ABSTRACTS

British Association of Sport and Medicine: Annual Congress 1996.

A randomised controlled trial of graded exercise therapy in patients with chronic fatigue syndrome

K Y FULCHER, P D WHITE
National Sports Medicine Instituute, St Bartholomew's Medical College, Charterhouse Square, London, EC1M 6BQ

Aims—There are no established treatments for the chronic fatigue syndrome. Sufferers are often advised to rest, which can lead to physical deconditioning. This study tested the efficacy of a graded aerobic exercise programme, designed to improve fitness. *Methods*—66 subjects with the chronic fatigue syndrome, who had neither a psychiatric disorder nor significant sleep disturbance, were recruited. Equal numbers were randomly allocated to 12 weeks of either graded aerobic exercise or flexibility exercises and relaxation therapy. The main outcome measure was the self rated clinical global change score, rating very much better" or "much better" as clinically important improvements. Subsidiary outcome measures included fatigue, mood and functional capacity as well as measures of strength and fitness. *Results*—16/29 (55%) of subjects rated themselves better after exercise, compared to 8/30 (27%) who completed flexibility treatment (P=0.03). Analysing by intention to treat gave similar results. Fatigue and functional capacity significantly improved in both groups, but more so with exercise. Physiological measures of fitness improved more with exercise, with a 13% increase in aerobic capacity. 12/22 (55%) of those subjects who crossed over from flexibility to exercise rated themselves better after completing the exercise treatment. 32/47 (68%) of subjects felt better three months after completing exercise treatment, with physiological and symptomatic improvements maintained. 35/47 (74%) of subjects rated themselves better 18 months after starting exercise treatment, with a return to premorbid activity levels. *Conclusions*—These findings support the use of appropriately prescribed aerobic exercise in the management of patients with the chronic fatigue syndrome.

The beliefs and practices of West Glasgow general practitioners in the promotion of exercise uptake in their patients

S BLAIR, N MUTRIE, L HOLTON
University of Glasgow, Institute of Biomedical and Life Sciences, 64 Oakfield Ave, Glasgow, G12 8LT

There is an increasing body of evidence which suggests that inactivity is a serious risk to health.[1] There has been limited research on how general practitioners (GPs) promote exercise uptake. The aim of this study was to determine the beliefs and practices of West Glasgow GPs in the promotion of exercise uptake. All West Glasgow GPs (n=151) were invited to complete a postal questionnaire on this subject. The response rate was 58.9%. χ^2 Analyses showed that 94% of GPs believed exercise promotion to be part of their job and 60.7% believed that practice nurses would be best at providing this. The survey also found that: 3.6% of GPs run patient exercise classes; 17.9% prescribe exercise programmes for patients; 38.1% refer patients to leisure clubs for exercise prescription; 36.9% provide posters/leaflets in their practice, informing of local exercise classes. GPs viewed smoking, obesity and alcoholism to be of greater risk to health than inactivity. Efforts should be made to integrate non-physicians into the primary health care team and to develop a consolidated, structured, community approach towards tackling the inactivity epidemic.

1 Pate *et al.* Physical activity and public health. *JAMA* 1995;273:402–9.

Reliability and concurrent validity of the Scottish physical activity questionnaire

M P LOWTHER, N MUTRIE
University of Glasgow, Institute of Biomedical and Life Sciences, 64 Oakfield Avenue, Glasgow G12 8LT

The Scottish physical activity questionnaire (SPAQ) was designed to aid 7 d physical activity (PA) recall and provide information on work time PA as well as leisure time PA. To establish the reliability of the SPAQ subjects (drawn from an aerobics class; group 1, n = 19 and an exercise project; group 2, n = 16) were asked to complete an SPAQ on a Monday and again on the following Wednesday. Thus each questionnaire measured four identical days PA. Analysis revealed that group 1 reported significantly more PA over the 4 d than group 2. Additionally, the correlation coefficients for the relationship between the first and second questionnaires were significant for each group (0.991, group 1; 0.996, group 2), demonstrating test/retest reliability. To establish the concurrent validity of the SPAQ, 94 subjects completed both the SPAQ and an adapted stage of change (SOC) exercise questionnaire.[1] Two-sample *t* tests produced the expected relationship between PA and SOC (reported PA minutes: precontemplators, 452; contemplators, 395; preparers, 672; actioners, 1016; maintainers, 1234), showing that the SPAQ has concurrent validity with the SOC model.

1 Loughlan CW, Mutrie N. Recruitment of sedentary NHS staff for a workplace exercise programme using an adapted "stages of change" exercise questionnaire. *J Sports Sci* 1995;13:63–4.

