BASEM Congress 2000

001 MORPHOLOGICAL AND PHYSIOLOGICAL CHARACTERISTICS OF ELITE SOUTH AFRICAN BEACH VOLLEYBALL PLAYERS

S.E.H. Davies, M.F. Coetsee. Department of Human Movement Science, University of Zululand, South Africa


Methods: Parameters measured included stature, mass, percent-age body fat, maximal oxygen uptake (VO₂ MAX), maximal heart rate, and lactate after a treadmill run. All subjects freely volunteered after completing an informed consent form.

Results: The results indicate that elite SA beach volleyball players are generally shorter 185.28 cm and lighter 82.01 kg than elite indoor players, and a higher in percentage body fat 13.12%. Their physiological characteristics indicated a mean VO₂ MAX of 59.37 ml/kg/min with a maximal heart rate of 189.38 bpm and lactate measure of 11.87 mmol/L after a treadmill run to exhaustion.

Conclusions: The results suggest that a lack of emphasis on positi-ional specialisation in beach volleyball appears to have mitigated against the extreme physiques often observed in indoor volleyball players. Interestingly, it would seem elite beach volleyball players have superior selected strength characteristics in terms of isokinetic evalua-tions than cited for most sporting and athletic studies, along with indoor elite volleyball players. One might tentatively suggest that the increased physical demands of running and jumping on sand has beneficial outcomes in terms of increased strength gains. Vertical jump performance however, was lower for elite beach volleyball players, perhaps reflecting the importance of the principle of specificity during training and match play.

002 STRENGTH AND POWER (VERTICAL JUMP PERFORMANCE) CHARACTERISTICS OF ELITE SOUTH AFRICAN BEACH VOLLEYBALL PLAYERS

S.E.H. Davies, M.F. Coetsee. Department of Human Movement Science, University of Zululand, South Africa


Methods: Parameters measured included stature, mass, percent-age body fat, vertical jump performance, and isokinetic measures of peak torque for extension and flexion of both legs at 60, 180, and 240 °/s. One might tentatively suggest that the increased physical demands of running and jumping on sand has beneficial outcomes in terms of increased strength gains. Vertical jump performance however, was lower for elite beach volleyball players, perhaps reflecting the importance of the principle of specificity during training and match play.

003 PHYSICAL ACTIVITY IN DUBLIN SCHOOLCHILDREN AGED 7–9 YEARS

J. Hussey,1 J. Gormley,1 C. Bell. School of Physiotherapy and Dept of Physiology, Trinity College, Dublin, Ireland

The aim of this study was to determine physical activity levels in Dub-lin children between 7 and 9 years of age. 20 of the 30 children attending National Schools in Dublin. A modification of the “Modifiable Activity Questionnaire for Adolescents” was used (Aaron, DJ, et al. Am J Epidemiol 1995;142:191–201). The questionnaire was completed by a parent or guardian. Seven hundred and eighty-six questionnaires were analysed (352 boys and 434 girls). Participation in 20 minutes of vigorous exercise three or more times per week was done by 39% with gender differences (28% of girls and 53% of boys). Participation in 20 minutes of light exercise three or more times per week was done by 54% with very small gender differences. Thirty per cent of children were spending 2–3 hours per day in front of a screen (TV, video, PC games). Thirty three per cent were driven to school and 62% walked some or all of the journey. Fourteen per cent of boys and 24% of girls were reported to engage in less than the minimal recommendation of regular physical activity as defined by the CDC and ACSM (Sports Med Bull 1994;28:7). Boys participate in more physical activity than girls even at this relatively young age (unpaired t test p<0.001). It is reported that many are not undertaking the volume of physical activity necessary to benefit the cardiovascular system.

004 HORSE RELATED TRAUMA IN A RURAL DISTRICT GENERAL HOSPITAL

M.A. Quigley,1 S.H. Boyce.2 ‘Accident and Emergency Department, Dum-fries and Galloway Royal Infirmary,’ Accident and Emergency Department, Crosshouse Hospital, Kilmarnock

Aim: To determine the characteristics of horse related accidents attending a rural Scottish Accident and Emergency (A&E) department.

Method: A retrospective case record analysis was undertaken. Relevant cases were identified from the A&E database by performing a computerised search using “horse”, “pony”, or “riding” as keywords. The study period was for one year between 1/1/99 and 31/12/99.

Results: Fifty eight horse related accidents were identified (less than 0.2% of our total workload). Peak attendance was during June and July with 49% of the total presenting during these 2 months. Forty three (74%) were female and 15 (26%) were male. The age range from four to 78 years and mean age was 20. Eight of the 58 had to be admitted, three with concussional head injuries, two with lumbar spine fractures, one with neck pain and paraesthesia in upper limbs, one with a soft tissue back injury and one child with a dislocated elbow. Twelve patients required clinic review appointments and 38 were discharged. The sites of main injury were upper limb (22), lower limb (15), back (12), and head (9). There were a total of 15 fractures, 10 of which were to bones of the upper limb. There were no deaths. In 39 patients the mechanism of injury was stated to have been a “fall from horse”; five had been “kicked by horse” and five had been “stood on” or “trampled”. Other mechanisms included being bitten, being pushed over or being pulled by the horse.

