Physical Activity Review

-PAPOFF

September 2003
Issue 5

The Official Newsletter of the International Society of Physical Activity for the Prevention of Osteoporosis Falls and Fractures

The society is now in its fourth year and branches in different countries continue to develop in a diverse manner. This year the society formed links with the European Calcified Tissue Society and held a workshop during the 30th European Symposium on Calcified Tissues held in Rome (May 2003). Professor P. Kannus (Tampere, Finland) gave a well-appreciated review of physical activity in preventing falls and fractures. Magnus Karlsson (Malmo, Sweden) discussed the evidence showing the effects of physical activity in preventing bone loss in the postmenopausal period. Dawn Skelton (Manchester, UK) reviewed community falls prevention exercise initiatives in the UK. Charles Turner (Indianapolis, USA) presented data on mice showing that the addition of vibration noise to a simulated exercise regimen enhanced the osteogenic response by almost four-fold, and Dr H. Oxlund (Aarhus, Denmark) showed that the decreased strength of bone associated with ovariectomised rats can be prevented by low intensity high frequency vibration. Dr L. Dukas (Basel, Switzerland) showed data adding to the growing literature on the benefits of vitamin D and its analogues (specifically Alfacalcidol in this study) on fall prevention.

Rob Morris and Debbie Clarke
UK Branch of PAPOFF

IS-PAPOFF again organised the Physical Activity Working Group at the American Society of Bone and Mineral Research annual meeting in 2002 at San Antonio. It was a well attended and lively session with plenty of debate. The eight presentations covered the field widely. Tim Skerry (Royal Veterinary College, UK) gave an amusing but informative talk on prenatal mechanical influences on bone mass. Joan Lappe (Creighton University) and Shona Bass (Deakin University, Australia) discussed exercise in children and bone health. Kim Brixen and Kent Kramme (Denmark) showed data from Danish cohort studies. Dianne Cullen (Creighton University) presented interesting data on mechanical loading and PTH stimulation of DNA synthesis, and Robyn Fuchs (Oregon) showed data on synergistic effects of exercise and Alendronate on bone mass in ovariectomised rats. As well as ably co-chairing the session, Lynn Kohlmeier (Spokane) also presented the inspired review talk by Christine Snow (Oregon) who unfortunately was unable to attend. Many of the delegates at the working group continued lively discussions in the bars of San Antonio late into the night!

In this newsletter we focus on the UK branch of ISPAPOFF (see below) as we have done previously for other countries' branches in previous editions. Please send in news, photographs, articles etc for inclusion in future editions of the newsletter.

I'd like to give a special thanks to Jayne Mowson who is leaving ISPAPOFF in the secretariat office. Jayne has been instrumental in taking the Society forward during the last 4 years. I'd also like to welcome Debbie Clarke (see photo) who has taken over from Jayne in the summer of 2003.

T. Masud (Secretary, ISPAPOFF)

Table of Contents:

NEWS FROM THE UK BRANCH OF IS-PAPOFF

The UK branch has over 200 members who are interested in encouraging physical activity in the population. The branch held its 2003 annual meeting in July at Nottingham. The UK branch has a council which acts as a steering committee to establish priorities for each year. The newly elected Chairman of the UK branch is Dr Rob Morris (Consultant Physician, Nottingham). The outgoing Chairman Dr Shahid Jawed (Consultant Rheumatologist, Kingston) will remain on the council. Other council members are Joan Bassey (Nottingham), Katherine Brooke-Wavell (Loughborough), Dawn Skelton (Manchester), Susie Dinan (London), Rachael Lewis (Bristol), Dawn Irwin (London), Pat Turner (Middlesbrough), Bob Laventure (Leicester) and Tash Masud (Nottingham). The diverse background of the council members (clinicians, researchers, physiotherapists, exercise physiologists) is a great asset and many of the members belong to other important organisations making networking with other societies easier. Close links have been developed with the PROFANE [Prevention of Falls Network Europe] (via Dawn Skelton), The National Osteoporosis Society, The British Geriatrics Society and The British Heart Foundation. One main current focus for the society is the development of a national teaching programme for exercise practitioners and strong links have been formed with Derby University to enable this project to proceed. Already many exercise practitioners throughout the UK have been trained on this course.