The effect of exercise and injury on the later development of osteoarthritis in sportsmen

L STEVENSON, JA MACLEAN, PAUL MACINTYRE, WS HILLIS
Department of Sports Medicine, University of Glasgow

Osteoarthritis (OA) is the major cause of joint pain and disability. With the growing importance of the relation between exercise and health, this study was designed to investigate the role of exercise and trauma on the later development of OA. 420 subjects (360 footballers, 60 rugby players) were contacted by questionnaire and asked about past exercise history, injury pattern, treatment (including surgery and steroid injection), present symptoms, and diagnosis of OA. The response rate was 47%; 30% had known OA of the lower limb, suggesting that sportsmen do have a higher prevalence of OA than the normal population. Average total exercise time was 35 000 hours, with no statistical significance with the later development of OA. 380 injuries were recorded in 202 respondents, 47% of which were knee injuries. 61% of ligament and 88% of meniscal injuries had later developed knee OA. 36% of footballers had at least one knee steroid injection. Over 90% of those who had meniscal surgery later developed OA. This study confirms the role of trauma, but not exercise per se, in the development of OA and illustrates the possible long term effects of injuries and their treatments. A follow up study to include clinical and radiological assessment is planned.

The usefulness of an electronic pacing device in physiological testing in swimmers

J McCLURE, J BRADLEY, S GRANT, W S HILLIS, P MACINTYRE,
Department of Sports Medicine & Sports Science, University of Glasgow

Inability to achieve a prescribed pace has affected the validity of physiological testing in swimming. The usefulness of an electronic light/sound pacing system to enable swimmers to achieve defined swimming speeds was evaluated in 11 elite swimmers (4 females, 7 males, mean age 21, SD 3.6 years, range 17–27 years) in a randomised, crossover trial. On two separate days the subjects swam 5×200 m freestyle at various target times based on their personal bests using the pacing device and self pacing. 50 m split times and total times for 200 m were subtracted from their target times as an indication of adherence to the prescribed pace and then compared using paired tests. The subjects then performed a lactate (LA) minimum test using the pacing device to determine its usefulness in physiological testing. All results are expressed as mean (SD) (see table below). U-shaped LA minimum curves were achieved in all subjects with a mean LA speed of 1.33 (0.2) ms^{-1}, and a lactate minimum level of 3.8 (1.86) mmol L^{-1}. This confirms that the pacing device improves swimmers ability to achieve a desired pace and perform physiological testing.

The use of the ventilatory threshold and dyspnoea thresholds for exercise prescription to asthmatics

E M SYMONS*, A VARRAY**, P BIZEL***
**School of Human Studies, University of Teesside, Middlesbrough, TS 1 3BA U.K. **U.F.R. S.T.A.P.S. Université de Montpellier, Ave du Pic Saint Loup, Montpellier, France ***Institut de thérapies et d'éducation des Asthmatiques, Font Romeu, France*

This study investigated the viability of prescribing exercise at an intensity equivalent to the ventilatory threshold (VT), dyspnoea onset (ONSET), and dyspnoea threshold (DT) for aerobic exercise rehabilitation of young asthmatics. Twenty males (aged 12-16 years) diagnosed with moderate (MOD, n = 10) and severe (SEV, n = 10) asthma completed a continuous, incremental exercise test on a cycle ergometer to maximum exertion. Results showed four individuals (n=2 MOD and n=2 SEV) were unable to use the Borg scales appropriately and two of those

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Time (s)	*Self paced*	*Electronically paced*	*P Value*
Split times for 50 m	0.813 (0.61), CI (0.721, 0.901)	0.427 (0.311), CI (0.385, 0.468)	< 0.0001
Total times for 200 m	1.675 (0.677), CI (0.751, 1.819)	0.389 (0.172), CI (0.273, 0.50)	< 0.0003

subjects (MOD) experienced exercise induced asthma (FEV_1 postexercise drop greater than 15% pre-exercise level). Two way mixed ANOVA revealed significant differences ($P < 0.01$) between heart rate at ONSET [126 (SD14) beats min^{-1}] and VT [156 (8) beats min^{-1}], ONSET and DT [163 beats min^{-1}], but not between VT and DT. There were no significant between group differences. The above data represent 59% (ONSET), 75% (VT), and 79% (DT) of peak recorded heart rates. Subjective reports of RPD and RPE portrayed wide intersubject variation particularly at the VT and DT (Borg ratings 2-7 and 2-9 for RPD and RPE respectively). It may be concluded that for the purpose of exercise rehabilitation in these asthmatic populations, the exercise intensity at the dyspnoea onset is possibly too low to enhance aerobic capacity, whereas at the VT and DT the exercise intensity appears to be appropriate for encouraging aerobic adaptations but is too severe for some individuals and induced respiratory distress. The study emphasises the importance of individualised exercise prescription in the asthmatic population.

Patellofemoral pain in the sportsperson: which rehabilitation exercises are best and is patellar taping of benefit?

