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ispapoff 2007

THE OFFICIAL NEWSLETTER OF THE INTERNATIONAL SOCIETY OF PHYSICAL ACTIVITY FOR THE PREVENTION OF OSTEOPOROSIS FALLS AND FRACTURES.

Physical Activity Review

Dear Colleagues

2007 has been an exciting year for ISPAPOFF in many areas. We had a productive working group at the European Calcified Tissue society (ECTS) meeting in Copenhagen. Following this a number of collaborative projects were discussed and I wish these collaborations good success. We also had a lively working group in Honolulu during the American Society of Bone and Mineral Research (ASBMR) meeting. Heather Mackay (Canada) spoke discussed structural adaptation of growing bone to mechanical loading. Kirsti Uusi-Rasi (Finland) gave an excellent account of the effects of physical activity and calcium on bone mass and structure. In an excellent double act, Karim Khan (Canada) and Stephen Lord (Australia) talked about falls assessment particularly the Physiological Profile development by Stephen's team. We also had some excellent contributions from researchers in USA, France, Germany and Japan. I'd like to thank Ari Heinonen (Finland) for organising working group and choosing the abstracts.

Professor Tash Masud
President of ISPAPOFF

News From the UK

In May, the Board of UK-PAPOFF met and Dawn Skelton took over the Chair of the Board. Dawn's main interests (<http://www.nursing.manchester.ac.uk/staff/DawnSkelton> & http://www.profane.eu.org/profiles/personal_profile.php?record_id=3) lie in both research and in health promotion on the benefits of both physical

activity and specific exercise programmes in the prevention of falls, maintenance of independence and improvements in bone health. She is the Co-ordinator of ProFaNE (Prevention of Falls Network Europe), a European funded Thematic Network aimed at spreading good practice in falls prevention across Europe (www.profane.eu.org). She is also Reader in Ageing and Health at HealthQWest (www.healthqwest.org).

Her passion for preventing falls extended to her jumping out of an airplane in June this year to raise money for National Falls Awareness Day (<http://www.helptheaged.org.uk/en-gb/AdviceSupport/HomeSafety/FallPrevention/NFAD>). Her interest for encouraging physical activity and exercise amongst older people and ensuring evidence based practice amongst exercise instructors is evident in her work for the charity EXTEND (www.extend.org) and her involvement with Later Life Training Ltd (www.laterlifetraining.co.uk). Thanks were given to Pat Turner for her work for UK-PAPOFF as the leaving Chair of the Board.



WHO Global

http://www.who.int/ageing/projects/falls_prevention_older_age/en/index.html

The World Health Organisation launched in August 2007 a Global Report on Falls Prevention in Older Age - including international and regional perspectives and evidence-based recommendations. The Report is based on the following background papers prepared by internationally recognized experts:

- :: Epidemiology of falls in old age [pdf 602kb]
- :: Biological, Medical and Behavioural Risk Factors on Falls [pdf 216kb]
- :: Environmental and Socioeconomic Risk Factors on Falls [pdf 356kb]
- :: Health Service Impact and Costs of Falls [pdf 250kb]
- :: Intervention, Policies and Sustainability of Falls Prevention [pdf 260kb]
- :: Role of Physical Activities in Falls Prevention [pdf 171kb]

And regional/national perspectives on Falls prevention in Older Age

- :: From Regional Office for Africa (AFRO) [pdf 238kb]
- :: From Regional Office for the Americas (AMRO)-Chile [pdf 147kb]
- :: From Regional Office for the Americas (AMRO)-Jamaica [pdf 368kb]
- :: From Regional Office for the Eastern Mediterranean (EMRO) [pdf 216kb]
- :: From Regional Office for South-East Asia (SEARO) [pdf 187kb]
- :: From Regional Office for the Western Pacific (WPRO) [pdf 290kb]

Literature Review

1. Does Exercise during Growth Prevent Fractures in Later Life? Karlsson MK. Med Sport Sci. 2007;51:121-36.

[http://www.ncbi.nlm.nih.gov/sites/entrez?](http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=17505123&ordinalpos=28&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_Res)

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[ultsPanel.Pubmed_RVDocSum](http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=17505123&ordinalpos=28&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_Res)