Selected Recent Papers: Effects of exercise and/or calcium on bone in children

Effects of exercise and/or calcium on bone in children

Specker B & Binkley T (2003) Randomized trial of physical activity and calcium supplementation on bone mineral content in 3- to 5- year old children

This nicely designed trial examined effects of calcium supplementation (1000 mg/day, 5 days per week) and/or taking part in gross motor activities in 239 children. In children receiving calcium, leg BMD increased by nearly 10% more than those receiving placebo. To take account of dietary calcium intakes, which were fairly high in this sample, results were reanalysed according to quartile of total intake. Greater increases in leg BMD in exercisers compared to controls were observed only in groups consuming > 1100 mg calcium per day. Physical activity was also found to provoke greater increases in bone diameters (both periosteal and endosteal) at the tibia (20% distal site), regardless of calcium intake. It would be interesting to see whether these benefits persist after cessation of the exercise and/or calcium interventions.

Iuliano-Burns S, Saxon L, Naughton G, Gibbons K, Bass SL (2003) Regional specificity of exercise and calcium during skeletal growth in girls: a randomised controlled trial. Journal of Bone and Mineral Research 18:156-162

Another randomised controlled study examining the possible interactive effects of exercise and calcium, this time in girls aged 7 to 11. The exercise intervention consisted of moderate impact (hopping, skipping, jumping) versus low impact (stretching, low impact dance). The calcium supplementation was achieved by provision of calcium fortified foods. Femur BMC increased more in the calcium plus exercise group than other groups. At lower limb, BMD increased more in exercise groups regardless of calcium intake, whilst arm BMD increased more in calcium groups regardless of exercise. No effects on bone size were observed. The authors concluded that exercise produced effects at loaded areas, whilst calcium supplementation produced generalized effects. Some minor limitations of the study was that the intervention was only 8.5 months in duration, with some components of the exercise (use of hand weights) being introduced only for the last 8 weeks. It is possible that further effects might have been seen with longer duration. There were also slight (although not significant) differences between groups in the proportion of girls entering puberty which could have influenced findings.

Stear SJ, Prentice A, Jones SC, Cole TJ (2003) Effect of a calcium and exercise intervention on the bone mineral status of 16-18 year old adolescent girls. American Journal of Clinical Nutrition 77:985-992

In this study 16-18 year old girls were randomised to calcium supplement (1000mg/day) and/or exercise. Subjects assigned to exercise were invited to attend three 45-minute exercise sessions per week during 24 weeks of term-time. The sessions consisted of weight-bearing moderate to high impact movements performed to music. Compliance with exercise was poor- only 27% of girls attended more than 50% of the prescribed sessions. These girls increased total hip and trochanter BMC, although no significant effect was seen in the group as a whole. Compliance with calcium supplements was higher (70%). Groups assigned to calcium supplementation showed greater increases in size-adjusted BMC of whole body, spine, forearm and hip. No interaction effect of calcium and exercise was observed. It is likely that the poor compliance with exercise limited the response in exercise groups.

