

January 21-23, 2013

International Symposium

Physical Activity and Health Promotion During Life Course

ISPAH 2013



Book of abstracts



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Editors

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Book of abstracts

International Symposium

Physical Activity and Health Promotion During Life Course

January 21st – 23rd, 2013

Jyväskylä, Finland

Organized by



UNIVERSITY OF JYVÄSKYLÄ
DEPARTMENT OF HEALTH SCIENCES

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Dear colleagues

The Faculty of Sport and Health Sciences of University in Jyväskylä, Finland is hosting the International Symposium “Physical Activity and Health Promotion during life course”, 21-23 January, 2013.

Symposium will offer an interdisciplinary forum for the leading international and national scientists, post docs, graduate students and people working already in the field to share the latest scientific findings.

Symposium is part of the 50th anniversary of Faculty of Sport and Health Sciences and will have about 250 participants from 13 different countries. In addition to 35 oral presentations, there will be demonstrations and defended poster presentations which are available also on the smart boards during the symposium.

On behalf of the organizers, we wish you both professionally and socially enjoyable and profitable Symposium in Jyväskylä and we do our best to meet your expectations and to organize a successful meeting.

Arja Häkkinen

Symposium chair, Professor

Department of Health Sciences

University of Jyväskylä

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Invited Symposia

Monday: Motivating for physical activity

Monday 21 January Theme: Motivating for physical activity

9:30 Coffee and registration

10:00 - 10:30 Opening words

Dean **Lasse Kannas**, Faculty of Sport and Health Sciences, University of Jyväskylä

Chief Medical Director **Markku Voutilainen**, Central Finland Health Care District

10:30 Session: Cognitive training and Measurement of physical activity during life span

Chair: Sarianna Sipilä

10:30 - 11:10 Cognitive Training for Smart Ageing

Ryuta Kawashima, Smart Ageing International Research Center, IDAC, Tohoku University, Japan

11:10 - 11:50 Measurement of physical activity

Ulf Ekelund, Department of Sport Medicine, Norwegian School of Sport Sciences, Oslo, Norway and MRC Epidemiology Unit, Cambridge, UK

11:50 - 12:30 Physical activity among pre-school children

Jessica Gubbels, Maastricht University Medical Center, Department of Health Promotion, Maastricht, the Netherlands

12:30 - 13:30 Lunch

13:30 Session: Promoting physical activity Chair: Marita Poskiparta

13:30 - 14:00 Promotion of physical activity among school-aged children, Finnish Schools on the Move

Tuija Tammelin, LIKES – Research Center for Sport and Health Sciences, Jyväskylä, Finland

14:00 - 14:30 Motivating adults in physical activity

Pilvikki Absetz, National Institute for Health and Welfare, Helsinki, Finland

14:30 - 14:45 Aspects of physical activity behavior change among type 2 diabetes high-risk population

Kati Vähäsarja, Department of Health Sciences, University of Jyväskylä, Finland

14:45 - 15:00 Promotion of PA among under school-aged children (HIPPA-intervention)

Anette Mehtälä, Research Centre for Health Promotion, University of Jyväskylä, Finland

15:00 - 15:45 Posters and coffee

15:45 Session: Promoting physical activity Chair: Arja Piirainen

15:45 - 16:00 Promotion of physical activity among people with functional disabilities

Iloa Autti-Rämö, The Social Insurance Institution, Research Department, Helsinki, Finland

16:00 - 16:15 Outcome of Multilevel surgery in Cerebral Palsy - effectiveness on functional ability

Krista Lehtonen, Metropolia University of Applied Sciences, Helsinki and University of Jyväskylä, Finland

16:15 - 16:30 The application of value based intervention in enhancing a physically active lifestyle among physically inactive adults

Anu Kangasniemi, LIKES – Research Center for Sport and Health Sciences, Jyväskylä, Finland

16:30 Sponsor Presentations Chair: Arja Häkkinen

16:30 - 17:00 Therapeutic benefits of assisted cycling on neurological diseases

Vesa Väänänen, Kuntoväline Oy

17:00 - 17:30 Measurement of physical activity from the wrist – validation and usability

Paula Virtanen, Polar Electro Oy

17:30 - 18:00 Cost-effectiveness of exercise in senior context

Mats Manderbacka, Hur

18:00 - 20:00 Welcome reception

COGNITIVE TRAINING FOR SMART AGEING

Kawashima R

Smart Ageing International Research Center, IDAC, Tohoku University

Background and Purpose

In Japan, the percent of the population of elderly people age 65 and over was 23.1% in 2010, an unprecedentedly high percentage, making Japan the world's first super-aging society. This super-aging environment necessitates the formation of a society in which all individuals can play an active role, even as they grow older. Ideally, it should be a society in which people can share their wisdom and knowledge, regardless of their age or gender, in order to maintain and improve the quality of life of all people and to maintain a healthy society.

Generally, an individual's quality of life increases with age; however, events like retirement can trigger a loss in one's sense of purpose in life and a feeling of disconnection from society, in turn lessening the quality of life. However, we believe that quality of life can be improved to one's last moments if the following four factors are given due consideration and if a social system dedicates its resources to achieving them for its population: cognitive stimulation, regular exercise, balanced nutrition, and a relationship with society.

To support the establishment of a social system that aims to realize these goals, we have been developing cognitive intervention programs to promote healthy, long lives so that individuals can continue to be intellectually stimulated, find their places as integral members of society, and maintain and improve their quality of life and mental and physical health.

Cognitive training is receiving increasing interest as a solution to age-related cognitive decline. Although the general public's interest in cognitive training, or mental exercises, is increasing, the generalizing or transfer effect of such training remains unclear. With regard to the changes in cognitive functions aging induces, it is important to note that while cognitive functions related to semantic knowledge do not decline with age, all cognitive functions are dependent on the prefrontal cortex, particularly the executive function, which declines linearly with age [1, 2]. We previously demonstrated that cognitive intervention programs using intensive adoptive training of working memory [3, 4] induce a plastic change in the brain structures of healthy young subjects in addition to improving their non-trained cognitive functions (transfer effects).

The purpose of this study was to examine the beneficial effects of Learning Therapy, a new cognitive intervention program designed for the care [5] and prevention of dementia [6]. The concepts of Learning Therapy are derived from our working memory training program, the tasks of which include systematized basic problems in arithmetic and Japanese language. The task of reading aloud is accomplished with a combination of several cognitive processes, for example, recognition of visually presented words, conversion of these graphic representations to phonological representations, analysis of the word meanings, and control of pronunciation. Solving arithmetic problems is also a task that cannot be accomplished without many cognitive processes, for example,

recognition of visually presented numbers, performance of arithmetic operations, and control of hand movement. Both tasks are simple and easy, so even people with senile dementia are able to understand, perform, and continue doing the tasks prepared in our program.

Methods

Study 1; 16 individuals in the experimental group and 16 in the control group were recruited from a nursing home. All of the individuals in both groups had a clinical diagnosis of dementia Alzheimer type. Study2; we performed a single-blind, randomized controlled trial on cognitive intervention in 124 community-dwelling seniors (62 for intervention and 62 for control groups). In both studies, the daily training program using reading and arithmetic tasks was carried out approximately 5 days a week, 15 to 20 minutes a day for the intervention groups. We did not designate a placebo intervention for the control groups. Neuropsychological measures were determined prior to and after six months of the intervention (post-test) by mini-mental state examination (MMSE), and frontal assessment battery at bed side (FAB) in both the intervention and control groups at the same time.

Results

Study1; after 6 months of training, the FAB score of the experimental group showed a statistically significant improvement. The FAB score of the control group decreased slightly over the 6-month period, and the difference between the scores of the experimental and control groups was statistically significant. We also observed the restoration of communication and independence in the experimental group. Study 2; the FAB score showed a statistically significant improvement in the post-test compared with the pre-test, such improvement was maintained up to 6 months of follow-up tests in only the experimental group.

Conclusions

In general, aging is considered negatively as the loss of something that people have in their youth or a form of regression. As a result, a false image that aging is something like an illness or ugly, and that young people are superior to the elderly in many respects, has been formed. However, we consider that aging means that people can grow and become wiser as they reach later stages of life. We call this concept smart aging and have proposed the concept to society. Generally, many people tend to lose their sense of purpose in life when they lose their connection with society, triggered by, for example, retirement, leading to a decrease in their quality of life. However, we believe that the quality of life can be increased up until the last moment if one pays careful attention to the following four factors, i.e., cognitive stimulation, regular exercise, balanced nutrition, and relationship with society, and if a social system to realize this for everyone can be established. Here, we proposed a smart but less expensive system for cognitive stimulation. The results of our investigations indicate that the transfer effect of cognitive intervention by reading and solving arithmetic problems was demonstrated, and are convincing evidence that cognitive training has the beneficial effects of maintaining and improving cognitive functions of dementia patients and healthy seniors.

References

1. Park DC, Lautenschlager G, Hedden T, Davidson NS, Smith AD, Smith PK. Models of visuospatial and verbal memory across the adult life span. *Psychol Aging* 2002; 17: 299-320.
2. Salthouse TA. Mental exercise and mental aging. *Perspect Psychol Sci* 2006; 1: 68–87.
3. Takeuchi H, Sekiguchi A, Taki Y, Yokoyama S, Yomogida Y, Nozomi K, Y et al. Training of working memory impacts structural connectivity. *J Neurosci* 2010; 30: 3297-3303.
4. Takeuchi H, Taki Y, Sassa Y, Hashizume H, Sekiguchi A, Fukushima A, et al. Working memory training using mental calculation impacts regional gray matter of the frontal and parietal regions. *PLoS ONE* 6; e23175: 2011.
5. Uchida S, Kawashima R. Reading and solving arithmetic problems improve cognitive functions of normal aged people –A randomized controlled study. *Age* 2008; 30: 21-29.
6. Kawashima R, Okita K, Yamazaki R, Tajima N, Yoshida H, Taira M, et al. Reading aloud and arithmetic calculation improve frontal function of people with dementia. *J Gerontol A Biol Sci Med Sci* 2005; 60A: 380-3841

MEASUREMENT OF PHYSICAL ACTIVITY

Ekelund U

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Medical Research Council Epidemiology Unit, Cambridge, UK

Background

Physical activity can broadly be divided into self-reported physical activity and objectively measured physical activity. Precise assessment of habitual physical activity is important in order to characterize the dose response relationships between physical activity and health outcomes; to monitor temporal trends and population levels of physical activity; to assess the effects of an intervention and compliance to a to that intervention. In addition, accurate measurement of physical activity can decrease sample size when examining gene – physical activity interactions with health outcomes.

Aim

The aim of this presentation is to present various methods available when assessing physical activity in large scale studies and intervention research. Advantages and disadvantages with the methods will be discussed and examples of how these methods have been implemented exemplified.

Results

Self-report methods, physical activity questionnaires (PAQs) are currently the most feasible method for assessing physical activity. PAQs are commonly used for practical reasons such as limiting cost and reducing participant and researcher burden, and PAQs have been used for several purposes, including international surveillance (e.g., the International Physical Activity Questionnaire [IPAQ]), risk stratification (e.g., the EPIC Physical Activity Questionnaire [EPIC-PAQ]), and etiologic investigation (e.g. the short European Prospective Investigation into Cancer and Nutrition [EPIC]-Norfolk Physical Activity Questionnaire [EPAQ2]). However, PAQs may misclassify an individual's physical activity level due to deliberate misreporting or cognitive limitations related to recall or comprehension.

Objective methods for assessing physical activity involve the measurement of physiological or biomechanical parameters and use this information to estimate physical activity outcomes, such as daily physical activity energy expenditure, time spent in sedentary and in different intensity levels of activity, and total body movement or accumulated number of steps taken. Accelerometers are the most commonly used motion sensors and measures the acceleration of the body in different planes, combined sensors can be used to estimate daily PAEE by combining a physiological measure with acceleration whereas pedometers measures the number of steps taken.

Conclusion

There is no single method available for assessing all dimensions of activity accurately. The choice of method may be a compromise between accuracy level and feasibility, but the ultimate choice of tool must suit the stated aim of the research.

PHYSICAL ACTIVITY AMONG PRE-SCHOOL CHILDREN

Gubbels J.S.

Maastricht University Medical Centre, Department of Health Promotion, Maastricht, the Netherlands

Background and purpose

Promoting physical activity in pre-school children is essential to establish an active lifestyle and prevent overweight throughout life. The purpose of the current presentation is to provide an overview of various studies on pre-schoolers' physical activity levels and related factors.

Methods

Questionnaire data, observations and accelerometry were used to examine pre-schoolers' (0-6 years old) physical activity levels, and its determinants, correlates and consequences. Data were collected regarding physical activity at home, childcare and pre-school, and originated from the Netherlands, Belgium and Finland. In addition, qualitative techniques were used to examine parents' and childcare workers' view of physical activity in pre-schoolers.

Results

Pre-schoolers were sedentary for substantial parts of the day. Consistent behavioral patterns were found across studies, such as a sporty-computer pattern. Physical activity facilities (e.g. play equipment), behaviour of parents (e.g. rules about PA and sedentary behaviour), childcare workers, pre-school teachers and peers, and individual characteristics of each child (e.g. age, gender, temperament) were significantly related to the pre-schoolers' physical activity levels. Several of these factors interacted with each other in explaining pre-schoolers' physical activity levels. Childcare workers and parents perceived various barriers to promoting physical activity in pre-schoolers.

