

Abstracts

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001 EXERCISE BEHAVIOUR IN PREGNANCY

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Aims: To determine the different exercise levels and information needs during pregnancy in the athletic and general population.

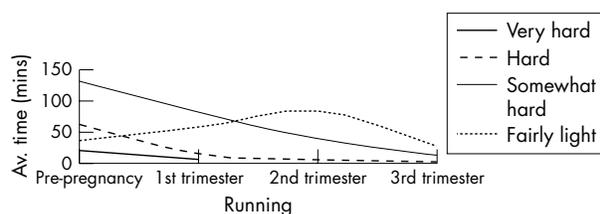
Objectives: To compare the exercise levels of pregnant women in an athletic and a general population group to recommended guidelines (American College of Obstetricians and Gynaecologists. *Technical Bulletin* 1994;189). To look at the information needs of these two groups.

Methods: A retrospective questionnaire study was conducted with an athletic population recruited from running magazines/athletic clubs and a cohort of women from general practice.

Results: Ninety five athletes and 74 women from general practice are compared to determine socioeconomic variables. Their different pre-pregnancy exercise behaviours, in type, frequency, duration, and intensity (O'Neil M. *Br J Sports Med* 1992;26:121-4) are recorded and the changes made during pregnancy are determined. The factors affecting changes in their exercise behaviour through the trimesters of pregnancy are ascertained. The advice the women had obtained about exercising in pregnancy and the perceived deficiencies in the information available are identified.

Abstract 1 Percentage of women exceeding recommended exercise guidelines in pregnancy

Trimester of pregnancy	Athletic group	Practice group
1-3	51	24
2-6	25	14
6-9	9	5



Conclusions: Women in this study were shown to often exceed the recognised guidelines for exercise levels in pregnancy, this was more so among athletic women. In particular, the duration and intensity of weight bearing activities such as running reduced and that of swimming and walking increased. Inadequate information about exercise in pregnancy is highlighted by both groups of women in particular being unaware of what are the safe upper limits for exercise in pregnancy, but this was more of a concern for the athletic population who expressed the need for a more tailored approach for the regular exerciser.

002 THE MANAGEMENT OF ACUTE SPORTS INJURIES PRESENTING TO ACCIDENT & EMERGENCY DEPARTMENTS IN SCOTLAND

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Objective: To determine the management of acute sports injuries on a national level by assessing the views of Accident & Emergency (A&E) consultants on various issues regarding the concept of sports injury management in patients presenting to A&E departments in Scotland.

Method: A ten point questionnaire concerning different aspects of sports injury management was sent to each of the twenty five A&E departments participating in the Scottish Trauma Audit Group. This included teaching hospitals, district generals, and rural hospitals. The responses on each returned questionnaire were analysed.

Results: A response rate of 76% was obtained with 19 questionnaires returned. Sports injuries were estimated to account for 10% and soft tissue injuries 23% of overall A&E attendances. Ninety per cent felt that A&E departments had a role to play in the management of sports injuries. Seventeen A&E departments provided formal teaching on soft tissue injury management as part of the Senior House Officer training programme, however, only three departments specifically included teaching on sport injuries. Direct referral access for the review of patients was available at A&E review or soft tissue injury clinics (90%), fracture clinics (100%), orthopaedic clinics (85%), and the physiotherapy department (95%). Only three departments had physiotherapists present at their review clinics. Fifty three per cent felt that sports injuries were best reviewed by A&E doctors, 21% by the general practitioner, the remainder having no strong opinion. Sixty three per cent were in favour of sports medicine clinics being available on the National Health Service. Sixty three per cent would advise patients to attend a local privately based sports injury clinic for further management, 16% disagreed, and 21% were unsure.

Conclusion: Acute sports injuries often present to A&E departments for treatment. While doctors receive training in the management of soft tissue injuries, consideration should be given to including specific training in relation to sports injuries. The presence of physiotherapists at A&E review clinics would offer valuable assistance in the rehabilitation of sporting injuries however financial costs may render this impractical. The majority of A&E consultants appear to support the concept of sports medicine as a specialty however many feel that whilst having a role in the management of sports injuries, they should not be given preferential treatment over patients with similar injuries from a non-sporting cause.

003 WRIST FRACTURES IN SOCCER GOALKEEPERS: A ONE YEAR PROSPECTIVE STUDY

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Objective: When saving a ball that has been kicked with force, a goalkeeper will sustain a forced dorsiflexion action at the wrist joint similar to the injury mechanism of falling on the outstretched hand. We aimed to determine the type of wrist fractures sustained by goalkeepers when saving a ball during participation in organised or recreational soccer.

Method: Adults and children attending the Accident & Emergency department of Crosshouse hospital, Kilmarnock with a wrist fracture from goalkeeping at soccer were identified prospectively over a period of one year.

Results: Nineteen patients were diagnosed as having a wrist fracture. Ages ranged from 7-41 years. Thirteen patients were children (under 16 years on day of presentation). The following injuries were seen:

- 12 Greenstick fracture (#) distal radius
- 2 Undisplaced distal radius #
- 1 Displaced distal radius # requiring manipulation
- 1 Colles # requiring manipulation
- 1 Comminuted distal radius #
- 1 Radial styloid #
- 1 Scaphoid # (waist of scaphoid)

The 12 greenstick # and one displaced distal radius # occurred in children. The remaining fractures were in adults. Three further patients were initially diagnosed as having a "clinical scaphoid #" who were later found to have no radiological evidence of scaphoid injury on further examinations. There were also seven soft tissue injuries to the wrist.

Conclusion: Significant injury can occur when a soccer goalkeeper saves a football kicked with force. All accident and emergency doctors must be aware of the potential for injury from goalkeeping in soccer in what may at first appear to be a trivial mechanism of injury, especially in children, and manage accordingly.

004 IS THERE A RELATIONSHIP BETWEEN THE MENSTRUAL CYCLE AND INJURIES IN FEMALE FOOTBALLERS?

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Certain phases of the menstrual cycle, particularly the premenstrual and menstrual phases, have previously been associated with an increased risk of musculoskeletal injury in female athletes. In addition a protective effect against such injuries has been suggested to arise in women who are prescribed the oral contraceptive pill (OCP).

A retrospective postal questionnaire, with a prospective diary questionnaire study was used, and telephone interviews or postal questionnaires employed in the medical provisions survey to determine any possible relationships between the menstrual cycle, OCP use and the occurrence of athletic injury, in a group of female footballers in the Scottish Women's Football League (SWFL).

No significant differences were found between the menstrual cycle phase and injury occurrence or in injury rates in OCP v non-OCP users. ($\chi^2=0.229$, DF=1, p value=0.633), suggesting that women are not more susceptible to injury during either premenstrual or menstrual phases of their cycles. No significant beneficial effect from use of the OCP against injury was seen. Although the medical provision within the leagues was considered fair for an amateur sport, there remains considerable room for development. Until these foundations are laid, further medical research cannot be successfully performed.