Effects of exercise on bone in children

Zanker CL, Gannon L, Cooke CB, Gee KL, Oldroyd B, Truscott JG (2003) Differences in bone density, body composition, physical activity and diet between child gymnasts and untrained children 7-8 years of age. Journal of Bone and Mineral Research 18:1043-1050

Gymnasts (10 male and 10 female) aged 7-8y were compared with controls matched for sex, height, weight and age. Gymnasts tended to have higher areal and volumetric BMD than controls. Differences were significant at the lumbar spine and arms in girls. Differences were attributed to differences in BMC as bone area did not differ, although BMC and bone area were not reported. BMD was higher in female than male gymnasts- a finding which could be related to the greater training volume and longer history of participation in the girls. The study confirms findings of previous studies that gymnasts have higher BMC and indicates that this difference can be observed as early as 7 or 8. Studying this younger age group means that results are less likely to be confounded by differences in pubertal stage between gymnasts and controls, but the study is still subject to selection bias as gymnasts were performing competitively at regional level.

Scerpella TA, Davenport M, Morganti CM, Kanaley JA, Johnson LM (2003) Dose-related association of impact activity and bone mineral density in pre-pubertal girls. Calcified Tissue International 72:24-31

Female gymnasts aged 7-11 years, defined as high dose (>8 hours per week) or low-dose (1-8 hours per week) were compared with controls who were carefully matched for age, height, weight and maturation. Total and forearm BMD were higher in the high dose group than the low dose group and higher in the low dose group than controls. The authors thus observed a dose dependent relationship between training duration and BMD. However it could be that high-dose gymnasts are training at greater intensity, or have a longer history of training, so it is difficult to be sure that training duration is the only factor underlying this association.

Faulkner RA, Forwood MR, Beck TJ, Mafukidze JC, Russell K, Wallace W (2003) Strength indices of the proximal femur and shaft in prepubertal female gymnasts. Medicine and Science in Sports and Exercise 35(3): 513-518

Competitive female gymnasts, aged around 12y, were significantly shorter and lighter than age-matched controls, although lean mass was similar. Bone mineral content and several structural parameters of the proximal femur (e.g. cross-sectional moment of inertia; section modulus; strength index) did not differ significantly between groups when unadjusted or adjusted for lean body mass, but were significantly greater in gymnasts when adjusted for height and weight. The study adds further weight to the proposition that training during growth can influence bone geometry as well as bone density. However, there are several possible limitations. The study is liable to selection bias. A greater proportion of controls had reached a more advanced stage of pubertal development (although this difference did not reach significance). Differences in bone only appeared after adjustment for size. This adjustment presumably assumes that smaller size in gymnasts is related to smaller skeletal size. However the major difference between the groups was lower fat mass in gymnasts (as lean mass was similar). The differences in size-adjusted measures of bone could be a spurious finding resulting from this adjustment. For these reasons it would be interesting to see a longitudinal study of these parameters.

Sundberg M, Gardsell P, Johnell O, Karlsson MK, Ornstein E, Sandstedt B, Sernbo I (2002) Physical activity increases bone size in prepubertal boys and bone mass in prepubertal girls: a combined cross-sectional and 3-year longitudinal study. Calcified Tissue International 71:406-415

More active 13-year old girls had greater BMC and BMD than their less active peers, whilst bone dimensions did not differ significantly. Differences persisted in 3 years follow-up of girls who remained in the same activity group. In boys, higher activity was associated with higher BMC and bone size but not higher BMD. Again, differences persisted during follow-up. The authors conclude that physical activity increases bone mass in girls and bone size in boys. This is an interesting proposition, although it is possible that with relatively small sample size (~21 per group) differences between groups were present by chance or that selection bias may have influenced findings. It is interesting to note that even the low physical activity group participated in 2-4 40-minute physical education classes per week. The additional activities practised by the high activity group were extremely variable in nature (e.g. soccer, horseback riding, swimming, motorcross). The disadvantage of this is that differences in activities practised may have influenced findings. The advantage is that these were the activities habitual for the sample group- demonstrating that an achievable volume/type of activity was associated with a noticeable increment in BMC (6-23% at femoral neck), which was maintained whilst activity was maintained.