Regular weight-bearing exercise, especially during the pre- or early peripubertal years, leads to substantial benefits in bone mass and skeletal structure, enhancing bone strength at loaded sites. However, few fragility fractures occur in young adulthood, and only if the exercise induced skeletal benefits are retained into older age, a time when the incidence of fragility fractures rises exponentially, would these changes be of biological significance for fracture reduction. The limited data available indicate that exercise benefits in bone mineral density are eroded in the long term. In contrast, several studies suggest that exercise-induced structural changes may be retained even following the cessation of exercise. These structural changes may be more important to overall bone strength than bone mass or density alone. In addition, residual benefits in nonskeletal factors, such as improved muscle strength, coordination and balance, may also reduce fracture risk. However, it is uncertain what actually happens to the fracture risk of individuals who retire from exercise and reduce their level of activity to that of the average individual. Recent retrospective observational and case-control studies suggest that there could be a reduced fracture risk in former athletes. However, since these studies are cross-sectional, no inferences could be drawn as regards causality. Therefore, based on the current evidence, the authors recommend a physically active lifestyle during growth as a possible preventive strategy against fragility fractures in old age

2. Bone mineral density in female high school athletes: Interactions of menstrual function and type of mechanical loading. Nichols JF, et al. Bone. 2007 May 13; [Epub ahead of print]

[http://www.ncbi.nlm.nih.gov/sites/entrez?](http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=17572167&ordinalpos=11&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_Res)

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During adolescence, skeletal integrity of girls is largely dependent on menstrual function and impact exercise, yet currently there is limited research regarding the interaction between menstrual status and type of mechanical loading associated with various high school sports. This study examined associations of menstrual status, type of mechanical loading, and bone mineral density (BMD) in female high school athletes participating in high/odd impact or repetitive/non-impact sport. Participants were 161 female high school athletes (15.7+/-1.3 years) representing high/odd impact (n=93, including soccer, softball, volleyball, tennis, lacrosse, and track sprinters and

Update on ProFaNE – Prevention of Falls Network Europe

The ProFaNE website www.profane.eu.org and the Community Online Newsletter originated from a European Commission funded project under Framework 5. The ProFaNE project was coordinated from Manchester University and involved 6 partners and 25 partners institutions from 13 EU and EEA countries.

Following the success of the project, Help The Aged recognised the valuable contribution the ProFaNE website and community were making to the field and funded continuation of the website until the end of August 2008. Dawn Skelton will continue to devote one day a week to keeping the ProFaNE resources and discussion board up to date.



jumpers), or repetitive/non-impact sports (n=68, including swimmers, cross-country and track distance runners who participated in events ≥ 800 m). Areal BMD was measured by DXA at the spine (L1-L4), proximal femur, and total body. Menstrual status was determined by self-report. Athletes with primary, secondary or oligomenorrhea were combined into a single group (oligo/amenorrheic) and compared to eumenorrheic athletes. They found significantly greater total hip and trochanter BMD among eumenorrheic high/odd impact compared to eumenorrheic repetitive/non-impact athletes, and greater spine and trochanter BMD among high/odd impact eumenorrheic athletes compared to repetitive/non-impact oligo/amenorrheic athletes. Chi-squared analysis of BMD Z-scores adjusted for gynecological age showed a significantly greater percentage of repetitive/non-impact athletes (33.9%) compared to high/odd impact athletes (11.8%) with low spine BMD for their age (BMD Z-score ≤ -1 SD) ($p=0.001$), indicating that a high percentage of female high school athletes participating in repetitive loading sports, and especially those with oligo/amenorrhea, may not be accruing bone at the expected rate. Female adolescent athletes should be evaluated periodically and advised of the possible negative effects of oligo/amenorrhea on bone health.

3. Potential benefits of marathon training on bone health as assessed by calcaneal broadband ultrasound attenuation. Drysdale IP, et al. *J Clin Densitom.* 2007;10(2):179-83.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=17485036&ordinalpos=39&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

The purpose of this study was to determine calcaneal broadband ultrasound attenuation (BUA) of marathon race participants and compare this information with previously obtained normative data. BUA was assessed using the McCue CUBA clinical device in 217 male and 184 female runners, aged 20-93 yr, participating in the 2004 Flora London Marathon. The normative data included 267 men and 334 women, aged 20-80 yr. A significantly higher mean BUA was observed for men compared to the women and for the marathon runners compared to the nonrunners among men and women. A significant decline in BUA with age was observed in all males and females, with the males starting from a higher baseline and with the rate of decline significantly ameliorated by marathon training (from -0.35 to -0.25 dB/MHz per year in men and -0.51 to -0.15 dB/MHz per year in women). This study provides observational evidence in support of the potential benefits of weight-bearing exercise, such as marathon training and running, on BUA of the calcaneus, an index of bone mineral density.

