were selected to obtain gains in flexibility and muscle strength. Therefore, there was between and within group analysis using independent t-test (Caromano & Candeloro 2007). **Results:** Hydrotherapy promoted significant increases in the elderly men's muscle strength, as assessed using the test 30-Second Chair stand ($p < 0.001$) and the chair sit-and-reach test ($p < 0.001$). **Discussion:** This was similar to the results obtained by many other authors (Chu et al 2004; Caromano & Candeloro 2007) in which the application of a hydrotherapy program increased balance among elderly people. The proposed hydrotherapy program was efficient in improving flexibility and partially effective in improving muscle strength among the early elderly women who took part in the study. Our results are compatible with the findings from similar studies carried out on the ground. **Keywords:** Hydrotherapy; Muscle Strength; Flexibility; Sedentary.

Chronic musculoskeletal pain and physical activity in older adults: A secondary analysis of the health survey for England 2008

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Introduction: Chronic musculoskeletal pain (CMP) is common amongst older adults. There is a lack of consensus on the relationship between CMP and physical activity in older adults. **Aims:** The aim of this study was to investigate the relationship between CMP and adherence to physical activity guidelines. **Methods:** Data were obtained from the Health Survey for England (2008), a cross-sectional survey of a random sample of people living in England. Only respondents who were ≥ 60 years of age were included in this study ($N = 4770$ [males 2128], age 71 (± 8) [mean (\pm SD)]). Chi-square analysis was used to investigate if there was a difference in physical activity guidelines adherence between those with and without CMP. Binary logistic regression was then carried out with physical activity guideline adherence [yes, no] as the independent variable and CMP presence [yes, no] as the dependent variable with age, gender, BMI, smoking status, alcohol intake, and diet variables entered as covariates. **Results:** Out of 4770 older adults, 30% (1,367) of respondents had CMP whilst 18% (814) adhered to current physical activity guidelines. There was a poorer adherence to physical activity guidelines in those with chronic pain compared to their non-pain counterparts (21% vs. 10%, $\chi^2 = 92$, $p < 0.001$). Individuals with CMP were only half as likely to adhere to current physical activity guidelines (Odds Ratio [95%CI] = 0.50 [0.40 to 0.63]). **Discussion:** Older adults with CMP have a reduced adherence to physical activity guidelines compared to those without CMP. These findings agree with surveys of older adults in North America and younger adults in the UK. These results highlight CMP as a barrier to physical activity in older adults. The fact that physical activity is the cornerstone of treatment for CMP

emphasises the importance of these findings and the need for strategies specifically designed to increase activity in this under researched population. **Keywords:** Musculoskeletal; Pain; Physical Activity; Guidelines.

Sirsasana (headstand) technique alters head/neck loading: Considerations for safety

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Headstand, the sirsasana, of all yoga poses, requires practitioners to support the full body with the forearms and crown of the head. A goal of novice and expert practitioners alike, sirsasana performance technique significantly modifies head and neck loads. This study examined the weight-bearing responsibility of the head and neck (separate from the arms) at moments of peak force during entry, stability, and exit of three typical performance methods. The three methods were: symmetrical extended leg (SE), symmetrical flexed leg (SF), and asymmetrical flexed leg (AF). Three groups of 12 participants each (1 male, 11 females) were formed, each group performing one technique. All 36 subjects (18-60 years of age) reported an active yoga practice including sirsasana with no record of cervical injury. After a 10 min warm up, participants performed three headstands. Volunteers were spotted but not supported as they held the pose for five self-paced breaths followed by 2 min of rest between poses. Kinematic and kinetic Vicon data was analyzed to locate peak forces acting on the head, center of pressure, and neck angle at C3 in the frontal plane. Force plate data revealed flexed leg techniques produced the greatest forces during entry and nominal forces on exit, whereas SE produced larger forces that increased upon exit. Kinematic data revealed that AF showed greatest deviations from midline in the sagittal plane and SE showed the least. In the frontal plane, neck angle about C3 tended towards extension in SE and flexion in SF and AF. Previous research has shown asymmetrical loading to increase potential damage to the cervical spine especially in the middle-aged population. As that population is heavily represented in yoga studios, the data support the conclusion that SF is preferred as AF exhibited increased lateral variation and SE exhibited the largest sustained loads. Entering the posture with symmetrical flexed legs appears to reduce mechanical risks of headstand. **Keywords:** Yoga; Head/Neck; Safety; Cervical Spine.

Preliminary investigation into gait characteristics and jump performance in older adults

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Background: The aim of a jump is to displace the body's centre of mass in a vertical direction. A common and ecologically valid movement involving a high degree of muscular power, joint coordination, tendon elasticity, and neuromuscular parameters. Therefore, it may be ideal to assess the age-associated decline of the musculoskeletal system. **Aim:** In this study, we compare walking temporal-spatial parameters (TS) with jump performance in older adults. **Methods:** Movements were recorded using a Vicon 9-camera system synchronised with Kistler force plates. The participants were adult women, age >60 years, classified according to frailty measures. Gait was freely selected along a 10m walkway. TS parameters combined left and right strides beginning with force plate contact. The total jump height was the difference of the heights of the COM at take-off (TO) to maximum. The start of countermovement (CM) was the point where there was a fall of 3mm in COM from standing height. The end of the CM was where the COM began to rise, corresponding to the start TO.

The instant when vertical force < 10N marked end TO. Jump time is from the start of CM to TO. **Results:** Gait TS parameters are slower in frail compared to non-frail: cadence 89 v 113 steps/min; speed 0.65 v 1.51 m/s; stride length 0.87 v 1.59 m. Total jump time is similar between frail and non-frail (0.69 vs 0.71 s). There was less time in the CM phase in the frail (55 v 61% of total). While overall jump height (2.57 v 11.3 cm) and power achieved (1.686 v 1.987 N/BW) are quite different in frail v non-frail. **Discussion:** Jump height and peak jump force are measures reflecting musculoskeletal components of which power is vital. These findings are in agreement with the suggestion that lower extremity muscle power is a good predictor of mobility performance in older adults. **Keywords:** Walking; Gait; Jump Force; Musculoskeletal; Mobility Performance.

Functional exercise improves mobility performance in older adults with diabetes

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Mobility impairment is an important but under-recognized complication of Type 2 diabetes mellitus (T2DM) in older adults. We conducted a randomized controlled trial to determine the effectiveness of a practical, community-based, combined group and home-based exercise intervention in sedentary older adults with T2DM. **Methods:** Ninety-three adults aged 60 to 85 with T2DM were computer-allocated into Intervention (I, n = 57) or Control (C, n = 36) groups in order to minimize differences in age, gender, and functional status (EPSE, a battery of self-reported ADL and mobility items). The intervention consisted of 10 weeks of group functional circuit training with mixed aerobic and resistance components followed by 10 weeks of a tailored, behaviourally supported home exercise with a focus on physical activity enhancement. Controls underwent a 10-week group flexibility and toning class followed by 10 weeks of relevant health education. Outcomes were timed get up and go (TUG), speed (CGS), and six min walk distance (6MWD). **Results:** Groups (C vs I) did not differ significantly in key demographic or baseline measures (mean or %): age both 71 yrs; female 53 vs 64%; BMI 34 vs 33; HgbA1C both 7; TUG both 9 s; CGS both 1.2 m/s; and 6MWD 1293 vs 1337 ft. Attrition did not differ between the groups (20% I and 19% C did not complete 20 week testing). Using multivariate, intent to treat analyses and controlling for age, gender, BMI, and functional status, significant improvements for I versus C were demonstrated at 20 weeks for CGS ($p < .03$) and 6MWD ($p < .04$) but not for TUG. The model estimate for improvement for CGS was .11 m/s and for 6MWD was 94 feet, both considered at least small clinically meaningful improvements based on Perera 2006 (CGS .05 m/s, 6MWD 20m). **Conclusion:** On-site plus home-based exercise improves mobility performance in older adults with type 2 diabetes. Future studies must test whether this improvement can be sustained over a longer period of time. **Keywords:** Diabetes; Mobility; Intervention; Home Exercise; Sedentary

SEDENTARY BEHAVIOUR AND OLDER PEOPLE

Sedentary behaviour in older adults: A systematic review

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Background: There are published review articles addressing the current state of knowledge regarding sedentary behaviour in children, adolescent and adults, but there are no review-

level data for older adults. **Objectives:** To collect and appraise the current literature on the prevalence and correlates of sedentary behaviour among older adults. **Methods:** Studies published in English up to and including December 2011 were located from computerised and manual searches. Observational or baseline data from intervention studies that included a sample of older adults with a mean age of >50 years, and that reported on the prevalence and/or correlates of time spent in at least one sedentary behaviour, were included. **Results:** 16 studies including 29 samples were included. Most studies (n = 15) were cross-sectional, one included a retrospective study design. Sedentary behaviour was primarily measured as TV viewing (n = 9) followed by multiple assessments of sitting, including reading, socialising, and total sitting time. Only one study included an objective measure of total sedentary time, with the remaining studies utilising self-report measures. All 16 studies included data on prevalence of one or more sedentary behaviours. Prevalence of television viewing >2h/day ranged from 39.6% to 67.1%. Prevalence of sitting during leisure time varied greatly depending on the type of activity and the categorisation of time. In the one study including objective assessment of total sedentary time, prevalence of > 9 hours sedentary time per day was 66.7%. Associations were evident for correlates of age, gender, education, employment, BMI, leisure-time physical activity with sedentary behaviour (mostly defined as television viewing). **Conclusion:** Prevalence of sedentary behaviour in older adults is high. Correlates of sedentary time appear to be largely socio-demographic. Further work is required on how sedentary behaviour can be changed in this important population. **Keywords:** Sedentary Behaviour; Socio-Demographic; Television Viewing; Motivation and Behaviour Change.

Sedentary behaviour and physical activity are independent predictors of successful aging in middle-aged and older adults

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Sedentary behaviour is emerging as an independent risk factor for health and well-being. Unfortunately, little data exist on the association between sedentary behaviour and successful aging (SA) despite evidence that physical activity is strongly correlated with each of the components of SA. **Objective:** To determine whether there is an association between sedentary behaviour (hours spent sitting/day) and SA, independent of physical activity (number of hours walked/week) using the Canadian Community Health Survey. **Methods:** SA variables were created for all three components of SA (physical, psychological and sociological) based on the model proposed by Rowe and Kahn. Multivariate logistic regressions controlling for age, marital status and income were conducted for each SA outcome with both physical activity and sedentary behaviour as main exposure variables. **Results:** Among older adults (n = 9,478), those who were moderately (2-4 hours/day) and least sedentary (<2 hours/day) were 38% (OR: 1.38; CI: 1.12-1.69) and 43% (OR: 1.43; CI: 1.23-1.67) more likely to age successfully compared to those who were sedentary (4 hours or more/day). Among middle-aged adults (n = 10,060), compared to those who were sedentary, those who were least sedentary were 43% (OR: 1.43; CI: 1.25-1.63) more likely to age successfully. For the physical component of SA, a dose-response relationship was evident such that those who were least sedentary had greater odds of aging successfully than those who were moderately sedentary when compared to those who were classified as sedentary. For the psychological and sociological domains, being sedentary for less than two hours seemed to be the minimum required dose for SA. **Conclusions:** Engaging in sedentary activities is significantly associated with lower odds of aging successfully among middle-aged and older adults in Canada. Furthermore, a

dose-dependent relationship between sedentary behaviour and the individual components of SA may exist. **Keywords:** Sedentary Behaviour; Health; Wellbeing; Physical Activity.

Is long sleep duration “sedentary behaviour” in later life?

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Introduction: Increased all-cause mortality has been associated with longer (8-10 hours+) and (though less consistently) shorter (<5 hours) self-reported sleep durations. While the physiological consequences of chronic sleep disturbance may help to explain excess mortality associated with shorter sleep durations, mortality associated with longer sleep durations remains poorly understood. The present analyses explore the possibility that longer sleep duration in later life impact survival through sedentary lifestyles and ‘inactive’ ageing.

Methods: Detailed profiles of sleeping patterns, health, and physical activity were obtained from a random community sample of 1042 older people (aged 65+) interviewed in 1985 for the Nottingham Longitudinal Study of Activity and Ageing. In the 27-year period 1985-2012, the project received notification of 981 deaths. To assess sleep-mortality relationships, baseline sleep durations were categorized <5, 6, 7 (reference), 8, 9 or >9 hrs, and 2 separate Cox survival models were fitted adjusted for: age, sex, social class, and baseline anxiety & depression (Model 1); and as Model 1, plus baseline walking durations (categorized as below: <150 min / week; or above: >150 min/week international guidelines). **Results:** The modal self-reported sleep duration was 7 hours. In Model 1 longer sleep durations (>9 hrs) were significantly associated with mortality (HR = 1.51 (95% CI = 1.10-2.06, $p < 0.01$). However, in Model 2, adherence to physical activity guidelines, but not longer sleep durations significantly predicted mortality (HR = 0.77 (95% CI = 0.67-0.89, $p < 0.01$). Shorter sleep durations were not significantly associated with mortality in any of these models.

Conclusion: Physical inactivity and sedentary behaviour are under-researched confounders in long sleep duration mortality relationships. Survival outcomes indicate that longer sleep durations may compromise survival potential through reduced physical activity. **Keywords:** Mortality; Sedentary Behaviour; Sleep Duration; Physical Activity

Levels and patterns of daily physical activity and sedentary behaviour measured objectively in older care home residents in the UK

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Background: Physical activity (PA) is important for maintaining independence and improving quality of life in care home residents. Little is known about patterns of PA or sedentary behaviour (SB) in this population. This study aims to characterise these patterns in older adults living in care homes. **Methods:** 21 care home residents (80.4±9.6yrs) wore an Acti-Graph GTX-3 accelerometer for 7 days (Monday–Sunday). Acceptable monitor wear time was 10hrs on 5 days, with non-wear time defined as <100mins continuous counts of zero. Time spent in SB, low, light and moderate-to-vigorous PA (MVPA) was recorded according to cut-off points of <100 count/min (cpm), 100-759cpm, 760-2019cpm and 2020cpm, respectively. The number of bouts of SB (>60mins), low and light PA (>10mins) and mean bout length (min) were calculated. Care staff reported activities of daily living (Barthel index; BI) and functional ambulation classification (FAC) for each participant. **Results:** Participants spent on average 79% of their day (10.3hrs) in SB, 14% in low PA (1.8hrs),

6% in light PA (46mins) and 2% in MVPA (12mins). Age, BI and FAC correlated with time spent in light PA ($r = -0.5, 0.53, 0.53$ respectively) and MVPA ($r = -0.5, 0.45, 0.45$ respectively; $P < 0.05$). Mean daily cpm (163.5 ± 126.4) correlated with age ($r = -0.61$), BI ($r = 0.57$) and FAC ($r = 0.5$; $P < 0.05$). Participants averaged 4 bouts of SB/day (2.1 hr/bout). SB bout length correlated with age ($r = 0.48$), FAC ($r = -0.67$) and BI ($r = -0.66$; $P < 0.05$), number of bouts did not. Five participants performed 1 bout of low PA/day (11.8min/bout) and two performed one bout of light PA twice/week (11.9min/bout). SB and PA levels did not significantly differ between days or hours of the day ($P > 0.05$). **Conclusion:** Levels of PA were very low and time in SB high. PA and SB both correlated with age and disability. Few participants performed regular bouts of low or light PA. This study can help inform PA/SB interventions and guidelines for care homes residents. **Keywords:** Sedentary Behaviour; Physical Activity; Quality of Life; Care Homes.