Arnett MG, Lutz B (2002) Effects of rope jump training on the os calcis stiffness index of postpubescent girls. Medicine and Science in Sports and Exercise 34:1913-1919

The study aimed to examine whether rope jumping could influence calcaneal ultrasound in postpubescent girls, and whether ultrasound measurements were related to BMD by dual X-ray absorptiometry. Girls were randomly assigned to high volume rope jumping (10 min per day, 4 days per week for four months), low volume jumping (5 min/day) or control. The increase in calcaneal stiffness index was significantly greater in the high volume than

control group. The low volume (5 min/day) group had intermediate results. Ultrasound measurements were correlated with BMC at baseline and followup. The study demonstrated that jumping can produce changes in bone in only four months, and that these changes can be detected by ultrasound. The study might have benefited from a longer follow up. Furthermore, it would have been interesting to examine whether changes in ultrasound were associated with changes in BMC.

Bass SL, Saxon L, Daly RM, Turner CH, Robling AG, Seeman E, Stuckey S (2002) The effect of mechanical loading on the size and shape of bone in pre-, peri- and postpubertal girls: a study in tennis players. Journal of Bone and Mineral Research 17:2274-2280

This study aimed to determine effects of loading on bone size and shape, and whether these effects differed according to maturational stage. Subjects were pre- peri- and post-pubertal competitive tennis players, who averaged 10, 12 and 14 years. Age of starting playing averaged 5, 6 and 7 years respectively, so presumably all girls had commenced playing whilst prepubertal. Humerus BMC was measured using DXA. Mid and distal humerus periosteal (bone + cavity) cortical (bone only) and medullary (cavity) areas were assessed by magnetic resonance imaging. Measurements were made of both dominant and non-dominant arms, with the non-dominant arm assumed to be unloaded.

To examine effects of maturation, differences in the non-dominant arm were examined. Peripubertal girls had greater cortical, periosteal and medullary areas than prepubertal girls. Postpubertal girls had greater cortical areas but lower medullary areas than peripubertal girls. Periosteal diameter was greater at mid- but not distal humerus. It was concluded that growth from pre-to peri- puberty is associated with increased periosteal and medullary expansion. From peri- to post- puberty the periosteal apposition was greater than medullary expansion particularly at the distal humerus.

To examine effects of loading, dominant and non-dominant limbs were compared. BMC was 11-14% higher in loaded limb in all age-groups. In pre- and peri- pubertal girls, cortical and periosteal areas were significantly greater in the loaded limb. In postpubertal girls cortical and periosteal areas were significantly higher in the loaded limb with differences being of similar magnitude to those in peripubertal girls. In addition, medullary area was significantly smaller at the distal humerus. It was concluded that loading is associated with higher BMC which is the result of increased periosteal expansion from pre- to peri- puberty. From peri- to postpuberty, continued loading is associated with no further increment in periosteal diameter but increased endocortical apposition at distal humerus.

The study is important in examining some of the effects of loading on bone geometry which will have influences on bone strength independent of BMD. There are some minor limitations however. Firstly, as some of the comparisons were cross-sectional, with groups being fairly small (e.g. n=11 in peri-pubertal girls) individual differences could contribute to some of the observed effects. Secondly, as the majority (87%) of girls used a double handed backhand, the assumption that the non-dominant limb is unloaded may be flawed. Different loading patterns on the two limbs may contribute in part to the observed effects. It would thus be interesting to see these findings confirmed by longitudinal studies. In this study, all girls had started training pre-puberty- it would be interesting to examine effects on bone geometry of training commenced peri- or post-puberty.