005 AN AUDIT OF FIRST AID QUALIFICATIONS AND KNOWLEDGE AMONGST TEAM OFFICIALS IN TWO ENGLISH YOUTH FOOTBALL LEAGUES: A PRELIMINARY STUDY

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The aim of this study was to determine if youth football officials charged with the responsibility of dealing with injuries possess appropriate first aid qualifications? Adults have both a moral and legal duty of care to their players. Indeed they may be liable to litigation if they fail to foresee risk and reasonably prepare for it (Grayson E. *Sport and the Law*. London: Butterworth & Co, 1998:206).

Information was collected from two youth football leagues by questionnaire. First aiders were asked to provide details of their qualifications, the equipment, and consumables they had access to and their response to an "injury scenario" from a list of alternatives.

A total of 52 out of 86 respondents did not possess a current first aid qualification. Three quarters of teams had no access to any form of cryotherapy. The correct response to the injury scenarios "player choking" and "player unconscious" were given by 12% and 38% respectively.

Player's health and injury records were kept by 40% and 19% of teams respectively. Written parental consent to emergency treatment was obtained by 30% of teams.

This preliminary study illustrates the obligation for teams who do not possess a qualified first aider to evaluate their legal and moral responsibilities. The Football Association and Health and Safety Executive together need to provide a list of recommended equipment and facilities that teams should have access to at games and training sessions. First aid training providers need to reassess their teaching of the management of the choking and unconscious casualty.

005 A SURVEY OF FLEXIBILITY TRAINING PATTERNS AND HAMSTRING STRAINS IN PROFESSIONAL FOOTBALL CLUBS IN ENGLAND

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The survey investigated the relationship between flexibility training patterns and hamstring strain rates in English professional football clubs.

Questionnaire based data from 30 English professional football clubs in the four divisions were analysed using cross tabulation, correlation, and multiple regression.

Training patterns were characterised by wide variability, often without standardisation. Static stretching was the most popular stretching technique used in combination with proprioceptive neuromuscular facilitation (PNF) and ballistic in a ratio of 5:1:1. Hamstring strains represented 10.3% of all injuries, and a third of all muscle strains, which itself represented 32.1% of all injuries. Hamstring strain rates were highest in the Premiership with the lowest rates in Division Two clubs. Hamstring strains were mostly grade I and II. Two thirds of hamstring strains occurred late during training/matches with forwards being more frequently injured.

Approximately 80% of hamstring strain variability was accounted for by hamstring stretching holding time (SHT), use of standard stretching protocol (SSP) and hamstring stretching technique (STE), from the multiple regression equation:

$$HSR=(37.785-0.325 \text{ SHT}-10.05 \text{ SSP}-2.236 \text{ STE}) \pm 2.34$$

Hamstring stretching was the most important training factor associated with hamstring strain rates, with STE, SHT, and use of SSP probably involved in a complex synergism preventing hamstring strains.

006 THE DEVELOPMENT OF A SPORTS GYNAECOLOGY CLINIC

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Attitudes towards women in sport have nearly done a full circle over the last 300 years. Prior to the Industrial Revolution women's participation in vigorous sport was widespread, involved all age groups and involved both married women and mothers. Women were seen to be physically capable of extreme exertion. During the 19th century evidence suggests that attitudes in Britain discouraged the participation by women and girls in vigorous sport. As we move into the 21st century there is now a total acceptance of women participating in vigorous sport. Indeed, there may be evidence to indicate that women may soon outperform men in certain endurance sports.

With this development there is an increasing need to develop evidence based practical information on the obstetric and gynaecological care of the exercising woman. The benefits of exercise cannot be underestimated but the serious, potential life threatening effects of the female "athletic triad" which consists of amenorrhoea, eating disorders, and osteoporosis need to be addressed. Hormonal influences on performance, whether perceived or real, need to be questioned and evidence based answers are required.

With this in mind a sports gynaecology clinic has been established at the British Olympic Medical Centre, Northwick Park. This allows a multidisciplinary holistic approach to the gynaecological problems in sportswomen.

Increasing awareness of the healthcare industry and athletes of exercise related problems in exercising women is essential to allow exercise to have benefit and few detrimental effects.

007 A PILOT STUDY TO INVESTIGATE THE EFFECTS OF CORE STABILITY/TRUNK STRENGTH TRAINING AS AN INCLUSION IN THE REHABILITATION PROGRAMME FOR SHOULDER INSTABILITIES IN YOUNG ATHLETES

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The purpose of this pilot study was to assess the effects of improved posture and trunk strength/stability on shoulder strength in athletes with shoulder instabilities.

Assessment involved objective measurements of posture, shoulder function, and rotator cuff strength before and after a rehabilitation intervention. Isokinetic strength was tested in a modified abducted position using a Kincom isokinetic dynamometer with test speeds of 50°/s and 120°/s. Rehabilitation intervention involved an eight week traditional shoulder strengthening regime combined with trunk strengthening and core stability exercises. Nine male and female amateur athletes (age 18-33 years) with unilateral shoulder instability participated in the study.

Subjects as a group significantly improved rotator cuff strength in both affected and unaffected shoulders. Improvements were also demonstrated in posture scores.

Postural training would appear to increase rotator cuff strength and improve shoulder function. A larger scale, more detailed study would be required to confirm these results.

008 EXERCISE PERFORMANCE, CLINICAL OUTCOMES AND QUALITY OF LIFE AFTER ANGIOPLASTY IN PATIENTS WITH CORONARY ARTERY DISEASE

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This study assesses the effects of percutaneous coronary intervention on exercise capacity, clinical outcome, and quality of life in patients with obstructive coronary artery disease.

Eighty six consecutive patients (25 prospective and 61 retrospective) were studied who had coronary angioplasty with/without stent placement. Symptom limited exercise tests were performed before and after intervention. Coronary angiograms performed before and after PCI were analysed visually. Vessels with a stenosis >50% were considered significant. Angiographic success was defined as a residual stenosis <20%. Physical Activity Questionnaires (quality of life) were completed by patients in the prospective group before and four weeks after angioplasty.

Primary angiography success was achieved in 88% and 85% in the prospective and retrospective groups with complete revascularisation in 44% and 64% respectively. After angioplasty exercise capacity improved by a mean of 9% and 7% in the prospective and retrospective groups. ST segment depression during exercise was significantly reduced in both groups (1.17 to 0.3 mm, $p=0.01$; 2.0 to 0.97 mm, $p=0.001$). Chest pain was improved in most patients. Exercise improvements were greatest in patients with single vessel disease compared with those with triple vessel disease and complete revascularisation compared with incomplete. Total daily activity levels increased by 90 (197.1) minutes ($p=0.039$) with a positive correlation between exercise capacity and activity levels.

These results confirmed that coronary angioplasty improved exercise performance, reduced ST depression and chest pain in the majority of patients.

The greatest improvements were in patients who achieved complete revascularisation, particularly those with single vessel disease. Quality of life (activity levels) improved depending on the severity of disease and revascularisation success.