Conclusions

The implications of the findings will be discussed. Interventions and policies targeted specifically at pre-school children and the people and contexts surrounding them are urgently needed, to promote a healthy, active lifestyle throughout life. Examples of such interventions will be discussed.

PROMOTION OF PHYSICAL ACTIVITY AMONG SCHOOL-AGED CHILDREN: FINNISH SCHOOLS ON THE MOVE PROGRAMME

Tammelin T

LIKES - Research Center for Sport and Health Sciences, Jyväskylä, Finland

Finnish Schools on the Move is a national action programme aiming to establish a physically active culture in Finnish comprehensive schools. Schools and municipalities participating in the programme implement their own individual plans to increase physical activity during the school day. The programme is funded by the Ministry of Education and Culture and is organized by the Board of Education, regional state administrative agencies and various other organisations, and it is part of the Government Programme.

The presentation describes the results of the pilot phase of the programme (2010–2012), which consisted of 21 local regional projects with a total of 45 schools and 10,000 grade 1–9 students from throughout Finland. Progress of the local projects was monitored by surveys of their coordinators and school staffs. At the student level, the aim of the evaluation was to determine the level of and changes in self-reported and objectively measured physical activity during the pilot phase. Objectively measured physical activity levels and sedentary time among 670 Finnish school-aged children from grades 1 –9 will be presented.

The Finnish Schools on the Move programme created both administratively and functionally new approaches and succeeded in linking the goals of various parties in a shared network. Finnish Schools on the Move was perceived as a positive and successful programme at several levels: among local project coordinators, school principals and staff, and schoolchildren. Physical activity increased among lower comprehensive school students overall, especially in physically active commutes to school over short distances. However, changes in objectively measured physical activity of schoolchildren were still minor. It takes time for the actions taken to manifest, and as a result, long-term and systematic development work is required to make the culture at school physically more active and less sedentary.

ASPECTS OF PHYSICAL ACTIVITY BEHAVIOR CHANGE AMONG TYPE 2 DIABETES HIGH-RISK POPULATION

Vähäsarja K¹, Salmela S¹, Villberg J¹, Rintala P², Vanhala M³, Saaristo T⁴, Peltonen M⁵, Keinänen-Kiukaanniemi S⁶, Korpi-Hyövälti E⁷, Kujala U¹, Moilanen L⁸, Niskanen L⁹, Oksa H¹⁰, Poskiparta M¹

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⁴Finnish Diabetes Association and Pirkanmaa Hospital District,

⁵National Institute for Health and Welfare

⁶University of Oulu, Oulu University Hospital and Health Centre of Oulu

⁷Seinäjäki Central Hospital ⁸Kuopio University Hospital

⁹Central Finland Central Hospital and University of Eastern Finland

¹⁰Tampere University Hospital

Background and purpose

Physical activity substantially reduces the risk of type 2 diabetes. High-risk individuals' perceptions of physical activity are important to acknowledge in motivating people to increase their physical activity levels (PAL). The results of the studies examining perceived sufficiency of PAL, and perceived need to increase PAL in high-risk individuals are discussed in the presentation.

Methods

In total, 10 149 high-risk individuals participated in primary-care based lifestyle intervention as part of the national diabetes prevention programme. Logistic regression was used to identify factors associated with physical activity perceptions at baseline.

Results

In total, 65 % of the participants were physically inactive. Among all participants, PAL was rated as sufficient by 33% of men and 30% of women. Waist circumference was the only objective risk-factor associated with self-rated PAL sufficiency. Among inactive, 20% of men and 17% of women overestimated their PAL sufficiency. This was predicted by dyslipidemia, family history of diabetes, lower BMI and smaller waist circumference. In all participants, 75% perceived a need to increase their PAL. Smoking, hypertension, dyslipidemia, and family history of diabetes were not associated with this perception. Instead, larger waist circumference, physical inactivity, lower perceived fitness, perceived PAL insufficiency, and intention to increase PAL increased the likelihood of perceiving the need. PAL overestimators were less likely to perceive the need to increase their PAL than realistic inactive participants.

Conclusions

Majority of high-risk individuals perceived a need to increase their PAL, and rated the sufficiency of their PAL rather critically. However, these perceptions were rarely determined by objective diabetes risk factors. The results highlight the importance of assessing individual physical activity perceptions as misperceptions may be barriers for preventing diabetes.

PROMOTION OF PA AMONG UNDER SCHOOL-AGED CHILDREN (HIPPA-INTERVENTION)

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1: Research Centre for Health Promotion,

2: Department of Sport Sciences, University of Jyväskylä, Finland,

3: LIKES Research Center for Sport and Health Sciences, Jyväskylä, Finland

Purpose

The aim of this presentation is to describe the content and preliminary results of the one-year intervention on 4-5-year-old children's physical activity (PA), both at day care center and home.

Methods

Intervention was longitudinal and quasi-experimental.

Participants: Baseline (2010) and post intervention (2012) data were gathered from 40 (20 intervention) children (year of birth 2007) in the late summer. Children participated from intervention (7) and control (7) day care centers.

Measures: The PA of the children was measured for five consecutive days using ActiGraph accelerometers.

A one-year-intervention was implemented in day care centers from August 2011. The Intervention was low intensity and easy to implement by early years educators. Baseline PA measurements were utilized in shared discussions with the early years educators. Every month, a health-related behavior theme was presented to the day care centers and homes. Families and early years educators received monthly letters, PA tips, and training.

Analyses: General linear model was used to assess differences between the measurements.

Results

Light PA on weekdays increased significantly ($P=.035$) in the intervention group. There weren't significant differences during the weekend days or any other PA parameters between the intervention and control group.

Discussion

The findings indicate that the intervention increased light PA in the day care children. The foundation of motor ability is created in childhood; balance and the majority of movement skills are learned before school age. The increase in PA, even at a light intensity level, may have beneficial effects on the development of these motor skills.

PROMOTION OF PHYSICAL ACTIVITY AMONG PEOPLE WITH PHYSICAL DISABILITIES

Autti-Rämö I

The Social Insurance Institution, Research Department, Helsinki, Finland

Background and purpose

Persons with functional difficulties are more likely to have decreased physical activity levels compared to their peers and therefore to be at higher risk for negative health implications such as obesity, cardiovascular risk, musculoskeletal pain and inability to use their functional potential due to poor muscle strength and endurance. Given that physical activity can lead to increased participation and improve quality of life and psychosocial wellbeing, a lack of ability to join physical activity programmes may have a negative impact on overall wellbeing.

Methods

This presentation will focus on existing research results on various physical fitness programmes for children and adolescents with cerebral palsy. Possible barriers to access and participation in physical activity programmes will be discussed as well.

Results

Feasibility and effects of various kinds of fitness training – swimming, cycling, circuit training, various games, strength training exercises, treadmill, stepper, etc. – have been studied. The evidence suggests that aerobic exercises can improve physiological outcomes but that the influence of these changes on outcomes representing activity and participation are largely unknown and less studied. Environmental barriers (lack of assistance, costs, need of technical devices) and personal factors (challenges to identity such as having to show others an unfit body or lacking confidence and competence in core skills) need to be overcome to achieve a physically active lifestyle.

Conclusions

As more and more persons with functional disabilities have the possibility to lead productive and active lives it is important that the scientific community provides information that can contribute to making informed decisions about the type and extent of fitness-related activities most beneficial to persons with functional difficulties. It is also important to identify ways to tackle existing environmental and personal barriers that may hinder participation in physical activity programmes.

THE IMPACT OF SINGLE-EVENT MULTILEVEL SURGERY (SEMLS) ON GAIT IN CHILDREN AND ADOLESCENTS WITH CEREBRAL PALSY (CP)

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²University of Jyväskylä

³Helsinki University Central Hospital, Department of Paediatric and Adolescent Diseases

Background and purpose

Cerebral palsy (CP) is defined as a group of motor disorders caused by a non-progressive disturbance that occurred in the developing brain. The injury is by nature non-progressive but musculoskeletal difficulties increase with age. (1) Deterioration of functional abilities is often seen in walking function.(2) Orthopaedic procedures are one way of treating gait deviations and musculoskeletal pathology developing with age. Single-event multilevel surgery (SEMLS) has become the common practice. In SEMLS musculoskeletal pathology is corrected in one operation by multiple procedures on different lower limb levels on both sides. There is growing evidence that SEMLS can improve gait, but functional abilities and changes in ICF participation domain have been studied less (3). The purpose of this study is to evaluate the changes in gait 2 years after surgery.

Methods

The participants are 27 patients (GMFCS I-III, mean age at operation 12,7 years (8,6-18,5)) who had SEMLS in Helsinki University Central Hospital 2000-2010. Data was collected from 3d gait analysis Vicon, Oxford Metrix, UK) from before and two years after the operation. Data was analysed using SPSS 19.0.

Results

Significant increase in hip and knee extension and better lower limb rotational alignment and increased stride length were noted in 2-year follow-up gait analysis. Non-significant improvement in gait velocity was found.

Conclusion

Walking ability had improved 2 years after Single-event multilevel surgery. How the positive change in physical functioning performance capacity enhances actual physical functioning performance and physical activity in everyday life is an important issue for future studies

References:

(1) Rosenbaum P et al. 2007 A report: the definition and classification of cerebral palsy April 2006.Dev Med Child Neurol 49

(2) Oheim A et.al. 2009. Walking function, pain and fatigue in adults with cerebral palsy:a 7 year follow up study Dev Med Child Neurol 51

(3) McGinley et al. 2012. Single-event multilevel surgery for children with cerebral palsy: a systematic review. Dev Med Child Neurol 54

THE APPLICATION OF VALUE BASED INTERVENTION IN ENHANCING A PHYSICALLY ACTIVE LIFESTYLE AMONG PHYSICALLY INACTIVE ADULTS

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² Department of Psychology, University of Jyväskylä, Finland

Background and purpose

This randomized controlled trial demonstrated the feasibility of a value based intervention to promote a physically more active lifestyle among physically inactive Finnish 30-50 years old adults. The conceptual framework was based on an innovative behavioural therapy called, Acceptance and Commitment Therapy (ACT). ACT focus is pragmatic, the emphasis is on what works for a person to move toward a valued life.

Methods

Participants (n=70) were randomly allocated to an ACT group or a control group. The ACT group attended 6 group sessions and wore a pedometer throughout the 9 week intervention. The intervention sessions targeted to clarify individual values and enhance committed actions according to the meaningful life. In addition, participants were also taught new skills to work with subjective barriers related to physical activity. Physical activity was measured objectively, by an accelerometer, at baseline, and again after the intervention. Both groups received written feedback about their physical activity.

Results

The ACT-group improved their health enhancing physical activity (HEPA)-time more than the control group ($p=0.045$) after adjustment for depressive symptoms. The ACT-group increased their HEPA-time from 5.3 (SD 7.0) to 12.4 (SD 12.1) minutes per day, which means a total of 50 minutes more HEPA-time a week. The ACT intervention also had a positive impact on participants psychological well-being.

Conclusions

The application of value based intervention may offer a novel and innovative method for enhancing the physical activity among adults.

Invited Symposia

Tuesday: Physical activity in promoting health

Tuesday 22 January Theme: Physical activity in promoting health

8:30 Session: Mood and physical activity Chair: Hannu Koponen

8:30 - 9:15 Pathophysiology of depression: how could physical activity impact on this?

Brenda Penninx, Department of Psychiatry, VU University Medical Center, Amsterdam, the Netherlands

9:15 - 9:45 The antidepressive effects of physical activity

Hannu Koponen, Department of Psychiatry, Kuopio University Hospital and University of Eastern Finland, Finland

9:45 - 10:00 Interrelationships of physical activity and depressive symptoms with cardio-metabolic risk factors

Katariina Korniloff, Department of Health Sciences, University of Jyväskylä, Finland

10:00 - 10:30 Coffee and exhibition

10:30 Session: Physical activity and metabolic health Chair: Harri Sievänen

10:30 - 11:00 Responses to exercise training and diet - The DR's EXTRA Study,

Rainer Rauramaa, Kuopio Research Institute of Exercise Medicine, Kuopio, Finland

11:00 - 11:30 Physical activity/exercise and cardio-metabolic risk factors,

Urho Kujala, Department of Health Sciences, University of Jyväskylä, Finland

11:30 - 11:45 Cardiorespiratory fitness, muscle strength and cognition – DR's EXTRA and FINGER –studies

Heikki Pentikäinen, Kuopio Research Institute of Exercise Medicine, Kuopio Finland

11:45 - 12:00 Physical activity, endocannabinoid system and metabolic health

Petri Wiklund, University of Jyväskylä

12:00 - 12:30 Round table discussion (morning presenters)

Mood and metabolic health, Chair: Urho Kujala

12:30 Lunch

13:30 Session: Effects of exercise on bone and cartilage Chair: Urho Kujala

13:30 - 14:15 Improved image analysis confirms in vivo dGEMRIC suggestions of relationship between matrix quality, GAG content and load

Leif Dahlberg, Department of Clinical Sciences Malmö, Lund University, Sweden

14:15 - 14:45 The effects of exercise on bone mineral, mass, size and estimated bone strength

Ari Heinonen, Department of Health Sciences, University of Jyväskylä, Finland

14:45 - 15:00 Effects of high-impact bone exercise on bone and articular cartilage

Juhani Multanen, Department of Health Sciences, University of Jyväskylä, Finland

15:00 - 15:45 Poster presentations and coffee

15:45 Technical know-how about measurements of cartilage and bone structure

Chair: Ari Heinonen

15:45 - 16:15 Quantitative magnetic resonance imaging. Methods for characterization of articular cartilage

Eveliina Lammentausta, Department of Diagnostic Radiology, Oulu University Hospital, Oulu, Finland

16:15 - 16:45 Challenges in bone densitometry (DXA and pQCT)

Harri Sievänen, UKK Institute for Health Promotion Research, Tampere, Finland

16:45 Alternative programme

a) Data analysis of quantitative MRI of Cartilage: theory and practice, **Eveliina Lammentausta**

b) Visit to University laboratory of Sport and Health Sciences and laboratory demonstrations (DXA, pQCT and other). Address: Rautpohjankatu 8, 600 m walk from symposium venue.