R M NICHOLAS, J BULLOCK-SAXTON, S C REED, P T MYERS
Brisbane Orthopaedic and Sports Medicine Centre and University of Queensland Physiotherapy Department, Brisbane, Queensland, Australia

Quadriceps rehabilitator exercises are recommended in managing patellofemoral pain but selective vastus medialis obliquus (VMO) training and patellar taping remain controversial. Electromyographic (EMG) analysis of the relative activity of VMO and vastus lateralis (VL) during 10 quadriceps exercises (weight-bearing and non-weight-bearing) was performed. The influence of patellar taping on muscle activity was investigated. 20 sportspeople with patellofemoral pain underwent surface EMG during the exercises. Root mean square values for each were calculated and normalised against a submaximal voluntary quadriceps contraction to enable comparisons and proportionate muscle activity between patients. After patellar taping, using tilt and glide components, the EMG data were recollected. Statistical evaluation of data using ANOVA in patients without patellar taping did not reveal preferential enhancement of vastus medialis over vastus lateralis in any of the exercises, with levels of muscle activation being very similar. With patellar taping significant increases in activation of both VMO and VL were observed, with statistically significant enhancement of VMO over VL in one weight-bearing and four non-weight-bearing exercises. This study suggests that non-weight-bearing rehabilitation exercises with patellar taping in sportspeople with patellofemoral pain will produce the greatest selective EMG activity enhancement of VUO over VL.

Gym & tonic: a profile of 100 steroid users

N A EVANS
Cardiff Royal Infirmary, Cardiff, UK

Aim—Identification of unsupervised anabolic-androgenic steroid regimens used by athletes and physical signs of steroid use. *Methods*—100 athletes attending four gymnasia were surveyed using an anonymous self-administered questionnaire. *Results*—Anabolic steroid doses range from 250 to 3200 mg per week and users combine different drugs to achieve such doses. Injectable abd oral preparations are used in cycles lasting 4 to 12 weeks. Over 80% of users admit to the regular use of drugs other than steroids for various reasons including additional anabolic effects and also minimisation of steroid related side effects and withdrawal symptoms. Acne, striae, and gynaecomastia are the most frequently reported adverse effects. The estimated prevalence of steroid use by athletes attending these gymnasia is 30%. *Conclusions*—(1) Multiple drugs are combined in megadoses and self-administered in a cyclical fashion. (2) Polypharmacy is practiced by over 80% of steroid users. (3) Muscular hypertrophy along with acne, striae, and gynaecomastia are frequent physical signs associated with steroid use. (4) Grading steroid users should prove useful in clinical practice and future scientific studies.

The effect of a single pass VDD pacemaker on exercise capacity (VVD versus VVIR mode)

H ROBERTSON, P MACINTYRE, J NICHOLL, C MCDOUGALL, W S HILLIS
Department of Sports Medicine, Western Infirmary, Glasgow

A single pass dual chamber pacemaker (VDD) with a floating atrial sensor incorporated in a ventricular lead has the advantages of ease of insertion while still permitting A-V synchronous pacing. The effect of VDD pacemaking on exercise capacity was compared to VVIR mode in eight patients (four males, four females mean age 73, SD 5.4, years, range 67-80) with chronic complete heart block in a randomised single blind crossover trial. Cardiopulmonary exercise testing was performed in each mode using the modified Bruce protocol. Ventilation ($\dot{V}E$), oxygen consumption ($\dot{V}O_2$), and heart rate (HR) were monitored continuously. Blood pressure (BP) and blood lactate [LA] were measured at rest, at peak exercise and at 3 minutes intervals during exercise and recovery. Peak values were compared for each pacing mode using paired t tests. The results below are expressed as a mean (SD) (see table below). As shown, peak $\dot{V}O_2$, HR, [LA], and total exercise time were significantly greater in VDD mode, indicating improved aerobic capacity.

Evaluation of peripheral vision loss using helmets with visors

F MCBURNEY, M O'BRIEN, B DONNE
Human Performance Laboratory, Trinity College, Dublin 2, Ireland

Skull and facial protection remains optional in Hurling and Camogie except at juvenile level. The aim of this study was to investigate the visual field loss using four commercially available helmets with visors [Scanda (S), Christy(CH), Mycro Round (MR) and Mycro Square (MS)]. 21 subjects with normal vision participated in this study, five males and 16 females (age range 20-30 years), all competitive in team sports. Subjects participated in two separate experiments to measure peripheral field using both a kinetic (Arc perimeter, n=11) and a static (Henson 4000, n=10) technique. In both experiments, subjects were randomly assessed wearing each helmet and no helmet (control). Results were expressed as % reduction in visual field over control and analysed using MANOVA. Mean (SEM) % reductions in kinetic visual field were 17.2 (5.4)% ($P<0.01$), 11.6 (3.7)% (NS), 8.5 (2.4)% (NS), and 8.8 (3.7)% (NS) for S, CH, MR, and MS respectively. Mean (SEM) % reductions in static visual field were 19.9 (2.0)% ($P<0.001$), 12.0 (2.0)% ($P<0.001$), 5.5 (2.2)% ($P<0.05$), and 5.1 (2.0)% ($P<0.05$) for S, CH, MR, and MS respectively. Under both kinetic and static conditions the greatest % reduction in peripheral visual field was recorded when the Scanda (S) helmet was worn. Significant % reductions were observed under static conditions with the other helmets. Inter helmet comparison indicated that both MR and MS were similar and resulted in minimal % reduction in peripheral visual field. The difference between helmets may in part be due to bar thickness and geometric arrangement.