Relationship between physical activity, pain, function and quality of life in older adults with lumbar spinal stenosis

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Introduction: Performance (physical activity in day-to-day life) has been identified as an important clinical outcome for older adults with lumbar spinal stenosis (LSS). We have recently begun to objectively measure performance using accelerometers. Yet, it is not clear how performance measurements relate to traditional outcomes of pain, function, and quality of life. **Methods:** Subjects were >50 with LSS. All subjects wore an activity monitor for 7 days, completed the Self-Paced Walking Test and a questionnaire including the Oswestry Disability Index (ODI), Swiss Spinal Stenosis Questionnaire and SF-36. Performance was measured with activity counts, steps/day and sedentary time (duration of time spent < 100 counts/min). Maximum continuous activity (capacity) was defined as the maximum number of consecutive min above 'light intensity' activity (>100 counts/min). **Results:** Subjects ($n = 19$) were 66.7 ± 7.8 years old and 78% were female. Total activity (counts/week) was related only to male sex ($r = 0.54$) and steps/day associated only with BMI ($r = 0.53$) ($p < 0.05$). Sedentary time was associated with leg pain ($r = 0.72$), back pain ($r = 0.60$) and male sex ($r = 0.53$) ($p < 0.05$). None of the performance variables were correlated significantly with the walking test, or self-report measures of disability (ODI), or physical function (Swiss Spinal Stenosis Questionnaire). Maximum continuous activity was correlated with leg pain ($r = 0.52$), BMI ($r = 0.47$), Emotional ($r = 0.49$) and Mental Health ($r = 0.55$) measures. **Conclusion:** Performance measures were not significantly correlated with outcomes commonly used to measure function and disability. This suggests that current outcome tools are not capturing the construct of performance. Because improvement in physical activity is an important goal of intervention, performance measurements should be added to future outcome batteries. Given the strong relationship with pain, sedentary time may become an outcome of choice when examining physical activity. **Keywords:** Physical Activity; Performance Measurements; Sedentary Time; Quality of Life.

PHYSIOLOGICAL AND BIOMECHANICAL EFFECTS OF EXERCISE

Resistance training volume, recovery intervals between sets and repetitions sustainability, in trained older women

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Introduction: The effectiveness of resistance training programs depends on several parameters, such as intensity, number of repetitions (NR), volume, frequency, and duration of the recovery intervals (RI). Although the results of studies in young people or those related to upper-limb performance are important to the understanding of the effects of RI on NR, sustainability and volume, such findings may not be applied to either lower-limb or older adults performance, due to changes imposed by the aging process. **Objective:** The aim of this study was to analyze potential effects of RI, between sets, on sustainability of repetitions, NR, and total volume during a lower-limb exercise, in trained older women. **Method:** Twenty-one resistance-trained older women (66.4 ± 4.4 years, 69.1 ± 11.4 kg, 157.2 ± 5.0 cm) performed three sets of repetitions to voluntary exhaustion, with loads that corresponded to 15 maximum repetitions, in two experimental sessions (ranging from 48 to 72 hours apart). In each session, one of two duration of RI (1 or 3 min; RI-1 and RI-3, respectively) was tested, according to a randomized and counterbalanced design. A two-way ANOVA followed by Scheffé's post-hoc test or Student-t test was used whenever appropriate. **Results:** Significant differences ($p < 0.05$) found: a) reductions of NR in both RI (RI-1 = 14.0 ± 1.4 ; 7.8 ± 1.7 ; 6.8 ± 1.3 , and RI-3 = 13.9 ± 1.2 ; 10.3 ± 1.4 ; 9.5 ± 1.7 repetitions for the first, second and third sets, respectively); b) RI-3 session presented a higher sustainability (less reduction in NR between sets) and total volume (load in Kg x NR; RI-1 = 2683 ± 631 ; RI-3 = 3154 ± 656 kg/repetition) compared to the RI-1 session. **Conclusion:** The NR, sustainability of repetitions, and total volume are influenced by the length of the RI between sets, in resistance trained older women. Longer RI should be used when the goal of training is to increase the total volume. **Acknowledgements:** Brazilian Agencies (FAPESP, CNPq, CAPES, FUNDUNESP, PROEX-UNESP). **Keywords:** Resistance Training; Recovery Intervals; Older Women.

Effect of concurrent training on body composition and bone mineral density in postmenopausal women

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Introduction: Aging and menopause are independent risk factors for the development of obesity and osteoporosis, and these risks increase when associated with sedentary lifestyle. **Objective:** To investigate the effect of concurrent training on body composition and bone density in postmenopausal women. **Methods:** Sample consisted of 94 postmenopausal women, aged 50-75 (61.4 ± 6.9) years, from Presidente Prudente, Sao Paulo-Brazil. The participants were distributed in three groups: training group(TG): performed only concurrent training during eight weeks, three times/week; training + diet group(TDG): performed the same concurrent training with supervised food ingestion, and control group(CG): did not train or diet. Total fat mass (FM), % of body fat (%BF), fat-free mass (FFM), trunk fat mass (TFM) and bone mineral density(BMD) were estimated by Dual Energy X-ray Absorptiometry (GE Lunar DPX-NT). The intervention period lasted eight weeks, and consisted by the combination of 50-min strength training followed by 30-min aerobic exercise. The training prescription followed the recommendations of the ACSM (2002). The caloric intake followed

the recommendations of the AHA (2000). The comparison between periods, before and after training, was made using the Student's *t* test for paired variables. All statistical analysis was performed using SPSS, version 17.0 ($p < 0,05$). **Results:** The comparisons between both moments, before and after intervention, showed that the TG presented significant decrease in the FM ($p = 0.043$), %BF ($p = 0.010$), and improvement in the FFM ($p = 0.003$). The CG presented significant decrease in the BMD ($p = 0.001$). No significant differences were observed in the TDG. **Conclusion:** Concurrent training without diet was effective to decrease fat mass and % of body fat, and increase fat-free mass. These results were not observed in the other two groups. **Keywords:** Bone Mineral Density; Postmenopausal Women; Diet; Body Fat.

The effects of eccentrically biased versus conventional resistance training in older adults

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Resistance training has established benefits for older people, but the most efficacious mode of training has yet to be determined. We therefore compared the effects of eccentrically biased (ECC) and conventional (CONV) resistance training on strength, muscle architecture, and function in older adults aged 60-75 years. Twelve participants were randomly assigned to CONV, 13 to ECC and 13 to wait-list control. Training was performed twice a week for 16 weeks. Exercises were leg press, toe press, bench press and latissimus pull down. Participants in ECC performed three sets of 10 bilateral lifts at 50% of one repetition maximum (1RM), with the eccentric phase performed unilaterally, alternating between each leg or arm with each repetition. Participants in CONV performed two sets of 10 bilateral lifts at 75% of 1RM. Isometric and concentric knee extensor strength was assessed from 0°/s to 360°/s. Vastus lateralis (VL) and gastrocnemius medialis (GM) muscle architecture were assessed using ultrasonography. Functional capacity was assessed using the: six-metre fast walk (6MFWT), timed up & go (TUG), stair climb and descent, and vertical jump. Compared to the control condition, training increased strength at 60°/s and 120°/s (6-8%; $p < 0.05$) in both training groups. Isometric strength and strength at fast contraction speeds (240°/s and 360°/s) only increased in ECC (7-11%; $p < 0.05$). Training improved performance in the 6MFWT in both training groups (5-7%; $p < 0.01$). TUG and vertical jump performance improved in CONV (5% and 7% respectively; $p < 0.01$). Stair climb performance improved in ECC (5%; $p < 0.01$). VL thickness increased (5%; $p < 0.05$) in ECC. The improvement in strength at fast contraction speeds in ECC means that this modality may be more effective than CONV for improving fast contractions, such as those needed to prevent falls. It is inconclusive as to which modality is more effective at improving function. ECC may be more effective at increasing muscle mass than CONV. **Keywords:** Resistance Training; Strength, Muscle Architecture; Older Adults.

Six weeks of functional training enhances balance, strength and cardiovascular endurance among postmenopausal women

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Introduction: Resistance training in isolation proved to be effective in enhancing strength in older adults, but their effectiveness respecting balance performance (1) and cardiovascular endurance (2) is unclear. As recent mixed and multicomponent approaches seem to induce more consistent and holistic improvements (3), our purpose was to analyze the effects of

a short-term functional training program on strength, balance, and cardiovascular endurance. **Methods:** A training program mainly consisting of mixed balance-strength exercises, using Swiss balls and elastic tubing, was applied in 12 postmenopausal women (70.69 ± 4.23 yrs), 2 times per week during 6 weeks. Participants performed 6-min Walk test, Up & Go test and Chair-Stand test before and after the training (4). Distance covered in 6MWT, time employed to complete Up & Go test (UGT) and number of repetitions performed in Chair-Stand test (CST) were retained for statistical analysis. After testing for normality (Shapiro-Wilks), nonparametric Wilcoxon test was conducted and Cohen's d was used to assess the magnitude of the effect. **Results:** The results of the study are presented in Table 1 and Figure 1. A significant moderate to large improvement was found in all the three test following the training program ($p < 0.05$; $d > 0.70$). **Conclusions:** The outcomes of the present study demonstrate that 6 weeks of functional training, even if performed only twice a week, are sufficient to enhance lower-limb strength (i.e. CST), dynamic balance (i.e. UGT), and cardiovascular endurance (i.e. 6MWT) among postmenopausal women. A recent study from Hallage et al. (5) reported similar improvements following step aerobics training, but it consisted of 3 sessions a week during 14 weeks. Therefore, current results, despite their preliminary nature, point to a great efficiency of combined balance-strength training programs regarding functional fitness improvement, and suggest them as an alternative to aerobic rhythmic activities (i.e. step). **Keywords:** Postmenopausal Women; Functional Training; Balance; Cardiovascular Strength.

Effect of progressive resistance training on strength evolution of ageing people living with HIV compared to healthy controls

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Objectives: Human Immunodeficiency Virus (HIV) infection worsens the frailty of elderly people, compromising their quality of life. In this study, we prospectively evaluated eleven living with HIV and 21 controls older than 60 years and without prior regular physical activity, who engaged in a one-year progressive resistance exercise program to compare its effects on muscular strength, physical fitness, and body composition. **Methods:** Exercises for major muscular groups were performed 2 times/week, under professional supervision. Strength increase was evaluated bimonthly, while body composition, lipid and glycaemic profiles (only of those living with HIV), and physical fitness were evaluated before and after the one-year training. **Results:** Those living with HIV were lighter, had smaller Body Mass Index, and were initially much weaker than controls. However, their strength increased more (1.52-2.33 times the baseline values for those living with HIV \times 1.21-1.48 times for controls, $p < 0.01$), nullifying the differences initially seen. These effects were seen independently of gender, age, or baseline physical activity. In addition, those living with HIV improved their fast glucose levels and showed a tendency to improve their lipid profile after the one-year training program. **Conclusions:** Resistance exercise safely increased the strength of older adults living with HIV, allowing them to equal otherwise healthy controls' performances. These findings favor the recommendation of resistance exercise for elder living with HIV adults. **Keywords:** Resistance Training; HIV; Body Mass Index; Strength Evolution.

Nordic walking for older adults: Effect on quality of life and functional capacity

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Developing strategies and policies to maintain and increase the level of physical activity among older adults is among vital priorities of the most developed and developing countries. Many of them experience significant negative effects of sedentary lifestyles upon quality of life of the population, functional capacity, and ability to be independent in the later years. Active living is cornerstone of health and quality of life. Although the scientific evidence indicates that regular exercise by older adults can help delay, or prevent, the onset of disabilities and many chronic diseases, reduce the risk of falls and fractures, improve mood and relieve depression, increase mental acuity, and in a way increase life expectancy. However, many older adults are not as physically active as they could and should be. Nordic walking, due to its functionality, safety, and availability for almost everyone, helps to involve elderly people into the process of health maintenance as well as into the social relationships maintenance therefore it can serve as a universal tool for being active. The aim of our study was to examine the benefits of NW for functions of everyday life in older individuals who report sedentary lifestyles. We used functional capacity tests, health questionnaire and modified WHOQOL-BREF to determine whether regular NW exercise increase perceived functional capacity, independence, and quality of life in such individuals. We also studied the reasons to evade physical activity reported by elderly people and whether NW can help to overcome these main reasons to sedentary lifestyles. The study showed that NW is a natural, safe, intensive form of physical activity that can be widely used by older adults as it is cheap and affordable, easy to practice, it allows overcoming main reasons to sedentary lifestyles and is very promising from the point of view of motivation. It increases functional independence and quality of life in older adults. **Keywords:** Nordic Walking; Quality of Life; Functional Independence; Sedentary Lifestyle.

Kinematics of lower limb segment movement during gait in a healthy population aged 18 to 97 using inertial measurement units

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Introduction: Walking ability is a key aspect of maintaining independence during ageing; impairment of gait has also been shown to be associated with falls in the elderly. In this study, we have investigated how the kinematics of limb segment movement changes in healthy ageing using inertial measurement units (IMUs), which allow measurements to be performed without use of a standard gait laboratory. **Methods:** Subjects were recruited who were in general good health and active for their age. Participants were excluded if they had had previous surgery on their lower limbs, had a neuromuscular condition that might affect gait (e.g. stroke, Parkinson's disease), had current back pain, were not able to walk 10 metres without a walking aid, or if they could not give informed consent. The study used four IMUs, with one sensor strapped to each shank and thigh. Participants were then asked to walk for 10 metres at their normal pace. The ranges of motion (ROM) were calculated for thigh, shank, and knee, in addition to the stride duration. Ethical approval for the study was given by UCL Research Ethics Committee, and all participants gave informed consent. **Results:** 113 participants were recruited with an age range from 18 to 97. Results for knee, thigh, and shank ROM showed little change up to the age of 80, but declined noticeably after that age. Stride duration did show a slight linear increase with age, by about 0.1% a year.

Discussion: The IMUs were able to provide data on limb segment kinematics in a community setting. In this study of an active population, there was little change in limb segment range of motion until about the age of 80. It is known that peak muscle power declines with age. We propose that after the age of 80, peak muscle power has decreased below a threshold, at which point it has an effect on normal gait and mobility. The work does suggest that in an active healthy population a normal gait pattern can be maintained for many years. **Keywords:** Walking; Gait; Kinematics; Mobility; Inertial Measurement Unit.

Practical Workshops

DEVELOPMENT AND USE OF CRITERION-REFERENCED FITNESS STANDARDS FOR MAINTAINING PHYSICAL INDEPENDENCE IN LATER YEARS

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With the projected increase in the number of older adults throughout much of the world, it is critical for both economic and personal reasons that this large segment of the population remains healthy and independent as long as possible. A key factor in preserving mobility and independence is maintaining the physical capacity (strength, endurance, agility, and balance) needed to do everyday activities—simple housework, climb steps, lift and carry objects, get in and out of a chair or transportation vehicle, and walk far enough to do one's own shopping and errands. Unfortunately, little is known about the threshold fitness requirements for performing the kinds of activities needed for independent living. This presentation will describe recent research leading to the first-of-their type, fitness standards (criterion reference points) for evaluating physical capacity in older adults relative to that which is needed to remain mobile and independent until late in life. The criterion standards were developed for use with the Senior Fitness Test (SFT), a previously validated and widely used battery of test items that was designed for easy use in the field (non-laboratory) setting. The criterion standards provide an important adjunct to the normative standards already developed for the SFT, based on data collected from over 7,000 older Americans, ages 60-90+. Included will be a discussion of how criterion standards differ from normative standards, how the fitness criterion 'cut-points' were developed and validated based on both cross-sectional and longitudinal research, and how the standards can be used to predict physical independence. Most importantly, there will be discussion on how the standards can be used to set 'fitness goals' for older adults and to plan interventions that target specific areas of weakness, thus reducing the risk for premature loss of mobility and independence.