5. Older elite football players have reduced cardiac and osteoporosis risk factors. Lynch NA, et al. *Med Sci Sports Exerc.* 2007;39(7):1124-30.

http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=17596780&ordinalpos=6&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Aging with a sedentary lifestyle is associated with increased risk for developing cardiovascular disease (CVD), osteoporosis, and sarcopenia. The purpose of this study was to determine whether former professional football athleticism would be associated with reduced risk factors for CVD and osteoporosis, and higher muscle mass in later life. Maximal aerobic capacity (VO₂max), body composition, and lipid and glucose risk factors for CVD were compared between 16 older former professional football players and never-athletic men matched for age, body mass index, current physical activity, and race. Regional bone mineral density of the football players was compared with age-matched reference norms. Despite greater physical activity into middle age, the former football players had similar VO₂max as the controls. Former football players had 26% lower total-body fat mass, 26% lower visceral adipose tissue area, and 13% higher muscle mass compared with the controls. High-density lipoprotein cholesterol (HDL-C) levels were 37% higher, HDL₂-C levels were fourfold higher, and triglycerides were 31% lower in the former football players than the controls. The former football players also had 20% and 6% higher total-body bone mineral content and density than the controls and higher lumbar spine, femoral neck, and greater trochanter bone mineral density than similar age-referenced norms. In this small sample of older men, former successful professional athletes who remained physically active in middle age have a favorable body composition and reduced risk factors for CVD and osteoporosis compared with healthy age- and BMI-matched older men.

6. Simple, novel physical activity maintains proximal femur bone mineral density, and improves muscle strength and balance in sedentary, postmenopausal Caucasian women. Young CM, Weeks BK, Beck BR. *Osteoporos Int.* 2007 Jun 16; [Epub ahead of print]

[http://www.ncbi.nlm.nih.gov/sites/entrez?](http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=17572834&ordinalpos=11&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_Res ultsPanel.Pubmed_RVDocSum)

[Db=pubmed&Cmd=ShowDetailView&TermToSearch=17572834&ordinalpos=11&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_Res ultsPanel.Pubmed_RVDocSum](http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=17572834&ordinalpos=11&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_Res ultsPanel.Pubmed_RVDocSum)

A simple, appealing, physical activity program can be prescribed to reduce the risk of falls in sedentary, postmenopausal, independent-living, Caucasian women. Foot stamping, progressively loaded squats, and in-line dancing positively influence proximal femoral bone mineral density, lower extremity strength, and static and dynamic balance. Forty-five postmenopausal women not taking medications for bone health were randomly assigned to one of three groups. All groups attended one line dance class per week. Two groups additionally performed progressively loaded squats five times per week. One group also performed four foot stamps, twice daily, five times per week. Broadband ultrasound attenuation (BUA), proximal femur (PF) and lumbar spine (LS) bone mineral density (BMD), squats number, and balance variables were measured. There were no differences within or between groups in baseline and follow-up BUA, PF or LS BMD; however, a strong stamp compliance effect was apparent for BUA ($r = 0.73$) and PF BMD ($r = 0.79$). Number of squats, single leg stance time increased, while timed up and go time decreased for all participants. Line dancing, particularly in concert with regular squats and foot stamping, is a simple and appealing strategy that may be employed to reduce lower extremity bone loss, and improve lower limb muscle strength and balance, in independent living, otherwise healthy, postmenopausal Caucasian women.

7. Hyperkyphotic posture and risk of injurious falls in older persons: the rancho bernardo study. DM Kado, et al. *J Gerontol A Biol Sci Med Sci.* 2007; 62: 652.

[http://www.ncbi.nlm.nih.gov/sites/entrez?](http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=17595423&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_Res ultsPanel.Pubmed_RVDocSum)

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Because hyperkyphotic posture is associated with impaired physical functioning, the authors hypothesized that kyphosis may also be associated with falls. Participants were 1883 older adults from the Rancho Bernardo Study. Between 1988 and 1991, kyphosis was measured using a system of 1.7-cm blocks placed under the participants heads if they were unable to lie flat without neck hyperextension. Data on falls including injurious falls, demographics, health, and habits were obtained from a self-administered questionnaire completed at the same visit. In this cohort, men were more likely to be hyperkyphotic than were women ($p < .0001$). Of those who fell, 36.3% were hyperkyphotic, versus 30.2% among those who did not fall ($p = .015$). Those who fell were older, more likely to be women, had lower body mass index, did not exercise, did not drink alcohol, and had poor self-reported physical and emotional health. In age- and sex-adjusted models, those with hyperkyphosis were at 1.38-fold increased odds of experiencing an injurious fall that increased to 1.48 using a cutoff of ≥ 2 blocks versus ≤ 1 blocks. Although women were more likely to fall, after adjustment for possible confounders, men with moderate hyperkyphosis were at greatest fall risk.