PATHOPHYSIOLOGY OF DEPRESSION: HOW COULD PHYSICAL ACTIVITY IMPACT ON THIS?

Penninx BWJH

Department of Psychiatry, VU University Medical Center, Amsterdam, The Netherlands

Background and purpose

Depressive disorders are complex disorders with diverse pathophysiological mechanisms involved. Several central bodily stress systems have shown to be dysregulated, including the hypothalamus-pituitary-adrenal (HPA) axis and immune, metabolic and autonomic nervous systems. Physical activity could impact on depressive disorders by favourably influencing these biological stress systems as well.

Methods

Data are from 2981 participants of the Netherlands Study of Depression and Anxiety (NESDA, aged 18-65 years, 66% female), including 1701 persons with a current depressive disorder, 627 persons with a remitted depressive disorder and 652 healthy controls.

Results

Data from the NESDA study indicate that depressed participants - especially those with a melancholic depression profile - had significantly higher cortisol awakening response levels, indicating a hyperactive HPA-axis. Chronic inflammation and metabolic dysregulations were more present among depression persons with an atypical depression profile. Autonomic dysregulation - both an increased sympathetic and a decreased parasympathetic activation - was also seen among depressed persons, but was completely driven by antidepressant use and not by depression status itself. Independent of psychopathology status, data also confirmed that immune, autonomic and metabolic stress systems are more dysregulated among non-physically active individuals.

Conclusions

This large-scale study confirmed the presence of various inflammation, metabolic and HPA-axis dysregulations among depressed persons. Since these stress systems are also more dysregulated among non-active individuals and trial evidence suggests a favourable impact of exercise on the functioning of bodily stress systems, physical activity could favourably impact on the pathophysiology involved in depression. More studies should examine to what extent exercise can help in preventing and treating depression.

INTERRELATIONSHIPS OF PHYSICAL ACTIVITY AND DEPRESSIVE SYMPTOMS WITH CARDIO-METABOLIC RISK FACTORS

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Background and purpose

Although physical inactivity is undoubtedly a common etiological factor in the development of both cardio-metabolic risk factors and depressive symptoms (DS), only little is known about the effect of the simultaneous presence of accumulation of cardio-metabolic risk factors known as metabolic syndrome (MetS) and DS on physical activity. Purpose of this presentation is to show relationship between physical activity, DS and cardio-metabolic risk factors, also in a lifetime perspective, and further perceived barriers to PA based on the population-based FIN-D2D cross-sectional survey conducted in 2007.

Methods

4500 randomly selected Finnish female and male aged 45–74 years were initially enrolled; 2868 (64%) attended this study. All participants completed a standard questionnaire including questions about cardiometabolic risk factors, health behaviour, functional ability, and somatic diseases. PA was assessed with the self-administered short version of the International Physical Activity Questionnaire, with a question about leisure-time physical activity (LTPA), and lifetime historical LTPA frequency. MetS was based on the National Cholesterol Education Program criteria and DS were assessed by the Beck Depression Inventory (BDI-21), and the cut-off point for mild depression was $\geq 10/63$.

Results

The physically inactive participants more commonly had health risk factors and DS. In addition, the rate of simultaneous MetS and DS was over fivefold higher among the participants with low LTPA, than among those in the high LTPA group. Lifetime LTPA seemed to be associated with occurrence of DS and somatic diseases in later life. Lack of time proved to be the main reason for inactivity, while among those with DS or MetS the main reason for inactivity was illness or disability.

Conclusions

To conclude, physical activity plays a significant role in terms of DS and cardiometabolic risk factors. Health-related risk factors seem to accumulate in inactive individuals. Therefore, promoting LTPA over the lifespan would be beneficial in respect of DS and somatic diseases.

PHYSICAL ACTIVITY/EXERCISE AND CARDIO-METABOLIC RISK FACTORS

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The risk factors for cardio-vascular diseases include hypertension, dyslipidemia and the axis of insulin resistance-obesity-metabolic syndrome-type 2 diabetes (T2D). These are modifiable by physical activity (PA). So, physical inactivity and poor cardiorespiratory fitness are major risk factors for cardiovascular diseases.

Metabolic syndrome and T2D are at the moment highly significant public health problems. People with T2D have increased prevalence of cardiovascular risk factors, including hypertension and the dyslipidemias and consequently a high prevalence of manifestations of atherosclerosis. Exercise and PA play a clear role in preventing and treating metabolic syndrome and T2D.

Genes are known to play a role in chronic disease predisposition and to contribute to physical fitness levels and PA participation. Physical fitness, PA and risk factor levels may be partly due to underlying genetic factors that have a favourable effect on all these traits (genetic pleiotropy). This means that in observational studies the relationship between baseline activity and the later occurrence of diseases may not be interpreted entirely as causal. Usually the associations between PA and risk factors are strong in observational cohort studies, but somewhat weaker effect sizes of exercise training are seen in intervention studies - which give stronger proof for causality

PA or exercise therapy can have a positive effect on health via many disease-specific mechanisms. The overall strong health benefit of PA/exercise therapy in the prevention and treatment of cardio-metabolic disease seems to be the sum effect of long-term exercise mediated via different mechanisms.

References:

1. Physical Activity Guidelines Advisory Committee Report, 2008. Washington, DC: U.S. Department of Health and Human Services, 2008.
2. Kujala UM Br J Sports Med 2009; 43:550-555
3. Kujala UM et al. Circulation 2012 , e-pub ahead of print.

CARDIORESPIRATORY FITNESS, MUSCLE STRENGTH AND COGNITION- DR's EXTRA AND FINGER STUDIES

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4) Department of Clinical Physiology and Nuclear Medicine, Kuopio University Hospital, Kuopio, Finland

Background and purpose

With increasing age of the population cognitive disorders are common challenges in our society. Good cardiorespiratory fitness is suggested to have a positive effect on cognitive functions like memory. The purpose of this cross-sectional study was to examine an association of muscle strength with cognition in the DR's EXTRA Study.

Methods

Dose-Responses to Exercise Training (DR's EXTRA) Study is a randomized controlled trial on the health effects of physical exercise and diet. The target population was a representative sample of men and women who lived in the city of Kuopio in Finland and who were 55–74 years of age in 2002, when they were randomly selected from the national population register. The present study included 170 men and 170 women. Finnish Geriatric Intervention Study to Prevent Cognitive Impairment and Disability (FINGER) is an ongoing multi-center randomized controlled trial in Finland including 1200 older individuals at risk of cognitive decline.

Cognitive function was evaluated with the CERAD neuropsychological tests. Sum scores were calculated for CERAD total, total memory, immediate memory, delayed memory, verbal performance, visual performance and for MMSE. Strength of leg extension, leg curl, leg press, chest press and seated row was tested and gender specific scores were calculated.

Results

Higher levels of muscle strength are associated with better scores in CERAD total, total memory, verbal performance and MMSE. Magnitude of these associations did not change after adjusting for age, gender, education and depression. The effect of whole body muscle strength on CERAD total score was more eminent in men compared to women.

Conclusions

A higher level of muscle strength may be positively associated with cognition, especially with memory functions. In future, the brain imaging data from FINGER study can offer valuable information about the effect of cardiorespiratory fitness and muscle strength on brain structures.

IMPROVED IMAGE ANALYSIS CONFIRMS IN VIVO dGEMRIC SUGGESTIONS OF RELATIONSHIP BETWEEN MATRIX QUALITY, GAG CONTENT AND LOAD

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2. Department of Medical Technology, University of Oulu, Oulu, Finland

Today there is no definitive cure for osteoarthritis (OA), the most common joint disease. Treatment involves information/education and physical exercise. For obese people, weight loss is an important factor, since high BMI is a risk factor.

During past years our and other research groups have been developing a new contrast enhanced MRI technology which has proven to be sensitive for assessing early cartilage degeneration, (1) dGEMRIC (delayed gadolinium-enhanced magnetic resonance imaging of cartilage), that has great potential in enabling better knowledge of the pathogenesis of OA and other cartilage-related diseases. dGEMRIC enables detection of cartilage pathology although radiography does not show signs of OA, and it is the most sensitive method of today for monitoring early OA related to the molecular structure.

In a study we reported an adaptive capacity of human knee cartilage by comparing dGEMRIC results between different exercise groups (2). Recently and not yet published, we confirmed this finding by analysing superficial cartilage of weight-bearing and non weight-bearing areas of the knee in both an exercise and a sedentary group. Weight-bearing and exercised cartilage was shown to have improved quality than the non-weight bearing non-exercised cartilage.

Presently we perform improved image analysis of superficial and deep cartilage in partially meniscectomized patients that had an exercise intervention (3) to confirm dGEMRIC results suggesting that exercise has a beneficial effect on cartilage quality.

In conclusion, several studies suggest that contrast-enhanced cartilage MRI can be used to monitor cartilage quality in healthy exercising subjects and in joint disease in order to evaluate matrix improvement in interventions as well as prognosis in those at risk of OA (4-7).

- 1 Dahlberg et al. European Musculoskeletal Review, 2012
- 2 Tiderius et al. Magn Reson Med. 2004
- 3 Roos & Dahlberg. Arthritis Rheum. 2005
- 4 Van Ginckel et al. Osteoarthritis Cartilage. 2010
- 5 Anandacoomarasamy et al. Annals Rheum Dis. 2011
- 6 Owman et al. Arthritis Rheum. 2008
- 7 Ericsson et al. Osteoarthritis Cartilage. 2009

EFFECTS OF HIGH-IMPACT BONE EXERCISE ON BONE AND ARTICULAR CARTILAGE: 12 MONTHS RANDOMISED CONTROLLED QUANTITATIVE MAGNETIC RESONANCE IMAGING STUDY

Multanen J¹, Nieminen MT^{2,3}, Häkkinen A^{1,4}, Kujala U¹, Jämsä T^{2,5}, Kautiainen H^{6,7}, Lammentausta E², Koli J¹, Ahola R⁵, Selänne H⁸, Ojala R², Kiviranta I⁹, Heinonen A¹

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Background and purpose

Osteoarthritis and osteoporosis often coexist in postmenopausal women. The simultaneous effect of bone-favorable exercise on these diseases is not well understood and is a topic of controversy. We evaluated the effects of high-impact exercise on bone mineral content and the biochemical composition of knee cartilage in postmenopausal women with mild knee osteoarthritis.

Methods

Eighty women aged 50-66 years with mild knee osteoarthritis were randomly assigned to undergo supervised progressive exercise 3 times a week for 12 months (n=40) or to a non-intervention control group (n=40). The femoral neck bone mineral content was measured by DXA. The biochemical composition of knee cartilage was evaluated using delayed gadolinium-enhanced MRI of cartilage (dGEMRIC), sensitive to cartilage glycosaminoglycan content¹, and T2 mapping that is sensitive to the properties of the collagen network².

Results

Thirty-six trainees and 40 controls completed the study. The mean gain in femoral neck bone mineral content in the exercise group was 0.6% (95% CI: -0.2 to 1.4) and the mean loss in the control group was -1.2% (95% CI: -2.1 to -0.4). The baseline and body mass adjusted bone mineral content change between the groups was significant (P<0.001). No changes occurred in the biochemical composition of the tibiofemoral cartilage, while patellofemoral cartilage showed a significant positive decrease in mean T2. Balance, muscle force and cardiorespiratory fitness improved significantly more (3-11%) in the exercise group than in the control group.

Conclusions

Progressively implemented high-impact exercise, which improved bone integrity, had positive effect on the biochemical composition of patella cartilage and may be feasible in the prevention of osteoporosis and fall risk factors in patients with mild knee osteoarthritis.

References

1. Bashir et al. Magn Reson Med, 1999;41:857-65, 2. Nieminen et al. Magn Reson Med, 2000;43:676-81.

QUANTITATIVE MAGNETIC RESONANCE IMAGING, METHODS FOR CHARACTERIZATION OF ARTICULAR CARTILAGE

Lammentausta E

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Background and purpose

Osteoarthritis (OA) is degenerative joint disease causing deterioration of articular cartilage, thus inducing pain and stiffness in joints. Magnetic resonance imaging (MRI) is non-invasive imaging modality. It allows observing different joint tissues in slices with arbitrary orientations. Quantitative MRI (qMRI) aims for indirect assessment of cartilage quality by measuring relaxation parameters. Different relaxation parameters have been reported to correlate with concentration or quality different cartilage constituents.

Methods

qMRI parameters have been validated against histological, biochemical and biomechanical properties of articular cartilage. The concentration, structure and interactions of main constituents, namely collagen fibrils and proteoglycans and extracellular water, have been determined thoroughly and compared to qMRI parameters. Degeneration of cartilage has also been investigated using patients with OA, different animal models, and enzymatic digestion of cartilage components separately. The traditional qMRI parameters are T1 and T2 relaxation time and delayed gadolinium enhanced MRI of cartilage (MRI). More recently applied parameters include magnetization transfer and chemical exchange related parameters, and parameters utilizing rotating frame of reference, namely T1_p, T2_p and relaxation along fictitious field (RAFF).