FUNCTIONAL FITNESS EXERCISES FOR OLDER ADULTS

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Functional fitness is a fairly new concept in the realm of exercise for older adults. Functional Fitness is the level of fitness necessary to perform a range of functional movements and activities, thus allowing older adults to adopt a more active lifestyle and improve their quality of life. Functional fitness training also helps older adults perform daily tasks such as driving, gardening, housework, and shopping. The key to functional fitness training is integration. It's about teaching all the muscles to work together rather than isolating them

to work independently. Many fitness professionals are faced with the challenge of providing exercise programs for older adults with a multitude of chronic conditions, disabilities, and functional limitations. However, they may not have the training or resources to be able to develop specific exercise programs to meet all of their functional needs. Thus, the purpose of this workshop is to provide participants a better understanding of the benefits of functional fitness exercise in preserving functional capabilities and independence. By the end of the workshop, participants will be able to select and safely conduct the most appropriate functional fitness exercise programs based upon their clients' goals, needs, limitations, and/or disabilities. Ten different functional fitness programs will be presented throughout the workshop. The exercise programs are designed to improve upper- and lower-body strength, core stability, balance, range of motion, functional performance, and cognitive functioning. Finally, using the built environment (parks and community gardens) as a means to promote physical activity will be discussed. **Keywords:** Functional; Fitness; Independence; Strength; Balance.

A SHORT FILM ABOUT THE DAILY LIFE OF AN OLDER WOMAN

Theou, Olga

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In 2008, I conducted my PhD project "*Physical Function During Performance-Based Tasks and Throughout Daily Life. Is It Different Across Levels of Frailty?*" in a rural area of Greece. During this project, community-dwelling older women were first screened for frailty and then fitted with four devices (accelerometer, HR monitor, EMG device, and GPS watch) to "quantify" their daily life. The quantitative data of the study was published in scientific peer-review journals, however, I felt that an important part of my study was not presented. By just looking at my articles, the reader could not see the actual daily activities of these women nor could they hear their thoughts about their everyday lives, information which I gained through my interaction with them. For this reason, I decided to create a film inspired not by the responses of my participants to my scientific questions, but on what they *chose* to share with me. The short film/documentary (approximately 21 min) is entitled "I Will Sleep When Night Falls" and focuses on the daily life of an older woman. A camera operator followed her through her daily activities to capture her everyday life. The final project emphasizes not only the description of one day of an older person's life, but also my experiences from my PhD study. We focused on daily activities that are important to them, objects that surround them and their thoughts about daily life in the past and present. You could say that by making this film I stopped feeling "guilty" about presenting only what I considered important from my study and not letting my participants being heard about what they consider important to share. In this way, we contributed by giving voice to those typically unheard.

EXERCISE AND FITNESS TRAINING AFTER STROKE (EfS)

Townley, Bex

Later Life Training Ltd, UK.

There is an increasing need for people who have had a stroke to engage in exercise, as a stroke often results in reduced strength, mobility, fitness and mood as well as social isolation. Many of these problems could be alleviated through exercise, but a stroke may also result in a myriad of additional challenges such as pain, impaired movement or comprehension,

which may render it difficult for people with stroke to access exercise facilities. These challenges – as well as other complications – need to be recognised and managed effectively by exercise instructors to enable people to exercise safely. Providing exercise classes for people after stroke can be hugely rewarding – but this requires specialist knowledge and brings with it a considerable responsibility. Although there is an increasing number of exercise referral schemes for people who have had a stroke, there was – until recently – no accredited course for exercise instructors to work with this population. This accredited Exercise after Stroke Specialist Instructor Training Course has been designed to fill this gap. This session will give the evidence base behind the training and allow participants to have a go at some of the exercises and see how to adapt exercises for people with different stroke-related functional and visual impairments.

SETTING UP A NATIONAL EXERCISE REFERRAL SCHEME (IN WALES)

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Welsh Local Government Association, UK.

The National Exercise Referral Scheme (NERS) is a Welsh Government (WG) funded scheme which has been developed over the last 5 years to standardise exercise referral opportunities across all Local Authorities and Local health Boards in Wales. NERS offers a 16-week programme for clients who have or are at risk of developing chronic disease; they have a consultations at weeks 1 and follow up consultations at weeks 4, 16, 32 and 52. The principal aims of the Scheme: To offer a high quality Exercise Referral Scheme across Wales; To increase the long term adherence in physical activity of clients; To improve physical and mental health of clients; To determine the effectiveness of the intervention in increasing activity levels and improving health. All protocols used on NERS represent the best current known practice and meet with current national guidance. WG commissioned a randomised controlled trial design to investigate whether self-reported physical activity and depression and anxiety at 12 months is different among those patients receiving an exercise referral programme compared to those receiving usual GP care. It also investigated the cost-effectiveness of NERS; its findings were: All participants in NERS had higher levels of physical activity than the control group, with this difference being significant for patients referred for coronary heart disease risk factors; There were positive effects on depression and anxiety; The economic evaluation demonstrated a cost per QALY of £12,111. For those who adhere to the programme there is a marginal cost saving (£-367 per QALY). In 2008, the WG agreed to fund the appointment of a National Coordinator to commission approved training which met the new National Occupational Standards for chronic conditions and develop standard protocols. These are being implemented where there are rehabilitation programmes in operation and exercise professionals hold the necessary qualifications.

Keywords: Exercise; Referrals; Physical Activity; Costs; Economic.

LEARNING FROM THE LIVED AGEING BODY: ADVANCING KNOWLEDGE OF PHYSICAL ACTIVITY IN LATER YEARS

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Little is known about the ineffable and less tangible - sometimes called the subjective knowledge - about the older active body. Older adults are individuals with stories that are

as mysterious as their bodies and whose biographical ageing is as intricate and important as their biological bodies, and pertinent to their health. Considering ageing from this perspective means giving attention to what older people themselves say about the role and meaning of living in and through an (in) active body. Knowledge and reality as lived do not exist apart. In this symposium, we present research findings from the UK, USA and NZ to illustrate the value of taking seriously people's lived experiences of ageing and physical activity. In so doing, we consider what kind of knowledge can be expected; how it can enhance our theoretical assumptions about active ageing; and the consequences this has for policy and practice. First, Phoenix presents results from an Economic and Social Research Council funded project. Using in-depth life-history interview data, she illustrates the ways in which having and being an active body in older age is embedded within the broader context of one's past, present, and anticipated future. Second, Kluge considers how researchers might come to understand the lived body. She provides examples where different methodological approaches have been used to elicit lived experiences of physical activity in older age (e.g. phenomenological approach, intrinsic case studies). Finally, Grant presents findings of an ethnographic study, which investigated the phenomenon of active ageing within its real-life context. When studying the development of a community initiative, physical activity and ageing was viewed from a social and cultural context as well as, an organizational and institutional perspective. **Keywords:** Active Ageing; Physical Activity; Demographics; Ethnographic; Culture.

LIFEBALL - THE GAME YOU PLAY FOR LIFE

Lord, Brian L

Healthy Lifestyle Health Promotion Services, Australia.

An Australian Community Health Educator has invented a walking pace team ball game for older adults. Called "Lifeball," the game features rules to make it safe for older adults (no high throws, no contact between players, no walking backwards etc.) and other rules to make it inclusive - every player must touch the ball, and every player has the chance to play every position. The game is based on netball and basketball - played on a similar sized court - but the goals are shorter (eye height) and off the end of the court by a few metres, making scoring still a challenge. The game is played by thousands of older Australians in clubs from Queensland, New South Wales, Victoria, South Australia, and Western Australia. It has been going for over 10 years in some centres, and the players maintain it is a "mainstream" sport (it is played in the Masters Games in two states) and a regular socialising attraction to rival any other mainstream team sport, and better than most - so much so that the score is rarely ever kept during the games. Research (1 masters, 1 honours, and several papers in Australian Health journals) on the efficacy of Lifeball has shown improvements in all aspects of physical wellbeing, but (not surprisingly), most respondents rated the social value of belonging to the Lifeball "family" as being the prime reason for playing. It is also played by people of much younger age (even primary schools play it) and hence the name - Lifeball - the game you play for life. **Keywords:** Ball Games; Seniors; Group Exercise.

ACTIVATING OLDER ADULTS WITH NORDIC POLE WALKING AND POLE EXERCISE PROGRAMS

Rutlin, Tom

Exerstrider Products Inc., United States.

Learn how to launch successful and popular Nordic walking and pole group exercise programs in continuing care retirement communities and senior wellness programs. Discover how such programs can sustain and increase participant involvement and significantly improve participants' balance and functional independence, while creating a culture of mind, body, and spirit that enhances the overall vitality of your community. Earn an Exerstrider Method Nordic Walking Advanced Instructor certificate and learn how to grow your own "grass roots" community of Nordic walkers. Learning objectives: 1. Competently equip, fit, and instruct residents in Nordic walking and other FUN activity programs utilizing Nordic walking poles. 2. Understand and implement the steps required to attract and train a group of Nordic walkers and pole exercisers, which can then grow throughout the community and successfully attract many residents including those who already exercise and those who have traditionally been non-exercisers. 3. Maximize ongoing resident participation in physical activity while minimizing staff involvement, overhead, and facility space requirements while creating new revenue generating potential. Who should attend? CCRC fitness and wellness professionals and administrators who are looking for physical activity programs that address most ability levels, are easy to implement and won't bust their budgets. **Keywords:** Nordic Walking; Group Exercise; Balance, Functional Independence.

PILATES MAT BASED MAGIC FOR THE ANTI AGEIST

Done, Sheila

Modern Pilates and the Older Adult, Neuropilates & Later Life Training Ltd, UK.

Functional exercises designed to combat the ageing process that sometimes interferes with the quality of life. This class will introduce the Pilates teachers and others to new ideas for their classes, and thus promote the health and well-being for the older clients. Research states to maintain bone density we should be on our feet for 4 hours a day. This session aims to keep the older client on feet for 40 min of those precious 4 hours - 40 min of quality bone loading.

Meet-the-Expert Sessions

PHYSICAL ACTIVITY AND HEALTHY AGEING: ENHANCING REGULAR PARTICIPATION

Hetherington, Sharon¹; Orpin, Peter²; Fell, James²; Shing, Cecilia²

¹*Exercise & Sports Science Australia, Australia;* ²*University of Tasmania, Australia.*

Despite the health benefits of regular physical activity, up to 50% of older people are not adequately physically active. In this study a mixed methods approach was used to better understand the complex interaction of environmental, social, and individual factors that contribute to older people's physical activity behaviours. 223 participants (82±7 years) completed a physical activity survey assessing their physical activity level, perceptions of activity and the degree of social support for activity they received. Twenty people were selected for face-to-face interviews to explore in-depth the complex phenomenon of ageing and physical activity. Twenty-one% of participants were inadequately physically active. Interest in, perceived importance and utility of physical activity were high and positively associated with activity level, while the perceived amount of effort it took to be active was negatively associated with activity level. The least active quartile reported significantly higher effort associated with being active. Analysis of interview data revealed the main barriers

to activity to be injury or illness, lack of competence and lack of time. Interviewees' main motivations were the support of enthusiastic others, being fully engaged in activities and having fun while being active. Enhanced social engagement positively influences multiple factors within a model of health action and presents an important intervention point for changing people's behaviour. Based on findings from the present study a health action model was developed that provides greater insight into the factors influencing physical activity behaviours. Findings supported the redistribution of barriers and motivators from a single factor as depicted in previous models to individual and specific factors. To increase participation in activities, exercise professionals need be skilled in a variety of motivational and leadership techniques that support engagement. **Keywords:** Physical Activity; Wellbeing; Social Engagement; Motivation.

Posters

SCOTTISH BELIEFS ABOUT LOW BACK PAIN: DOES AGE MATTER?

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Introduction: Low back pain (LBP) is one of the most common musculoskeletal conditions for which sufferers seek medical attention. The societal costs of LBP are huge. Remaining active with LBP has shown to have been effective in helping sufferers to normal. Similarly, rest for LBP has been identified as harmful in promoting recovery. Maintaining activity levels in general has been shown particularly in the older population groups has been shown to maintain joint movement and muscle strength and contribute to reduced falls and mobility problems. LBP is a common complaint in an aging population. **Description:** A survey was conducted in 2010 via face-to-face public interviews to measure the incidence of back pain in a sample of the Scottish population and whether or not beliefs of back pain differed compared with age. Subjects were asked 'had they had a history of LBP and whether they agreed with the following statements: 'If you have back pain you should try and stay active'. 'If you have back pain you should rest.' **Evaluation:** 887 members of the Scottish public participated. 52 (n = 461) reported a history of LBP. The incidence of LBP increased with age, with subjects aged over 65 reporting LBP twice as much as younger age groups. Overall in those subjects with a history of LBP, 66% (n = 306) agreed with the question 'If you have back pain you should try and stay active.' 53% (n = 245) agreed with the question 'If you have back pain you should rest.' In answers to both questions, subjects ≥ 65 and ≤ 30 , were less likely to agree that activity was the best action and rest the worst action. **Conclusions:** In a sample Scottish population, LBP is common, more so in the older age groups. Whilst there are positive beliefs that activity is good for LBP, this is less in people over 65. With an aging population, the benefits of exercise to this age group should be emphasised not just for back pain but for general health benefits. **Keywords:** Musculoskeletal; Pain; Beliefs; Active; Strength.

TURNING TO SITTING-DOWN STRATEGIES AND VARIABILITY IN OLDER ADULTS: KINEMATICS AND ELECTROMYOGRAPHY ANALYSIS

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Background: Turning involves complex interactions between neural and biomechanical factors for postural stability in older individuals. The purpose of the study was to compare the kinematics and electromyography (EMG) of the head, lumbar, and knee during the turning in older adults to young ones. **Methods:** Twenty old adults (OA) and 20 young adults (YA) were recruited. Every subject performed "turning-to-sitting" test. A 16-channel telemetry EMG system with electrogoniometers and an inclinometer was used to record kinematic and EMG data. **Results:** OA group had lower joint displacements of lumbar lateral flexion and angular velocity of head flexion, and larger variability of head and knee angular velocity than young adults during turning step. The onset of the lumbar movement and head lateral flexion were earlier significantly in the OA group than the YA group. The old adults had higher muscle activity of right gastrocnemius, left biceps femoris, and left external abdominal oblique muscles than young adults through all turning phases. **Conclusion:** Comparing to young adults, older adults perform turning with higher velocity variability of head and knee joint but less lumbar displacement in frontal plane to cope with complex turning phases. Older adults need to increase the extensor synergy muscles of the stance leg to provide a braking force to avoid forward motion, and also to increase the external abdominal muscle activity for trunk roll motion during turning. **Keywords:** Postural Stability; Electromyography; Turning; Kinematics.

INFLAMMATION, FAT MASS, AND FUNCTIONAL DECLINE OVER 4 YEARS IN OLDER ADULTS OF VARIOUS BODY COMPOSITION

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Objective: Obesity and elevated inflammatory markers are two factors that affect significantly mobility disability and functional decline in older person. However, to date, there are no studies that determined if the impact is independent to measure mobility disability using objective measures of physical capacity. **Methods:** 122 well-functioning adults aged 68-83 years old with various body compositions were followed for functional limitation over 4 years. Body composition (Fat mass (FM), total fat-free mass (FFM) and trunk FM obtained by DXA) and physical capacity (timed up and go (TUG), chair stands (CS), walking speed at normal and fastest pace (NWS and FWS), and one leg stand (LS)) at baseline (T1) and after 4 years (T4), were measured. Pearson's correlations were used to examine the relations between C-reactive protein (CRP) with all physical capacity tests. Then, ANOVA and ANCOVA (adjusted for trunk FM) were used to compare participants divided in 2 groups based on the presence of elevated CRP ($>3\text{mg/ml}$) or not ($<3\text{mg/ml}$; measured with a high-sensitivity assay) with respect to physical capacity. **Results:** CRP is significantly and positively associated with TUG and CS at T1 and T4 ($0.162 < r < 0.234$; $p < 0.05$) and negatively for the other remaining tests ($-0.293 < r < -0.167$; $p < 0.05$). Most physical capacity tests (MWS-T1, TUG-T1 and T4, CS-T1 and LS-T1 and T4) were significantly different between the 2 groups of participants ($p \leq 0.05$). When adjusted for trunk FM, this difference was no longer present ($p > 0.05$) between the groups. Finally, a paired T-Test shows that physical capacity decline significantly between T1 and T4 whereas trunk FM increased significantly. **Conclusion:** Our data highlight that, in well functioning older adults, trunk FM seems more useful to predict mobility disability than level of inflammation. Intervention at early stages to reduce obesity may preserve physical capacity in this population over the time. This result needs to be further investigated. **Keywords:** Obesity; Inflammation; Physical Capacity; Mobility; Body Composition.