Kontulainen S, Sievanen H, Kannus P, Pasanen, M, Vuori I (2003) Effect of long-term impact-loading on mass, size and estimated strength of humerus and radius of female racquet-sports players: a peripheral quantitative computed tomography study between young and old starters and controls. Journal of Bone and Mineral Research 18:352-359

Bone mass, geometry and indices of bone strength were compared in three groups of women. Young starters had started playing racquet sports prior to menarche (at age 10 on average) and were currently aged 27 $\pm$ 8 years; old starters had started after puberty (at age 26 on average) and were currently aged 44 $\pm$ 11 years and controls were aged 34 $\pm$ 10 years. Differences between dominant and non-dominant arms were examined to quantify effects of loading from tennis/squash playing. At the humeral shaft, BMC, cortical area and diameter and torsional bone strength index were greater in young starters than old starters, and in old starters than controls. At the distal radius the major differences were in BMC, BMD and trabecular density. The authors concluded that tennis playing resulted in periosteal expansion at the humeral shaft, with greater gain in young starters, whilst at the distal radius the major effect of loading was on trabecular bone, with similar magnitude of effect in young and old starters. DXA measurements of BMC and BMD detected differences between groups but underestimated differences in bone strength resultant from differences in bone size.

Physical activity and bone in young adults

Proctor KL, Adams WC, Shaffrath JD, Van Loan M (2002) Upper-limb bone mineral density of female collegiate gymnasts versus controls. Medicine and Science in Sports and Exercise 34:1830-1835

Female gymnasts had substantially higher spine, hip and arm BMD and BMC than weight-matched controls, despite menarche being on average one year later in gymnasts (all of whom had commenced training before 9 years of age). Upper limb BMD and BMC were higher in the dominant arm in controls, but no difference between limbs was observed in gymnasts.

Bakker I, Twisk JWR, Van Mechelen W, Roos JC, Kemper HCG (2003) Ten-year longitudinal relationship between physical activity and lumbar bone mass in (young) adults. Journal of Bone and Mineral Research 18:325-332

Physical activity and bone mass were followed between ages of 27 and 36 in 466 adults in Amsterdam. Two measures of physical activity were used- mechanical (MECHPA, estimated from ground reaction force associated with activity) and metabolic (METPA). During follow-up, body mass and physical activity scores increased substantially, but lumbar BMD declined. There was a linear association between mechanical activity score and BMD in men but not women. As regards metabolic activity, there was no linear relationship but those in second and third quartiles had higher BMD than those in first quartile, although those in the highest quartile did not differ from those in the lowest. The study thus demonstrates that mechanical loading of the skeleton is associated with higher BMD (in men at least). Moderate levels of metabolic activity were associated with higher BMD but high metabolic activity was not. This study is valuable for its size and duration of follow-up. The measures of physical activity are necessarily somewhat crude. The rather surprising increase in activity from age 27 to 36 was attributed by authors to household/family activities and/or a change in interview structure. It would have been interesting to see whether activity type contributed toward BMD. Adjustment was made for some possible confounding factors (weight and calcium intake) but many other factors could have influenced BMD, such as illness, medication, pregnancy and lactation. These factors could potentially have concealed an effect of physical activity in women.

Cobb, KL, Bachrach LK, Greendale G, Marcus R, Neer RM, Nieves J, Sowers MF, Brown BW Jr, Gopalakrishnan G, Luetters C, Tanner HK, Ward B, Kelsey JL (2003) Disordered eating, menstrual irregularity and bone mineral density in female runners. Medicine and Science in Sports and Exercise 35:711-719

This study confirmed previous reports of reduced bone mass in amenorrhoeic athletes. Interestingly, disordered eating was associated with lower spine BMD even in regularly menstruating athletes. The number of women in the eumenorrhoeic disordered eating group was rather small, so it would be interesting to see whether this findings is confirmed in further studies.

Greendale GA, Huang M-H, Wang Y, Finkelstein JS, Danielson ME, Sternfeld B (2003) Sport and home physical activity are independently associated with bone density. Medicine and Science in Sports and Exercise 35:506-512

This study examined associations between different domains of activity (work, home, sport and active living) and BMD in over 2000 US women. Sport and home physical activity was positively associated with spine and femoral neck BMD, but work activity or “active living” (walking/cycling) were not associated with BMD. This study highlights that home activities as well as sporting activities might have beneficial effects on BMD, although further studies would be required to elucidate whether such effects were causal.