009 EVALUATION OF A PATELLOFEMORAL PAIN RATING SCALE

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Objectives: To (a) develop a valid disease specific questionnaire to diagnose and quantify anterior knee pain and (b) to evaluate the sensitivity and specificity of the questionnaire.

Methods: The Orthopaedic & Arthritic Hospital (Toronto, Canada) questionnaire assesses subjective symptoms, clinical examination, and radiographic findings, with a total score of 100. The evaluation of the questionnaire was based on a cohort of 140 symptomatic knees with different pathologies. The study was organised in two parts.

Part one was a retrospective study involving 23 patients (25 knees) with known patellofemoral pathology before and after tibial tubercle transfer. Scores were compared to those from established questionnaires for knee pathology (Fulkerson and Lysholm Scores). This part of the study was used to establish a standard for known patellofemoral syndrome.

The second part of the study involved 105 patients (115 knees) who underwent arthroscopy for various indications or were clinically diagnosed and treated for patellofemoral syndrome. Assessment included the new questionnaire and the Outerbridge classification. The various pathologies were compared using the Hospital for Special Surgery's Score.

Results: Using the designed questionnaire, we are able to discriminate between patellofemoral and non-patellofemoral pathology ($p<0.0001$). None of the other questionnaires were able to achieve this. The sensitivity of the assessment was 76%, the specificity 89%. Positive and negative predictive values were 0.93 and 0.66 respectively. There was a positive correlation between the severity of patellofemoral disease and the test score ($p<0.0001$).

Conclusion: The questionnaire assists in diagnosing patellofemoral pain syndrome. Patients with a score less than 50 were likely to suffer from patellofemoral syndrome, whereas scores greater than 50 denoted meniscal tears or ligament injuries. The lower the score, the worse the clinical and pathological findings for the patellofemoral group.

010 MOVEMENT ANALYSIS IN UNILATERAL, SINGLE SHOULDER DISEASE USING FASTRAK 3-D TRACKING SYSTEM

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Aim: To ascertain whether the Fastrak system is able to distinguish between normal and pathological shoulder joint movement. A before and after study design was employed with the intervention being a shoulder injection. The non-symptomatic shoulder was used as control.

Material and Methods: Fifteen patients (13 male, 2 female), with a mean age at presentation of 47.53 years (range 31–69) were studied. Inclusion criteria were point of maximal tenderness localised at the acromioalvicular joint, positive anatomical abduction test, and high arc impingement pain.

Intervention: Injection with 1 ml of 0.5% Bupivacaine and 20 mg of Triamcinolone into the ACJ under image intensifier guidance.

Measurements: (1) Bilateral standardised shoulder Fastrak before and after injection of the symptomatic ACJ for flexion/extension, anatomical, scapular, and horizontal abduction. (2) Pain assessment via visual analogue scale pre and post injection. (3) Subjective treatment outcome 14 days post-injection

Results: There was a significant restricted range of movement in the symptomatic shoulder both pre and post-injection ($p=0.01$). Extension was significantly improved post-injection ($p=0.04$). In the asymptomatic shoulder no significant difference was found following injection.

Conclusion: This study demonstrates a validated system (Jordan K, et al. *Rheumatology* 2000;**39**:382–8; Johnson GR, Anderson JM. *Clin Biomech* 1990;**5**:131–6) suitable for the clinical study and documentation of diagnosis and treatment outcome of both the normal and the pathological shoulder. However our cohort is small, not randomised, and the potential to interpret the graphical representation of the data needs to be evaluated in future studies.

011 A SURVEY OF SPORTS INJURIES MANAGED BY PHYSICAL EDUCATION TEACHERS IN SCOTTISH SECONDARY SCHOOLS

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One hundred and eighty one physical education (PE) teachers, working in different secondary schools throughout Scotland were surveyed on the types of sports injuries sustained by pupils during PE, procedures used in their management, also what first aid facilities were available within their school and individual departments. They were also asked about the types of injuries on which they wished further information.

Injuries attended to most often were sprain/strain, cuts, and abrasions, bleeding, and bruising for which RICE was used by most teachers. Those attended to least were fractures/dislocations and head and neck injuries which were either referred to hospital or a first aider. Further information being sought on this latter injury group. Most teachers were comfortable in applying sterile dressings to cuts/abrasion injuries or bleeding.

Seventy eight percent of teachers had formal first aid training, with only 30% of the total reported being happy with their first aid knowledge. All teachers had access to a first aid box within their school, and most had access to a first aid manual, first aider, ice, medical room, though few had access to all of these within their department.

All physical education departments should be appropriately equipped to facilitate appropriate first aid training for PE teachers, allowing skill acquisition and confidence to manage such injuries.

012 THE RELATIONSHIP BETWEEN ECCENTRIC AND CONCENTRIC ISOKINETIC QUADRICEPS AND HAMSTRINGS STRENGTH AND FUNCTIONAL HOP PERFORMANCE

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Strength testing for musculoskeletal profiling and following injury is a component of many support programmes for elite athletes. However, the functional relevance of isokinetic testing and the reliability and

sensitivity of functional measures has been questioned. This study aimed to ascertain which thigh strength measure most closely related to performance.

Twenty normal subjects with no history of lower limb injury performed a hop for distance and hop for height. Peak torque of quadriceps and hamstrings was measured on a Kin Com isokinetic dynamometer at 60°/sec. Testing was performed on the dominant leg, order was randomised and standardised instructions used. Pearson's Correlation was used to determine the correlation coefficients. Significance was set at $p=0.01$.

Eccentric quadriceps correlated highly with distance hopped ($r=0.76$; $p<0.01$) and moderately with height hopped ($r=0.63$; $p<0.01$). Eccentric hamstrings correlated with hop for distance ($r=0.56$; $p<0.01$) and hop for height ($r=0.69$; $p<0.01$). Concentric quadriceps correlated weakly with both hops and concentric hamstrings correlated weakly with hop for distance but these results were not significant.

Eccentric isokinetic measurement of quadriceps and hamstrings would appear to have more functional relevance than concentric. Possible explanations are that eccentric work controls the ability to land and hence limits performance; it is also less dependent on velocity, allowing testing at lower, more reliable testing speeds.

013 THE INJURY PROFILE OF COMPETITIVE, AMATEUR, NATIONAL LEVEL SHORTBOARD WINDSURFERS

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Aims: To describe the profile and incidence of the recurrent and overall injuries of a cohort of competitive, amateur, national level shortboard windsurfers.

Methods: A retrospective and a prospective telephone interview study (using structured questions) over one year was conducted on a cohort of 63 competitive, amateur, national level shortboard windsurfers. The windsurfers were recruited from British Windsurfing Association (BWA) race events. Follow up interviews were conducted at three months.

Results: Follow up interviews were achieved in 96.8% of occasions. The average overall incidence of all injuries sustained during training and competition was 2.6/1000 participant hours. The overall incidences of recurrent and acute injuries were 0.7/1000 participant hours and 2.1/1000 participant hours respectively. The most common injuries sustained during training were ligamentous lower limb injuries. The most common injuries sustained during competition were non-specific back pain.