HABITUAL PHYSICAL ACTIVITY AND USUAL GAIT SPEED IN OLDER ADULTS

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Introduction: Few studies have assessed the association between habitual physical activity, various confounders (e.g., age, disease), and usual gait speed (UGS). Classification and regression tree (CART) analysis can identify the interaction by stratification and segmentation, and is a better model for predicting impairments in older adults than multiple linear regression analysis. The purpose of this study was to identify the association between habitual physical activity and UGS using CART analysis in older adults. **Methods:** A cross-sectional analysis was conducted on data from 754 older adults, aged 60-101 years (73.6 ± 6.9 years). Subjects were interviewed about medical history, joint pain, cohabitation, smoking, drinking, depression, and habitual physical activity (frequency of household and job; the quantity of moderate-to-vigorous-intensity exercise: MVE). UGS less than the lowest quarter (<1.06 m/s) was defined as low-UGS. CART analysis was performed to identify a hierarchical order and interaction between different habitual physical activity levels and other variables (age, number of medications, stroke, heart disease, osteoporosis, low back pain, knee joint pain, living alone, drinking, depression) with low-UGS. **Results:** Age, depression, and MVE were significantly associated with low-UGS. Age (>77.5 years) was the most important factor to increase the prevalence of low-UGS. The MVE was significantly associated with low-UGS in those aged over 82.5 years. For those aged less than 77.5 years, there was no factor associated with low-UGS. For those aged 77.5-82.5 years, depression was associated with low-UGS. Misclassification rate of this tree was 18.3%. **Conclusions:** It is suggested that adults aged 78-83 years and who have depression, and those aged over 83 years who do not participate in MVE at least 50 min/week, are likely to have low-UGS. **Keywords:** Physical Activity; Gait Speed; Depression.

STRETCHING TRAINING, MAXIMUM MUSCLE STRENGTH AND FLEXIBILITY, IN THE ELDERLY

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Although it is known that stretching exercises can enhance flexibility, questions remain regarding the impact of stretching training on muscle strength in old people. Thus, the aim of this study was to analyze the effect of an eight-week stretching training on maximal voluntary contraction (MVC) and flexibility in the elderly. Twenty-six older women were randomly assigned either into a training group (TG; n = 13; 69.7 ± 8.8 years; 64.6 ± 10.8 kg; 1.53 ± 0.07 m; 27.5 ± 4.6 kg/m²) or control group (CG; n = 13; 66.6 ± 6.0 years; 75.3 ± 13.1 kg; 1.58 ± 0.07 m; 30.3 ± 5.6 kg/m²). Both groups attended the laboratory three times a week for eight weeks. The TG performed three sets of eight static stretching exercises for major muscle groups, which were held for 30 seconds; the CG participated in artistic and cultural activities, which did not involve systematic physical activity. The MVC was obtained by means of a force transducer while the participants performed maximal isometric unilateral knee extension on a leg extension machine (chair). Flexibility was assessed by means of the sit and reach test. For statistical analysis, a two-way ANOVA (2 × 2) for repeated measures

and the Scheffé post hoc test were used ($p < 0.05$). There was no statistically significant difference between pre-and-post experimental period regarding the MVC, for both groups (TG: Pre = 216.9 ± 51.2 and Post = 221.0 ± 61.0 ; CG: Pre = 255.8 ± 87.8 and Post = 259.0 ± 89.2). The ANOVA showed group \times time interaction and significant time effect for flexibility ($p < 0.01$) (TG: Pre = 51.6 ± 1.0 and Post = 58.3 ± 9.9 ; CG: Pre = 49.7 ± 8.8 and Post = 49.6 ± 9.7). In conclusion, eight weeks of stretching training: a) are not effective for improving maximum muscle strength; b) on the other hand, they can be beneficial to increase flexibility, in older women. **Keywords:** Stretching; Flexibility; Strength.

THE EFFECTS OF STRENGTH AND POWER TRAINING ON FUNCTIONAL ABILITIES IN OLDER ADULTS

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The purpose of the study was to compare the effects of strength and power training on the functional abilities of older adults. Thirty-two male ($n = 7$) and female ($n = 25$) volunteers (74 ± 6.2 yrs) participated in this randomized controlled trial. All groups performed 3 sets of 10 repetitions on 6 pneumatic resistance machines 3 days per week for 12 weeks. The high-velocity 70% 1RM (70% Fast, $n = 11$) and the high-velocity 50% 1RM groups (50% Fast, $n = 8$) performed the exercise movements as quickly as possible during the concentric phase. The low-velocity 70% 1RM (70% Slow, $n = 13$) group performed the exercise movements in a slow and controlled fashion (2-3 sec) during the concentric phase. Leg press strength, peak power, and average peak power were assessed using a computerized pneumatic system. Functional performance was assessed from 50' fast walk test, 30-sec chair stand, 8-ft timed up-and-go test (TUG), Berg Balance Scale (BBS) and Activities-Specific Balance Confidence Scale (ABC) before and after the 12-wk intervention. There were main effects of time ($p < .05$) for leg press strength, peak power, average peak power, BBS, 50' fast walk, and 30-sec chair stand. There were no main effects for group. Significant interactions were found only for the ABC and 50' fast walk. Post-hoc analyses revealed that the 70% Fast group declined significantly ($p < .05$) on the ABC and increased significantly on the 50' fast walk test ($p < .05$). Partial correlations at baseline, when controlled for age, revealed significant relationships between peak power and average peak power with all measures of function accounting for 20-24% of the variance in performance. Leg press strength, when controlled for age, was significantly correlated only with performance on the chair stand test. In conclusion, high and low-velocity training improved functional performance. Although the relationship between power and function was strong, the added benefits of training at higher velocities remain equivocal. **Keywords:** Strength; Power; Functional Performance; Exercise.

DAILY SITTING TIME AND PHYSICAL PERFORMANCE TEST IN BRAZILIAN ELDERLY OVER 80 YEARS OF AGE

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Objective: The cross-sectional epidemiological and household-based study was to examine the association between daily sitting time and physical performance in all residents ($n = 134$) aged 80 + years in Antônio Carlos, Santa Catarina State, Brazil. **Method:** Physical inactivity was ascertained through reported time spent sitting/day (International Physical

Activity Questionnaire). Physical performance test was assessed using tests "chair stand" and "pick up a pen" (assessed by time), and "balance" (four measures of static balance). The associations between the dependent variable (sitting time) and the explanatory variables (dichotomized physical performance tests) were carried out using the chi-square test or Fisher's exact test and Binary Logistic Regression. The significance level adopted was $p < 0.05$. **Results:** The results showed that the mean sitting time was higher for women. The elderly men had good results in all physical performance tests. Women who spend more time sitting have, respectively, 2.92 (IC95%:10.3;82.3) and 3.68 (IC95%:11.3;120.2) more chances of performing poorly in the "chair stand" and "balance" tests. **Conclusion:** The results suggest that longer sitting time is a limiting factor of good performance in the tests, and this should be taken into consideration when assessing physical performance in long lived elderly women. **Keywords:** Physical Inactivity; Sitting Time; Performance; Brazilian.

DYNAPENIC-OBESITY AND DEPENDENT STATUS IN OLDER WOMEN

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Introduction: Dynapenia (low muscle strength) and obesity are independently associated with low physical function. Although a few studies have shown that dynapenic-obesity is associated with poor physical function, little information is known about the association between dynapenic-obesity and dependent status. The purpose of this study was to determine whether dynapenic-obesity would have a higher risk for dependence. **Methods:** This cross-sectional study included 255 older women, aged 65-101 years (77.7 ± 8.0 years). They were assigned to one of three categories: independent, frail, or dependent according to the classification criteria of the long-term care insurance system in Japan. Fat mass was estimated by bioelectrical impedance (BI) method. As a measure of muscle strength, knee extension strength and handgrip strength by dynamometer were measured. Participants were classified into four independent groups: normal, obese, dynapenic, and dynapenic-obese, based on fat mass and muscle strength (knee extension strength and handgrip strength) tertiles. Logistic regression analysis was conducted to determine whether obesity and dynapenia status had additive effects on dependent status. **Results:** Compared with the normal group, the age adjusted odds ratios (95% confidence interval) for dependent status were 10.89 (3.35-35.46) in the dynapenic-obese group, 7.03 (2.49-19.83) in the dynapenic group, and 1.98 (0.61-6.42) in the obese group as determined by knee extension strength and fat mass. When determined by handgrip strength and fat mass, dependent risk was elevated in the dynapenic-obese group (16.00, 5.06-50.57), followed by the dynapenic group (6.04, 2.07-17.62), and the obese group (0.87, 0.22-3.54). **Conclusion:** These results suggest that dynapenic-obesity is more tightly associated with dependent status as compared to obese and dynapenic groups. Handgrip strength may reflect dynapenic-obesity more than knee extension as a measure of muscle strength. **Keywords:** Dynapenic-Obesity; Physical Function; Strength; Dependence.

BODY IMAGE IN A REPRESENTATIVE SAMPLE OF OVERWEIGHT OLDER WOMEN: CORRELATIONS WITH BODY COMPOSITION AND FUNCTIONAL CAPACITY

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Purpose: To examine relationships between body composition and functional capacity according to body image in a representative sample of overweight physically active older women. **Methods:** We measured body composition (body mass, body mass index [BMI] and waist circumference [WAIST]) and functional capacity (grip strength [GS], lower limb strength [LLS], chair stand, balance, walking velocity, maximal walking velocity, cardiovascular endurance [SIP], arm curl and 30-second chair stand) on 398 overweight women (BMI > 27 kg/m²). Other 304 women were considered as control volunteers. Current (CBI) and ideal body image (IBI), and dissatisfaction (DS [current - ideal]) were determined by silhouettes (ranging from very thin [1] to very heavy [9]). **Results:** The prevalence of DS ranged from 60.2% to 82.4%. Body mass, BMI and WAIST were important predictors of DS. CBI and IBI were consistently and positively correlated with balance, walking velocity, arm curl and 30-second chair stand. There were some few significant positive correlations with DS in obesity group. Multiple regression analyses verified positive (CBI) and negative associations (DS) for balance in obesity and overweight plus obesity categories. It was also observed a positive association with walking velocity and maximal walking velocity for current (eutrophic, obesity and overweight and obesity categories) and IBI (overweight). It was also observed associations for SIP, arm curl and 30-second chair stand. In general, there was an age-mediated effect for almost all associations. **Conclusion:** Our results demonstrate that physically active older women showed an elevated prevalence of dissatisfaction regardless of BMI, which mediated by age, impacts on functional capacity; similar phenomenon seems to be expanded for current body image. **Keywords:** Body Image; Body Composition; Functional Capacity; Obesity; Dissatisfaction.

THE EFFECTS OF PHYSICAL ACTIVITY IN IMPROVING THE MUSCULO-SKELETAL CONDITIONS OF STROKE SURVIVORS

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Introduction: Stroke is a significant leading cause of mortality in Westernized countries. The prevalence of stroke is expanded with increasing age, and it leads to disability of the ageing population with musculoskeletal impairment like muscle weakness, imbalance gait, and increase fall risk. Physical activity participation is identified as one of the approaches to improve the musculoskeletal conditions apart from medication treatment. The purpose of this study is to identify the effects of physical activity in improving the musculoskeletal conditions of stroke survivors. **Methods:** Literature was searched with key words "physical activity," "musculoskeletal," and "stroke" on multiple databases. The relevant literature were reviewed and analyzed by thematic analysis. The results were summarized and presented. **Results:** Physical activity participation demonstrated positive results in improving musculoskeletal fitness and enhancing walking ability among stroke survivors. Planned physical activity programs showed significant positive effects on the balance and gait performance. It is supported that the balance ability was increased with decrease fall risk and lesser use of assistive devices for walking. Nevertheless, the ambulatory capacity, musculoskeletal contractile ability, and muscle strength are improved by regular physical activity. **Conclusion:** This study supports the beneficial effects of physical activity on the musculoskeletal

conditions of stroke survivors. It is recommended to encourage physical activity participation among stroke survivors as to minimize the post-stroke musculoskeletal disability. **Keywords:** Physical Activity; Musculoskeletal; Stroke; Balance; Gait.

EFFECT OF LIGHT EXERCISE ON MUSCULAR STRENGTH AND FUNCTIONAL FITNESS OVER 12 MONTHS IN FRAIL COMMUNITY-DWELLING OLDER ADULTS

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The purpose of this study was to determine the effect of two light-intensity exercise programs on lower body muscular strength and functional fitness over 12 months in a group of frail community-dwelling older adults. Sixty-one individuals, mean age (\pm SD) 72 (\pm 10) yr, were assigned into two groups (resistance (R) group = 32 and balance (B) group = 22). The resistance group underwent a 12-wk exercise program using an exercise band and a pneumatic exercise kit in the seated position and the balance group underwent a 12-wk program using a pneumatic exercise kit for customized balance exercise in the seated position. Both groups performed the program for 12 months. Measures of lower body muscular strength (knee extension (KE), ankle dorsal extension (AE) and flexion (AF), hip adduction (HAD) and abduction (HAB)), functional fitness (chair stand (CS)), gait speed for 10m (WT), functional reach (FR), and single leg balance with eyes open (SLB) were assessed at pre- and post-3 months and again at 12 months. Significant improvements in both groups were noted for KE, AE, and HAD muscular strength at three months and these effects were maintained at 12 months (except AE in B group). No changes were found for CS, WT, FR, or SLB. These results indicate that light-intensity exercise consisting of either resistance or balance activities is effective in improving strength among frail older adults. However, likely due to the seated nature of the exercise program, functional fitness, walking speed, and balance did not improve. The development of other light-intensity exercise programs to improve these measures in this population is warranted. **Keywords:** Resistance; Balance; Strength; Fitness; Frail.

MAXIMAL MUSCULAR FORCE RECOVERY AFTER RESISTANCE EXERCISE IN OLDER WOMEN

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The recovery of the capacity to produce muscular force, in the elderly, is a very important parameter on exercise prescription and control. However, such parameter has been poorly studied, mainly in trained individuals, particularly in the elderly. The purpose of this study was to analyze the maximal voluntary contraction (MVC) recovery, in elderly trained women after leg press exercise. Fourteen resistance trained older women (66 ± 4 years; 68.8 ± 13.3 kg; 1.58 ± 0.05 m; 27.7 ± 5.2 kg/m²) volunteered for participation. They performed two different conditions, control (CON) and exercise (EX). In both conditions, the MVC was assessed through maximal isometric effort of unilateral knee and hip extension by means of a force transducer. In the EX condition, the participants performed three sets of 15 maximal

repetitions (100% of 15 RM) of horizontal leg press exercise with 2-min rest period between sets. The evaluations occurred five min (POS 5), 24 (POS 24), 48 (POS 48) and 72 (POS 72) hours after exercise. Regarding the CON condition, the MVC was assessed in the same way of the EX condition, except the previous exercise performance. A two-way ANOVA (2x4) with repeated measures was applied in order to compare different conditions and times. The level of significance adopted was $p < 0.05$. The results were 980 ± 233 , 1015 ± 241 , 1007 ± 250 and 1020 ± 216 to EX condition and 1017 ± 228 , 1033 ± 267 , 1020 ± 253 , 1024 ± 253 to CON condition at POS 5, POS 24, POS 48 and POS 72 respectively. The statistical analysis showed no significant interaction of condition by time ($F = 0.373$; $p = 0.773$) and no significant main effect of time ($F = 2.701$; $p = 0.218$). In conclusion, resistance trained older women recover their ability to produce maximum isometric force as soon as five min after having performed three sets of resistance exercise. **Keywords:** Resistance Exercise; Muscular Force; Women.