Conclusion: The volume of work created by horse accidents repre-sents a small proportion of the overall A&E workload. Females are 2.5 times more likely to attend with horse related accidents than men, and it is still predominantly the young who are injured. The majority of
injuries are soft tissue. The whole spectrum of trauma was represented from head injuries, chest injuries, blunt abdominal injuries, and limb and spinal fractures. The most frequently injured area was the upper limb and 10 of our 15 fractures were to this region. Protective equipment is unlikely to be effective in these situations. People who work with horses put themselves at risk of injury both in and out of the saddle and although most injuries are of a minor nature there exists the very real potential for serious trauma.

PREVALENCE OF OBSTRUCTIVE AIRFLOW LIMITATION IN COLLEGIATE ATHLETES

E. Smith, N. Mahony, M. O’Brien. Department of Anatomy, Trinity College, Dublin 2, Ireland

This study investigated the prevalence of obstructive airflow limitation, level of control and inter-sport differences in asthma, in two groups of collegiate athletes, swimmers (SWIM) and endurance athletes, runners and rowers (END).

Ninety eight athletes, 50 male and 48 female, age range 16–28 years completed a respiratory questionnaire and performed spirometry (Microlab 3300, Micro Medical Ltd., UK) to assess FEV1, FVC, FEV1/FVC and PEF, pre-exercise and at 5, 10, and 15 min post-exercise. Between and within group analyses were carried out using single factor and repeated measures ANOVA, respectively, values of p<0.05 were considered significant.

Previously diagnosed of asthma were reported by 30% of subjects. The numbers of asthmatics in each sports group is shown in table 1.

Abstract 5 Prevalence of asthma across sport and gender

<table>
<thead>
<tr>
<th></th>
<th>END</th>
<th>SWIM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>25 (4)</td>
<td>25 (10)</td>
</tr>
<tr>
<td>Female</td>
<td>23 (4)</td>
<td>25 (11)</td>
</tr>
<tr>
<td>Total</td>
<td>48 (8)</td>
<td>50 (21)</td>
</tr>
<tr>
<td>% Asthmatics</td>
<td>8.2</td>
<td>21.4</td>
</tr>
</tbody>
</table>

Number of asthmatics in parentheses. *Indicates significance at p<0.05 (% test).

Twenty asthmatics were on treatment; two required intermittent treatment for symptoms precipitated by exercise, cold weather or pollen; four were asymptomatic and no longer required treatment; and three had stopped medication but were symptomatic. All mean FEV1, and FVC data, expressed as a percentage predicted, were significantly (p<0.01) greater in SWIM than in END, although SWIM accounted for a significantly greater number of asthmatics.

In conclusion, the majority of athletic asthmatics were adequately controlled, allowing full participation in their chosen sport.

AN INVESTIGATION OF THE USE OF PROTECTIVE EQUIPMENT IN RUGBY UNION FOOTBALL

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Aims: (1) To examine the use of “protective” equipment in elite English Rugby Union Football. (2) To investigate the attitudes, beliefs, and knowledge of players, coaches, clinical sports medicine staff, and referees regarding the current use of “protective” equipment within the laws of the game.

Methods: Self completed survey questionnaires were distributed to all clinical sports medicine staff, coaches, and players among the 12 Allied Dunbar Premiership Division One, Rugby Union Clubs and 10 Senior Referees officiating at this level.

Results: Indicated that coaches, clinical sports medicine staff, and players are aware that “protective” equipment not specified within Law 4 is illegal. However, players are still taking to the field of play wearing illegal "protective" equipment. Players appear to be using this equipment on medical advice, exposure to previous injury, and prevention of injury. However, there was a general opinion that injury could be prevented if referees enforced Law 4 more rigorously.

CONCLUSIONS: While there is little scientific evidence for the benefits of “protective” equipment in preventing injuries, its use is widespread in Rugby Union, often in contravention of the law, which may have consequences for players’ well-being.

PHYSIOLOGICAL COSTS OF A STANDARDISED BOXING TRAINING REGIME

P.E. Murphy, B. Donne, M. O’Brien. Human Performance Laboratory, Trinity College, Dublin 2, Ireland

We investigated the physiological costs of a 60 min boxing training session relative to maximal and threshold data recorded during an incremental treadmill test to exhaustion in 10 male national competitive boxers. Metabolic (VO2) by open circuit spirometry, heart rate (HR) by radio telemetry, and blood lactate ([La]) by fingertip capillary technique data were recorded during treadmill and boxing sessions. The boxing training regime comprised of four by two minute repetitions of abdominal exercises, and six by two minute repetitions of shadow boxing, skipping, and bag work, with a 30s rest between repetitions. VO2 and HR data were recorded continuously, and [La] were collected pre, mid, and post-set of exercise. Data were analysed using ANOVA, values of p<0.05 were considered significant.