Physical activity and bone in older adults

Milliken LA, Going SB, Houtkooper LB, Flint-Wagner HG, Figueroa A, Metcalfe LL, Blew RM, Sharp SC, Lohman TG (2003) Effects of exercise training on bone remodelling, insulin-like growth factors and bone mineral density in postmenopausal women with and without hormone replacement therapy Calcified Tissue International 72:478-484

This study aimed to examine effects of weightbearing exercise and/or HRT on BMD, bone remodelling and insulin-like growth factors (IGFs). Women aged 40-65 who were 3-10 years postmenopausal self-selected into HRT or no HRT groups. Groups were subdivided with half being randomly assigned to take up an exercise intervention which consisted of aerobic activity with weighted vests, interspersed with high impact moves, followed by resistance exercises and stretch and balance training. Numbers completing the study ranged from 17 to 27 per group. HRT use was associated with increases in total, femoral neck and Ward’s triangle and lumbar spine BMD. Exercise was associated with reduced bone loss at Ward’s triangle in non-HRT group and at greater trochanter in the HRT group. HRT resulted in reduced remodelling, whilst exercise had no significant effect. There were no significant changes in IGFs. These findings are consistent with previous reports that exercise and HRT have additive effects on bone. A larger sample size might have given the study power to detect differences between groups in bone remodelling.

Iki M, Saito Y, Dohi Y, Kajita E, Nishino H, Yonemasu K, Kusaka Y (2002) Greater trunk muscle torque reduces postmenopausal bone loss at the spine independently of age, body size and vitamin D receptor genotype in Japanese women. Calcified Tissue International 71:300-307

This study examined factors associated with the change in lumbar spine BMD over 4 years in 119 healthy postmenopausal women. Most muscle strength indices were related to baseline BMD. Grip and leg strength were associated with changes in BMD, whilst indices of trunk extensor strength were associated with changes in BMD only after adjustment for age, weight and height.

Kemmler W, Engelke K, Lauber D, Weineck J, Hensen J, Kalender W A (2002) Exercise effects on fitness and bone mineral density in early postmenopausal women: 1-year EFOPS results. Medicine and Science in Sports and Exercise 34:2115-2123

Effects of a programme of exercise (running, jumping, resistance training) in early postmenopausal women were examined. 59 women who complied with exercise showed significant improvements in lumbar spine BMD (+1.3%) relative to 41 controls who lost bone (-1.2%). Exercisers also showed improvements in strength, quality of life, insomnia and mood. The study demonstrates that bone loss can be reduced by starting exercise in early postmenopausal women. Disadvantages are that the study was not randomised, and results for women who did not comply were excluded. It is possible that by including compliers only a greater effect was seen than would have been observed in a randomised trial.

Cussler EC, Lohman TG, Going SB, Houtkooper LB, Metcalfe LL, Flint-Wagner HG, Harris RB, Teixeira PJ (2003) Weight lifted in strength training predicts bone change in postmenopausal women. Medicine and Science in Sports and Exercise 35:10-17

Women aged 44-66 took up a 1-year progressive strength training programme. Half the women took HRT (various regimens). The change in BMD was found to be related to the total weight lifted over the year, indicating a dose-response relationship. There were also some significant relationships between weight lifted in particular exercises (e.g. weighted squat) and femur trochanter BMD.
The study is valuable in attempting to evaluate the dose response relationship between strength training and bone response. One difficulty in interpretation is that the weight lifted depends both on the magnitude of weight lifted and the number of times lifted – it is thus difficult to differentiate effects of loading magnitude, frequency and duration. Women selected the volume completed, rather than being assigned to different groups. The association could thus be explained by other factors such as age, size or HRT use although statistical adjustment was made for some possible confounding factors.