PRELIMINARY INVESTIGATION OF JUMPING ABILITY OF OLDER ADULTS

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Much research has investigated which factors determining the loss of functional ability, particularly mobility, with increasing frailty and disability in older adults. Lower extremity muscle power has been suggested as a better predictor of mobility performance than muscle strength. A maximal vertical jump is a useful movement to measure maximal joint power capacity in a whole body movement [1] and it is an accurate and reliable movement to test power and bilateral strength deficits [2]. Studies have assessed the jump ability of older people have shown that jump ability is affected by training and related to functional ability [3]. The height of flight is related to the overall capacity of the limbs to produce movement and individual joint power output and reduced capacity at the joint can be determined [4]. Therefore it may be a useful, demanding movement to assess musculoskeletal capacity in older people. The jumping ability of older participants with low (LA) and high (HA) timed-up-and go scores and activity levels was assessed. Participants performed maximal vertical jumps on two forceplates while kinematic data was recorded using a 9-camera VICON infrared system. The LA participant did not jump as high as the HA participant. Reduced range of motion at all joints coupled with eccentric power absorbed in the lowering/ countermovement phase was evident. This was followed with reduced concentric power in the propulsion phase. This movement may prove to be a useful movement to assess joint and overall power capacity. The movement may indicate the specific joints which should be targeted in a strength and power training programme. **References:** 1. Fukashiro, S. et al, 1987. IJSM 8, 15-21; 2. Impellizzeri, F.M., et al., Medicine & Science in Sports & Exercise, 2007. 39, 2044-2050; 3. Kalapotharakos, V.I., et al., The Journal of sports medicine and physical fitness, 2005. 45, 570-5; 4. Strike, S.C. and C. Diss, Prosthet Orthot Int, 2005. 29, 39-51. **Keywords:** Jumping; Musculoskeletal; Functional Ability.

A GREATER REDUCTION IN HEART RATE COMPLEXITY DURING 6-MIN WALK TEST IS RELATED TO A BETTER PERFORMANCE AMONG ELDERLY WOMEN

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Introduction: It has been described a phenomenon of Cardiac Autonomic Resources during the execution of mental tasks, by which those who were capable of greater reducing their Heart Rate Variability (HRV) during the task (in relation to their baseline HRV) achieved a better performance (1). However, linear methods employed by Hynynen et al. (1) have been deprecated to assess cardiac autonomic control during exercise (2), whereas analysis of HR complexity seems to provide a suitable approach (3). Therefore, our purpose was to examine whether the change in HR complexity from resting to exercise condition was related to performance in a physical task among elderly women. **Methods:** 24 older women (71.4 ± 3.6 yrs) participated in the study. Heart interbeat intervals (RR) were recorded during 10 min using a Polar RS800 in a resting situation and during a 6-min walk test. Then the last 5-min epoch from resting and exercise recordings were artifact corrected and those subjects with > 3% of artifacts were excluded from the analysis. Eventually, HR complexity was quantified by means of Sample Entropy algorithm (SampEn), utilizing Kubios HRV software. Pearson correlation analysis was used to assess whether SampEn was related to distance covered in 6MWT. Previously, values of SampEn at resting condition were set at 100% and exercise ones expressed in relation to this individual 100%. **Results:** SampEn was largely and significantly correlated with 6MWT ($r = -.58$; $p < 0.01$). **Conclusions:** Our results confirmed that Cardiac Autonomic Resources hypothesis proposed by Hynynen et al. (1) is also applicable to elderly women response to aerobic efforts (i.e., 6MWT). Accordingly, a larger reduction in SampEn during the 6MWT, thus indicative of a greater usage of autonomic resources and capacity to respond to a given challenge, would enable a better performance. Hence, HR dynamics analysis during physical tasks is suggested as a way to assess cardiac autonomic response capacity among elderly women. **Keywords:** Heart Rate; Cardiac; Aerobic Fitness; Autonomic.

THE EFFECT OF TAI CHI ON MOBILITY AND STRENGTH IN LOW INCOME FEMALE SENIORS WITH ARTHRITIS

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Tai Chi is an ancient form of exercise which dates back over 500 years. Requiring slow precise movements combined with breathing techniques, tai chi is a safe exercise option for seniors. Arthritis is a prevalent disease amongst seniors which can limit and reduce their daily activities. Using tai chi would be a safe and inexpensive method to allow seniors to engage in physical activity. Little is known about the health effects of tai chi programs in a community based setting. **Purpose:** To assess the mobility and strength of female seniors with arthritis after involvement in a 12-week community based tai chi intervention. **Methods:** A total of 61 women between the age of 55-84 who have arthritis and who live in low-income urban neighbourhoods were considered for this study. Upon recruitment in the study, all participants completed physical tests including but not limited to hand grip dynamometer, sit and reach, up and go, functional reach, 30 second chair stand, and 30 second arm curls. The physical measures were then repeated after 12 weeks had transpired. Demographic characteristics such as age, race, income, education level, marital status, and gender were collected. A paired samples t-test was conducted to assess differences in pre and post means of all physical measures. **Results:** Approximately 93% of seniors earned <\$14,000 with an education of junior high or less (78%). Participants were ethnically diverse with Chinese (21%) and Guyanese (18%) being the largest groups respectively. A significant improvement was reported with an increase in handgrip strength ($P = 0.013$), up and go ($p = 0.00$),

functional reach test ($p = 0.049$), 30 sec arm curl ($p = 0.00$), and 30 sec chair stand ($p = 0.00$). **Conclusions:** Improvement in various musculoskeletal and mobility measurements illustrate that Tai chi is beneficial for seniors suffering from arthritis. Tai chi may be used at a community wide level as a safe activity to increase fitness in subjects with arthritis. **Keywords:** Tai Chi; Strength; Arthritis; Urban; Mobility.

PREVALENCE OF MUSCULOSKELETAL INJURIES IN SPANISH MASTER TRACK AND FIELD ATHLETES

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Introduction: The joining to sport competition is a current leisure physical activity among adults and elderly, even though there is a high risk of musculoskeletal injuries. The prevalence of injuries should be known in order to develop useful prevention strategies. Our purpose was to record the prevalence of injuries in elite track and field Spanish master athletes, and explore if there were risk groups (gender, modalities, or practice time). **Methods:** A cross-sectional survey was carried out during 2010 Spanish indoor championship for master athletes. One hundred ninety-four (158 males, 36 females, (35-91 years old)), from an eligible study population of 821 athletes, accepted to participate in our study. All subjects filled a questionnaire about their modalities; sport training history and musculoskeletal injuries (MEI). According with the previous data, two groups were created: (AG) aerobic group, (SPG) speed-power group. Frequencies of injuries were calculated to establish the prevalence; odds ratios were performed to estimate the risk of injury between genders, training-competition, and AG-SPG groups. **Results:** The prevalence of injuries was higher in AG than SPG ($OR = 1.4$, $p < 0.05$). Training sessions showed the highest prevalence of total cases of injury (83%). Women did not have a higher MEI risk than men ($OR = 0.3$; $p > 0.05$), and the highest prevalence was between 40-49 years. The most affected regions were hamstrings (20.4%), knee (17.66%), calf (17.16%), ankle (12.69%), and foot (8.21%). Both genders had similar injury patterns in lower limb: thigh (women, 21.42%; men 27.4%), calf (women, 20%; men 27.7%) and knee (women: 17.4%; men 18.3%). **Conclusions:** We found a higher risk of MEI on AG than SPG. Our results suggest that master athletes need be screened frequently in order to avoid regular injuries, mainly during the training. Future studies should be focused on the relationship between load training and MEI types to improve prevention. **Keywords:** Musculoskeletal; Injuries; Spanish; Athletes.

OLDER ADULTS' PERCEPTIONS AND VALUES IN RELATION TO PHYSICAL ACTIVITY

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Fife Physical Activity Strategy Group (FPASG) commissioned a study to gain a better understanding of older adults' perceptions and values in relation to physical activity and whether or not this changed with different groups of older adults (as defined in "Active for Later Life", Health Scotland 2007). 223 participants took part in the study and information was gathered using focus groups and a questionnaire (on-line and self-return). 84% of respondents were retired. In relation to the defined groups, 64% did not consider their health to affect their capacity to undertake daily living, 33% felt that they had some limits due to health

and 3% were dependent on others to help them. The study aimed to establish: 1. what was important to older adults in maintaining a healthy older life and how they valued physical activity; 2. what their perceptions were of the terminology used and what physical activity meant to them; 3. to what extent did their own and other's beliefs affect their participation in physical activity; 4. their awareness of what physical activity they should be doing to maintain health in later years. The study found that in general participants valued their health and the impact that physical activity had on this. Differences were noted between those in employment and the retired, and between different levels of dependency. As a result of the study, it was recommended that FPASG should review the messages about physical activity given by agencies to different groups of older adults, ensuring that the aspects of health that can maintain or promote health are highlighted. Attention needs to be given as to how activities can be adapted for and promoted to different groups of older adults, as does how to motivate and encourage participation. The report also recommended that a communication and promotional plan, reflecting different groups of older adults, needs to be developed, and that the training needs of service providers needs to be investigated. **Keywords:** Perceptions; Values; Physical Activity; Dependency; Focus Group.

CDSM FOR HEALTH: A DEVELOPMENTAL APPROACH FOR ACCREDITED EXERCISE PHYSIOLOGISTS AND HEALTH PROFESSIONALS SUPPORTING SELF MANAGED CHANGE FOR ADULTS

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Initiative: A priority focus in the Australian National Chronic Disease Strategy (Australian Better Health Initiative:2006) has been training in chronic disease self-management (CDSM). In 2009 Active Ageing Australia (AAA) collaborated with Ortran Self Management Solutions and the Centre For Physical Activity in Ageing to develop a Federal Government funded project CDSM for Health, a training program for 100 Accredited Exercise Physiologists (AEP) to provide CDSM support for their clients. **Aims:** Development of 1) personal professional skills 2) a professional community of practice to facilitate CDSM support 3) and implement a plan for the delivery of this training including other Allied Health professions (AHP), 4) a supporting and professionally confirming mode of interaction for AEP's, 5) to better understand the diversity of practice settings that AEP's work, 6) individuals to further deliver this training. **Methods:** An online training module was developed utilising a Moodle learning platform which was completed prior to participating in a face-to-face workshop of skill development for clinician/client interaction. The training provided the foundation for individual development within participants' own work environment. Online forum participation provided ongoing personal development and reflection opportunities. Outcomes: 1) 91 of 100 AEPs progressed to various stages of the training and development. 2) Participants completed a post training evaluation and personal development plan. Participant reflections revealed high support for the training content and methodology. 3) An evidence-based resource for effective CDSM support in a range of settings has developed and is the subject of further study. Ongoing training is continuing through AAA. **Conclusion:** The project outcomes indicated that CDSM for Health content and methodology provided a foundation for support of self-managed change in a clinical exercise setting. AAA continues CDSM development training for a range of AHP's. **Keywords:** Self-Management; Health Professionals; Training; Evidence-Based.

POSITIONING OF THE OMRON WALKING STYLE PRO PEDOMETER: DOES IT MATTER?

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Background: Pedometers are frequently used as motivational tools in interventions aiming to increase physical activity. Especially for older adults, handling of the pedometer should be as easy as possible. According to the manufacturer, the Omron Walking Style Pro pedometer can be worn not only on the waist (the usual location) but also at other locations on the body. The aim of this study was to evaluate the validity of this pedometer when worn at different locations. **Methods:** Forty subjects (20 males, 20 females) aged 37.5 ± 14.7 years (body mass index $24.4 \pm 3.8 \text{ kg} \cdot \text{m}^{-2}$) participated in the study. All participants wore the Omron Walking Style Pro (HJ-720IT-E2) pedometer on the left side of the body at the following locations: shirt's chest-pocket, waist belt, sling bag, and pant's front-pocket. One single instrument was used for all measurements to exclude any influence of inter-instrumental differences on the results. Every participant walked (self-paced) four times on an oval 400-meter outdoor track. The wearing location of the pedometer was changed (in randomized order) after every lap. To determine the actual steps (AS) taken, every lap was videotaped and analyzed for number of steps and time. For every location the intra class correlation (ICC) between AS and steps measured by pedometer (PS) and the absolute% error [APE = $(\text{PS} - \text{AS}) / \text{AS} \cdot 100\%$] was calculated. **Results:** Walking speed, stride length and AS did not differ between the four wearing locations. ICC (95% confidence interval) between AS and PS was 0.990 (0.980; 0.995) for the shirt pocket, 0.989 (0.980; 0.994) for the waist belt, 0.988 (0.976; 0.994) for the sling bag, and 0.968 (0.941; 0.983) for the pant pocket. APE was $-0.35 \pm 0.92\%$ for the shirt pocket, $0.03 \pm 1.03\%$ for the waist belt, $-0.35 \pm 0.99\%$ for the sling bag, and $-0.22 \pm 1.80\%$ for the pant pocket. **Conclusion:** The tested pedometer can accurately count steps during self-paced walking when worn at different locations on the body. **Keywords:** Pedometer; Walking; Positioning; Steps.

OLDER ADULTS' PERCEPTIONS OF NORDIC WALKING AND ITS LONG-TERM EFFECTIVENESS ON PHYSICAL ACTIVITY BEHAVIOUR

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This study examined older adults' perceptions of Nordic walking and its long-term effectiveness on physical activity behaviour. Retrospective telephone interviews regarding a Nordic walking programme completed eight months previously were conducted with 78 older adults aged 50-85 years. It was established that 81% of the participants self-reported currently engaging in regular physical activity, with 44% of those still participating in Nordic walking. Interview data were inductively analysed and overall themes relating to perceived benefits of Nordic walking were established: gain physical benefits; mastery experience and social interaction. Overall older adults' perceptions of Nordic walking were positive, suggesting that Nordic walking is considered a feasible and appropriate activity. Social validation findings suggest that future design and delivery of Nordic walking programmes should consider inclusivity of older adults who reside in nursing homes as these individuals could gain additional benefits from Nordic walking yet are currently a hard to reach sub-group. **Keywords:** Perception; Nordic Walking; Physical Activity; Interviews.

PHYSICAL ACTIVITY AMONG OLDER ADULTS WITH SIGHT LOSS: A QUALITATIVE RESEARCH STUDY TO INFORM POLICY AND PRACTICE

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In light of an ageing, largely inactive population and decreasing budgets for health and social care the promotion of healthy ageing through regular physical activity is a government priority. The Department of Health physical activity recommendations and indeed the aforementioned policy initiatives are relevant to older adults with sight loss as their sighted peers. However, like research in general, they have little to say about the involvement of older adults who are experiencing late onset sight loss, nor how their participation can be facilitated. The absence of this population within current policy recommendations and research is especially alarming because what with there is shows that visually impaired older adults, in general, have poorer general health than the sighted population. Also important is the fact that we policy makers, organisations, and so forth cannot assume that what is known about one population (e.g. older sighted people/young physically active/young visually impaired people) can simply be transported into recommendations for promoting physical activity among another (e.g. older adults with sight loss). The proposed research therefore responds to our lack of knowledge by examining the following: 1) What does it mean to be physically (in) active when living with late onset sight loss in older age?; 2) Why do some visually impaired older adults adopt and maintain a physically active lifestyle when others may not?; and 3) How is physical activity accomplished (or not) within the context of everyday life? Results are discussed in light of theories within social gerontology and the sociology of ageing. **Keywords:** Physical Activity; Vision; Policy.