Mean (SD) maximal treadmill data were 64.1 (6.5) mL/kg/min and 193 (10) beats/min for VO2 and HR respectively. Table 1 presents the mean results for the training session as percentage of maximal and threshold data. Abdominal, shadow, and skipping exercises each generated a significant HR and VO2 responses significantly (p<0.001) lower than at TLac, while VO2 for bag work was lower (p<0.05) than at TlLac. All boxing exercises (except abdominal) met criteria outlined by the ACSM for increasing individual aerobic threshold.

Abstract 7 Mean (SD) data for training session as percentage of max and that at TlLac

<table>
<thead>
<tr>
<th>Exercise</th>
<th>%HR at TLac</th>
<th>%HRmax</th>
<th>%VO2 at TLac</th>
<th>%VO2max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal</td>
<td>65.5 (6.7)</td>
<td>59.3 (7.0)</td>
<td>36.1 (8.6)</td>
<td>30.1 (6.5)</td>
</tr>
<tr>
<td>Shadow</td>
<td>89.7 (7.3)</td>
<td>80.7 (5.7)</td>
<td>79.2 (15.1)</td>
<td>66.1 (11.4)</td>
</tr>
<tr>
<td>Skipping</td>
<td>92.1 (16.4)</td>
<td>82.9 (5.3)</td>
<td>76.2 (8.8)</td>
<td>63.8 (7.7)</td>
</tr>
<tr>
<td>Bag work</td>
<td>101.7 (5.7)</td>
<td>90.8 (3.5)</td>
<td>90.1 (8.5)</td>
<td>75.3 (7.0)</td>
</tr>
</tbody>
</table>

A SURVEY OF SPORTS INJURIES ATTENDING AN ACCIDENT & EMERGENCY DEPARTMENT

S.H. Boyce,5 M.A. Quigley,7 Accident and Emergency Department, Crosshouse Hospital, Kilmarnock;6 Accident and Emergency Department, Dumfries and Galloway Royal Infirmary

Aim: To assess the frequency, type of injury, sport involved, and management of sports injuries in patients attending an Accident & Emergency (A&E) department.

Method: All patients, aged 16 years and over, presenting with an injury related to sport, were studied prospectively over a period of three months.

Results: During the study period, 273 patients attended the A&E department with a sports injury. This represented 2.3% of the department overall workload. Males (89%) were injured more frequently than females (11%), Injury rates in both males and females peaked in the 16–20 age category. Football was the most common sport implicated in injuries (65%). Rugby (6.6%), basketball (3.3%) and badminton (2.5%) were the next most frequently involved sports. Soft tissue injuries dominated (70%). The lower limb was the most common anatomical area injured (60%). Other injuries involved the upper limb (25%), head and neck (10%), and the trunk (4%). Ankle sprains were the most common injury (19%). The majority of patients were referred to their general practitioner for review (61%). 25% were reviewed at out patient clinics, 5% were referred for physiotherapy, and 3% required hospital admission. The remainder required no follow up.

www.bjsportmed.com
Two cardiac arrests are reported, one during a football game, the other whilst swimming. One of these patients died, the other was resuscitated but suffered significant brain damage.

**Conclusion:** Many people participate in exercise and sporting activities. In pursuing an active lifestyle they can suffer injury. Management of the sports injured patient presents different problems to the clinician as patients often wish to return their sport as soon as possible. A greater emphasis should be placed on the prevention of injury and the use of hospital specialists, sports injury clinics, and physiotherapy during the rehabilitation process.

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**009** SPORTS INJURY CLINICS ON THE NHS: A PATIENT SURVEY

S.H. Boyce, 1 M.A. Quigley, 2 1Accident and Emergency Department, Crosshouse Hospital, Kilmarnock; 2Accident and Emergency Department, Dumfries and Galloway Royal Infirmary

**Aim:** To determine patients attitude to the treatment of their sports injury and whether they would prefer follow up at a Sports Injury Clinic within the National Health Service (NHS).

**Method:** Forty people were selected at random from patients attending the Accident & Emergency (A&E) department of Crosshouse hospital, Kilmarnock, with a sports injury who were discharged to the care of their general practitioner (GP) for follow up. A questionnaire was sent to each patient asking two questions: were you happy with the treatment you received in the A&E department? If a specialised sports injury clinic was present at the hospital would you have preferred your injury to have received further treatment at this clinic rather than your local GP practice?