Results

Significant relations has been established between qMRI parameters and several reference methods. In vivo studies have shown connection between qMRI parameters and pain, cartilage damage and even surgery outcome.

Conclusions

qMRI parameters show promising results both in vitro and in vivo. More validation with proper OA disease model is needed, as well as determining the difference of several parameters between in vitro and in vivo circumstances. Newest parameters have not been validated in vivo at all but they show very promising results in vitro.

CHALLENGES IN BONE DENSITOMETRY – DXA AND pQCT

Sievänen H

UKK Institute for Health Promotion Research, Tampere, Finland

In biological and medical research, conclusions – the primary outcome of scientific research – rest on measurements. So that the conclusions one reaches are valid and have scientific bearing, it is essential that the used measurements sufficiently accurate and precise. Measurements are always more or less compromised because of technical limitations and assumptions of the used methods that cannot be managed or met in real-life.

The accuracy (internal validity) denotes the degree to which a measured value is likely to be true in tangible and unambiguous sense and is free of systematic errors. The precision (consistency) corresponds to the degree to which a measured value can be replicated and is free of random errors. High precision is a prerequisite but not in itself sufficient. Measurement should also be accurate enough to be meaningful. If so, the measurement has adequate external validity to permit generalization to other circumstances and be of scientific and practical value.

Dual energy X-ray absorptiometry (DXA) and peripheral quantitative computed tomography (pQCT) are common methods in bone research and several seminal discoveries rest on results obtained with these methods. What are the major challenges investigators using DXA or pQCT should understand and take into account before making conclusions? First, they should know the precision. Second, they should recognize main methodological constraints and assumptions that may compromise the results.

Both DXA and pQCT images comprise 0.5x0.5 – 1.5x1.5 mm² pixels that make the appearance of bone structure coarse. They also employ density thresholds in detecting bone edges or areas that make the analysis apt to partial volume effect (PVE). Specifically, DXA assumes that the measured body is composed of homogeneous soft tissue and bone; obviously this is not true. As a result, the measurement of areal bone mineral density (aBMD) is uncertain to unknown extent (even more than one T-score to either direction) without any possibility to correct it. Since DXA gives a planar projection of the 3-dimensional bone, the interpretation of BMD is ambiguous; aBMD depends both on bone size and volumetric apparent density. Further, the planar imaging makes DXA results sensitive to bone position and rotation. In contrast to DXA, pQCT does not make any assumptions and is basically insensitive to soft tissue composition or distribution. Since pQCT images represent the actual bone cross-sections, analyses are sensitive to the anatomic location and proper alignment. In addition, volumetric bone density analyses are affected by PVE.

Whereas many of the above inherent challenges in DXA and pQCT cannot be corrected, it is of utmost importance that they are recognized and properly taken into account when making conclusions.

Invited Symposia

Wednesday: Aging and physical activity

Wednesday 23 January Theme: Aging and physical activity

8:30 Session: Physical activity and functional plasticity of the brain aging Chair: Tuija Tammelin

8:30 - 9:15 Basic principles of neuroplasticity

Randolph J. Nudo, Landon Center on Aging, University of Kansas Medical Center, Kansas City, USA

9:15 - 10:00 Vascular aging of the brain

Andreas Luft, Clinical Neurorehabilitation, University Hospital Zurich, Switzerland

10:00 - 10:30 Coffee and exhibition

10:30 Session: Physical activity and cognitive function Chair: Jan Wikgren

10:30 - 11:00 Exercise and recovery from stroke

Ina Tarkka, Department of Health Sciences, University of Jyväskylä, Finland

11:00-11:30 TMS in studying motor functions

Laura Säisänen, Department of Clinical Neurophysiology, Kuopio University Hospital, Kuopio, Finland

11:30 - 11:45 Differences in flexible cognition in rats selectively bred for endurance running capacity

Jan Wikgren, Department of Psychology, University of Jyväskylä, Finland

11:45 - 12:00 Metabolic syndrome and cognition. Role of diet and fitness.

Reija Männikkö, Kuopio Research Institute of Exercise Medicine, Kuopio, Finland

12:00 - 12:30 Round table discussion (morning presenters)

Active ageing and brain function, Chair: Ina Tarkka

12:30 - 13:30 Lunch

13:30 Session: It's never too late to become physically active Chair: Arja Häkkinen

13:30 - 14:00 Plasticity of physical performance in older adults

Harri Suominen, Department of Health Sciences, University of Jyväskylä, Finland

14:00 - 14:30 Physical Activity after Hip Fracture

Sarianna Sipilä, Department of Health Sciences, University of Jyväskylä, Finland

14:30 - 14:45 Effects of life-long physical training on musculoskeletal health

Marko Korhonen, Department of Health Sciences, University of Jyväskylä, Finland

14:45 - 15:00 Effects of individually tailored rehabilitation program on physical disability in older persons recovering from hip fracture

Johanna Edgren, Department of Health Sciences, University of Jyväskylä, Finland

15:00 Closing of the symposium and prizes

Symposium Chair: Arja Häkkinen

BASIC PRINCIPLES OF NEUROPLASTICITY

Nudo RJ

Kansas University Medical Center

Over the past 25 years, evidence has mounted regarding the capacity of the central nervous system to alter its structure and function throughout life. Correlates of plasticity have been observed at various levels of analysis from molecular to synaptic to cellular to network and systems levels. In both normal and injured mammalian species, cortical representational maps are altered, synapses change their morphology, dendrites and spines grow and contract, axons change their trajectory, neurotransmitters are modulated, synapses are potentiated or depressed, and to a limited extent, new neurons differentiate and survive.

Injury to the central nervous system appears to be a particularly potent trigger for plastic mechanisms to be elicited. Since post-injury plasticity can be both adaptive or maladaptive, current research is directed at understanding how plasticity may be modulated to develop more effective therapeutic interventions for neurological disorders. Behavioral training appears to be a significant contributor to adaptive plasticity after injury, providing a neuroscientific foundation for the development of physical therapeutic approaches. In addition, restorative therapeutics are now envisioned that will have the ability to greatly augment the benefits of physiotherapy. These restorative therapies include pharmacologic and cell-based therapies that target specific growth-promoting mechanisms, as well as devices that serve to modulate specific brain networks.

EXERCISE AND RECOVERY FROM STROKE

Tarkka IM

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GeroCenter Foundation for Research and Development, The Central Finland Central Hospital,
Jyväskylä, Finland

Background and purpose

Cerebrovascular stroke is a leading cause of long-term disability in the Western world. Physical and cognitive impairments after stroke may lead to limitations in daily activities which may be worsened by the often encountered sedentary life-style following stroke. Walking ability after stroke is often thought to be improved by intensive treadmill training, yet the data is still controversial (e.g. Moseley et al. 2005, Brogårdh & Lexell, 2012).

Methods and results

This paper describes the roles rehabilitation of physical functioning and physical exercise during early post-stroke period in active rehabilitation stage and later during life with disabilities. Recent issues in upper limb exercises, exercise specificity, walking exercises, guidelines for cardiorespiratory fitness training and resistance training are raised.

Conclusions

Focused physical exercise rehabilitative interventions are effective tools in early post-stroke period and later general fitness training may reduce a range of post-stroke problems, such as fatigue, and may compensate for the increased energy cost of the hemiparetic gait. Other benefits through exercise can be obtained e.g. in reducing the incidence of falls and fractures and in improving mood as well as quality of life.

PLASTICITY OF PHYSICAL PERFORMANCE IN OLDER ADULTS

Suominen H

Department of Health Sciences, University of Jyväskylä, Finland

Preserving adequate physical performance is an essential requirement for health and functioning among the ageing population. The greater the reserve capacity in physiological components such as muscle strength, speed, and endurance, the greater is the potential for elderly people to prolong an active and independent life. The plasticity of physical performance is preserved in later life thus making it possible to modify the age-associated decline in the different aspects of fitness and functioning. The studies in master sprinters have shown that participating in training programmes including heavy-resistance exercises, explosive type of weight training and plyometric exercises, may induce further improvement in the event specific athletic performance, maximal and explosive force production, hypertrophy of type II muscles fibres, as well as improvement in cortical bone thickness and mass distribution of the tibia shaft. Although the intensive physical training practised by athletes is beyond the scope of most sedentary older populations, there is a lesson to be learned from the individuals with healthy living habits and motivation throughout the life course. If older adults could make a step forward and switch their physical activity towards the type of training practiced by athletes, they would have considerable potential to improving their physical performance and, thereby, reducing the risk of mobility impairments, falls and fractures with ageing.

PHYSICAL ACTIVITY AFTER HIP FRACTURE

Sipilä S

Gerontology Research Center and Department of Health Sciences, University of Jyväskylä, Finland

Background and purpose

Hip fractures (HF) often lead in adverse health outcomes, mobility limitation and disability which may last years or become permanent. Less than half of HF survivors recover to their pre-fracture ambulatory level. Currently there is insufficient evidence on the best practices supporting mobility recovery after HF. The purpose of this presentation is to summarize some of the results of two studies investigating the determinants of mobility and physical activity after HF. In addition, the effects of resistance training on muscle strength and mobility in over 60 year old men and women with HF history will be presented.

Methods

Patient records at the local hospital were reviewed to recruit community-dwelling people 60 years and older operated for femoral neck or trochanteric fracture. Exclusion criteria were inability to move outdoors without assistance from another person, amputation of a lower limb, severe progressive or neurologic diseases, alcoholism, and severe memory problems. Comprehensive assessments for health, physical activity, mobility, balance, muscle strength and functional capacity were performed.

Results

Nearly 40% of the participants suffered from severe difficulty in moving outdoors and nearly 70% for walking 500 meters 6 weeks post-discharge to home. Fear of falling was associated with mobility limitation and poor muscle strength with poor mobility recovery. Still 3 years post hip fracture, asymmetrical muscle strength deficit was common and it was associated with pain, lower muscle mass, and disease/injury burden on the weaker side. Resistance training improved muscle strength and power and reduced mobility difficulties.

Conclusions

Older people with HF suffer from fear of falling, poor muscle strength and pain which are associated with mobility limitation and disability. Intensive physical training and follow-up for mobility recovery is needed for optimal recovery after HF.

EFFECTS OF HOME-BASED PHYSICAL REHABILITATION PROGRAM ON PHYSICAL DISABILITY AFTER HIP FRACTURE: A RANDOMIZED CONTROLLED TRIAL

Edgren J¹, Salpakoski A¹, Rantanen T¹, Heinonen A², Sihvonen SE³, Portegijs E¹, Kallinen M⁴, Arkela-Kautiainen M⁵, Jäntti P⁶, Vanhatalo J⁷, Pekkonen M⁸, and Sipilä S¹

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Background and purpose

Only half of the hip fracture patients regain the pre fracture level of physical functional capacity. Purpose of this study (ISRCTN53680197) was to investigate the effects of home-based rehabilitation program on physical disability among older people who had sustained a hip fracture.

Methods

Population-based sample of over 60-year-old men and women operated for hip fracture (n=81, mean age 79 years, 78 % were women) participated in the study and were randomly assigned into control (Standard Care) and intervention groups on average 6 weeks after discharged to home. The year-long intervention included evaluation and modification of environmental hazards, guidance for safe walking, non-pharmacological pain management, progressive home exercise program, physical activity counseling and Standard Care. Assessments took place at baseline, and 3, 6 and 12 months thereafter. Physical disability was assessed by a questionnaire containing 14 questions on perceived difficulty in basic (ADL) and instrumental activities of daily living (IADL). Two sum scores were composed. A higher score indicated more difficulty. Additionally, the original categorical variables were re-coded into 3-graded: 1) no difficulty, 2) some difficulty, and 3) lots of difficulty. GEE models were constructed.

Results

At the baseline the mean ADL score was 4.7 (SD=3.2) in the intervention group and 4.0 (3.1) in the control group. Respective values for IADL were 9.4 (7.7) and 7.6 (6.5). The intervention had no significant effect on ADL and IADL sum scores (group*time p=0.357 for ADL and 0.845 for IADL). However, when looking at the individual items, the intervention group improved in preparing food and handling medication (group*time p=0.034 and p=0.042 respectively).

Conclusions

The intervention was effective in improving two IADL items. In ADLs no such improvement occurred. This may be due the participants being community dwelling and therefore relatively independent in ADLs.