SPECIFICS OF THE TRANSITION PERIOD AND ITS IMPACT ON THE DEMOGRAPHICS OF THE ELDERLY

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Introduction: Although the elderly take up a small proportion of the population of Kazakhstan, this group uses considerable economic and medical resources. The aim of the study is to investigate the age and gender characteristics of the population of Kazakhstan during 2002-2009. **Methods:** We used the statistics collected by the Ministry of Labour and Social Welfare of the Republic of Kazakhstan. **Results:** The process of demographic aging had different consequences for men and women. The percentage of elderly women exceeds that of elderly men, especially at older ages. In 2002, there were 4.8% of persons aged above 65 years among men but 9.1% among women. In 2009, the percentages were 5.4% and 9.5%, respectively. At this time, for every 1,000 elderly men, there are 1,870 elderly women. In 2002-2007, with increasing age, the female-to-male ratio increased in the age groups of 65-74 years, while in the age groups of 75-84 years, this ratio becomes less extreme. Several peculiarities have been observed when comparing middle-aged men and women residing in urban and rural areas. Specifically, the average age of urban residents did not significantly change from 2003 to 2009. However, there was an increase in the average age of rural residents from 30.4 to 31.4 years among women and from 28.1 to 29.3 years among men. **Conclusions:** This study shows that in terms of the aging processes, Kazakhstan is situated between developed and developing countries. Aging-associated problems should be dealt

with by integrating the programs of social welfare, health care, education, and employment.
Keywords: Demographics; Rural; Urban; Kazakhstan.

PREDICTORS OF PHYSICAL ACTIVITY IN A 1-YEAR FOLLOW-UP AMONG FRENCH OLDER ADULTS: A PROSPECTIVE STUDY

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Introduction: Maintaining a physically active lifestyle is a hard to achieve behaviour. This behaviour can be influenced by several variables, including socio-demographic, physical, psychological, social, environmental, and cultural aspects. The purpose of the present work was to examine the importance of several variables in determining the level of physical activity in a 1-year follow-up among French older adults. We particularly examined the direct and indirect roles played by physical function decline in determining physical activity (PA). **Methods:** Participants were 168 women and 99 men, aged 70.7 ± 7.3 years-old, and who were covered by the medical insurance of the French National Education System. They completed a self-report questionnaire on PA and general health twice, at a year's interval (postal survey). Multinomial logistic regressions with PA level as the dependent variable were performed. **Results:** Physical function predicted PA level: the higher the declines on physical function, the lower the probability of having a high level of PA compared to a low level. When physical function decline was dropped from the model, age and satisfaction with body functioning were the only predictors of the level of PA. Physical function decline modulated the associations between PA level and each of the following variables: age, sex, and satisfaction with body functioning. **Conclusions:** Physical function decline is an important predictor of PA level one year later among older adults. Satisfaction with body functioning is possibly a relevant predictor of PA among persons who do not have declines on physical function. Interventions that help older adults to avoid decreases in physical function (other than PA, such as pain and disease management – cataract surgery, for example) would probably promote a physically active lifestyle in this population. **Keywords:** Physical Activity; Physical Function; Satisfaction; Sex.

IMPLEMENTATION OF ACTIVE AGEING MODEL TO IMPROVE SOCIAL SUPPORT IN COMMUNITY DWELLING ELDERLY

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Introduction: The WHO promotes health and well-being throughout the life course; Elderly are defined as people over 65 years of age (WHO). The 2001 census has shown that the elderly population of India accounted for 77 million. While the elderly constituted only 24 million in 1961, it increased to 43 million in 1981 and to 57 million in 1991. Social integration and participation of older adults in society are frequently seen as indicators of productive and healthy aging and it is widely accepted that social support has a strong protective effect on health. **Need of Study:** A better understanding is needed of the prevalence of social support in community dwelling elderly in India. And whether the active ageing model can provide social support Place, Type of the study Chattarpur, Delhi Prospective non-randomized unblinded experimental study Duration, sample size 12 months, 300 elderly. Inclusion Criteria: Elderly (above 65 years) willing to participate; Ability to read/write either English or Hindi. Exclusion Criteria: Elderly /subjects totally dependent for their activi-

ties of daily living requiring institutional support and care; MMSE < 23. **Methodology:** Collaborate with a senior citizen organization. Identify health issues. Distribute books on Health Awareness. Conduct workshops on health issues. Select of leaders from the targeted group of elderly. Form groups (members and leader). One to one home visits by health professional. Demonstrate physical exercises. Depression, social support, and QOL will be measured by GDS, SNQ, WHOQOL. Monthly group activities. QOL monitored twice in 6 months time. **Conclusion:** The study would help frame work policies for Indian elderly that may constitute a feasible alternative for substituting the current situation. **Keywords:** Social Support; Policy; Health Awareness; Quality of Life.

SENIORENGAGE: PROJECT CONNECTS SENIOR AND YOUNG PROFESSIONALS

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Demographic change brings many challenges to face in labour market. More and more seniors with good health are retiring, which means e.g. losing valuable tacit knowledge. SENIORENGAGE -project addresses the need to help retired senior professionals retain their sense of self-worth and continue to participate in society in the post-retirement years by developing network of online knowledge sharing and community. The current project is financed by the European Commission EU-Ambient Assisted Living (AAL) Joint Programme “ICT based solutions for Advancement of Social Interaction of Elderly People.” The main objective of SENIORENGAGE is to provide a tool by which seniors and new professionals may network with each other. SENIORENGAGE platform will allow senior professionals to continue their professions by mentoring younger generations through shared knowledge and expertise. Seniors will also be able to continue to be in contact with their profession by interacting with other seniors from their field and to form interest groups based on e.g. hobbies and professions. SENIORENGAGE platform is made up of two main modules with the aim to promote intergenerational education and cooperation. An E-learning tool will deliver a step-by-step course on the basics of use of the Internet and a Professional Self-Worth Network will allow senior professionals to continue their professions. **Keywords:** Demographics; Social; E-learning.

SENIORS' PLAYGROUND AND PHYSICAL ACTIVITY: PERCEPTIONS AND PRACTISES

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Objective: The seniors' playground was created for elderly people in order to promote physical activity in this age group and therefore an active aging. This study aims to explore the elderly perception on the seniors' playgrounds, see how this population uses these structures, the reasons that lead them to use it and their practices. **Methodology:** This is a descriptive research and the process of selecting the sample group was non-probabilistic and for accident. The sample consists of 60 people, 30 of which are users of seniors playground and 30 nonusers. The study was developed in two parks situated at Aveiro district (Cacia

and Gafanha da Nazaré) and the methods of data collection were the questionnaire and non-participant observation. **Results:** It was found that the elderly who use the playground, most do it occasionally, driven by improved health and physical condition. It could be once a week or even once a year. They don't show a routine. It was also found that the questioned elderly that use those playgrounds, most stay there 6–20 min. On the other side, the most elderly who doesn't use the senior playground it's because they don't identify with the type of equipment. We also found that the people observed were mostly children and adults. At the group of 129 observed persons, only 8 of them were older adults. **Conclusions:** The perception of the elderly, which consist the sample, about the seniors' playground is quite positive; however, it seems that they don't use it too much. According to the answers, seniors don't use the equipment very often and don't remain too long. **Keywords:** Playground; Physical Activity; Perceptions; Seniors.

LAGOS MUNICIPALITY PROGRAMME: EUROPEAN YEAR FOR ACTIVE AGEING AND SOLIDARITY BETWEEN GENERATIONS

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The municipality of Lagos will get involved in European year with a transversal programme of activities for promote active ageing and solidarity between generations. The first step was the constitution of a work team from several areas (sports, urban environment, education, social communication, Red Cross delegation, social assistance). This team will prepare the open day programme with a symposium and a participation of all the institutions that work with or for the elderly people and children. The second step was the promotion of a workshop of using the computer and the web for the elderly because all the activities information will be online. There is a website created by a municipality programme to everyone who wants to get active up to forty years old that was explained at the workshop (www.saudeemmovimento.org). The presentation will show the results of the programme and how people from Lagos get involved. An active municipality in a shining environment where everyone was taken into account. **Keywords:** Active Ageing; Generations; Municipality.

HAND GRIP ENDURANCE CANNOT BE USED AS A SURROGATE FOR QUADRICEPS ENDURANCE IN HEALTHY YOUNG ADULTS

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Background: Grip strength has been widely used as an indicator of whole body muscle strength but knowledge of grip endurance is lacking. Grip strength is known to decline more slowly than lower limb strength with ageing. Comparison between upper and lower limb muscle endurance has received little attention. The present study investigated the endurance of handgrip and quadriceps in young adults prior to studying the effects of ageing. **Methods:** Twenty-one healthy participants (13 males and 8 females) aged between 18–35 years (mean 23.5; SD± 1.4) were studied. Endurance testing consisted of 12 maximal intermittent contractions of 3 seconds duration, separated by 5-second rest periods. A Biodex isokinetic dynamometer and a Jamar dynamometer were utilised to measure quadriceps and grip endurance respectively. Fatigue index values were calculated for both muscle groups by: peak force of contraction 1 minus contraction 12, divided by peak force of the first contraction multiplied by 100. A repeated measures analysis of variance was used to document the

decline in force. Post hoc analysis by Bonferroni testing was used to identify where significant differences occurred. **Results:** Quadriceps and grip strength showed a significant decline in force during the 12 repetitions ($p < 0.05$). The most significant decline occurred on the 8th repetition ($p = 0.049$) during the quadriceps test and on the 2nd repetition ($p = 0.015$) during the grip test. Grip showed a higher mean fatigue index of 28.6% in comparison to that of quadriceps (18.1%). **Conclusions:** Grip showed a more rapid rate of fatigue than quadriceps during a maximal contraction protocol, which is a clinically feasible method of assessment. Studies of submaximal contractions and comparison with older participants are needed. The present findings indicate that caution is warranted when using grip measures as a surrogate for lower limb muscle function. **Keywords:** Endurance; Young; Dynamometer; Quadriceps.

INTEGRATION OF AN AUTOMATIC INDOOR AND OUTDOOR ACTIVITY MONITORING WITH A SOCIAL NETWORK

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Loneliness and insecurity are major motives that contribute to a decrease in independence while ageing. This work aims to develop a support mechanism for situations when an elder reaches unsafe geographical areas and need to contact his/her trusted persons, integrating sensor information within a dedicated social network. This integration will allow the provision of Informal Care services to elderly people and promote a more independent live. The general concept is to follow the person's location based behavior, using the sensors on his mobile device and various hotspots in his/her social environment, and provide relevant information to a selected group of people within the elder social network. The secure GPS-based outdoor support functionality is automatically enabled, to guide the user until his/her destination. The trespassing of pre-determined areas, previously indicated as being safe will trigger an alarm event that is broadcasted to the social network, alerting all the contacts in a list of emergency contacts. The indoor tracking will be made using Wi-Fi and Bluetooth. In case of an alert, the automated decision making functionality request each emergency contact position and availability, and notify the other contacts and the elder about who should provide the required assistance. In terms of technical impact, the work addresses the challenge of providing a distributed system that targets a collaborative behavior between mobile agents in case of an alarm situation is triggered. A key contribution of this solution is the ability to merge together the three dimensions of mobile, social, and sensing streams to generate a highly context-aware output. Attending to the social aspects, the use of ICT technology enhance the quality of life for older individuals who would otherwise lead solitary and inactive lives at home. The adoption of such a monitoring system could increase the elder independence and provide reassurance of safety conditions for the caregivers. **Keywords:** Measurement of Activity; Independence; Social Network; Technology.

RISK COMMUNICATION AND RISK PERCEPTION: BEHAVIOR OF THE AGING SOCIETY IN THAILAND

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This study aims to clarify the approach to educate and prevent potential risks to Thai elders through the risk communication process on health risk and disaster risk of floods. The main objective of this study is to analyze relationships between the risk communication channels and risk perception and behaviour of the elderly, who lives in different areas; rural communi-

ties, urban communities, and slum communities. Methods of research used qualitative and quantitative research through a questionnaire survey based on a random sampling technique with 125 elder respondents and an interview with other 208 respondents, who were involved in risk communication. The results showed that Thai elderly had learnt about risks through communicating with family rather than with mediated communication, community activities and neighbours. The current risk communication processes were effective at raising awareness of Thai elders moderately, whereas the elderly was aware of disaster risk relatively low level. Nevertheless, the most effective risk communication channel for raising awareness and motivating the elderly to perform protection measures was the communication through social network contagion approach in the neighbourhood and community level. To enhance awareness and stimulate the motivation to reduce risk, the development of risk communication among the elderly should be based on the participation of the community prevailed. **Keywords:** Risk Communication; Urban; Rural; Perception; Thailand.

OLDER WOMEN AND THEIR PARTICIPATION IN SPORTS AND RECREATIONAL PHYSICAL ACTIVITY: ENABLERS, BARRIERS AND THE ROLE OF WORK

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This study contributes to the wider policy debate that is concerned with the promotion of active ageing and the extension of working lives. These policy aims have gained prominence in many industrialised countries because of population ageing. Within this context, the research explores the factors that enable, motivate, and constrain the participation of older women in sport and other physical recreational activities. In this investigation, the role of employment is given particular attention. Theoretical considerations suggest that there are potentially both positive and negative links between participation in activity and participation in paid work. These relationships are explored using both quantitative and qualitative methods. The quantitative analysis uses data from 18 waves of the British Household Panel Survey and three Sport England Active People Surveys. The qualitative research involved interviews with key stakeholders and women in their 50s, 60s, and 70s. The research confirms that in most cases participation in recreational activity declines with age and is negatively related to participation in employment but there are exceptions. The strength and direction of these relationships varies according to factors such as type of employment, reason for not working and level and type of activity. Gender and gendered roles such as caring are also a factor as are psychological aspects linked to age. These findings suggest that the attitudes of older women toward physical activity are complex and individualised. They are shaped and influenced by a range of factors incorporating psychological, social, environmental, and economic aspects. **Keywords:** Sports; Physical Activity; Barriers; Work.

GERONTOLOGICAL REHABILITATION IN FINLAND: REHABILITATION GOALS OF ELDERLY CLIENTS WITHIN AN ICF CONTEXT

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Introduction: The study focuses on a R&D project, funded and coordinated by the Social Insurance Institution of Finland (IKKU 2009-2012), which involves 60 rehabilitation courses (à 8 clients, 74+), 6 rehabilitation centres and 21 municipalities. The multidisciplinary gerontological rehabilitation was intended to maintain functioning and enhance the inde-

pendence, meaningful living of older inhabitants in home settings, and their participation in society. The focus of project was to enhance the client-centred approach to treating the elderly by supporting an individual professional tutor and a peer client group. There are I-III study parts in the project. **Aims (Study II):** The first aim was to analyse the effectiveness of multidisciplinary gerontological rehabilitation by using the scale of an applied GAS method (Goal Attainment Scaling). The second aim was to analyse how the intervention goals for older clients are covered by using the ICF classification (WHO 2001). **Data and Methods:** Sample of 126 clients participated in 18 courses, took place in six centers at three different periods of time in 2009-2012. The content analysis was done by Cieza et al. (2002) based on the ICF classification. **Results:** According to the preliminary results, approximately 75% of clients reported they met their rehabilitation goals fairly well, well or very well during the rehabilitation process, lasted one year and entailed three assessment points using an applied GAS scale. The rehabilitation goals were covered mainly by levels of the ICF classification. **Conclusion:** Older Finnish inhabitants who live in their homes have multi-dimensional rehabilitation needs including risks to their health, functioning, and participation. The preventative rehabilitation is effective when the rehabilitation goals are formulated by the clients themselves. In the future client-centred, goal-oriented gerontological rehabilitation must be facilitated with innovative rehabilitation procedures and products. **Keywords:** Gerontology; Rehabilitation; Goals; Finland.