**Results:** A response rate of 47.5% was obtained. Eighty nine per cent of patients were happy with the treatment they received in the A&E department. The reason given for dissatisfaction was the waiting time and not the specific treatment of their injury. Eighty nine per cent also would have preferred their injury to be reviewed at a sports injury clinic and not their GP practice. The reasons given for this will be outlined.

**Conclusion:** The overwhelming majority of patients attending A&E with a sports injury in this survey would prefer to have their follow up care by specialists at a sports injury clinic within their local hospital.

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**010** DOES LIVE TV FOOTBALL AFFECT ATTENDANCES AT ACCIDENT AND EMERGENCY DEPARTMENTS?

S.H. Boyce. Accident and Emergency Department, Crosshouse Hospital, Kilmarnock

**Aim:** To determine if live terrestrial television football broadcasts affect patient attendance at an Accident & Emergency (A&E) department.

**Method:** Glasgow Rangers football club, the Scottish league champions, were competing in the European Champions League season 1999/2000. The competition was played for six weeks, either on a Tuesday or Wednesday evening.

The matches were broadcast live on Scottish television, the programme commencing at 19:30 and ending at 22:00. Patients attending the A&E department during these hours were noted prospectively. Only self presenting patients were noted. A questionnaire was noted prospectively. Only self presenting patients were noted. A questionnaire was noted prospectively. Only self presenting patients were noted.

**Results:** Table 1 highlights the results obtained.

<table>
<thead>
<tr>
<th>Champions League</th>
<th>Patients attending</th>
<th>Average patient attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>10</td>
<td>15.7</td>
</tr>
<tr>
<td>Week 2</td>
<td>14</td>
<td>16</td>
</tr>
<tr>
<td>Week 3</td>
<td>12</td>
<td>14.3</td>
</tr>
<tr>
<td>Week 4</td>
<td>16</td>
<td>14.1</td>
</tr>
<tr>
<td>Week 5</td>
<td>18</td>
<td>15.6</td>
</tr>
<tr>
<td>Week 6</td>
<td>8</td>
<td>15.7</td>
</tr>
</tbody>
</table>

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**011** THE EFFECT OF OVERHEAD SPORTS ON STATIC SCAPULAR POSITION

D.R. Simpson, K.T. Boyd. Centre for Sports Medicine, Queen’s Medical Centre, Nottingham

Anecdotally, postural adaptations around the shoulder are frequently seen in overhead sporting athletes. Clinically, abnormal scapular positioning is felt to be associated with shoulder impingement. The main aims of the study were: (1) To quantify the effect of overhead sports on static scapular position, (2) Determine the clinical usefulness of such measurements.

Three cohorts of subjects (aged 16–25 years) were evaluated, tennis players (n = 35), swimmers (n = 33), and controls (n = 33). The scapular position was determined using the method described by DiVeta et al (Phys Ther 1990; 70:470-9). Measurements included scapular distance (T3 to inferior angle of acromion), scapular size (medial border of scapula to inferior angle of acromion), and an additional anterior distance (sternoclavicular joint to inferior angle of acromion).

The results were analysed using ANOVA and an independent t-test. Scapular distance was significantly increased in the dominant shoulder in tennis players (p < 0.05) and in both shoulders in swimmers (p < 0.01) compared with controls. DiVeta’s normalised ratio and our new anterior/posterior ratio failed to show significant differences. The incidence of shoulder pain did appear to be related to the degree of scapula abduction, but not at a significant level.

Our findings suggest quantifiable postural adaptations do occur as a result of overhead sports. These measurements are easy to perform and could be used to monitor athletes during rehabilitation.

**012** QUESTIONNAIRE BASED STUDY OF ATTITUDES OF COACHES AND PHYSIOTHERAPISTS TO WARM UP AND WARM DOWN IN THREE SPORTS

A. Naushad

**Objective:** To determine the attitudes of medical and coaching staff working with elite performers to warm up and warm down in three team sports.

**Methods:** Questionnaires were sent to 40 male football clubs, 37 female football clubs, 50 male rugby clubs, 50 male hockey clubs, and 107 female hockey clubs across Scotland. Two questionnaires were sent to each club, one to be completed by the coach and the other by the physiotherapist.

**Results:** In total, 176 Replies were received: 42% from coaches and 20% from physiotherapists. Warm up was regularly used by 90% of clubs. Over 90% of coaches and physiotherapists believed from personal experience that warming up enhanced performance and...
reduced the risk of injury. Eighteen per cent to 35% of clubs in differ-
ent sports always warmed down, while those who never warmed
down ranged from 10% to 32%. Fifty eight per cent of coaches and
74% of physiotherapists felt that warming down enhanced subsequent
performance, while 76% of coaches and 79% of physiotherapists
believed that this practice reduced the risk of injury. The main reasons
highlighted for not warming down were that there was not enough
time (26%) and that players were told not to do so (26%). Overall the
majority of coaches (53%) and physiotherapists (72%) believed that
warm up and warm down were of equal importance.