Posters

Session 1, Monday 21st

POSTER PRESENTATIONS Parallel sessions in 3rd floor lobby
Monday 21st January 15:10 – 15:45

Session 1, Electronic Poster Board 1, Chair: Tarja Kettunen

FAMILY AFFLUENCE DIFFERENCES IN VIGOROUS PHYSICAL ACTIVITY LEVELS BETWEEN CHILDREN WITH AND WITHOUT LONG TERM ILLNESSES OR DISABILITIES

Ng K, Liu Y, Tynjälä J

SOCIOECONOMIC DIFFERENCES IN PHYSICAL ACTIVITY OF ADOLESCENT: A COMPARATIVE STUDY BETWEEN CHINA AND FINLAND

Liu Y, Wang M, Tynjälä J, Villberg J, Kannas L

PHYSICAL ACTIVITY, SEDENTARY ACTIVITY AND SOCIOECONOMIC STATUS IN A POPULATION SAMPLE OF CHILDREN – THE PHYSICAL ACTIVITY AND NUTRITION IN CHILDREN (PANIC) STUDY

Lampinen EK, Eloranta AM, Lintu N, Väistö J, Karjalainen P, Lindi V, Laaksonen DE, Lakka TA

BODY COMPOSITION AND MOTOR SKILLS IN 6- TO 8-YEAR-OLD CHILDREN – THE PANIC STUDY

Haapala EA, Lampinen EK, Sääkslahti A, Lindi V, Lakka TA

ALTHOUGH UNSEEN, CHRONIC PAIN IS REAL - A PHENOMENOLOGICAL STUDY

Ojala T, Häkkinen A, Karppinen J, Sipilä K, Suutama T, Piirainen A

“CONQUERORS OF THE USELESS”: THE PARADOX OF ROCK CLIMBING

Gallicchio G, Eek F

Session 2, Electronic Poster Board 2, Chair: Katja Waller

FEEDBACK IN POST STROKE MOTOR LEARNING STUDIES. WHAT KIND OF FEEDBACK COULD BE USEFUL IN PHYSIOTHERAPY? SYSTEMATIC REVIEW OF RCTs.

Hyttinen A, Kosonen S, Pirkkalainen M, Wesman T, Sjögren T

LEARNING THEORIES, MOTOR LEARNING THEORIES AND QUALITY OF STUDIES USED IN PHYSIOTHERAPY RCT STUDIES AMONG PATIENT WITH STROKE

Janhunen E, Utecht M, Sjögren T

MEASUREMENTS OF MOTOR CONTROL AND MOTOR LEARNING IN PATIENTS WITH STROKE IN FRAMEWORK OF ICF CLASSIFICATION

Lankinen K, Lehtonen E, Ryhänen A, Sjögren T

TRUNK MUSCLE STRENGTH AND DISABILITY THREE MONTHS AFTER LUMBAR SPINE FUSION

Tarnanen S, Neva MH, Kautiainen H, Pekkanen L, Ylinen J, Kaistila T, Häkkinen A

CHANGES IN PHYSICAL FUNCTIONING IN PERSONS WITH MULTIPLE SCLEROSIS (MS): A TEN-YEAR FOLLOW-UP STUDY

Alanko T, Paltamaa J, Häkkinen A

FUNCTIONAL DISABILITY AND MUSCLE FUNCTION OF THE SHOULDER AFTER A ROTATOR CUFF REPAIR AT ONE-YEAR FOLLOW-UP

K Piitulainen, A Häkkinen, P Salo, J Ylinen

DEVELOPING AQUATIC THERAPY AND EXERCISE THROUGH A REGIONAL PROJECT ON HEALTH PROMOTION

Päykkönen E, Reunanen M

FAMILY AFFLUENCE DIFFERENCES IN VIGOROUS PHYSICAL ACTIVITY LEVELS BETWEEN CHILDREN WITH AND WITHOUT LONG TERM ILLNESSES OR DISABILITIES

Ng K, Liu Y, Tynjälä J

University of Jyväskylä.

Background and Purpose

Recent research shows an association between being in an affluent family and physical activity (PA) levels of adolescents (Currie et al, 2008). However, the breakdown of adolescents was only seen only as composites of gender and age. Within this group of adolescents, a further subgroup can be found in children who indicated they have a long term illness, disability or a medical condition (LTID). This study examines the associations between affluence families and PA in children with LTID.

Methods

The sample consisted of Finnish pupils (n=3873) approximately 13.5 and 15.5 years of age in general education. This study is part of the Health Behaviour in School-age children (HBSC) study. The standardised, according to the HBSC protocol, 2010 questionnaire was used for this study. Family affluence Scale (FAS; Currie, 2008) and Vigorous physical activity – 2hours and 3 times a week (VPA) outside of school hours was used. Adolescents were divided into two groups, those with LTID (n=611) and without LTID (n=3262). Three groups of family affluence were also detected of low (n=258), middle (n=1572), and high (n=2043).

Results

For all samples (13 and 15 yrs), the difference of VPA % is statistically significant ($p = 0.029$) for children with or without disability in the low FAS group. The difference of VPA % is statistically significant ($p = 0.008$) for children with disability among different FAS group. For all samples (13 and 15 yrs), the difference of VPA % is statistically significant ($p < 0.001$) for children without disability among different FAS group.

Conclusions

Previous studies have demonstrated there is a clear association between affluences of a family and physical activity levels across adolescents. VPA levels of adolescents with LTID and low FAS falls in line with the existing research. However, middle and high FAS groups did not demonstrate the same association. More research is needed to understand these differences between groups.

SOCIOECONOMIC DIFFERENCES IN PHYSICAL ACTIVITY OF ADOLESCENT: A COMPARATIVE STUDY BETWEEN CHINA AND FINLAND

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Background and purpose

Physical activity (PA) is essential for the development of children and adolescent. The literatures addressed socioeconomic inequalities in PA among adolescents is limited and the results are not consistent. The purpose of this study is, therefore, to investigate the socioeconomic inequalities in PA of adolescents in China and Finland and then compare the similarities and differences between these two countries.

Methods

The samples for this study included 5876 Chinese (boy 47.9%) and 5249 Finnish (boy 47.8%) schoolchildren aged 11, 13, 15 years. Those data were collected from the Health Behaviour in School-aged Children (HBSC) linked project in Beijing 2008 and the Finnish HBSC survey 2008. Measurement of physical activity comprised moderate to vigorous PA (MVPA) last week, and the frequency and duration of vigorous PA (VPA) per week. Socioeconomic status (SES) was measured by the Family Affluences Scale (FAS). Descriptive statistics, Pearson's Chi-square test, and logistic regression were used for analyses.

Results

Boys from the high affluent families were more likely to meet the MVPA recommendations among all age groups in China, which only appeared among the youngest group in Finland. These differences were also absent for girls in both countries. Finnish girls from high affluent family were more likely to be involved in the VPA than those from the low affluent family. For Chinese girls, this pattern was not consistent among all age groups.

Conclusions

The study indicated different patterns of socioeconomic difference in physical activity among boys and girls in China and Finland. Therefore, specific policies and interventions should be encouraged and designed for reducing the socioeconomic inequalities in PA of boys in both countries. Promoting the girl's participation of PA is one of priorities for Chinese educational professionals. And the girls with from the low affluent family should be targeted for enhancing their VPA in Finland.

PHYSICAL ACTIVITY, SEDENTARY ACTIVITY AND SOCIOECONOMIC STATUS IN A POPULATION SAMPLE OF CHILDREN – THE PHYSICAL ACTIVITY AND NUTRITION IN CHILDREN (PANIC) STUDY

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Background and purpose

Habitual physical activity (PA) is decreasing and sedentary activity (SA), particularly media time (MT), is increasing among children. Few studies have provided comprehensive data on different types of PA and SA in population samples of children and the associations of socioeconomic status (SES) with PA and SA. We studied these issues in a large population sample of children at baseline of The Physical Activity and Nutrition in Children (PANIC) Study.

Methods

The subjects were a population sample of 504 Finnish children (244 girls, 260 boys) aged 6–8 years. We assessed PA, SA, MT (watching TV, using computer, playing mobile and video games) family income and parental education by questionnaires administered by the parents.

Results

We found that 66 % of the girls and 55 % of the boys spent less than the Finnish recommendation of at least 2 hours per day in PA. Moreover, 19 % of the boys and 10 % of the girls spent more than the recommended maximum of 2 hours of MT per day on weekdays. However, 57 % of the boys and 35 % of the girls exceeded the recommended MT on weekend. The most common types of PA in both genders were unorganized PA, PA during recess, commuting to school and physical education at school. The most common types of SA in boys were watching TV, using computer and reading, and those in girls were watching TV, drawing, reading and hobby crafts. A lower parental education was associated with lower levels of organized PA ($p=0.002$) and unorganized PA ($p=0.014$) and with a higher MT on weekdays ($p=0.001$). A lower family income was related to lower levels of organized PA ($p<0.001$) and a higher MT on weekdays ($p<0.001$). These associations were stronger in boys than girls.

Conclusions

PA should be increased and SA decreased in children. More attention should be paid to children from families with a lower SES when planning and carrying out interventions aimed at increasing PA and improving health.

BODY COMPOSITION AND MOTOR SKILLS IN 6- TO 8-YEAR-OLD CHILDREN – THE PANIC STUDY

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Background and purpose

A high body mass index (BMI) has been linked to poor motor skills that are important predictors of physical activity engagement. BMI is a crude measure of body adiposity and therefore the present study compares the associations of total body fat percentage (BF%) and BMI-standard deviation score (SDS) with motor skills in children.

Methods

The participants were a population sample of 424 children 6-8 years of age from the PANIC study. Weight and height were measured, BMI was calculated and BMI-SDS was assessed by the national references. Overweight was defined by International Obesity Task Force (IOTF) cut-offs. BF% was measured using a dual-energy X-ray absorptiometry (DXA). Motor skills were assessed by a 5x10m shuttle run (SHR), standing long jump (SLJ), Flamingo balance (FB), and Box and block (BBT) tests. Linear regression analyses and ANCOVAs were controlled for age, sex, parental education, birth weight, physical activity, electronic media time and sexual maturity.

Results

Higher BF% was associated with poorer SHR time ($\beta=.241$, $p<.001$), a shorter distance jumped in SLJ ($\beta=-.397$, $p<0.001$) and increased number of errors in FB ($\beta=.119$, $p=.021$). Higher BMI-SDS was associated with poorer SLJ ($\beta=-.223$, $p<.001$) performance. Children in the highest third of BF% were slower in SHR ($p=.001$; $p=.025$) and had poorer performance in SLJ ($p<.001$) than those in the lowest and middle thirds. Moreover, children in the lowest third of BF% had a better performance in SLJ than those in the middle third ($p=.045$). Overweight children had a longer SHR time ($p=.001$) and poorer performance in SLJ ($p<.001$) than normal weight children. Children in the thirds of BF%, and overweight and normal weight children did not differ in FB and BBT.

Discussion

BF% was more strongly related to locomotor and balance skills than BMI-SDS. These results emphasize the importance of prevention of excess gain of adipose tissue that may have adverse effect on locomotor and balance skills during childhood.

ALTHOUGH UNSEEN, CHRONIC PAIN IS REAL - A PHENOMENOLOGICAL STUDY

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Background

Manifold identity of chronic pain is a challenge for research and clinical practice. Research has emphasised the essential role of psychosocial risk factors. In practice, pain is usually verified with a visible physical cause. Without any distinct pathology, pain is easily defined as imaginary pain. The aim of this study was to describe life with unseen chronic pain from the participant's perspective.

Methods

Thirty-four chronic pain outpatients were interviewed, and the transcribed interviews were analysed with Giorgi's four-phase method. The mean age of the participants was 48 years and 19 of them were women. For 21 of the participants the pain had lasted more than five years, and the most common pathological finding was degenerative spinal changes.

Results

Under the main theme, the following subthemes were found in our interviews: "Being disbelieved", "Adolescent's pain is also disbelieved", "Denying pain", "Underrating symptoms", "The pain is in your head", "Second-class citizen", "Lazy pain patient", "False beliefs demand passivity". The invisibility of pain was the main concern of all of the respondents. Without any visible evidence for their pain, the participants spoke of being disbelieved by their friends, family members and HCPs (health care provider). The greatest concern was against HCPs who showed their disbelief by underrating or denying the respondents' symptoms. The participants were stigmatised as insane and were guided to contact a psychiatrist for their pain. The respondents reported experiencing that they were second-class citizens who were rejected by health care and social security, which contributed to additional unnecessary mental health problems.

Conclusions

In health care, pain that is experienced without any pathology is considered to be imaginary pain. A phenomenological approach, finding out the subjective meanings of chronic pain enables to see the unseen pain in multidisciplinary clinical practice.

“CONQUERORS OF THE USELESS”: THE PARADOX OF ROCK CLIMBING

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Lund University

Background and purpose

Rock climbing, as a physical exercise and an adventure activity is supposed to be healthy and dangerous at the same time (Jones, 2007). Despite the growing interest among the general population scientific literature still regards rock climbing as a marginal and professional phenomenon (Willig, 2008). While most of the studies focused on measuring personality differences along the Sensation-seeking scale a recent trend has revealed that adventure activities hold more than just the mere adrenaline rush (Willig, 2008). The present research aims at investigating motivations, barriers and personal meanings in recreational rock climbing.

Methods

An inductive qualitative methodology combining experiential ethnography and Grounded Theory will be used. Ten recreational Italian climbers will be interviewed by the first author, climber himself, during a few-day backpacking/climbing trip in the Italian Alps in March 2013. Data analysis will focus on identification and integration of analytic categories with the aim of producing an explanatory model, which will be then confronted with the relevant literature.

Results

Although a priori expectations are against the proposed methodology, participants may account for themes which have been already reported in similar studies, as instance *adrenaline rush*, *personal growth*, *enjoyment* and *mastery* (Willig, 2008).

Conclusions

The study will shed some lights on the reasons why people engage in rock climbing despite the presumed high barriers.

Furthermore, exploring what motivates recreational rock climbers to exercise in such risky conditions can provide new hints on how to motivate towards physical exercise in general.

References

- Jones, G., Asghar, A., Llewellyn, D. J. (2007). The epidemiology of rock-climbing injuries. *British Journal of Sports Medicine*, 42, 773-778.
- Willig, C. (2008). A Phenomenological Investigation of the Experience of Taking Part in 'Extreme Sports'. *Journal of Health Psychology*, 13(5), 690-702.