Conclusions: The overall incidence of windsurfing injuries of 2.6/1000 participant hours was low compared with that of other sports. There was an overall recurrent injury incidence of 0.7/1000 participant hours. This indicated that almost one third of all injuries sustained were recurrent injuries, confirming that this was an important group of injuries. Further research should focus on the mechanical properties of the footpads and footstraps, as footstraps are the most common cause of twisting ankle injuries.

014 THE EFFECT OF TRANSVENOUS CLOSURE OF ATRIAL SEPTAL DEFECTS USING THE AMPLATZER SEPTAL OCCLUDER DEVICE ON EXERCISE CAPACITY

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It is well documented that exercise capacity is reduced in patients with atrial septal defects. Improvement in exercise capacity has been shown post surgical closure, however little is known about exercise capacity post-transcatheter closure.

Thirty patients performed a standard Bruce Protocol exercise test with continual expired gas analysis to determine maximal oxygen uptake (VO_{2MAX}). Twelve patients performed the protocol immediately prior to device closure and repeated the exercise test post closure at time equals 2.12 (0.84) months. Eighteen patients performed the protocol at 10.02 (6.14) months post closure. Predicted VO_{2} was calculated. Successful closure of the ASD was confirmed using transthoracic echocardiography and transcranial doppler contrast studies.

VO_{2MAX} significantly increased at 2.12 ± 0.84 months post device closure. (Mean pre-closure 21.25 (SEM 1.59), mean post-closure 23.22 (1.56) $p=0.004$.) Despite this improvement, post closure VO_{2max} remains significantly reduced at 2.12 (0.84) months

compared to predicted VO_{2} . (Mean post-closure 23.22 (SEM1.56), predicted 29.87 (1.57) $p=0.002$.) This reduction in VO_{2} was still evident at 10.02 (6.14) months. (Mean post-closure 24.84 (SEM1.77), predicted 31.52 (2.1) $p=0.001$.)

Transcatheter closure of ASD's significantly improves exercise capacity. Despite this improvement these patients continue to have reduced exercise capacity than predicted. The benefits of ASD closure are seen as early as two months post closure but further studies are needed to confirm the long term benefits in this group.

015 THE EFFECTS OF CARDIAC REHABILITATION ON HAEMOSTASIS POST MYOCARDIAL INFARCTION

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It is well documented that strenuous dynamic exercise affects haemostasis and may precipitate myocardial infarction (MI). Bruce protocol exercise testing is used routinely in risk stratification post myocardial infarction. Twelve patients with confirmed MI completed a Bruce protocol exercise test at four weeks post infarct, repeating the test after eight weeks cardiac rehabilitation. A control population carried out the same protocol. Haematological parameters were measured pre exercise, immediately post exercise and at 2 hrs post exercise. Flow cytometry was used to assess platelet activation using CD62 (see results in table 1). The balance of haemostasis with exercise changes in the 12 weeks post MI. Platelet activation did not occur with exercise post cardiac rehabilitation and we hypothesise that this may be as a result of statin therapy and its beneficial effect on the vascular endothelium. This study has highlighted areas of interest for further research with particular respect to the relationship between white cell count, platelet count, and platelet activation as well as the risks versus benefits of early exercise testing post MI.

016 THE EFFECTS OF ISOMETRIC EXERCISE ON HAEMOSTASIS IN ISCHAEMIC HEART DISEASE

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It is well documented that strenuous dynamic exercise affects haemostasis and may precipitate myocardial infarction. This study was designed to examine the effects of isometric exercise on haemostasis in a stable angina population.

Eleven patients with ischaemic heart disease (IHD) prior to elective angioplasty and eight healthy controls undertook sustained isometric contraction of their dominant arm to 50% of their maximal voluntary contraction. Haematological parameters were measured before, after, and 2 hours post exercise. Flow cytometry was used to assess platelet activation. Platelet count increased post exercise in both groups. CD62 (p-selectin) was increased only in patients immediately post exercise (2.129 (SEM 0.609), 1.299(0.319) $p=0.051$) and remained elevated at 2hrs (2.187 (SEM 0.662), 1.299 (0.319) $p=0.096$). PT significantly shortened in patients post exercise (12.636 (SEM 0.799), 12.273(0.856), $p=0.038$) with the difference most marked in the dominant arm (12.0,12.545 $p=0.082$). tPA was significantly reduced in patients at baseline (0.53(0.34), 2.98(0.83), $p=0.023$). tPA increased in both groups with exercise (0.53(0.34), 2.27(1.87) $p=0.377$) and 2.98(0.83), 3.113(0.975) $p=0.699$). Baseline WCC was significantly higher in patients (6.88(0.22), 4.96(0.39) $p=0.001$). WCC increased post exercise in controls (4.96(0.207), 5.328(0.245) $p=0.002$) and remained elevated at 2 hrs (4.96(0.207), 5.795(0.409), $p=0.023$). These results suggest that isometric exercise may be prothrombotic in patients with stable angina relative to controls. Risk stratification using dynamic exercise is well established however isometric exercise induces haemostatic imbalance and is essentially ignored in exercise recommendations.

017 QUALITATIVE STUDY OF VIEWS OF HEALTHCARE PROFESSIONALS OF SECONDARY PREVENTION SERVICES INCLUDING EXERCISE

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To explore healthcare professional views of secondary prevention and the implication of these for future service provision.