Conclusion: Coaches and physiotherapists seem convinced of the
benefits of warm up. However, uncertainty still surrounds the issue of
warm down, although it does appear that more coaches and
physiotherapists are accepting the value of this practice.

A SIX WEEK HOME EXERCISE PROGRAMME FOR
INDIVIDUALS WITH CHRONIC OBSTRUCTIVE
PULMONARY DISEASE

L. Barr.

Background: Chronic Obstructive Pulmonary Disease (COPD) is a
non-specific term used to describe airflow obstruction diseases of the
lungs. It is the fifth leading cause of morbidity in the USA and is a pri-
mary cause of death for all ages in the UK.

Methods: Seven individuals, four males and three females from the
pulmonary rehabilitation list of one Glasgow Hospital agreed to par-
ticipate in a six week home exercise study. Each individual completed
two baseline tests—a six minute Walking Test and an Activities of
Daily Living Test (ADL) together with The Breathing Problems
Questionnaire. The individuals were then randomised into an
exercise and control group. The exercise group followed a six week
graduated walking and muscle strengthening programme, with the
controls continuing with their normal ADL. At completion of the
six week home exercise programme, all individuals were retested. The
results of the exercise group suggested an improvement in the walking
test and the ADL tests had occurred, however, no statistical
significance was observed. The results of the control group showed
that two of the subjects showed an improvement in their walking
distance, but again no statistical significance was observed. The controls
also recorded slower ADL tests as well as higher questionnaire scores,
but these findings were also not significant.

Conclusion: This study should therefore be viewed as a pilot study
in assessing the benefits of a six week home exercise programme for
individuals with COPD.

THE MEASUREMENT OF PHYSICAL ACTIVITY IN A
GROUP OF CARDIAC PATIENTS

T. Thompson.

Objective: The purpose of this study was to examine the relationship
between activity counts (CSA accelerometer) and energy expenditure
(VO₂) measured during various walking speeds and daily living
activities in a group of cardiac patients.

Methods: Fifteen cardiac patients (13M, 2F; age 59.6 (6.3)) par-
ticipated in the study. Patients walked at three different speeds (slow,
normal, and brisk) and completed daily living activities (hoovering,
warm up and warm down were of equal importance.

Objective: To measure the total oxygen consumption in patients
before and 4 weeks after transcatheter closure of an ostium secundum
type ASD or Patent Foramen Ovale (PFO).

Methods: The study was performed as a joint prospective and ret-
rospective study. Eight consecutive patients who underwent transcat-
ther ASD closure between January and March 2000 were included.

Results: The prospective patients had a significantly decreased
VO₂MAX (p=0.0069) and there was no significant difference between
pre and post-closure values (p=0.757). There was no significant
difference between predicted and measured VO₂MAX in the retrospec-
tive study. There was no significant change in right ventricle (RV)
diameter pre and post-closure in either the prospective or retrospective
group (p=0.128, p=0.126). There was significant correlation
between shunt and device size (r=0.045) and between preclosure RV
diameter and shunt size (r=0.001).

Conclusion: The device efficiently prevented right-to-left shunting in
the majority of patients. The results are similar to those obtained by
previous studies on ASD closure. This pilot study suggests the need for
a prospective longitudinal study in this group.

COMPARISON OF TWO FIELD TESTS WITH A LACTATE
THRESHOLD TEST IN SEMI PROFESSIONAL SCOTTISH
FOOTBALLERS

N. MacLeod.

The primary aim of this study was to see whether a suitable field test
could be found which gives an accurate indication of aerobic fitness
levels in a group of semi professional footballers. To do this, the results
from a multistage shuttle test (20-MST) and the Cooper test were com-
pared to a laboratory lactate threshold test. A secondary aim was to
compare the aerobic fitness levels of the players in mid-season with
their pre-season values. The results showed no significant difference
between the pre and mid-season 20-MST scores (r=0.25, 2.5 C.I.
95%). The correlation between the 20-MST and the treadmill test was
0.857 with a p value of 0.003. The correlation between the Cooper
test and the treadmill test was 0.222 with a p value of 0.565.

These findings suggest that there was no difference between the
aerobic fitness levels of these footballers between pre and mid-season.
They also indicate that fitness levels assessed by the 20-MST correlate
well with the treadmill assessment whereas the Cooper test did not
have a significant correlation with the treadmill test. This suggests that
the 20-MST is an appropriate test to use to monitor the fitness levels of
footballers throughout the season.

OSTEOARTHRITIS—THE EFFECTS OF EXERCISE
HISTORY, CORTICOSTEROID INJECTIONS, AND
INJURY IN FOOTBALL PLAYERS

R. Chaudry.

Aims: To determine whether exercise history, use of corticosteroid
injections, previous injury and playing surfaces increase the risk of
developing osteoarthritis (OA) of the knee in ex-professional foot-
ballers.