Posters

Session 2, Monday 21st

FEEDBACK IN POST STROKE MOTOR LEARNING STUDIES. WHAT KIND OF FEEDBACK COULD BE USEFUL IN PHYSIOTHERAPY? SYSTEMATIC REVIEW OF RCTs.

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Background and purpose

According to earlier systematic review studies the scientific evidence of used feedback methods among stroke patients was inconsistent (1, 2, 3). Purpose of this systematic review was to identify types of feedback used in post stroke rehabilitation and evaluate effect or effectiveness of feedback methods.

Methods

A systematic literature search was conducted in OVID MEDLINE database from 1/2007 to 9/2011. Inclusion criteria were randomized controlled trials (RCT) of motor control and/or motor learning for patient over 18 years old with stroke and published in Finnish, Swedish, English or German. Feedback was classified using the classification for sensory information (intrinsic/extrinsic feedback) according to Schmidt & Wrisberg (2008).

Results

Out of 116 publications 10 were eligible involving 255 patients, mean age 57. All ten studies used intrinsic feedback; three studies visual, three audition, two visual and audition and two proprioception feedback. Additionally five studies used extrinsic feedback; all five knowledge of performance and two also knowledge of results. In seven studies the type of feedback in control group was not reported. In three studies the feedback in control group was equal or partly equal compared to intervention group. The effect of used feedback method on health related outcomes varies greatly. Statistically significant effect was found in one proprioceptive feedback study, one visual plus audition feedback study, one audition feedback study and one audition feedback and knowledge of performance study. In two studies the outcome was negative compared to control group. The positive health related outcome was measured in muscle strength and in stroke-specific performance.

Conclusions

According to results based on 10 RCT- articles showed significant results while using audition feedback for stroke rehabilitation. Compared to earlier systematic reviews similar positive results about audition feedback (3) and in audition plus visual feedback (2) was found.

References

- 1) Paltamaa et al., 2011, Hyvän kuntoutuskäytännön perusta. Käytännön ja tutkimustiedon analyysistä suosituksiin vaikeavammaisten kuntoutuksen kehittämishankkeessa. 158-1591.
- 2) Barclay-Goddard et al. 2009. Force platform feedback for standing balance training after stroke (Review). The Cochrane Collaboration.
- 3) Brand et al. 2010. Music therapy for acquired brain injury (Review). The Cochrane Collaboration.

LEARNING THEORIES, MOTOR LEARNING THEORIES AND QUALITY OF STUDIES USED IN PHYSIOTHERAPY RCT STUDIES AMONG PATIENT WITH STROKE

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Background and purpose

Physiotherapy is traditionally based on different learning theories that combine conceptual models of motor performance with a situation-based learning approach (1). Using solely motor learning or neurophysiological approach, e.g. Bobath-concept, has been found to be less effective treatment compared to use of mixed physiotherapy approaches (2). Purpose of this study was to investigate how different types of learning models was taken account in physiotherapy studies among patient with stroke in the latest randomized controlled trials (RTC). The second purpose was to evaluate the quality of the articles.

Methods

A systematic literature search was conducted in OVID MEDLINE database from 1/2007 to 9/2011. Study inclusion criteria were RCT of motor control and/or motor learning for patients over 18 years old with stroke and published in Finnish, Swedish, English or German. Methodological quality was assessed using the criteria of van Tulder et.al. (2003)(3). RCTs were classified as high-level, acceptable or poor according to yes-rated items and number of subjects (4).

Results

The initial search yielded 116 publications. A screening of titles, abstracts and full text papers revealed 10 eligible publications (n=255 patients, mean age 57) related to stroke and motor control and/or motor learning approach. These preliminary results are based on 10 articles. None of these studies stated clearly which learning theory method or motor learning method, was used in exercise interventions. Methodological quality of the included RCTs was moderate (mean 5.30, SD 2.15, range 1–8). One of studies were high-level, four acceptable and five poor.

Conclusions

Neither the learning theories nor motor learning theories were clearly presented in physiotherapy interventions. More specific research based on learning theory or motor control theory is still required to promote effect and effectiveness of motor re-learning among patient with stroke.

References

1) Schmidt & Wrisberg, 2008, Motor learning and performance: a situation-based learning approach. 4th ed, 19-20. 2) Pollock et al, 2007, Physiotherapy treatment approaches for the recovery of postural control and lower limb function following stroke: a systematic review. Clin Rehabil, 21:395-410. 3) vanTulder et al, 2003, Updated Method Guidelines for Systematic Reviews in the Cochrane Collaboration Back Review Group. Spine, 28(12):1290-9. 4) Paltamaa et al., 2011, Hyvän kuntoutuskäytännön perusta. Käytännön ja tutkimustiedon analyysistä suositukseen vaikeavammaisten kuntoutuksen kehittämishankkeessa. 158-159.

MEASUREMENTS OF MOTOR CONTROL AND MOTOR LEARNING IN PATIENTS WITH STROKE IN FRAMEWORK OF ICF CLASSIFICATION

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Background and purpose

Physiotherapy is a significant part of the rehabilitation of patients with stroke. The common goal in physiotherapy is to encourage patients be active in their own environment. International classification of functioning, disability and health (ICF) is developed by the World Health Organization providing a framework for various aspects of health (1). The purpose of this study was to evaluate measurements used in motor control and motor learning studies among patients with stroke and classify these measurements according to the ICF (body functions and structures, activities, participation) to indicate the effect or effectiveness of therapy.

Methods

A systematic literature search was conducted in OVID MEDLINE database from year 1/2007 to 9/2011. Inclusion criteria were randomized controlled trials (RCT) investigating motor control and /or motor learning for patients over 18 years old with stroke and published in Finnish, Swedish, English or German. Exclusion criteria were non-randomized and controlled pre-experimental studies and protocols.

Results: A screening revealed 10 eligible publications. Fugl-Meyer Assessment (FMA) of physical performance was used in seven trials and 3Dgait analyses were used in three trials. According to ICF both evaluates activities. Two trials used Functional Independence Measure (FIM) as a measurement. FIM evaluates body functions and structures, activities and participation. Other measurements like Box and Block, Motor Activity Log, Rancho Functional Test and other functional tests were used in single studies, measuring mainly activities.

Conclusions

When taking all the measurements into account the most used component of ICF classification was evaluating activities. This was also found in Paltamaa's et al. edited study (2011) (2). In this systematic review, the measurements of the studies represented stationary and unchangeable environments and they do not clearly indicate patient's ability to performance in their daily living. Measurement of FIM takes best into account the components of ICF and motor skills requirements of the functioning and the demands of the environment.

References

1) WHO. ICF/ICIDH-2. 2001. <http://www.who.int/icidadh>. 2) Paltamaa et al., 2011, Hyvän kuntoutuskäytännön perusta. Käytännön ja tutkimustiedon analyysistä suosituksiin vaikeavammaisten kuntoutuksen kehittämishankkeessa.158-1591.

TRUNK MUSCLE STRENGTH AND DISABILITY THREE MONTHS AFTER LUMBAR SPINE FUSION

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²Department of Orthopaedic and Trauma Surgery, Tampere University Hospital, Finland;

³Jyväskylä Central Hospital, Finland

Background and purpose

The chronic low back pain and spine surgery may lead to structural and functional changes of the trunk muscles and those changes can increase disability [1]. The aim of this study was to evaluate the early effect of lumbar spine fusion (LSF) on trunk muscle strength and its relation to disability measured before and 3 months after surgery.

Methods

114 patients (36% males, age 57 ±13 and 64% females age 61±11) undergoing LSF participated in the study. Oswestry Disability Index (ODI) was used to evaluate disability. Isometric trunk muscle extension and flexion strength was measured by a dynamometer. Patients were encouraged to walk daily and perform light exercises, and stretches during the first three postoperative months.

Results

Pre-operatively the trunk extension and flexion strength levels were in males 319 N and 436N, and in females 160N and 214N, respectively. The increases of 39 N (95% CI (18 to 59) in trunk flexion and 38N (95% CI (18 to 59) in extension strength were statistically significant in females in the 3 months follow-up measurement ($p<0.001$) while in males strength levels remained unchanged. Post-operatively the strength of trunk extensors and flexors were in males 36% and 55%, and in females 29% and 36% of body weight, respectively. The ODI decreased from 39 to 23 in males ($p<0.001$) and from 45 to 23 in females ($p<0.001$) during follow up. The changes in the ODI associated moderately with changes of trunk extension [$r= -0.38$ (95%CI: -0.50 to -0.23)] and flexion [$r= -0.43$ (95%CI: - 0.58 to -0.27)] strength.

Conclusions

LSF leads to considerable decrease of disability, but patients still have low trunk extension and flexion strength levels 3 months postoperatively. The correlation between muscle strength and ODI indicate that increase of muscle strength may decrease disability of these patients, thus intensive rehabilitation may be needed to normalize trunk muscle strength after LSF.

References

[1] Keller et al., Spine 29, 3-8, 2004.

CHANGES IN PHYSICAL FUNCTIONING IN PERSONS WITH MULTIPLE SCLEROSIS (MS): A TEN-YEAR FOLLOW-UP STUDY

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²JAMK University of Applied Sciences and Peurunka Medical Rehabilitation Centre

Purpose

The aim of this prospective study was to study changes over ten years in physical functioning in persons with multiple sclerosis (MS) in the Central Finland Health Care District.

The study cohort (n=211) was obtained from a population-based cohort conducted in the year 2000. The response rate of this questionnaire study was 84 %. The average age of the participants was 57 years; 74 % were women and 26 % were men; and 86 % had relapsing-remitting MS and 13 % primary remitting MS. The participants had had MS symptoms for over 25-56 years.

Methods

The ICF-classification (International Classification of Functioning, Disability and Health) was used as a theoretical framework. The Functional Status Questionnaire was used to study changes in activities and participation in self-care, mobility and domestic life (FSQ-index). In addition, walking without aids (PAD- index) and Expanded Disability Status Scale moving in own's environment (self EDSS- scale) was assessed.

Results

The total FSQ index (scale 0-100) had decreased by 13 % and indices of self-care, mobility and domestic life domains index had worsened by 17 %, 15 % and 21 %, respectively. Overall, 57 % of persons with MS were fully independent in domestic life ten years later as against 64 % in the year 2000. PAD index (scale 0-100) had worsened by 23 %. Moving around in own's neighborhood assessed by the self EDSS was 59 % at the beginning of the study and 46 % in 2010. The number of wheelchair users had increased from 9 % to 19 % and bedridden participants from 1 % to 5 %.

Conclusion

The study demonstrated the progressive nature and heterogeneity of MS. Both activities of daily living and walking without aid had decreased over the 10-year follow-up period, although more than half were still walking fully independently at the end of the study. Regular assessment of the functioning and disease prognosis of persons with MS is recommended, in order that they may receive rehabilitation services as the need arises.

FUNCTIONAL DISABILITY AND MUSCLE FUNCTION OF THE SHOULDER AFTER A ROTATOR CUFF REPAIR AT ONE-YEAR FOLLOW-UP

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2 Department of Physical Medicine and Rehabilitation, Central Finland Hospital District, Jyväskylä, Finland

Background and purpose

To find out the changes in shoulder disability and muscle function after a rotator cuff repair at one-year follow-up.

Methods

A total of 66 patients (mean age 54 years, 57% males) who had gone through an operation due to a rotator cuff tear, were included in the study. Self-rated shoulder disability was measured by The American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form (ASES) questionnaire (Scale 0 to 100). Isometric shoulder muscle strength was measured using a custom made dynamometer. Measurements were completed at 2 and 14 months after the operation.

Results

Mean (SD) ASES score improved from 72 (16) points to 95 (8) points ($p < 0.001$). Shoulder muscle strength of the operated side improved significantly during the follow-up; flexion from 5 kg to 7 kg ($p < 0.001$), external rotation from 7 kg to 10 kg ($p < 0.001$), and internal rotation from 12 kg to 15 kg ($p < 0.001$). At 14 months the flexion strength was 16% and the external rotation strength 7% lower and the internal rotation strength was 5% higher on the operated side compared to the contralateral side. The strength ratio of external/internal rotation of the operated shoulder changed from 0.58 to 0.67 ($p < 0.001$), and of the contralateral side from 0.75 to 0.78 ($p = 0.163$) (difference between the sides at both time points, $p < 0.001$).

Conclusions

Self-rated functional ability of the operated shoulder recovered to a normal level, but muscle function remained disturbed. Therefore, strength exercises should be included to the rehabilitation program after a rotator cuff repair.

DEVELOPING AQUATIC THERAPY AND EXERCISE THROUGH A REGIONAL PROJECT ON HEALTH PROMOTION

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Background

Students in physiotherapy degree programmes in Finland participate in researchdevelopment and innovation (RDI) activities through various projects during their studies. Projects involve researchers, teachers, students and representatives of external organizations. The VESKU Aquatic therapy and exercise - project at Mikkeli University of Applied Sciences is an example of an innovative project to promote health and wellbeing among individuals and groups in communities, and develop new service models for aquatic therapy and exercises. The project is funded by the European Social Fund (ESF) and the Centre for Economic Development, Transport and the Environment in Southeast Finland.

Purpose

The purpose of the poster presentation is to describe the main goals and activities of the VESKU-project during years 2011 - 2013. The main goals are 1) to develop know-how in aquatic therapy and exercise at the regional level among physiotherapists, physiotherapy students and other professionals as well as students working with health promotion, rehabilitation and physical fitness, 2) to promote health and wellbeing of citizens by producing new aquatic exercise services, 3) to produce aquatic physiotherapy services for rehabilitation and 4) to develop regional service models of aquatic therapy and exercise.