Abstract 15

Paired t-Test	Pre cardiac rehabilitation ETT 1			Post cardiac rehabilitation ETT 2		
	Pre v post	Post v 2 hrs	Pre v 2 hrs	Pre v post	Post v 2 hrs	Pre v 2 hrs
Platelets ($\times 10^6/l$)						
means	227.1, 249.8	249.8, 224.1	227.1, 224.1	217.1, 233.6	233.6, 211.4	217.1, 211.4
(CI)	(-33.81, -11.69)	(16.80, 34.70)	(-1.67, 7.67)	(-32.18, -0.70)	(6.41, 37.81)	(-2.32, 13.65)
p Value	0.001	0.001	0.0	0.043	0.012	0.141
PT (s)						
means	11.833, 11.667	11.667, 12.250	11.833, 12.250	12.33, 12.44	12.44, 12.67	12.33, 12.67
(CI)	(-0.081, 0.414)	(-0.911, -0.256)	(-0.744, -0.089)	(-0.367, 0.145)	(-0.561, 0.117)	(-0.718, 0.051)
p Value	0.166	0.002	0.017	0.347	0.169	0.081
APPT (s)						
means	32.92, 31.42	31.42, 32.83	32.92, 32.83	31.11, 32.22	32.22, 32.67	31.11, 32.67
(CI)	(0.187, 2.813)	(-2.936, 0.103)	(-0.947, 1.113)	(-2.572, 0.350)	(-1.469, 0.580)	(-2.999, -0.112)
p Value	0.029	0.065	0.862	0.117	0.347	0.038
Fibrinogen						
means	3.383, 3.376	3.376, 3.185	3.383, 3.185	3.230, 2.024	2.02, 2.67	3.23, 2.67
(CI)	(-0.1458, 0.1608)	(-0.094, 0.476)	(-0.068, 0.464)	(0.190, 2.221)	(-2.940, 1.656)	(-1.91, 3.03)
p Value	0.916	0.169	0.129	0.026	0.537	0.613
Factor VIII (%)						
means	108.8, 162.8	162.8, 130.0	108.8, 130.0	155.9, 182.5	182.5, 132.0	155.9, 132.0
(CI)	(-87.9, -20.3)	(-10.5, 76.1)	(-42.81, 0.31)	(-76.8, 23.6)	(15.9, 85.1)	(-6.2, 54.0)
p Value	0.005	0.123	0.053	0.25	0.011	0.103
WCC ($\times 10^6/l$)						
means	7.556, 10.491	10.491, 8.662	7.556, 8.662	7.11, 9.27	9.27, 7.34	7.109, 7.343
(CI)	(-3.790, -2.080)	(0.453, 3.206)	(-1.941, -0.270)	(-3.458, -0.855)	(0.697, 3.147)	(-0.890, 0.421)
p Value	0.00	0.014	0.014	0.005	0.007	0.433
CD62 (%)						
means	44.909, 47.182	47.182, 44.364	45.000, 44.333	45.556, 45.556	45.556, 44.000	46.556, 44.000
(CI)	(-3.778, -0.768)	(0.995, 4.641)	(-0.724, 2.057)	(-0.960, 2.960)	(0.687, 2.424)	(0.518, 4.593)
p Value	0.007	0.006	0.314	0.273	0.003	0.02
tPA Antigen (ng/ml)						
Means	3.08, 7.75	7.55, 2.97	2.93, 2.97	1.59, 4.80	4.8, 0.71	1.589, 0.711
(CI)	(-6.98, -2.360)	(2.3, 6.87)	(-0.842, 0.751)	(-5.66, -0.76)	(0.55, 7.63)	(-0.663, 2.418)
p-value	0.001	0.001	0.901	0.017	0.029	0.22

Twelve healthcare professionals working in secondary, primary, and community care undertook a qualitative study with focus groups with subsequent analysis to identify recurrent themes.

Participants identified four areas for intervention to improve secondary prevention services. (1) Patients: the identification of multiple factors supports the need for individually tailored menu based services. (2) Professionals' practice: inter-professional communication should be improved to help liaison and referral patterns. (3) Resources: identified as the limiting factor in current service provision include staff time pressure and rationing of services. (4) Service organisation: formal protocols for practice are required at the interfaces of care. Information and communication networks are necessary and the development of the role of the community is considered essential to assist the maintenance of lifestyle changes.

Existing secondary prevention services seem inadequate. Although enhanced resources are required, optimal use of existing human resources can be accomplished by making changes in the way professionals work both together and with patients and their communities. Such measures are likely to result in improvements in patients' concordance with secondary prevention change and equate to long term improvements in morbidity and mortality.

018 THE ROLE OF WARM DOWN ROUTINES ON THE OCCURRENCE AND DURATION OF INJURIES SUSTAINED BY PROFESSIONAL FOOTBALL PLAYERS

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Twenty three players volunteered and self selected their groups. Ten undertook the standard warm down routine after all first training sessions and matches. The control group (13) did not do the warm down. Before first team training sessions and matches, all players participated in standard warm up. Type and mechanism of injury and days lost were recorded.

During 52 matches and 138 training sessions, 61 injuries were sustained by 22 (96%) of the total subjects, resulting in 1077 days lost.

Of these injuries 35 involved the warm down group ($n=10$), with 23 (66%) being contact and 12 (34%) non-contact injuries, resulting in 747 days lost from training. Of the 26 injuries sustained by the control group ($n=13$), 13 (46%) were contact and 14 (54%) were non-contact, resulting in 330 days lost.

The incidence and anatomical location of the injuries confirm the findings of previous work. Perhaps surprisingly the warm down group sustained more injuries, resulting in more days lost and resultant considerable increase in recovery time compared to the control group who did not warm down. Time lost from injuries greater than 28 days was significantly greater in the control group compared to the study group. Our study does not support the use of warm down routines and the reduction of injury sustained during a competitive football season.

019 THE SPORTING ANKLE: EFFECTS OF PROPRIOCEPTIVE AND POSITIONAL BLOCK TAPING DURING SPEED INVERSION STRESS

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Studies have shown that 90–95 % of ankle sprains are inversions causing partial or complete ligament rupture.

Our study investigates the efficacy of two different inversion injury prevention ankle taping techniques (mechanical block and proprioceptive), using dynamometer analysis and kinematic analysis during a speed inversion stress task.

Seven hockey or football players had their passive ankle inversion measured, and compared with the inversion restriction caused by each taping technique. Subjects then performed shuttle runs (speed inversion stress task) with and without taping techniques applied. The inversion stress task was filmed and maximum inversion, dorsiflexion, and plantarflexion was recorded following computer digitisation calculations for each subject.

A significant reduction was observed both during the speed inversion stress task ($p=0.01$) for the proprioception taping and for themechanical block taping compared with the control. The proprioceptive

taping only, compared with the control, significantly restricted dorsiflexion.

Proprioceptive and mechanical block taping are effective at limiting inversion during speed inversion stress. Taping applied specifically for proprioceptive enhancement, with no mechanical block to movement demonstrated, is shown to be effective at limiting inversion. This study suggests that development of proprioceptive taping methods is needed to maximise the considerable potential for injury protection and prevention.

020 PATIENT PERSPECTIVES: SECONDARY PREVENTION OF CORONARY HEART DISEASE

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The aim was to determine the priorities and opinions of patients currently undergoing cardiac rehabilitation with regard to secondary prevention of coronary heart disease using qualitative research methods.

Patients attending a 12 week cardiac rehabilitation programme in a District General Hospital were identified and invited to take part in a focus group discussion. Recurrent themes were identified across transcripts.

The patients in the focus group showed a high level of understanding of risk factors and the heart disease process. Society has set ideas about who is a candidate for heart attacks and there can be complacency if these prerequisite are not deemed to be met by an individual. This type of "lay theorising" can act as a barrier to the aims and outcomes of health education. The patients spoke about involving family members in the education and rehabilitation process. As with previous studies, the patients expressed a desire for more information, also suggesting that conflicting information sometimes given was confusing. The priority for the patients seemed to be maintaining the lifestyle modifications and exercise at the end of the 12 week period, and to remain motivated without the constant supervision of health professionals, more follow up was requested at the end of the 12 week rehabilitation period.

Patient attitudes influence uptake, satisfaction, and compliance with cardiac rehabilitation. If these areas highlighted by patients are not adequately addressed then any intervention will have limited effectiveness.