Table 1: Mean activity counts and mean VO₂ ml/kg/min for daily living activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Activity counts</th>
<th>VO₂ ml/kg/min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hoovering</td>
<td>337 (406)</td>
<td>10.51 (3.14)</td>
</tr>
<tr>
<td>Shopping bags</td>
<td>2184 (564)</td>
<td>12.32 (1.62)</td>
</tr>
<tr>
<td>Shopping trolley</td>
<td>1881 (591)</td>
<td>12.56 (2.48)</td>
</tr>
</tbody>
</table>

Table 2: Activity counts and VO₂ ml/kg/min during daily living activities

<table>
<thead>
<tr>
<th>Walking speed</th>
<th>Activity counts</th>
<th>VO₂ ml/kg/min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slow-normal</td>
<td>-1227 to -734</td>
<td>-2.221 to -1.182</td>
</tr>
<tr>
<td>Normal-brisk</td>
<td>2747 to -1703</td>
<td>9.977 to 4.706</td>
</tr>
</tbody>
</table>
Subjects and Methods: Nine hundred questionnaires were sent out to ex-professional Scottish footballers registered with the Scottish Football Association (SFA). Questions covered personal details including occupation, exercise history, injury history, playing surfaces, use of steroid injections, and current symptoms. Subjects were divided into three groups: those with clinically/radiographically diagnosed OA (Group 1), those with symptoms of OA (Group 2), and those with no present symptoms (Group 3).

Results: No significant difference was found between the three groups with respect to exercise history and playing surface (p=0.322 and 0.055 respectively). Number of steroid injections received was found to be a significant risk factor for OA (p=0.002); those with OA had received significantly more injections compared to subjects with symptoms, CI (0.076, 3.813) and those without, CI (0.911, 4.501). Previous knee injury was also found to significantly increase risk of OA development (p=0.003 and p=0.055 for right and left knees respectively). The most significant differences were seen in cartilage injuries in both knees (p=0.000 and p=0.006 right and left respectively).

Conclusion: The use of intra-articular steroid injections in treating knee injuries does appear to increase risk for OA suggesting caution in their future use until more research is carried out. All types of injury were found to increase risk of joint degeneration including those to the collateral and cruciate ligaments although injury to the cartilage (meniscus) carried the greatest risk.

The study investigated short term immunological responses to a typical rowing training microcycle.

Eight endurance trained male rowers underwent incremental ergometer test to determine blood lactate response to exercise. Individual load at lactate threshold, interpolated graphically, determined workloads for subsequent supervised weekly ergometer training schedule of three by (steady state (S), long distance (E), and high intensity (H)). Duration of E and H equated to work done in S and alternated daily with rowing on water (60 min E). Blood samples were taken for immunological assay, pre, one, and two hours post-exercise at final weekly training sessions. Post-exercise cell counts were expressed as percentage of pre-exercise value for T cells, NK cells, and total lymphocyte count.

Mean per cent reductions are shown in Table 1. Pre-exercise values were similar across the microcycle. NK cells were significantly reduced one and two hours post-exercise for S, E, and H; T cell and total lymphocyte count showed significant reductions for S and H but not E.

Rowing ergometer training S, E, and H (duration <45 min; three per week) alternating with active recovery (60 min E) showed no cumulative reduction in cell counts over each week or over the entire microcycle.

Aim: To determine whether participation in a primary care based exercise referral scheme leads to a change in exercise tolerance time or physical activity behaviour in patients with established coronary heart disease.

Methods: Sixty adults (mean age 63 years) were followed up 4–16 months after referral to a GP exercise referral scheme. Subjects underwent an exercise tolerance test and completed a physical activity questionnaire. The results were compared retrospectively to pre-participation data.

<table>
<thead>
<tr>
<th>% reduction NK cells</th>
<th>% reduction T cells</th>
<th>% reduction Total Lymphocytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>E</td>
<td>H</td>
</tr>
<tr>
<td>1h 71'</td>
<td>60'</td>
<td>78'</td>
</tr>
</tbody>
</table>

*Denotes significant reduction from pre-exercise value using Scheffe F test, (p<0.05).
RESULTS: Thirty eight patients had taken part in the exercise scheme. The number of physically active individuals increased between referral and follow up (14 v 24; p=0.02). There was an increase in the number of minutes of moderate or vigorous activity performed in the previous week (170 v 357; p<0.001). Exercise tolerance time (min/sec) increased in the most active group of participants from 7.13 to 8.06 (p=0.04). No differences in exercise tolerance time were found for less active participants, or for non-attenders. There were no changes in the frequency or extent of exercise induced ischaemia after taking part in the exercise scheme.