Methods

This poster presentation will describe the VESKU - project activities and cooperation with regional organizations.

Results

VESKU - project produces educational activities on aquatic know-how and carries out health promotive aquatic therapy and exercise pilot-studies in organizations involved in the project.

Conclusions

The project is an example of regional health promotion development and intensive cooperation between physiotherapy studies at Mikkeli University of Applied Sciences and regional wellbeing services.

Posters

Session 3, Tuesday 22nd

Tuesday 22nd 15:10-15:45

Session 3, Electronic Poster Board 1, Chair: Timo Rantalainen

INTRINSIC MOTIVATION FOR PHYSICAL ACTIVITY IN FEMALES PARTICIPATING IN A LIFESTYLE CHANGE PROGRAMME

Mamen A, Strand H, Nordengen S

EFFECTS OF AN INTENSIVE PROGRESSIVE AQUATIC EXERCISE PROGRAM ON THE QUALITY OF CARTILAGE IN WOMEN WITH MILD OSTEOARTHRITIS OF THE KNEE: PROTOCOL FOR A RANDOMISED CONTROLLED TRIAL

Waller B, Munukka M, Multanen J, Rantalainen T, Pöyhönen T, Nieminen MT, Kiviranta I, Kautiainen H, Sipilä S, Kujala U, Häkkinen A, Heinonen A

IMPROVEMENTS IN PHYSICAL FITNESS AND BODY COMPOSITION DURING SINGLE SESSION COMBINED ENDURANCE AND STRENGTH TRAINING WITH DIFFERENT EXERCISE ORDERS IN WOMEN

Schumann M, Häkkinen A, Avo T, Eklund D, Ikonen P, Kүүsmaa M, Mykkänen O, Pelttari P, Pulverenti T, Sirparanta A-I, Syväoja H, Yli-Peltola K, Häkkinen K

EFFECTS OF A NORMAL-PROTEIN VEGETABLE-BASED DIET AND A HIGH-PROTEIN NON-VEGETABLE DIET ON URINE pH AND SERUM CHOLESTEROL IN ADULTS AT REST

Hietavala E, Stenholm J, Laine T, Puurtinen R, Mero AA

EFFECTS OF A NORMAL-PROTEIN VEGETABLE-BASED DIET AND A HIGH-PROTEIN NON-VEGETABLE DIET ON CORTISOL RESPONSE AND LEUKOCYTOSIS IN EXERCISE

Stenholm J, Hietavala E, Laine T, Puurtinen R, Mero AA

NECK STRENGTH, MUSCLE MECHANICAL PROPERTIES, AND DISABILITY IN CERVICAL DYSTONIA FOLLOWING BOTULINUM NEUROTOXIN INJECTIONS

Mustalampi S, Kautiainen H, Korniloff K, Weir A, Häkkinen A

Session 4, Electronic Poster Board 2, Chair: Mikaela vonBonsdorff

THE ROLE OF PHYSICAL ACTIVITY IN AGE RELATED-CHANGES IN WALKING MECHANICS

Kulmala J-P, Korhonen M, Kuitunen S, Suominen H, Heinonen A, Avela J

MISMATCH RESPONSE TO SOMATOSENSORY STIMULI IN YOUNG AND ELDERLY ADULTS

Strömmer J, Astikainen P & Tarkka IM

DETERMINANTS OF BEING PHYSICALLY NON-ACTIVE IN AGING MEN AND WOMEN: THE DR'S EXTRA STUDY

Hakola L, Hassinen M, Komulainen P, Savonen K, Rauramaa R

SUPERVISED STRENGTH AND BALANCE TRAINING. PREDICTORS OF PARTICIPATION AMONG THE POPULATION 75 YEARS AND OLDER.

Aartolahti E, Hartikainen S, Lönnroos E, Sulkava R, Häkkinen A

CONCERN ABOUT FALLING IN OLDER WOMEN WITH A HISTORY OF FALLS: ASSOCIATIONS WITH HEALTH, FUNCTIONAL ABILITY, PHYSICAL ACTIVITY AND QUALITY OF LIFE.

Patil R, Uusi-Rasi K, Pasanen M, Kannus P, Karinkanta S, Sievänen H

DO MOBILITY, COGNITIVE FUNCTIONING, AND DEPRESSIVE SYMPTOMS MEDIATE THE ASSOCIATION BETWEEN SOCIAL ACTIVITY AND MORTALITY RISK AMONG OLDER MEN AND WOMEN?

Pynnönen K, Törmäkangas T, Rantanen T, and Lyyra T-M

INTRINSIC MOTIVATION FOR PHYSICAL ACTIVITY IN FEMALES PARTICIPATING IN A LIFESTYLE CHANGE PROGRAMME

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Background and purpose

Lifestyle change programmes are popular with women. In order to have success with lifestyle change that lasts more than a few weeks, intrinsic motivation seems to be important. In a study to examine whether a change in motivation for physical activity occurred during the initial phase of a lifestyle change programme, 15 females served as subjects, 42.5 (13.5) yr, 94.5 (13.0) kg body mass, (mean (SD)).

Methods

The subjects completed the Behavioural Regulation in Exercise Questionnaire-2 (BREQ-2), Markland & Tobin, 2004, at start and after four weeks. The BREQ-2 consists of 19 items related to five motivational orientations; amotivation, three forms of extrinsic motivation and intrinsic motivation. The lifestyle change programme has an introductory phase where the subjects eat a carbohydrate depleted diet and perform physical training under guidance. The re-test was conducted at the end of this phase. A t-test was used for pre-post comparison. Level of significance was set at $p \leq 0.05$.

Results

The group showed high intrinsic motivation for physical activity at start, 10.5 (3.4). At post-test, intrinsic motivation was even higher, 11.5 (1.9), but the increase was not statistically significant. The participants had a weight loss of 7.4(1.6) % during the initial phase, but there was no relationship between degree of weight loss and increase in intrinsic motivation for physical activity.

Conclusions

The high initial score on intrinsic motivation for physical activity shows that this group of females from the start were highly intrinsically motivated, and thus a further increase would be difficult to obtain. Also, the use of ketosis to enhance initial weight loss might be a stimulus for continued extrinsic motivation, because of the focus on weight reduction rather than physical activity.

Markland, D., Tobin, V. A modification to the behavioural regulation in exercise questionnaire to include an assessment of amotivation. *J Sport Exerc Psychol* 2004; 26:191-196.

EFFECTS OF AN INTENSIVE PROGRESSIVE AQUATIC EXERCISE PROGRAM ON THE QUALITY OF CARTILAGE IN WOMEN WITH MILD OSTEOARTHRITIS OF THE KNEE: PROTOCOL FOR A RANDOMISED CONTROLLED TRIAL

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Background

Symptoms associated with osteoarthritis of the knee result in decreased function, loss of working capacity and extensive social and medical costs. Aquatic exercise has been shown to be effective at reducing the impact of osteoarthritis by improving muscle strength and aerobic fitness, decreasing pain and increasing functional ability. The purpose of this study is to investigate the effect an intensive aquatic exercise intervention has on the cartilage in postmenopausal women with mild osteoarthritis of the knee.

Methods/design

A minimum of 80 volunteers who meet the inclusion criteria will be recruited from the local population through newspaper advertisements. Primary outcomes for this study are assessment of knee cartilage using T2- relaxation time and delayed gadolinium-enhanced magnetic resonance imaging techniques. Secondary outcome measurements consist of body composition and bone traits using dual energy x-ray absorptiometry and peripheral quantitative computed tomography, pain, quality of life and function using questionnaires and physical performance measures. Following initial assessment volunteers will be randomized into two groups. The intervention group will participate in an intensive progressive resistance aquatic exercise program of 1-hour duration 3 times a week for period of four months giving a total of 48 training sessions. The control group will be offered two sham treatments during the same period. The outcome measurement will be performed at baseline and after the 4-month intervention period and at one year follow up.

Discussion

This randomised controlled trial will investigate the effect an intensive progressive aquatic resistance exercise program will have on the quality of cartilage in post-menopausal women with mild osteoarthritis of the knee. This study is the first investigate what impact aquatic exercise has on the structure of human cartilage. The results of this study will help optimise the prescription of aquatic exercise to persons with early mild osteoarthritis.

Trial registration: ISRCTN65346593

IMPROVEMENTS IN PHYSICAL FITNESS AND BODY COMPOSITION DURING SINGLE SESSION COMBINED ENDURANCE AND STRENGTH TRAINING WITH DIFFERENT EXERCISE ORDERS IN WOMEN

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Background and purpose

International and national exercise guidelines recommend a high volume of both endurance (E) and strength (S) training for the development of physical fitness, body composition and health. However, especially among young women it is an increased struggle to combine life-changing events (e.g. family planning) and regular physical activity in order to match official exercise recommendations, which emphasizes the need of less time-consuming training strategies. The purpose of the present study was to investigate changes in physical fitness and body composition in young women during single session combined E+S or S+E training.

Methods

28 previously untrained women (29±5 years, 165±6 cm, 63±10 kg) were matched by anthropometrics and baseline physical performance to an E+S (n=14) or S+E (n=14) group and performed both E and S training in a single training session for 24 wks (2x12 wks). Time to exhaustion (T_{max}) by an incremental cycle test, muscle strength (1RM) by dynamic leg press and body composition by DXA were measured at wks 0 and 24

Results

Both groups significantly increased T_{max} at 24 (E+S, +22%, $p<0.001$; S+E 16%, $p<0.001$). 1RM was significantly increased at 24 in both groups (E+S, +15%, $p<0.001$; S+E, +16%, $p<0.001$). Both groups significantly increased whole body lean mass at 24 (E+S, +3%, $p<0.05$; S+E +3%, $p<0.01$) while no significant changes in body fat mass were observed. No significant differences between the groups were found in changes of T_{max} , 1RM and body composition.

Conclusions

The present results showed that both the E+S and S+E exercise orders were beneficial in improving aerobic fitness, muscle strength and body composition in previously untrained young women. Although no significant differences between the two groups were observed with the present training program and subjects, future investigations are needed to examine the order effect by modifying acute and chronic training program variables.

EFFECTS OF A NORMAL-PROTEIN VEGETABLE-BASED DIET AND A HIGH-PROTEIN NON-VEGETABLE DIET ON URINE pH AND SERUM CHOLESTEROL IN ADULTS AT REST

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Department of Biology of Physical Activity, University of Jyväskylä, Finland

Background and purpose

Diet high in grain products and animal protein but deficient in fruits and vegetables may cause chronic metabolic acidosis that is in connection with e.g. obesity, cardiovascular risk and type 2 diabetes (Adeva & Souto 2011, Otsuki et al. 2011, Souto et al. 2011). The purpose of this study was to investigate if a normal-protein vegetable-based diet (NPVD) and a high-protein non-vegetable diet (HPND) have an effect on acid load and serum cholesterol levels at rest.

Methods

Subjects were healthy, recreationally active men ($n=16$, 28.9 ± 2.8 years, BMI 24.5 ± 2.6) and women ($n=19$, 27.5 ± 3.3 years, BMI 21.7 ± 2.3) and were given exact instructions on what to eat during 7-day nutrition interventions: NPVD mainly contained vegetables and fruits but also e.g. chicken to ensure adequate protein intake whereas HPND contained mainly meat, grain and dairy products. A 12-hour urine and fasting venous blood samples were collected in the beginning and at the end of the diet periods. Urine samples were analyzed for pH and blood samples for total cholesterol, LDL and HDL levels.

Results

In men, urine pH increased ($p<0.05$) and total cholesterol decreased ($p<0.01$) during NPVD. In women, pH increased ($p<0.01$) and total cholesterol and LDL decreased ($p<0.05$ in both) during NPVD. Moreover, pH decreased during HPND ($p<0.05$).

Conclusions

Diet with high amount of vegetables and fruits decreases the acid load of the body which can be seen in higher urine pH. Moreover, it induces a healthier blood lipid profile by decreasing serum cholesterol both in men and women and also LDL in women.

Adeva MM & Souto G. 2011. Diet-induced metabolic acidosis. *Clin Nutr* 30(4):416–421

Otsuki M et al. 2011. Association of urine acidification with visceral obesity and the metabolic syndrome. *Endocr J* 58(5):363–367

Souto G et al. 2011. Metabolic acidosis-induced insulin resistance and cardiovascular risk. *Metab Syndr Relat Disord* 9(4):247–253

EFFECTS OF A NORMAL-PROTEIN VEGETABLE-BASED DIET AND A HIGH-PROTEIN NON-VEGETABLE DIET ON CORTISOL RESPONSE AND LEUKOCYTOSIS IN EXERCISE

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Background and purpose

Acid-base status can be modulated by nutrition which has impact on e.g. exercise performance, calcium metabolism, bone health and immune functions. (e.g. Kellum et al. 2004). The purpose of this study was to investigate if a normal protein vegetable-based (alkalogenic) and high protein non-vegetable (acidogenic) diets have an effect on cortisol response and leukocytosis in submaximal and maximal cycling loads.