OBJECTIVE AND SUBJECTIVE EVALUATION OF SELECTED FORMS OF PHYSICAL ACTIVITY OF OLDER PEOPLE

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Introduction: Accurately measuring physical activity is a complex task. Although self-reported PA and subjective methods are useful in research that involve large number of people but in the group of elders they are not always reliable. Health status, mood, depression, and fear have big impact on answers. There is growing use of devices to measure physical activity. The purpose of this study was to evaluate four forms of physical activity for older people that are most popular in Poland "C Nordic Walking, gymnastic, Tai Chi and dance. **Material and methods:** In the study participated seniors from University of Third Age (Jozef Pilsudski University of Physical Education, Warsaw) with the age ≥ 60 years old. The study involved three devices: IDEEA, ActiGraph GT3X+ and SenseWear Pro3 Armband. The measures with the use of devices were done during classes and all participants evaluate them with the 20-point Borg Scale. **Results:** The forms of physical activity differ a lot in the subjective and objective evaluation. The highest values of all parameters measured were reached during Nordic Walking and the lowest during Tai Chi. **Summary:** There is a need to define, which of the form proposed for elderly is the best for keeping them independent in everyday life. Measures should be done on bigger group and on other forms of physical activity that are recommended for older people. **Keywords:** Physical Activity; Evaluation; Objective; Nordic Walking; Tai Chi.

LIFESTYLE AT MIDLIFE PREDICTIVE OF INDEPENDENT LIVING AT OLD AGE?

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Objectives: We investigated the role of lifestyle factors at midlife in relation to independent living at old age in a cohort study with a follow-up time of 21 years. **Setting and Participants:** The study population was a random subcohort from the Netherlands Cohort Study (NLCS) aged 55-69 years at baseline in 1986 ($n = 4405$). **Measurements:** Independent living was assessed as: 1) ability to perform activities of daily living (ADLs) assessed in 2000, and 2) use of formal care (home care, institutionalized care), obtained through linkage with a nationwide insurance-based care registry, available for 2004-2007. Lifestyle (diet, physical activity, smoking, and BMI), age, education, and presence of chronic diseases (all measured in 1986) were used as independent variables in logistic regression with outcomes well-functioning and non-use of permanent formal care. **Results:** For men, current smoking was the only statistically significant lifestyle factor to reduce functioning (OR: 0.43, 95%CI: 0.32-0.58). In women, current smoking (OR: 0.64, 95%CI: 0.44-0.94), being overweight (OR: 0.77, 95%CI: 0.62-0.96) or obese (OR: 0.30, 95%CI: 0.18-0.48) reduced functioning, whereas physical activity (p trend 0.03), dietary saturated fat (OR per en% fat: 1.04, 95%CI: 1.01-1.08), and fruit consumption (p trend 0.01) enhanced functioning. Current smoking enhanced use of care in men (OR: 0.47, 95%CI: 0.32-0.70) and being an ex-drinker in women (OR: 0.34, 95%CI: 0.13-0.94). Adding ADL as independent variable did not change the ORs of the lifestyle variables, although having problems with ADL enhanced care use in men (OR: 0.57, 95%CI: 0.40-0.82) and women (OR: 0.39, 95%CI: 0.29-0.53). **Conclusion:** Not smoking is the main determinant of independent living in men, even after adjustment for chronic disease. In women, other lifestyle determinants besides smoking, i.e. physical activity, diet and BMI are also important. **Keywords:** Lifestyle; Independent; Smoking; Physical Activity.

ADHERENCE TO PHYSICAL EXERCISE RECOMMENDATIONS IN PEOPLE OVER 65: THE SNACKUNGSHOLMEN STUDY

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Purpose: To assess participation in health and fitness-enhancing exercises in people aged over 65, and to explore whether the possible differences in meeting current recommendations by age, gender and education could be explained by health status, lifestyle and physical performance. **Methods:** The study population was derived from the Swedish National study on Aging and Care, and consisted of a random sample of 2593 subjects, aged 65+ years. Baseline data were collected between 2001 and 2004. Participation in health- and fitness-enhancing exercise according to the WHO and the American College of Sports Medicine's recommendations in relation to demographic factors, health- and life-style factors, and physical performance was evaluated using multinomial logistic regression. **Results:** According to the recommendations, 46% of the participants fulfilled the criteria for health-enhancing and 17% for fitness-enhancing exercises. Advanced age and low education were negatively related to participation in both health and fitness-enhancing exercise independent of health and life style factors. Walking speed explained the association between age and health-enhancing exercise as well as between education and fitness-enhancing exercise. **Conclusions:** The majority of the participants aged 65+ did not meet the recommended level of exercise. Promoting physical exercise and encouraging participation, especially among older subjects, lower educated and with initial functional decline as shown by slow walking speed may help to reduce adverse health outcomes. **Keywords:** Adherence; Exercise; Demographic; Function.

ISSUES IN PHILIPPINE AGING POPULATION (WITH COMPARATIVE NOTES ON JAPAN)

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Introduction: In developing countries, like the Philippines, identifying present issues and problems among older persons (OPs) are of significance to better address their needs (specifically on physical activity promotion and leisure) and as bases for institutionalizing directions and strategies. Further, learning from the experiences of advanced countries like Japan could assist leaders on the nature and content of programs toward active aging. **Methods:** Research situ was Sariaya Quezon (rural) and Quezon City (urban) with data gathered in 2009 on policies, activities and services (interview, ethnographic observations, visitations); leisure activities (questionnaire); functional fitness tests. Comparative notes on Japan applied similar methods (in 8 districts). **Results:** As primary source of care is the home Filipino OPs generally engage in light PA around one's abode with few communities providing for the leisure time needs of the OPs (generally social in nature due to lack of physical activity leaders). More involved in ADL the rural OPs have higher levels of functional fitness. Community services are centered on primary medical needs. Day cares and homes are available only to those who are financially independent. These and a dearth on information regarding different aspects of healthy lifestyle maintenance, limitations in active aging organizational process and structure in the Philippines are notable. In contrast, in Japan (with its institutionalized policies and guidelines), varied programs and services to maintain and improve the quality of life of older persons in communities are realized. **Conclusion:** Population aging demands a national policy that should specifically state in its service delivery the need to institutionalize leisure education and leadership towards active aging. A holistic OP program with basic benefits and services from medical to recreational needs, IEC campaign and a coalition of stakeholders (with PA specialists) is needed. **Keywords:** Rural; Urban; Philippines; Quality of Life; Active Aging.

STRATEGIES TO REACH AND RECRUIT SEDENTARY OLDER ADULTS WITH A LOW SOCIOECONOMIC STATUS

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Background: A low socioeconomic status is related to unhealthy lifestyle characteristics and health disparities. However, these target groups are difficult to be recruited for interventions and intervention studies. Therefore, appropriate and effective strategies are needed to reach and recruit older adults with a low socioeconomic status for participation in lifestyle changing interventions. **Methods:** We combined multiple strategies to recruit sedentary older adults (>64 years) in a low socioeconomic neighborhood. Aim of this recruitment strategy is to reach all sedentary older adults, including social isolated and care avoiding older adults and to recruit as many as possible in our intervention study. First, older adults (n = 719) received a letter with an invitation to participate in the intervention program. Secondly, these older adults were visited at home. During these door-to-door visits, sedentary older adults were selected and informed about the project. Thirdly, a back door method was used: key peers from the neighborhood helped to make contact. Finally, a network method was used to recruit sedentary older adults: local professional organizations, like churches, social welfare

organizations, primary care and home care organizations, and ethnic associations, referred subjects. **Results:** In total, 719 older adults (>64 years) received a letter with an invitation to participate in the intervention program. Overall, 422 persons were visited at home. During these home visits, 80 older adults declared to participate (seven persons withdraw after registration). By use of the back door and network method, 30 older adults were recruited. In total, by the use of the multiple recruitment strategy, 14.3% of the announced elderly participated in the intervention program. **Conclusion:** A multiple recruitment strategy seems beneficial to recruit sedentary older adults in deprived neighborhoods for lifestyle changing interventions. **Keywords:** Sedentary; Socioeconomic; Intervention; Deprivation.

SELF-REPORTED HEALTH AND EDUCATION ARE ASSOCIATED WITH HIGHER PHYSICAL FITNESS IN ELDERLY PEOPLE

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Introduction: ageing process is accompanied by a decrease of physical fitness levels. The latter may lead to reduced quality of life among elderly people. This study aimed to identify potential factors for having good levels of fitness in order to develop future strategies to guarantee a successful aging. **Methods:** 724 men and 2412 women (aged 72.2 ± 5.3) were evaluated in Spain within the framework of the elderly EXERNET multi-centre study. A structured validated questionnaire was performed in all subjects. Education level and self-reported health variables were included in this report. The first one was classified into: higher education (including university studies and secondary school) and low education levels (primary school and non-educated people), whereas EQ5D questionnaire was used to assess the health related quality of life. Lower-body strength, agility, walking speed and endurance were evaluated using four different test modified from the Senior Fitness Test and Eurofit Testing Batteries. Three different categories were created for each fitness test based on the calculated scores. Age-adjusted logistic regression was applied to study the probability to have better results of fitness depending on the education level and/or health perception. **Results:** For men and women together, better perceived health was associated with higher physical fitness performance (highest tertile) by 2.5, 2.6, 2.4 and 2.5 times, lower-body strength, agility, walking speed and endurance, respectively (95% CI [(2.043-3.071); (2.073-3.153); (1.905-2.924) and (1.998-3.056)]). In women, the odds ratio of having higher levels of fitness was increased by 18, 58, 108 and 65% in those with higher education levels while in men the odds ratio were increased by 6, 65, 126 and 37% (respectively in the mentioned physical fitness test). **Conclusion:** An enhanced subjective health perception and higher education levels seem to be associated to better physical fitness levels among elderly people. **Keywords:** Fitness; Education; Quality of Life; Perception.

BREATHING EXERCISES IN THE PREVENTION AND SELF MANAGEMENT OF THE CONDITIONS ASSOCIATED WITH OLD AGE

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Introduction: Pulmonary function, as measured by spirometry (FEV1 or FVC), is an important predictor of morbidity and mortality in elderly persons. It is independent of gender or smoking history. Yoga has been practiced in India for more than 5000 years and is gaining increasing popularity in the West. Commonly performed yoga exercises include asanas (physical postures), pranayama (breathing exercises), and meditation. This poster illustrates several easy to perform breathing exercises that should improve lung function in the elderly. **Methods:** Several breathing techniques were reviewed from yoga texts and other publications on PubMed. Seven simple breathing exercises with the most benefit, ease of learning and general safety for seniors were picked for this poster presentation. Results: The following seven breathing techniques may be beneficial for the elderly. Except for pursed lip breathing, the rest are well described in the yoga texts. These exercises will be described in more detail, including their mode of performance and benefits in the poster: 1. High, middle, and low (complete) breathing 2. Alternate nostril breathing 3. Pursed-lip breathing 4. Humming breathing 5. Step breathing 6. Meditative breathing 7. Peaceful breathing. **Conclusion:** Decreased pulmonary function, as evidenced by a reduced FEV1, is an independent marker for cardiovascular mortality. The breathing exercises listed above are simple to learn, easy to perform and virtually free of any harmful effects. Their practice has been associated with excellent adherence. Regular performance of these exercises will help improve pulmonary function in the elderly. **Keywords:** Breathing; Yoga; Pulmonary Function; Cardiovascular.

MEDITATION IN THE PREVENTION AND SELF MANAGEMENT OF THE CONDITIONS ASSOCIATED WITH OLD AGE

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Introduction: Meditation is a part of religious and spiritual traditions of many ancient cultures. It has been practiced for thousands of years in the East. Its popularity in the West has steadily grown mainly because of its ability to impart mental calmness and induce physical relaxation. Meditation involves using certain techniques, including specific postures and focused attention, resulting in psychological balance. However, during the past several decades, a number of scientific studies have emerged documenting major cardiovascular and other benefits associated with its practice. **Methods:** All recent abstracts and articles on meditation and medical diseases available on PubMed and other reference sites were reviewed. Meditation techniques of clinical practicality were picked up for this poster presentation. These techniques will be addressed in detail in the poster. **Results:** The following five simple meditation techniques are easy to perform by seniors 1. Flame Focus Meditation 2. Deity Focus Meditation 3. Chanting Meditation 4. Prayer Meditation 5. Breath Meditation 6. Bead Meditation Side effects: There are rare cases of worsening of psychiatric problems in known mental patients. **Conclusion:** The practice of meditation has many potential health benefits. There is an improvement in high blood pressure, reduction of atherosclerosis and an improvement in life quality in patients with chronic heart failure. There is a reduction in total cardiovascular, cancer and general mortality with its practice. It improves psychologi-

cal balance. Meditation is easy to learn and perform. There are no known adverse effects.

Keywords: Meditation; Self-Management; Cardiovascular.

PROPRIOCEPTION AND FUNCTIONAL DEFICITS OF PARTIAL MENISCECTOMIZED KNEES IN ACTIVE MIDDLE-AGED PEOPLE

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Purpose: The purpose of the present study was to assess the proprioception and muscle function of the partial meniscectomized knee through balance and functional tests at least 12 months posterior to arthroscopic surgery in active middle-aged people. **Methods:** Twenty-six patients who fulfilled the inclusion criteria participated in the study. All patients performed balance and functional tests. On the balance system recorded the deviations from the horizontal plane, on the balance boards their performance was timed, and at the functional test triple jump their performance recorded in meter. One-way ANOVA used to determine significant differences between the healthy and injured limb. The level of statistical significance was set at $p < 0.05$. **Results:** The results revealed significant differences ($p < 0.05$) between the healthy and injured limb at all balance and functional tests performed. The present study demonstrated that 1-2 years after partial meniscectomy active middle-aged patients had reduced proprioception and knee muscular ability in the operated leg compared with the non-operated leg. **Conclusions:** It is concluded that these deficits significantly affect objective knee function, indicating the importance not only of the restoring muscle function but also of the proprioception ability in partial meniscectomy middle-aged patients. **Keywords:** Proprioception; Meniscus; Balance; Function.

AQUATIC THERAPY VERSUS CONVENTIONAL LAND-BASED THERAPY FOR ACTIVE MIDDLE-AGED PATIENTS WITH A PARTIAL MENISCECTOMIZED KNEE

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Purpose: The purpose of the study was to investigate the effectiveness of two different functional training programs (land versus water) on balance, strength, and functional ability in meniscectomized arthroscopic active middle-aged patients. **Methods:** Thirty-six partially meniscectomized active middle-aged patients (after 1-2 years) were randomly divided into three groups, twelve individuals in each. One subject group underwent no specific training (control group). The remaining two groups followed two different intervention functional programs for 12 weeks, 3 times per week, 50 min per session. One of the two training groups performed the functional program out of the water (land-based) and the other in the water (water-based). Before the beginning and after the completion of functional programs, all subjects performed a) balance tests on the balance system (deviations from the horizontal plane) and balance boards (time on balance), b) strength test (quadriceps and hamstrings peak torque) and c) functional test; triple jump. **Results:** According to the two-way repeated measures ANOVA (3x2), in the Control group no difference ($p > 0.05$) was found between pre-training and post-training of the injured leg. In contrast, in the Land-based and Water-

based groups, both functional training programs on the injury leg improved ($p < 0.01$) all the performance indicators examined. The Paired-samples t-test indicated that in post-training for both training groups (Land-based and Water-based) no differences were found between the injured and healthy leg ($p > 0.05$). **Conclusions:** it seems that knee functional exercise programs are essential to active middle-aged meniscectomized patients. Both Land and Water-based exercise programs almost equally cover any knee functional deficits. **Keywords:** Aquatic Therapy; Land-based Therapy; Meniscus; Balance; Strength.

BLOOD-BORNE BIOMARKERS OF MORTALITY: A SYSTEMATIC LITERATURE REVIEW OF PROSPECTIVE COHORT STUDIES.