CONCLUSIONS: Participation in a primary care-based exercise referral scheme can lead to an improvement in physical activity behaviour and functional capacity in patients with coronary heart disease.

022 NEWLY DESIGNED FENCING FACE MASKS: EFFECTS ON CARDIORESPIRATORY COSTS AND SUB-MAXIMAL PERFORMANCE
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We investigated the cardiorespiratory costs of polycarbonate visor and wire gauze fencing masks in nine male collegiate/national level fencers during sub-maximal treadmill exercise. Metabolic (VO2, VE, and RER) by open circuit spirometry, heart rate (HR) by radio telemetry, and blood lactate (BLa) by fingertip capillary technique data were recorded during both incremental and sub-maximal treadmill [8, 10, and 12 km/hr] tests. Mask order was randomly assigned during sub-maximal tests, PiO2, and PiCO2 were monitored, and a fencing specific questionnaire completed. Group results were presented as mean ±SEM and analysed using a two way repeated measures ANOVA, values of p<0.05 were considered statistically significant.

Mean VO2MAX was 59.3±2.0 ml/kg/min. Mean PiO2 was significantly reduced and mean PiCO2 significantly increased when wearing the visor fencing masks, p<0.01 see table 1. The mild level of induced hypoxia did not affect performance variables, no significant effects on sub-maximal metabolic, cardiovascular or blood lactate data were associated with the different fencing masks (p>0.05, see table 1). The questionnaire revealed concerns about the expense, safety, and visual attributes of the new visor masks.

In conclusion, visor fencing masks did not elicit higher cardiorespiratory costs during sub-maximal exercise under the mildly induced hypoxic conditions recorded.

023 FACTORS INFLUENCING THE UPTAKE AND ADHERENCE TO A COMMUNITY BASED EXERCISE REFERRAL PROGRAM (LIVING PLUS)
S. Parkhill.

BACKGROUND/AIMS: A questionnaire was designed to assess uptake, adherence, reasons for drop out, barriers to participation, and physical activity levels in all patients who were referred by their GP’s to a community based exercise program called ‘Living Plus’.

METHODS: Leisure centres records were used to identify patients referred to Living Plus between January 1996 and June 1999. A copy of the questionnaire, a covering letter explanation what the study was about, and a stamped addressed envelope were posted to 245 subjects.

RESULTS: One hundred and eighteen (48%) responded, 94 (79%) of these patients completed 7 or more weeks of the Living Plus program (completers). Twenty four (21%) completed less than 7 weeks of the program, 9 (8%) of these 234 were classed as drop-outs, and the remaining 15 (13%) who were not told or contacted about Living Plus were classed as non-participants. The most common barrier to participation (67%) was “lack of communication” between the patients and Living Plus staff. The most commonly cited reasons for drop out (67%) was illness. Social deprivation was not found to have a significant influence on uptake or attendance. Physical activity levels between completers, non-participants, and drop outs were not of a significant difference. The majority of patients in each of the groups were not regularly active.

CONCLUSIONS: This study demonstrates good uptake of and adherence to Living Plus but improved communication between staff and subjects is required. However structured exercise referral programmes for GPs do not influence long term physical activity levels.

024 SUBJECTIVE FUNCTIONAL ASSESSMENTS AND THE RETURN TO COMPETITIVE AND RECREATIONAL SPORTS ACTIVITY FOLLOWING ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION. A RETROSPECTIVE STUDY OF 77 ATHLETES FOLLOWED UP AT TWO TO SIX YEARS POST SURGERY
F. Smith.

OBJECTIVES: The primary study objectives were to address (a) the return to competitive sports participation within 12 months following surgery, (b) the maintenance of competitive participation at follow up, and (c) the relationship of the level of sports activity at follow up.

METHODS: Of 109 selected patients 77 (71%) responded. All patients were competitive athletes pre-injury and had undergone anterior cruciate ligament (ACL) reconstruction using the transtibial endoscopic technique and either bone-patellar tendon bone or a multiple looped hamstring autograft. Evaluation was carried out at a mean of 43 months (range 24–73) post surgery by a postal questionnaire consisting of the Cincinnati sports activity scale and sports function scales.

RESULTS: At 12 months, 80.7% of patients had returned to competitive participation of which 88.7% were competing at pre-injury or higher levels. Of the competitive patients, 74.2% competing at pre-injury levels at 12 months, were active as such at follow up. At 12 months, 21.8% of the competitive patients competing at pre-injury levels did so with significant complaints. At follow up, 50% of patients were active in sports at least four times per week. There was a relationship between sports activity score and the total sports function score at follow up. Male patients had significantly higher sports activity scores (p=0.0059) and overall sports activity scores (p=0.024) compared to female patients. Patients with few functional complaints maintained high levels of sports activity even after discontinuing competitive participation.