Methods

The subjects (16 healthy normal weight men and 19 women, aged 25-35) were given exact instructions on what to eat during one week's nutrition interventions: a normal protein vegetable-based (NPVD) diet and a high protein non-vegetable (HPND) diet. NPVD mainly contained vegetables, fruits but also e.g. chicken to ensure adequate protein intake, whereas HPND contained mainly meat, grain and dairy products. In cross-over design the subjects performed a submaximal test in which they cycled 3 x 10 min at 35, 55 and 75 % of VO₂max. Finally the subjects cycled at 100 % of VO₂max until exhaustion. There was a 4 minute break after each cycling stage during which blood samples were collected. From blood, serum cortisol, total white blood cell count (WBC) and WBC subpopulations were analyzed.

Results

Exercise induced significant ($p < 0.05$) leukocytosis in 55%, 75% and 100 % loads with both diets, whereas a significant increase in cortisol was seen only in maximal load. The cortisol response in the highest load was significantly lower ($p < 0.05$) with NPVD than with HPND in both men and women. Leukocytosis was significantly ($p < 0.05$) lower in 75 % and 100 % loads with NPVD than with HPND in women.

Conclusions

A diet that produces alkali in the body may protect the body against immune and physiological stress perturbations that emerge during high intensity exercise.

Kellum, J., Song M. and Li J. 2004. Science review: Extracellular acidosis and the immune response: clinical and physiological implications. *Clinical Care* 8: 331-336.

NECK STRENGTH, MUSCLE MECHANICAL PROPERTIES, AND DISABILITY IN CERVICAL DYSTONIA FOLLOWING BOTULINUM NEUROTOXIN INJECTIONS

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Background and purpose

Although the effects of Botulinum neurotoxin (BoNT) have been widely studied in patients with cervical dystonia (CD), there have been no prospective studies quantifying changes in strength or mechanical properties of the affected muscles after BoNT injections. The purpose of this study was to evaluate changes in disability, strength and mechanical properties of neck muscles in patients with chronic CD during 12 weeks following BoNT injections.

Methods

Eight patients with CD volunteered to this prospective clinical cohort study. Patients had received BoNT injections regularly for several years to neck muscles at three months intervals. Isometric neck strength was measured by a dynamometer and mechanical properties of the splenius capitis muscle by two different myotonometers. Clinical assessment was performed using the Toronto Western Spasmodic Torticollis Rating Scale (TWSTRS) prior to, and at 2, 4, 8, and 12 weeks after the BoNT injections.

Results

Mean decrease in isometric neck strength at two weeks after the BoNT injections was -28 (95% CI: -40 to -17) % in extension ($p=0.008$), -26 (95% CI: -47 to -6) % in rotation ($p=0.016$), and -17 (95% CI: -33 to -2) % in flexion ($p=0.047$). After that strength values gradually returned to baseline values within 12 weeks. There were no significant changes in mechanical properties of muscles. The TWSTRS-severity score decreased by -4.3 (95% CI: -6.3 to -2.2) ($p=0.002$) and TWSTRS-total score by -6.4 (95% CI: -9.1 to -3.6) ($p=0.001$) at two weeks after the BoNT injections. The TWSTRS scores at 12 weeks had returned to baseline values.

Conclusions

BoNT injections decreased neck muscle strength in average 24 % at two weeks after treatment, but the strength values returned to pre-injection levels within twelve weeks. The TWSTRS score improved in similar manner. There were no measurable changes in the mechanical properties of injected muscles.

Posters

Session 4, Tuesday 22nd

THE ROLE OF PHYSICAL ACTIVITY IN AGE RELATED-CHANGES IN WALKING MECHANICS

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⁵ Research Institute for Olympic Sports

Background and purpose

Elderly people decrease muscle moments and powers of the ankle and increase efforts of the knee and hip joints¹. Alteration of gait mechanics may contribute to the development of knee and hip OA by adversely affecting joint loading². The role of physical activity in the changes in walking mechanics with aging is poorly understood. Therefore, the aim of this study was to examine whether middle-aged and older subjects, who have maintained a high level physical activity, reduce age-rated changes in gait mechanics.

Methods

Young, middle-aged and old men with power trained background underwent 3D gait analysis. Data was statistically analyzed with a one-way ANOVA.

Results

The hip extensor moments were significantly greater in the middle-aged and old subjects compared to young ($p=0.015$ & $P=0.004$). Old subjects demonstrated greater eccentric knee power during loading response compared to young subjects ($p=0.002$). Old showed higher concentric knee power compared to both middle-aged ($p=0.047$) and young (0.002) subjects. No significant differences were present at the ankle level. Old subjects exhibited larger patellofemoral contact force than middle-aged subjects ($p=0.026$).

Discussion

Similar to previous findings¹, aging was associated with greater hip extensor moment during the first half of the stance phase. However, contrasts to previous findings¹, no differences were present in the ankle joint kinetics between groups. The oldest group exhibited greater knee eccentric and concentric power during the gait and they also showed largest patellofemoral contact force. No changes in the knee kinetics were present between middle-aged and young subjects. The results of the current study suggest that high level of physical activity may “slow down” age-related changes in gait mechanics, especially at the ankle and knee level.

References

1) DeVita et al. 2000. J Appl Physiol 88: 1804–1811

2) Andriacchi et al. 2004. Ann Biomed Eng. 32: 447-457

MISMATCH RESPONSE TO SOMATOSENSORY STIMULI IN YOUNG AND ELDERLY ADULTS

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Background and purpose

Research on neuro-cognitive changes in aging will help society to face the growing concern of psychological and financial burden related to aging. We used event-related potentials (ERPs) to study effects of aging to brain's automatic change detection mechanism in the human somatosensory system utilizing the ERP component called mismatch negativity (MMN; Näätänen, Gaillard, & Mäntysalo, 1978) that is shown to be sensitive to cognitive decline related to aging and several neurological conditions (Näätänen et al., 2011).

Methods

21 young and 13 elderly volunteers participated in EEG recording. A run of 1000 electrical pulses were delivered on the left forefinger and little finger in randomized order of standard ($P = 0.85$) and deviant ($P = 0.15$) stimuli with an ISI of 500 ms, while the participants were instructed to ignore finger stimuli and to be fully involved to a radio play.

Results

The results revealed significantly different responses to standards than those to deviants in the both age groups, indicating the automatic detection of deviant stimuli. The results showed also that the mismatch response is attenuated in amplitude and prolonged in latency in elderly participants, whereas earlier ERPs (P50 and N80) are prolonged in latency and have a tendency to increase in amplitude with aging.

Conclusions

The somatosensory change detection mechanism is sensitive to aging. Concerning its connections to cognitive decline, the somatosensory MMN can be utilized in the research of interventions heading to induce brain plasticity and recover of cognitive dysfunction.

References

Näätänen, R., Gaillard, A. W. K., & Mäntysalo, S. (1978). Early selective attention effect on evoked potential reinterpreted. *Acta Psychologica*, 42, 313–329.

Näätänen, R., Kujala, T., Kreegipuu, K., Carlson, S., Escera, C., Baldeweg, T. & Ponton C. (2011). The mismatch negativity: an index of cognitive decline in neuropsychiatric and neurological diseases and in aging. *Brain*, 1–19.

DETERMINANTS OF BEING PHYSICALLY NON-ACTIVE IN AGING MEN AND WOMEN: THE DR'S EXTRA STUDY

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Background and purpose

Multiple levels of factors can affect physical activity (PA). The aim was to study which sociodemographic, health, lifestyle and motivational factors are associated with low levels of PA in aging Eastern-Finnish men and women.

Methods

We used the DR's EXTRA baseline data, a random population sample of 1405 individuals aged 57-78 years. Past month leisure-time PA was assessed with DR's EXTRA PA Interview and individuals were categorized into 1) Non-active (no moderate or vigorous PA), 2) Somewhat active (0,1-2,5 h moderate + vigorous or 0,1-1,25 h vigorous PA) and 3) Active ($\geq 2,5$ h moderate + vigorous or $\geq 1,25$ h vigorous PA per week). Multinomial regression was used to study the risk for being non-active compared to active.

Results

The sociodemographic risk factors for non-activity were being divorced [OR 1,8 (95 % CI 1,24-2,74)] or widowed [1,8 (1,23-2,76)], age > 72 years [1,7 (1,22-2,41)], and female gender [1,7 (1,32-2,12)]. Of the health determinants poor or satisfactory perceived health [3,9 (2,85-5,40)], having ≥ 3 chronic diseases [2,0 (1,42-2,93)], a disease limiting PA [3,3 (2,44-4,44)] and BMI >30 [3,0 (2,14-4,24)] increased the risk for non-activity. Also, poor social network [1,8 (1,36-2,40)] increased the risk for non-activity. Competitive sports during lifetime [0,6 (0,47-0,78)] and reporting several PA motivational factors [0,4 (0,32-0,59)] decreased the risk for non-activity, whereas non-positive attitudes to school PA [1,7 (1,23-2,21)], and reporting ≥ 2 PA barriers [4,6 (3,30-6,47)] increased the risk for non-activity. In men, smoking [2,0 (1,18-3,37)] and poor diet [3,3 (1,92-5,71)] increased the risk for non-activity, but in women there was no association.

Conclusions

A large scale of determinants was associated with non-activity in aging men and women. Poor perceived health, high BMI and barriers for PA were emphasized in this population.

SUPERVISED STRENGTH AND BALANCE TRAINING. PREDICTORS OF PARTICIPATION AMONG THE POPULATION 75 YEARS AND OLDER.

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Background and purpose

Despite the recognized health benefits relatively few older adults participate in strength and balance training (SBT). The aim of this study was to define the characteristics of older adults that are associated with non-participation in SBT 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 counseling by physiotherapist and an opportunity to participate in supervised, group-based SBT at the gym once a week. Data collection included self-rated health, comorbidities, sedative load of drugs, cognition (Mini Mental State Examination), risk of malnutrition (MNA), 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 SBT. They were older ($p<0.001$), physically less active ($p=0.009$), more often in a risk of malnutrition ($p=0.002$), had shorter education ($p<0.001$), more comorbidities ($p=0.011$), lower cognition ($p<0.001$), more often sedative drugs ($p<0.001$), lower grip strength (women: $p<0.001$; men: $p=0.025$) and more difficulties in IADLs ($p<0.001$) and in postural balance by the BBS ($p<0.000.1$) and TUG ($p<0.001$) compared to persons who did initiate supervised SBT at the gym. 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 supervised SBT at the gym. In the future, more emphasis should be placed to lower participation threshold of those older people with more cognitive limitations and less strength.

CONCERN ABOUT FALLING IN OLDER WOMEN WITH A HISTORY OF FALLS: ASSOCIATIONS WITH HEALTH, FUNCTIONAL ABILITY, PHYSICAL ACTIVITY AND QUALITY OF LIFE.

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²School of Medicine, University of Tampere, Finland.

Background and purpose

Fear of falling has been linked to activity restriction, functional decline, decreased quality of life (QoL) and increased risk of falling. Factors that distinguish persons with high concern about falling from those with low concern have not been systematically studied. This study aims to identify and explore potential health-related, functional and psychosocial factors that correlate with fear of falling in community-dwelling women aged 70-80 years, who had fallen in the past year.

Methods

Baseline cross-sectional data of 409 women recruited from Tampere, Finland as participants of a randomised controlled trial for falls prevention (DEX) (NCT00986466) were used. Participants were classified according to their level of concern about falling using the Falls Efficacy Scale International (FES-I). Multinomial logistic regression analyses were performed to study associations between health-related variables, functional performance tests, current level of physical activity, QoL scores and FES-I score.

Results

68 % of the participants reported moderate/high concern (FES-I ≥ 20) about falls. Multinomial logistic regression showed that highly concerned women were significantly more likely to have poorer health and mobility, lower functional ability and QoL. Lower scores for instrumental activities of daily living, outdoor mobility and QoL, and perceived hindrance due to impaired balance contributed independently to greater concern about falling.

Conclusions

Concern about falling was highly prevalent in our sample of community-living older women. Particularly, poor perceived general health and mobility constraints contributed independently to the difference between high and low concern of falling. Knowledge of these associations may help in developing interventions to reduce fear of falling and activity avoidance in old age.

DO MOBILITY, COGNITIVE FUNCTIONING, AND DEPRESSIVE SYMPTOMS MEDIATE THE ASSOCIATION BETWEEN SOCIAL ACTIVITY AND MORTALITY RISK AMONG OLDER MEN AND WOMEN?

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Background and purpose

Social activity and health correlate in old age, but less is known about what explains this association. The aim of study was to investigate whether mobility, cognitive functioning, and having less depressive symptoms mediate the association between social activity and mortality risk, or whether they should be considered as resources for social activity in older Finnish men and women.

Methods

In 1988, 406 men and 775 women aged 65-84-years took part in face-to-face interviews about their health, socioeconomic status, and social activities. Confirmatory factor analyses were used to form latent variables describing collective and productive social activity. Latent variable models were used to investigate the possible pathways between social activity, mobility, cognitive functioning, depressive symptoms, and mortality risk.

Results

In the 21-year follow-up, 89% of men and 81% of women had died. Collective and productive social activity correlated with a lower risk for mortality among men and women. Part of the association between social activity and mortality was mediated by mobility. Cognitive functioning and having less depressive symptoms were prerequisites for participating in collective social activity among men and women. Among men, cognitive functioning, and among women, cognitive functioning and having less depressive symptoms were prerequisites for productive social activity.

Conclusions

The health-enhancing influences of social activity may be explained by better mobility among persons who are socially active. Moreover, social activity may maintain mobility and thus decrease mortality risk, as many social activities also include physical activity. Better cognitive functioning and having less depressive symptoms should be considered as resources for participating in social activities.

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