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Background: Lifespan and the proportion of older people in the population are increasing, with far reaching consequences for the social, political, and economic landscape. Unless accompanied by a simultaneous increase in health span, the associated increase in age related disease will burden health care resources. Physical activity intervention can be used to improve health span. The LiveWell Programme is an ongoing research programme which aims to develop lifestyle interventions to promote health and wellbeing in later life. Intervention studies need appropriate outcome measures and blood-borne biomarkers are potential outcome measures for such interventions because they are easily obtainable, cost-effective, and are widely accepted tools in clinical practice. There have been no previous systematic reviews of blood-borne biomarkers of longevity. **Aims:** To conduct a systematic literature review to identify blood-borne biomarkers of longevity which could be used as outcome measures for LiveWell and other physical activity interventions. **Methods:** A rigorous search strategy was devised. Four databases (Medline, Embase, Scopus, Web of Science) were searched for suitable prospective cohort studies and 9 which fulfilled the selection criteria were accepted for data extraction. Quality of the studies was assessed using the Newcastle-Ottawa Scale. **Results:** Higher levels of C-reactive protein (CRP; $p < 0.001$), non high-density lipoprotein cholesterol (non HDL-C; $p < 0.05$) and N-terminal pro-brain natriuretic peptide (NT-proBNP; $p < 0.001$), and lower levels of high-density lipoprotein cholesterol (HDL-C; $p < 0.02$) predicted mortality risk. **Conclusions:** These biomarkers should be considered for use as outcome measures in future physical activity intervention studies. The low number of studies found highlights the need for further biomarker research using standardised protocols and reporting methods. **Keywords:** Biomarkers; Mortality; Physical Activity.

THE ASSOCIATION OF DISABILITY AND CO-MORBIDITY WITH FRAILTY

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Frailty, disability, and co-morbidity clearly are linked. Even so, some researchers recommend against including disability and co-morbidity as frailty markers. Others recommend against excluding items of the frailty definition a priori, as long as each item increases with age and is associated with adverse outcomes. Examining how frailty, disability, and co-morbidities co-occur remains to be elucidated. **Purpose:** To estimate the proportion of frail participants experiencing disability and co-morbidities and to examine whether such items should be included in the Frailty Index (FI) in order to predict mortality risk. **Methods:** 2305 community-dwelling adults (874 men, 1431 women) aged 65+ from the second

wave of the Canadian Study of Health and Aging comprised the study sample. Frailty was defined using both the frailty phenotype and the FI. Following a standard procedure, two 37-items FI were constructed. One version included disability and co-morbidity items, the other excluded them. **Results:** The proportion of frail participants who had neither disability nor co-morbidity was 3.6% and 8.6% when the frailty phenotype and the FI approaches were used, respectively. At least 98% of the participants with a FI score less than 0.07 did not experience disability and more than 98% of participants with a FI score more than 0.52 experienced disability. Bathing was the activity which became impaired first with increasing frailty. When both FIs were included into the same regression model to evaluate survival, the hazard ratio per 0.1 increase in FI score was 1.19 (95% CI: 1.09-1.29) when disability and co-morbidity were included in the index. The index which excluded disability and co-morbidity did not add anything to the prediction of mortality. **Conclusions:** Most frail adults experience disability and co-morbidity and these two concepts contributed to the ability of the FI to predict survival. **Keywords:** Disability; Co-morbidity; Frailty.

DETERMINANTS OF IMPLEMENTATION OF FUNCTIONAL TASKS EXERCISE PROGRAM FOR OLDER ADULTS

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Objectives: The functional tasks exercise program (FTE) is the first program with sustainable improvement on physical capacity merely because it is adapted to daily activities of the elderly. The introduction of new programs is complex require a detailed understanding of impeding and enhancing factors – determinants –for designing implementation strategies. We studied the determinants the national implementation of FTE for community dwelling elderly. **Settings and Participants:** primary care physical and remedial therapists and elderly people (64 years and older). **Methods:** Focus(group) interviews with 20 therapists and 8 elderly and subsequently a questionnaire study among a random sample of 100 therapists (77% response). Determinants were classified into four categories referring to characteristics of the environment, the organization, the therapists and elderly, and the training program. **Results:** Critical determinants related to the environment and organization were: the recruitment of sufficient elderly that are suitable for the program; financial reimbursement for the therapist for providing the training; costs for the elderly. Determinants related to the therapists and elderly: lack of knowledge and skills to provide the training, self-efficacy. Furthermore, elderly were unconvinced that they were trainable. Determinants related to the program: therapists and elderly were enthusiastic about the content and evidence of the program, however the training frequency (3x a week) was judged to be too high. **Conclusion:** we adapted the implementation strategies to the determinants (e.g. adaption of the training, reimbursement, and strategies for recruiting and motivating elderly). Currently, a pilot implementation takes place among 20 therapy practices. At the congress, we will present the determinant analysis and the preliminary results of the pilot implementation of FTE. **Keywords:** Functional; Implementation; Exercise; Therapy.

FRAILTY AS A MULTIDIMENSIONAL CONSTRUCT: VALIDATION OF THE GRONINGEN FRAILTY INDICATOR

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Background: The Groningen Frailty Indicator (GFI) is a widely used self-report screening instrument to identify frail older adults. Frailty is suggested to be a dynamic and multidimensional construct. However, factor structure of the Groningen Frailty Indicator has not been examined yet. **Objective:** To evaluate the factor structure and validity of the 15-item Groningen Frailty Indicator questionnaire. **Methods:** Older adults aged 65 years and over ($n = 1401$) completed the GFI. A subsample of 120 older adults completed additional questionnaires (De Jong Gierveld loneliness scale, Hospital Anxiety Depression Scale (HADS), RAND-36 physical functioning). Factor structure, internal consistency, construct validity, and criterion-related validity of the scale were evaluated. Exploratory and confirmatory factor analyses were used to evaluate factor structure of the GFI. **Results:** Factor structure of the GFI provided support for a three dimensional structure of the scale. The subscales Mobility, General health and Psychosocial functioning showed moderate to good internal consistency (respectively Cronbach's alpha's: $\alpha = 0.81$, [95% CI = 0.79-0.82]; $\alpha = 0.60$, [95% CI = 0.56-0.63]; $\alpha = 0.80$, [95% CI = 0.78-0.81]). Analyses of construct validity showed significantly higher GFI subscale scores in older age groups, female respondents and institutionalized living respondents than in respondents in younger age groups, male respondents and independently living respondents. Scores on the GFI subscales correlated significantly with related scales: Mobility GFI with RAND36 physical functioning ($r = 0.61$); General health GFI with Rating of health ($r = 0.54$); Psychosocial functioning GFI with De Jong Gierveld scale ($r = 0.71$); Psychosocial functioning GFI with HADS ($r = 0.66$). **Conclusion:** Present findings support a three dimensional factor structure of the Groningen Frailty Indicator. Three valid and reliable frailty subscales were established to identify frail older adults in different domains of functioning. **Keywords:** Frailty; Multidimensional; Psychosocial.

REGULAR EXERCISE ASSOCIATED WITH LOWER RISK OF CATARACT INDEPENDENT TO AGING

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Purpose: To investigate the relationship between exercise and cataracts in a Chinese population. **Methods:** A total of 13,157 subjects were enrolled and divided into cataract and non-cataract groups. The definition of cataracts was clouding of either lens, which includes nuclear sclerosis, cortical opacity, posterior subcapsular opacity, or the presence of mature cataracts. Subjects with a history of cataract extraction were also categorized into the cataract group. Exercise habit was divided into regular (≥ 3 days/week), occasional (1-2 days/week), and non-exercise according to exercise status during the previous six months, with a day of exercise being defined as at least 20 min of vigorous physical activity. The Asia-Pacific modification of the National Cholesterol Education Program Adult Treatment Panel III guidelines was used to define metabolic syndrome. Binary logistic regression was used to investigate the relationship between cataracts and habitual exercise, with adjustments for sex, age groups, education level, metabolic syndrome, smoking, and alcohol drinking. **Results:** A total of 2,572 (19.5%) subjects had cataracts, and women had a higher prevalence of cataracts than men. Both regular exercise (OR: 0.80, $p = 0.03$) and occasional exercise (OR:

0.68, $p < 0.001$) were negatively associated with cataract. Multivariate analysis showed that female gender (OR: 1.20, $p < 0.001$), age ≥ 65 years (OR: 381.74, $p < 0.001$), age of 40-64 years (OR: 19.04, $p < 0.001$), metabolic syndrome (OR: 1.36, $p < 0.001$), and educational level ≤ 6 years (OR: 1.86, $p < 0.001$) were positively associated with cataracts. **Conclusions:** Not only regular exercise but also occasional exercise seems to have a protective effect with regard to preventing cataracts. **Keywords:** Cataract; Exercise; Chinese.

LOWER-LIMB STRENGTH IS RELATED TO RESPONSE INHIBITION AMONG OLDER WOMEN, INDEPENDENTLY OF AEROBIC FITNESS AND AGE

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Introduction: Executive function has been shown to be associated with gait speed and balance (1), and also with performance in Up and Go test (2, 3). There is a lack of agreement, though, respecting strength; a significant correlation between executive performance and knee extensor isokinetic strength has been described (4), but not between the former and lower-limb isotonic strength (5). Therefore, our purpose was to evaluate whether set shifting and response inhibition, as measures of executive function, were related to lower-limb strength. **Methods:** 19 older women (70.1 \pm 4.2 yrs) participated in the study. Lower-limb strength was assessed by the 30-sec chair-stand test (CST) and aerobic fitness measured by the 6-min walk test. Interference score of the Stroop Colour Word Test (SCWT) was used as an index of response inhibition and difference between parts B and A of the Trail Making Test (ÄTMT) as a measure of set shifting ability. Then, a partial correlation, controlling for age and aerobic fitness, was conducted. Previously, CST and SCWT were logarithmically transformed to meet normality assumptions. **Results:** CST was significantly associated with SCWT ($r = -.51$; $p < 0.05$), but uncorrelated to ÄTMT. **Conclusions:** The relationship found among lower-limb strength and response inhibition ability reinforces previous results from Huh et al. (4). Our stronger correlation ($-.51$ vs $-.11$) may be due at least partly to a greater functionality of the protocol employed. Therefore, although the cross-sectional design of the present study prevents us from reaching causal conclusions, our results suggest that performance of lower-limb strength tasks is related to executive function in the elderly, pointing to some shared control processes. Furthermore, this dependence seems to be stronger as motor control demands of the task increase. On the other hand, the discordance with Scherder et al. results (5) might be due to age differences between samples and statistical approach employed. **Keywords:** Strength; Response Inhibition; Aerobic Fitness; Executive Function.

POSSIBILITIES OF BODY COMPOSITION INFLUENCE BY WALKING PROGRAM IN SENIOR WOMEN

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Introduction: Successful ageing is a process of optimization of opportunities for maintaining good health (physical, social and mental), a process enabling senior citizens to actively participate in social life, without being discriminated against because of their age, and thus allowing them to enjoy a good-quality, independent life. The various methods currently available to assess the effect of physical activity vary greatly in their applicability in research and/or in practice. Usable method for these aims could be the body composition (BC) assessment.

The aim of study was to verify the moving programme based on walking for BC influence in women seniors. **Methods:** The walking with exercise intensity (minimally of 90% was walking) at a level of 50 to 70% VO_2max (HR ranged from 65 to 85% of HRmax or 100-140 beats.min⁻¹) was used in a group of healthy senior women [n = 53, age = 68.7 ± 5.0 yrs, body mass = 69.9 ± 7.9 kg, height = 161.0 ± 2.8 cm, % of body fat (%BF) = 37.5 ± 5.1%, free fat mass (FFM) = 43.7 ± 5.5 kg, body cell mass (BCM) = 20.6 ± 2.9 kg, $\text{VO}_2\text{max.kg}^{-1}$ = 25.9 ± 4.3 ml.kg⁻¹.min⁻¹]. The duration of exercise session ranged from 20 to 50 min, and exercise training was performed 3-5 times a week. **Results:** The exercise time ranged between 90-250 min (mean 156.8 ± 48.9 min), total energy content ranged from 650 to 1780 kcal (950 ± 230 kcal) per week. After 6 months of training, non-significant body mass increase (0.8 ± 1.7 kg), %BF decrease (0.6 ± 1.5%), and FFM and BCM increase (0.84 ± 0.33 and 2.0 ± 1.7 kg; both p < 0.01) was found. Similarly was increased the motor performance - maximal speed of walking by 0.5 ± 0.3 km.h⁻¹; (p < 0.01). **Conclusions:** The BC influence by help of walking intervention could significantly improve the senior's independency. The walking intervention advantage is that may be realized daily without of use of supplementary tools. We may conclude that walking lasting 6 months with total energy content of 950 kcal during a week is enough for significant improvement of BC in senior women.

PROGRESSIVE RESISTANCE TRAINING IN ELDERLY LIVING WITH HIV

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Background: Elderly people present alterations on body composition and physical fitness, compromising their life quality. Chronic diseases, including HIV/AIDS, worsen this situation. Resistance exercises are prescribed for improving fitness and promoting a healthier and independent aging. **Objective:** This study describes a case-series of HIV positive elderly participating in a progressive resistance training program and evaluates their body composition, muscular strength, physical fitness. **Methods:** Subjects were prospectively recruited for nine months. Training program consisted of 3 sets of 8-12 repetitions of leg press, seated row, lumbar extension and chest press, performed with free weights machines, 2 times/week during 1 year. Infectious diseases physicians followed patients, reporting all relevant clinical data. Body composition was assessed by anthropometric measures and by dual-energy x-ray absorptiometry before and after the training program. **Results:** 14 patients, aged 61-69 years old, of both genders, without regular physical activity and with an average 9 years HIV/AIDS history were enrolled. Strength of major muscular groups increased (74%-122%, p = 0.003-0.021), with a corresponding improvement on sit-standing and walking 2.4 m tests (p = 0.003). There were no changes on clinical conditions and on body composition measures, but triceps and thigh skinfolds significantly reduced (p = 0.037). **Conclusion:** Resistance training increased strength, reduced upper and lower limbs skinfolds and significantly improved physical fitness, without significant side effects.

USING ACCELEROMETRY TO MONITOR THE PATTERNS OF ACTIVITY IN ACUTE STROKE PATIENTS

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Background: Accelerometry provides a continuous, detailed objective measure of activity levels and patterns. Quantifying activity by total time spent upright or the number of transitions per day may miss important factors such as the time spent in each upright (standing/walking) or sedentary (lying/sitting) episode and the distribution of these events. The aim of this study was to investigate using accelerometry the pattern of daytime sedentary behaviour and upright activity in acute stroke patients. **Methods:** A multicentre observational study design was used. Each recruited stroke patient wore an accelerometer for one day whilst in the acute stroke unit. The length of each upright and sedentary event was determined for all patients and categorised (<5 min, 5–10 min, 10–30 min, 30–60 min, or >60 min). For each time category, the total time spent upright/sedentary was calculated as a percentage of the total time upright/sedentary. **Results:** Sixty-six patients were recruited from 3 hospitals between October 2010 & June 2011. Patient demographics were representative of the local population; with mean age of 73.2 years (SD 9.8) and similar numbers of males and females. The median time from stroke onset to the day of monitoring was 5.5 (interquartile range 4–9 days). The majority of total upright time was the result of short episodes of <10 mins upright activity. The opposite pattern was observed for sedentary events whereby the majority of total sedentary time was accumulated by prolonged episodes of >60 mins sedentary behaviour. **Conclusion:** This study revealed low levels of upright activity; however, the prolonged sedentary events may be more cause for concern. Rehabilitation should be focused on reducing these inactive periods rather than overall activity. Accelerometry can provide a fuller picture of the patient's pattern of activity and a baseline measure which could be used to inform the design and implementation of future rehabilitation interventions.

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