021 ECHOCARDIOGRAPHIC ASPECTS OF YOUNG ELITE FENCERS

H. Naghavi. *Chairman, Medical Committee Iran Fencing Federation*

Background: Modest increase in heart size (cardiac hypertrophy) represents a fundamental adjustment of healthy heart to exercise training. (1) Eccentric hypertrophy: in endurance training, internal ventricular dimensions increases. (2) Concentric hypertrophy: in resistance training, thickened ventricular wall represents compensation of workload on LV. There are no data about cardiac characteristics of fencers, thus this study was done as a starting point.

Methods: Twenty five members of Iran's Junior and Cadet National Fencing team were compared with 25 non-athletes as control group. Average age was 18.23 years (1.41) and 18 years (1.53) in fencers and controls respectively. Echocardiography was done in a heart hospital under supervision of Medical Committee of Iran Fencing Federation. Student's *t* test was used for analysing the data.

Results: Significant statistical differences were found between fencers and the control group in: interventricular septal thickness (9.55 and 7.66 mm, $p < 0.05$); ejection fraction (72% and 0/065, $p < 0.05$); left atrial diameter (34.02 and 30.16 mm, $p < 0.05$); diastolic blood pressure (66.66 and 74.16 mm Hg, $p < 0.05$). Other differences were not significant statistically.

Discussion: The results show that in fencers' interventricular septum is thicker than controls (9.55 v 7.55). There wasn't significant difference in left ventricular end diastolic and end systolic diameter. The findings support the idea that fencing could be considered as resistance training.

It is obvious that this study is not enough for an exact deduction, and larger studies must be done.

022 A STUDY OF TRAUMATIC EVENTS IN JUNIOR FENCING COMPETITIONS

H. Naghavi. *Chairman, Medical Committee Iran Fencing Federation*

Background: Fencing is one of the oldest and most beautiful sports in the world. The use of protective devices by today's athletes means that fencing is safe and injuries are rare. But physicians who are medical supervisors of fencing competitions must be aware of possible sporting injuries to be able to manage them. Knowledge of fencing injuries especially in "juniors" can be very useful and profitable to design methods that decrease the risk of injuries.

Methods: This survey was done during the Junior International Fencing Championship (men's sabre, foil, and epee), which was held in Yazd, Iran, February 2000. One hundred and fifty five fencers took part in 610 competitions. The average age of athletes was 17.88 years (1.20).

Results: Thirty one requests for medical attention (sabre: 20; foil: 6; epee: 5) related to injuries were classified as follows: (a) Injuries due to opponent's weapon, 20 cases (64.5%) including 12 wounds and eight bruises. (b) Skin abrasions and blisters on the contact site between handle and hand, 6 cases (19.3%). (c) Functional overloading and other types, 5 cases (16.1%). All the injuries were managed with RICE (rest, ice, compression, elevation) and no competition was cancelled due to injuries. The most dangerous injury was on the carotid area of neck due to sharp end of a broken sabre weapon.

Discussion: The result of study emphasised that if suitable protective devices are used, youth fencing competitions have a low risk of accidents and most of sports injuries in fencing can be managed with first aids and RICE. Although the dangerous injury due to sharp end of broken weapon is rare, medical teams of fencing competitions should be aware of this, and accident and emergency facilities must be available. Using protective devices around the neck should be obligatory.

023 STUDY OF TRAUMATIC INJURIES IN WOMEN FENCING COMPETITIONS

H. Naghavi. *Chairman, Medical Committee Iran Fencing Federation*

Background: Fencing is a traditional sport with increasing participation and population worldwide. Fencing was one of the nine sports in the first modern Olympics in Athens in 1896 and has remained as an Olympic sport ever since. Presently, due to the use of protective devices (protective clothing and mask), fencing is relatively safe and injuries occurring during competition and training are relatively rare. Nevertheless, physicians acting as medical officers at fencing competitions must be aware of possible sports injuries, injury severity, and incidence and be adequately equipped to manage them.

Knowledge of fencing injuries especially in "female juniors" can be very useful and profitable in designing methods for decreasing the risk and severity of injury. The aim of this study was to quantify the incidence, severity, and management of injuries in women fencing competitions.

Methods: This survey was undertaken during the Junior International Fencing Championship in women's foil and epee weapons, which was held in Yazd, Iran, February 2001. In total 50 fencers (foil=27 (54%); epee=23 (46%)) took part in 240 competitive matches (foil=131, epee=107). The mean age of athletes was 18.43 years (SD=1.65, 16-20). During this championship there were 14 requests for medical attention related to injuries. These requests were classified as follows: (a) The injuries across weapons: (epee=9; foil=5). There was no significant difference between them ($p=0.10$). (b) Cause of injuries: (i) injuries due to opponent's weapon, nine cases (64.3%), (ii) functional overloading and other types, five cases (35.7%). (c) Type of injuries: (i) wound, seven cases (50%), (ii) bruise, two cases (14.3%), (iii) sprain, three cases (21.4%), (iv) spasm, two cases (14.3%). (d) Location of injuries: (i) hand and fingers were the most common locations of injuries, three cases (21.4%), (ii) arm, ankle, and neck were second, with two cases of each (14.3%). (e) Cancellation due to injury: Only one competition (7.1%) was cancelled due to severe ankle sprain. (f) Rate of injuries per 100 participants was 28.

Injuries were managed with RICE (Rest, Ice, Compression, Elevation). Two cases of neck injuries (one wound and one bruise) happened due to an opponent's weapon in epee. The most severe injury was an ankle sprain, that was unresponsive to RICE. The athlete was unable to continue and competition was cancelled.

Conclusion: The results of this study have emphasised that if suitable protective devices are used, women's junior fencing competitions have only a low risk of accidents and injury, and that most of

sport related injuries occurring in fencing can be suitably managed with first aid and RICE. Although occurrence of dangerous injuries (like neck injuries) are rare, nevertheless, medical teams at fencing competition should be aware of possibility of these accidents, and suitable emergency facilities must be available.

024 BOLLEN'S JIG AND ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

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The gold standard for anterior cruciate ligament (ACL) reconstruction is the patellar tendon autograft (Johnson RJ, *et al. J Bone Joint Surg [Am]* 1992;**74**:140–51). The Bollen's jig is an instrument that facilitates the harvest of the graft. It is a simple, self centring device resulting in a reproducible and consistent autograft. It minimises the risks of donor site morbidity—for example, patellar fracture and tendon rupture.

Technique: Two longitudinal skin incisions of 2 cm are used. The upper incision is placed at the distal aspect of the patella and the lower, medial to the tibial tubercle.

The jig is inserted through the upper incision and because of its shape centres on the lower pole of the patella.

By angling the 11-scalpel blade either medially and laterally through the slots, one can consistently obtain a central third patella graft of 9 to 10 mm.

The arms act as a guide for cutting the patella block.

A trapezoidal shaped bone block measuring 20 to 25 x 9 mm can be removed from the patella using a small oscillating saw.

The patellar tendon is then split along its length with a finger. The patella block is retrieved through the lower incision and the tibial block is then cut.

This autograft is ready for use.