Hawkins SA, Schroeder ET, Dreyer HC, Underwood S, Wiswell RA (2003) Five-year maintenance of bone mineral density in women master runners. Medicine and Science in Sports and Exercise 35:137-144

This study examines changes in bone over five years in female runners with differing menstrual status/oestrogen use. No significant bone changes were observed over 5 years, in any of the groups. In this study, female master runners thus appeared to maintain spine and hip BMD regardless of menstrual status and oestrogen use.
As effects of physical activity are reversed on cessation, activity must be maintained over extended periods if fracture risk is to be reduced. The study is thus valuable for its long follow-up. Unfortunately the relatively small size of some of the groups limits the power of the study to differentiate bone changes between groups. The lack of a control group reduces the conclusions which can be drawn, although finding a well-matched control group may have been problematic.

Tomkinson A, Gibson JH, Lunt M, Harries M, Reeve J (2003) Changes in bone mineral density in the hip and spine before, during and after the menopause in elite runners. Osteoporosis International 14:462-468

Another study examining bone change in runners- this time in women aged over 40 who were followed up for 4 years. Women who were postmenopausal throughout (n=10) lost bone at the femoral neck and spine (at a rate of ~1% per year) whilst women who remained premenopausal/taking HRT (n=18) did not. The femoral trochanter was less affected by oestrogen withdrawal, indicating running may preserve bone at this site. Again, a comparison with changes in sedentary women might have been useful to determine whether bone loss differed in runners.

Gerdhem P, Akesson K, Obrant KJ (2003) Effect of previous and past physical activity on bone mass in elderly women. Osteoporosis International 14:208-212

Previous and past physical activity and total body, hip and spine BMD were assessed in 995 Swedish women aged 75 years. No significant correlations were observed, indicating that factors other than physical activity are more important determinants of bone in women of this age.
Possible limitations of the study are that questionnaires used did not assess types of activity likely to influence bone. It is possible that the variance of physical activity in this population was small- nearly 10% of women approached cited illness as a reason for not-attending, so perhaps the sample was biased towards the more able. No attempt was made to control for confounding factors, so these might have concealed any association.

Adami S, Giannini S, Giorgino R, Isaia GC, Maggi S, Sinigaglia L, Filipponi P, Crepaldi G, Di Munno O (2003) The effect of age, weight and lifestyle factors on calcaneal quantitative ultrasound: the ESOPO study. Osteoporosis International 14:198-207

This study examined factors related to calcaneal ultrasound. Nearly 7000 women aged 40-80 and 5000 men aged 60-80 were studied. The amount of outside walking/biking each day was associated with calcaneal stiffness, with those reporting >60 minutes per day having values 5% higher than those reporting none. Having been confined to bed for >2 months was associated with a similar decrement in stiffness. Findings persisted after adjustment for a number of possible confounding factors. This study demonstrates physical activity was associated with ultrasound measurements of the calcaneus with differences of substantial magnitude. The calcaneus may receive more

impact forces during weightbearing activity, so these findings might be expected to be greater than those at spine or hip. Furthermore, those who are more active in walking/biking may be more active in other activities or have better health

Kitagawa J, Omasu F, Nakahara Y (2003) Effect of daily walking steps on ultrasound parameters of the calcaneus in elderly Japanese women. Osteoporosis International 14:219-224

Ultrasound measures of bone were correlated with number of daily walking steps (measured by pedometer) up to a limit of approximately 12,000 steps per day. This study provides confirmation that physical activity is associated with ultrasound parameters of bone in older people. However it would be difficult to make conclusions about effects of walking on bone from this study because of the confounding effects of other physical activities, health status etc.