CONCLUSIONS: The return to competitive participation at pre-injury levels, both at 12 months and at follow up was high provided the appropriate standard of treatment, patient selection, and exclusion criteria were adhered to.

025 THE LONG TERM EFFECTS OF LOWER LIMB MUSCULOSKELETAL INJURY
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BACKGROUND: Injury to the lower limb is common in sport and recreational activities, however little is known of the long term outcome of rehabilitation.

AIM: To assess if any long term decrement in muscle strength, balance, functional activity, and bone mineral density occurs after unilateral lower limb injury.

METHODS: The uninjured and injured legs of 48 (11 female) subjects with previous lower limb injuries and a mean time since injury
of 9.7 years were assessed for: (a) isometric and/or dynamic strength of the quadriceps, hamstrings, and plantarflexor muscles (Kin Com 500H isokinetic dynamometer); (b) postural sway (Chattanooga balance system); (c) functional sitting to standing and step up/down tests, and (d) bone mineral density (BMD) (n=10) (DEXA, model DPX-L).

**Results:** Significant differences were seen between the injured and uninjured side for: quadriceps (p <0.0001) and plantarflexors (p=0.024), but not for the hamstring muscles (Holder-Powell HM, Rutherford OM. Arch Phys Med Rehabil 1999;80:717–20); sway index (p=0.012) (Holder-Powell HM, Rutherford OM. Arch Phys Med Rehabil 2000;81:265–8); sitting to standing (p=0.002), sitting to standing (p=0.0003), step-down functional tests (p=0.012), and BMD (p=0.017).

**Conclusions:** These studies show that in most subjects, with relatively straightforward lower limb musculoskeletal injury, return to the “pre-injured state” does not occur. Deficits in motor and sensory control appear to remain years after injury. Further study is needed to clarify the effects of specific rehabilitation and training.

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**026 EFFECTS OF HEEL-CUPPED AND FLAT ORTHOSES ON SYMPTOMATIC ANTERIOR KNEE PAIN RELIEF**

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**Purpose:** The effect of heel-cupped orthoses compared to flat orthoses, on anterior knee pain relief was investigated.

**Subjects:** Fourteen symptomatic anterior knee pain patients (eight female, six male, age range 20–44 yr), presenting themselves with Patellofemoral Pain Syndrome, characterised by the conditions: pes anserine bursitis, medial/lateral peripatella retinaculitis, and patellofemoral degenerative joint disease.

**Methods:** Subjects were randomly assigned to one of two intervention groups: a heel-cupped orthoses group (n=7), and a flat orthoses group (n=7). The assigned heel-cupped or flat orthoses were prescribed to the individual after clinical evaluation. A Visual Analogue Scale was used to assess the subject’s pain levels after a two week intervention period.

**Results:** A two way repeated measures ANOVA test, revealed significant differences between the groups (F2,26 = 39.3 at the 5% level), and post hoc analysis found significant differences at the 5% level, for both groups between pre and post-test scores. A significant difference in posttest scores between the two groups (p< 0.05) indicated that the pain reduction for the heel-cupped orthoses group was significantly greater than that of the flat orthoses group. Mean pain improvement was 66 % and 51 % for the heel-cupped and flat orthoses groups, respectively.

**Conclusions:** The results suggest that heel-cupped orthoses elicit a higher level of pain relief than compared to the flat orthoses, in subjects with Patellofemoral Pain Syndrome. This is theorised to be because the heel-cupped orthoses offer greater rearfoot control. This has clinical implications for reduced treatment times of patients with Patellofemoral Pain Syndrome.

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**027 HIGH PLANTAR PRESSURES IN CYCLING—THE POTENTIAL FOR INJURY**

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Forefoot pain in cyclists is increasingly common with the new smaller style of clipless pedals and stiffer soled shoes. Hennig & Sanderson measured plantar pressures in cyclists and found the peak pressures occurred in the first toe and first metatarsal head (Hennig EM, Sanderson DJ. Journal of Applied Biomechanics 1995;11:68–80). These pressures decreased when softer soled running shoes were used.

Six male subjects cycled on a King cycle trainer at a power output of 250 ± 10 watts with a cadence of 90 ± 5 rpm. The Pedar system measured the maximum forces and peak pressures in the subject’s forefeet. Three different pedal set-ups were compared in seated and standing cycling.

The results showed the maximum forces and peak pressures were occurring around the first toe and metatarsal head. The peak pressures increased as the pedal size reduced, it also dramatically increased during standing cycling where peak pressures in the first metatarsal head were measured at 80 ± 55 kPa.

Meinders, et al found during static loading of the calcaneus local circulation was occluded at 40 kPa (Meinders MJ, et al. Clinical Biomechanics 1996;11:410–17). The results show that the pressures produced are capable of causing circulatory occlusion as well as nerve compression either of which can lead to pain in the forefoot during cycling.