025 A STUDY TO COMPARE THE MULTI PIVOT BALANCE BOARD TO A CONVENTIONAL WOBBLE BOARD AS A METHOD OF IMPROVING POSTURAL STABILITY

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The ankle plays a key role in postural stability (Hall CM, *et al. Therapeutic Exercise: Moving Toward Function*. Philadelphia: Lippincott Williams & Wilkins, 1999), which can be improved by wobble board training (Rossi SL, *et al. Journal of Orthopaedic & Sports Physical Therapy* 1999;**29**:478–86). The aim of the study was to compare the effect of training on a conventional wobble board with the new Multi Pivot Balance Board (MPBB) on improving the postural stability of an uninjured population.

A randomised control led trial compared the effects of a two week supervised balance training programme using three groups of five subjects wobble board, MPBB and control. Postural sway index, used as a measure of postural stability, was recorded before and after training.

The analysis used a one way ANOVA for unrelated subjects followed by a Scheffe Multiple Range Test. Comparison of the mean sway indices for pre and post balance training showed an improvement in the wobble board (20.7%) and MPBB (25.6%) which was not statistically significant ($p > 0.05$).

The increased dynamic activity from the MPBB put a greater challenge on the motor control system than that from the wobble board, causing greater reductions in postural sway. Even this slight advantage may be judged useful in the sports world. A study using more intense training of larger subject numbers may show a significant difference.

26 FITNESS TESTING AND ANTHROPOMETRIC MEASUREMENTS IN SCOTTISH SCHOOLCHILDREN: A COMPARATIVE STUDY WITH FOOTBALLERS

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The prevalence of childhood obesity is rapidly increasing on a world wide scale, the consequence of a society that promotes excessive food intake and discourages physical activity. Schools have the potential to influence attitudes towards physical activity and promote an active lifestyle. Alarmingly UK schools allocate less time for PE than other European countries.

This study compared basic anthropometric, flexibility and aerobic fitness data (multistage fitness test) in two groups of male schoolchildren who did not take part in any out of school sporting activity (13 and 18 years $n=24$) with aged matched professional football controls ($n=28$). The chosen school had a well organised activity orientated PE department.

No significant differences were found between the two groups in BMI, muscle bulk, skinfold thickness, and flexibility. Measurement of aerobic fitness showed significantly greater predicted $\text{VO}_{2\text{MAX}}$ values in the U-13 school and U-18 football groups. However further analysis showed that 64% of the older schoolboys attained predicted $\text{VO}_{2\text{MAX}}$ values comparable to the footballers.

Our study suggests that the implementation and execution of a activity orientated school based PE programme can produce flexibility levels, anthropometric characteristics and aerobic fitness levels similar to those obtained in a formal sport setting. The hope must be that this will have a significant impact on childhood obesity and prevention of later medical problems related to inactivity.

27 KNOWLEDGE, ATTITUDES, AND PRACTICES OF ELITE RUGBY PLAYERS IN WALES WITH RESPECT TO THEIR PERSONAL HYDRATION

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Aim: Promoting optimal hydration status during exercise requires athletes to have individual strategies for fluid replacement (Dabinett JA, *et al. Int J Sport Nutr Exerc Metab* 2001;**11**:334–48) incorporating the use of simple markers such as body mass (BM), urine colour (UC) and urine output (UO) to approximate hydration status (Griffin J. *Br J Sports Med* 1997;**31**:78; Maughan R. *Br J Sports Med* 1997;**31**:77). This study examines frequency of use of simple markers for monitoring daily hydration by elite rugby players in Wales.

Methods: Between July 2000 and February 2001, 463 elite Welsh Rugby Union players were surveyed. Players under supervision completed a 12 page self report questionnaire, at either a national squad training session*, or a national age-group selection camp†. Participants reported frequency of recording fluid intake, heart rate, pre/post exercise BM, UO, UC, urine osmolality, frequency of urination and morning BM using a scale (1 = never, 2 = rarely, 3 = sometimes, 4 = often).

Results: UC was used to a greater extent ($p < 0.000$ Kruskal-Wallis test) than all other measures. A significant difference in the reported use of UC between squads was observed with Welsh Students reporting a higher use than national squad members ($p < 0.05$ Mann-Whitney test).

Conclusions: UC is the most frequently reported simple marker of hydration status used by elite rugby players in Wales (post 16 years). The impact of educational interventions on player hydration status is currently being investigated with a view to encouraging effective self monitoring in a range of sports.

Abstract 27 Reported use of urine colour by squads

	National Squad (men) [†]	National U21 [†]	National U19 [†]	Schools (up to 16) [†]	Welsh Students Squad	National Squad (women) [†]	Total
Sample size	45	108	133	133	25	19	463
Number of respondents (%)	45 (9.7%)	105 (23.3%)	126 (28.7%)	133 (28.7%)	24 (5.4%)	19 (4.1%)	452 (97.6%)
Median urine colour	3.0	3.0	2.0	1.0	4.0	3.0	2.0

*Players under supervision completed a 12 page self report questionnaire, at either a national squad training session; †or a national age group selection camp.

Abstract 28 Blood lactate concentration (mmol/L) at rest, following high intensity exercise bouts (post-HI), during intervention (I 10, I 20), and pre and post-Wingate test

Trial	Rest	post-HI	I 10	I 20	pre-Wingate	post-Wingate
Massage	1.21(0.06)	10.16(0.61)	4.50(0.43)	2.93(0.17)	2.03(0.15)	13.90(0.63)
No massage	1.49(0.15)	10.98(1.02)	6.22(1.09)	4.27(0.88)	2.76(0.73)	13.79(0.57)

28 EFFECT OF MASSAGE ON RECOVERY FROM HIGH INTENSITY EXERCISE

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The potential effect of massage on recovery from high intensity exercise is an area of considerable debate. This study aimed to control for many confounding factors that may limit the conclusions of previous work. Nine male games players participated in this study. Subjects attended the lab on two occasions one week apart and at the same time of day. Dietary intake and activity was replicated for two days prior to attending. On attending, following baseline measurements subjects undertook a standardised warm up on the cycle ergometer, followed by six 30 second high intensity exercise bouts, interspersed with 30 seconds of active recovery. Following five minutes of active recovery and either 20 minutes of massage or supine passive rest, subjects performed a second warm up and a 30 second Wingate test. Capillary blood samples, heart rate, peak power, mean power, and fatigue index were measured. There were no significant differences in mean power during the initial high intensity exercise bouts ($p=0.92$). No main effect of massage intervention was observed on blood lactate concentration between trials ($p=0.82$; Table 1) or heart rate ($p=0.81$). There was no difference in the maximum power ($p=0.75$) or mean power ($p=0.66$) but a significantly lower fatigue index was observed in the massage trial ($p=0.04$; 30.2% vs. 34.2%).

No measurable physiological changes were observed in the present study but the significant effect upon fatigue index warrants further investigation.