Physical activity and fall risk in older adults

Barnett A, Smith B, Lord SR, Williams M, Baumand A (2003) Community-based group exercise improves balance and reduces falls in at-risk older people: a randomised controlled trial. Age and Ageing 32:407-411

Subjects were recruited from a population aged 65+, judged to be at high risk of falling on the basis of poor performance in simple tests of strength, balance or reaction time. The 83 volunteers randomised to exercise were offered a weekly exercise class supplemented by home exercise, with content comprising strength, balance and co-ordination training, aerobic work and stretching. The frequency of participation was not great- subjects attended a median of 23 classes during the year, with the large majority performing exercises at home at least once a week. The exercise group showed significant improvements in three of the six measures of balance used, although there was no significant change in strength, reaction time or walking speed. Fall incidence was 40% lower in the exercise group than the control group. A particularly interesting feature of this study is the acceptability of the programme to the study population- nearly two-third of eligible subjects assessed to be at high risk of falling agreed to participate. Of those randomised to the exercise intervention, three quarters continued attending after the end of the trial. This feasible programme thus seemed effective in improving balance and reducing falls in a high-risk population.

Toulotte C, Fabre C, Dangremont B, Lensel G, Thevenon A (2003) Effects of physical training on the physical capacity of frail, demented patients with a history of falling: a randomised controlled trial. Age and Ageing 32:67-73

Subjects were 20 demented (mini mental state score < 21) older people with a history of falling but capable of walking at least 10m. Those randomly assigned to exercise completed two 45-minute sessions per week of strength, balance and flexibility training, with two physicians required per 5 subjects. After 16 weeks, the training groups showed improvements in sway, get-up-and-go times, walking times and flexibility. During the training programme there were no falls in the training group but 6 in the control group. This study demonstrates that demented older people can benefit from physical activity, although considerable supervision is required for training sessions.

Steadman J, Donaldson N, Kalra L (2003) A randomised controlled trial of an enhanced balance training program to improve mobility and reduce falls in elderly patients. J Am Geriatr Soc 51:847-852

A randomised trial compared enhanced balance training with conventional therapy for impaired mobility in 199 elderly patients (mean age 82). Both groups showed improvements in balance and mobility. There was no difference in fall incidence between the groups. More of the enhanced balance training group reported improved confidence walking outdoors. The conventional physiotherapy for patients with mobility problems thus appears to be effective in improving balance and mobility, with improved confidence the only additional benefit from enhanced balance training.

Brouwer BJ, Walker C, Rydahl SJ, Culham EG (2003) Reducing fear of falling in seniors through education and activity programs: a randomised trial. J Am Geriatr Soc 51:829-834.

38 volunteers who reported fear of falling and restricted activity were randomly assigned to activity (low resistance and weight-shifting exercises) or education (identifying and modifying fall risk factors), each consisting of a 1-hour session per week for 8 weeks. The activity groups showed improvements in measures of balance, whilst both groups reported reduced fear of falling. Either activity or education programs might thus help to improve confidence and maintain independence in older people with fear of falling.

IsPAPOFF

President	**Dr Ole Simonsen** Orthopaedic Surgeon Hjørring Hospital, Denmark. Email: 2202@hjs.nja.dk	Administrator: **Ms Jayne Mowson** Postgraduate Education Centre Nottingham City Hospital NHS Trust Hucknall Road, Nottingham NG5 1PB United Kingdom Tel: 0044 (0)115 840 2643 Fax: 0044 (0)115 9627937 Email: jmowson@ncht.trent.nhs.uk
Secretary & Newsletter Co-editor:	**Dr Tahir Masud** Consultant Physician Nottingham City Hospital NHS Trust Email: tm@nchhce.demon.co.uk	
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:

Ms Jayne Mowson, Post Graduate Education Centre, Nottingham City Hospital NHS Trust
Hucknall Road, Nottingham NG5 1PB **or** email: jmowson@ncht.trent.nhs.uk

I would like to become a member of IsPAPOFF [ ]

I am interested in developing a branch of the Society in my own Country [ ]

Name: …… Occupation: ……

Address: ……

……

……

……

Telephone No: …… Email ……