8. Comparison of the effects of tai chi and resistance training on bone metabolism in the elderly: a feasibility study. Shen CL, et al. *Am J Chin Med.* 2007;35(3):369-81.

[http://www.ncbi.nlm.nih.gov/sites/entrez?](http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=17597496&ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_Res ultsPanel.Pubmed_RVDocSum)

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This feasibility study compared the effects of Tai Chi (TC) and resistance training (RT) on bone metabolism in the elderly. Twenty eight sedentary, elder adults, were randomized into either TC ($n = 14$, 78.8 \pm 1.3 years) or RT ($n = 14$, 79.4 \pm 2.2 years) to participate in 40 min of exercise per session, 3 sessions/week for 24 weeks. The outcome measures assessed were the concentrations of serum bone-specific alkaline phosphatase (BAP), pyridinoline (PYD), parathyroid hormone (PTH) and calcium, and urinary calcium. The TC group had a higher compliance rate than the RT group. After 6 weeks, (i) both TC and RT resulted in higher level of serum BAP relative to the baseline and the TC group exhibited a greater increase in serum BAP than the RT group; (ii) there was an increase of serum PYD in the RT group only, not in the TC group; and (iii) the BAP/PYD ratio was higher than baseline only in the TC group, and the increase of the ratio in the TC group was greater than that in the RT group. After 12 weeks, the increase in serum PTH in the TC group was higher than the RT group. After 24 weeks, there was a reduction of the urinary calcium level in the TC group relative to the baseline. In conclusion,

these findings support that TC is beneficial for increasing bone formation in elderly, and long-term application is needed to substantiate the effect of TC as an alternative exercise in promotion of bone health.

9. Differential Effects of Strength versus Power Training on Bone Mineral Density in Postmenopausal Women - A two year longitudinal study.

von Stengel S, et al. Br J Sports Med. 2007 Jun 5; [Epub ahead of print]

[http://www.ncbi.nlm.nih.gov/sites/entrez?](http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=17550916&ordinalpos=15&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum)

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To investigate the effect of two different schemes of loading in resistance training on bone mineral density (BMD) and pain in pre-trained postmenopausal women this study examined 53 pre-trained women (58.2 +/- 3.7 yrs) who carried out a mixed resistance and gymnastics program. They were group wise randomly assigned to a strength training (ST) or power training (PT) group. The difference between the two groups was the movement velocity during the resistance training (ST: 4s (concentric) - 4s (eccentric); PT: explosive - 4s). Otherwise both groups carried out a periodized progressive resistance training at 70-92.5% of the one-repetition maximum (1RM, 2/week) for 24 months. After two years significant between-group differences were detected for BMD (PT: -0.3% vs. ST: -2.4; p<0.05) and area (PT: 0.4% vs. ST: -0.9%; p<0.05) at the lumbar spine. At the hip there was a non-significant trend in favour of the PT group. Also the incidence of pain parameters at the lumbar spine was more favourable in the PT group. The results show that PT may be superior for maintaining BMD in postmenopausal women. Furthermore PT was safe as it did not lead to an increased rate of injuries and pain.

More information on recent useful studies can be found at www.ispapoff.org

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President

Prof Tahir Masud Consultant Physician
Nottingham City Hospital NHS Trust
Email: tm@nchhce.demon.co.uk

Co-ordinator:

Mr Chris Hughes
34 Edwinstowe Drive
Sherwood
Nottingham
NG5 3EP
United Kingdom
Tel: 0044 (0)774 206 1011
Email: chris.hughes@nuh.nhs.uk

Vice-President

Mark A. Lissens, M.D., Ph.D.
Physical Medicine and Rehabilitation
KHK, Geel, KU Leuven Association, Belgium.
Email: info@marklissens.be

Newsletter Co-editor

Dr Katherine Brooke-Wavell
Loughborough University, UK
Email: k.s.f.brooke-wavell@lboro.ac.uk

MEMBERSHIP

There is no membership fee at present.

Please return to:
Mr Chris Hughes

34 Edwinstowe Drive, Sherwood, Nottingham NG5 3EP, United Kingdom
Tel: 0044 (0)774 206 1011 Email: chris.hughes@nuh.nhs.uk

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