Five familiarised volunteers (3 male, 2 female, aged 22–40) performed constant load cycling on an electrically braked ergometer at workloads 50W and 100W (cadence 60 rev/min), each repeated within 1–7d. During each visit VO_2 was monitored continuously using the MM, for 12-minutes rest followed by eight minutes of cycling. Additional VO_2 measures were made at rest (minutes 4–8) and during exercise (minutes 6–8) using Douglas bags (DB) fitted in series to the MM, and compared to concurrent MM data averaged over these time frames.

The systematic differences between repeated MM and DB measures, and between concurrent DB/MM measures were negligible (ANOVA not significant), and associated with narrow 95% limits of agreement (Atkinson G, Nevill AM. *Sports Medicine* 1998;**26**:217–38) (Table 1; Bias \pm LA).

Measures of VO_2 up to ~ 1.5 l/min, made using the MM, demonstrate high concurrent validity (Portney LG, Watkins MP. *Foundations of Clinical Research*. Norwalk, Connecticut: Appleton & Lange, 1993:509–16) with the criterion DB method, and show acceptable repeatability (similar to DB) during exercise and even at rest (Table 1. cv%).

In conclusion, the Metamax-3B system provides an accurate, reliable measure of energy expenditure within the low range of VO_2 typical of patients and elderly subjects.

30 HOMOEOPATHIC ARNICA REDUCES MUSCLE SORENESS INDUCED BY DOWNHILL RUNNING

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We wanted to find out if ingesting homoeopathic *Arnica* reduces the muscle soreness experienced by individuals after they have run downhill. We were prompted to do so by anecdotal evidence, subsequently confirmed, that some hill-runners routinely ingest homoeopathic *Arnica* when competing.

We carried out a double blind, cross over trial, over a two week period on 16 healthy adult volunteers of varying degrees of physical fitness. On days one to five of the trial they ingested four tablets/day of either *Arnica* (30C strength) or a placebo. On day two they ran as many laps as they could safely manage (range 1–10, mode 3 laps) of a fast downhill course (0.9 km long, 90 m descent). On days two to five they filled in a questionnaire to locate and quantify muscle soreness. On days three to five they completed two timed 190 m sprints to assess muscle performance. On days eight to 12 they repeated the process, ingesting placebo instead of *Arnica* or vice versa.

29 CONCURRENT VALIDITY AND RELIABILITY OF VO_2 MEASURED USING THE METAMAX 3B SYSTEM DURING MODERATE INTENSITY CYCLING

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The study aimed to assess the accuracy and reliability of the Metamax-3B ambulatory gas analysis system (MM) during measurement of low rates of oxygen utilisation (VO_2).

Abstract 29 Repeated measures of VO_2 l/min (SD) recorded concurrently using Douglas bags and the Metamax-3B at rest and during exercise. Bias and 95% limits of agreement (bias \pm LA) describe the repeatability of each system (V1 v V2) and their concurrent validity (DB v MM)

System	50W		100W	
	Resting	Cycling	Resting	Cycling
Douglas bags				
Visit 1	0.27 (0.05)	0.98 (0.08)	0.28 (0.05)	1.52 (0.04)
Visit 2	0.29 (0.05)	1.00 (0.07)	0.30 (0.03)	1.52 (0.05)
V1 v V2 (bias \pm LA) cv%	-0.02 \pm 0.083 10.6%	-0.02 \pm 0.10 3.6%	-0.02 \pm 0.017 18.7%	0.008 \pm 0.135 2.9%
Metamax 3B				
Visit 1	0.30 (0.07)	0.97 (0.09)	0.31 (0.05)	1.48 (0.03)
Visit 2	0.33 (0.07)	1.03 (0.12)	0.33 (0.06)	1.50 (0.09)
V1 v V2 (bias \pm LA) cv%	-0.025 \pm 0.060 8.4%	-0.060 \pm 0.076 4.9%	-0.007 \pm 0.052 5.8%	-0.017 \pm 0.142 3.2%
DB v MM (bias \pm LA)	-0.032 \pm 0.059	-0.008 \pm 0.135	-0.006 \pm 0.079	0.033 \pm 0.133

cv%, coefficient of variation; DB, Douglas Bags; MM, Metamax 3B

Abstract 30

Arnica week	Muscle soreness score		Running speed (m/s)	
	Week 1	Week 2	Week1	Week2
First	6.2	5.3	5.84	5.87
Second	13.0	7.3	5.47	5.71

Eleven subjects completed the trial. Their mean data were:

Statistical analysis showed a strong "repeat bout" effect: muscle soreness was less and running speed was greater on week two than on week one. It also showed Arnica reduced soreness and increased speed, albeit to a lesser extent.

31 THE EFFECT OF MEDIAL FOOT ORTHOSES ON IN-SHOE MEDIAL-LATERAL LOADING CHARACTERISTICS IN PATIENTS WITH A LOWER LIMB OVERUSE INJURY

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Medial foot orthoses are typically prescribed to control over pronation, but their effects on in-shoe forces are unknown. The aim of this study was to compare the in-shoe medial-lateral loading characteristics with and without medial orthoses.

A crossover design was used with the following conditions: (1) Without orthoses (Control); (2) With orthoses (Orthotic). Fourteen patients (12 male) were used in the analysis (mean age (SD): 29.9 (7.5); weight: 86.33 (14.3)). All subjects had overuse lower limb pain, varus alignment of the forefoot and were prescribed bilateral medial foot orthoses with at least a 3° insert in the rear and forefoot by a physiotherapist. Subjects walked on a treadmill at 1.39 m/s in

Abstract 31 Grouped subject mean (SD) and p values for 6x, PML, and M:L in the control v orthotic condition

Variable	Control (SD)	Orthotic (SD)	Within Subject p-values
6x (mm)	9.13 (2.28)	8.52 (2.54)	0.037*
PML (N.cm ²)	20.71(8.6)	23.12 (10.6)	0.020*
M:L	0.76 (0.22)	0.84 (0.27)	0.021*

*p<0.05

each condition. In-shoe plantar pressure data was collected (RS Scan system) from both feet simultaneously with subjects wearing their own footwear. Six to eight foot strikes of data on each foot were averaged for statistical analysis. The following variables were collected: (1) Medial-lateral deviation in centre of pressure (6x) during stance; (2) Peak medial load (PML) during the load acceptance phase of stance; (3) Ratio of medial:lateral pressure (M:L) at PML. An ANOVA (repeated measures) was used to make comparisons.

This study found a decrease in 6x when wearing orthoses, which may imply improved stability during the stance phase of the gait cycle. PML was greater in the orthotic, which is probably a mechanical effect of the medial inserts. The M:L ratio moved towards one with the orthoses intervention, suggesting a more even pressure distribution across the medial and lateral components. It should be noted that PML and M:L were taken at discrete time points in the gait cycle and different findings may have occurred if other time points were taken or a mean or integral was used. The change in plantar loading patterns when wearing the orthoses was also significantly different between subjects. This may be clinically important, and requires a longitudinal study to relate treatment efficacy with foot pressures. In summary, orthoses did seem to influence in-shoe loading and there is scope for more investigation with this technique to explore these effects.