The effects of a graduated training programme on menstrual cycle related basal plasma 2-hydroxy-catecholoestrogens

C DE CRÉE, P BALL†, H A KEIZER‡
Institute for Gyneco-Endocrinology Research, PO Box 134, B-3000 Leuven 3, Belgium; †Dept of Biochemistry and Clinical Endocrinology, Medical University of Lübeck, Germany; and ‡Dept of Movement Science, University of Limburg, Maastricht, Holland

Catecholoestrogens (CE) represent a major metabolic pathway of oestrogen metabolism. They strongly inhibit the enzymatic methylation and biological decomposition of noradrenaline by COMT. It has been hypothesised that the changes in oestrogen status and gonadotropin pulsatility observed in strenuously training females are part of a complex feedback system mediated by CE.[1] This study attempts to partially validate that hypothesis. Nine untrained eumenorrheic women participated in a 5 d graduated programme of aerobic and anaerobic exercise on a bicycle ergometer. Mean percentage of body fat was 24.8 (SD 3.1)%. After a 5 d period of aerobic and resistance graduated training programme, the $\dot{V}O_2$ max levels increased during the luteal phase (LPh) [from 41.5 (4.1) to 43.5 (3.4) ml min^{-1} kg^{-1}], but not during the follicular phase (FPh). Conjugated and unconjugated total CE during basal conditions in women averaged for total 2-hydroxyoestrogens (2-OHE) 200 (72) pg ml^{-1} during the FPh and 420 (161) pg ml^{-1} during the LPh. For 2-methoxyoestrogens (2-MeOE), we found 237 (95) pg ml^{-1} during the FPh and 339 (78) pg ml^{-1} during the LPh. Basal 2-CE following standardised intensive aerobic and interval training decreased during the LPh (-21%). Following training, the 2-OHE/E ratio (measure of CE formation) at baseline was increased during the LPb (+29%), whereas the

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	VVD mode	*VVIR mode*	*P Value*
Time (min)	12.4 (2.65)	9.5 (3.15)	0.031
HR	139 (16)	120 (16)	0.045
Blood pressure	211 (55)	195 (27)	0.420
Systolic	85 (21)	97 (17)	0.12
Diastolic			
$\dot{V}E$	39.5 (11.3)	37.1 (13.5)	0.400
$\dot{V}O_2$	18.7 (3.4)	16.0 (2.3)	0.014
[LA]	2.05 (0.6)	1.7 (0.5)	0.04

2-MeOE/2-OHE ratio (measure of CE activity) in both phases showed significantly higher baseline values following training (FPh +14%; LPh: +13%). These findings suggest that more CE re-*O*-methylated in response to intensive exercise and are increasingly competing with the enzyme COMT to help preventing degradation of neurotransmitters.

1 De Cree C. *Int J Sports Med* 1990;**11**:329–48.

The effect of variation in seat height on submaximal cycling performance in man

D PRICE, B DONNE, M O'BRIEN
Human Performance Laboratory, Trinity College, Dublin 2, Ireland

Optimum seat height is generally regarded as that height which produces the lowest costs for a fixed load and cadence, the scientific concensus being 96-100% of trochanteric height (TH), with no reference being made to seat tube angle (STA). The effect of seat height variation (96%, 100%, and 104% TH) at selected STA (68, 74 and 80) was evaluated in competitive road racing cyclists (n=14) using a discontinuous protocol (200 W) on an air resistance ergometer. Cardiovascular, metabolic and two dimensional lower limb kinematic data were collected in the final 2 min of each 4 min exercise element. Subjects were randomised to complete nine different seat positions in opposite directions from 100% TH at 74 STA to eliminate any time or sequence bias. Power efficiency (%EFF) was calculated at each position (%TH, STA) from work done and $\dot{V}O_2$. Results were analysed using MANOVA, values of $P<0.05$ were considered significant. At each STA studied, $\dot{V}O_2$ and HR were significantly higher ($P<0.001$) and %EFF significantly lower ($P<0.001$) at 104%TH compared with 96% or 100%TH; no significant differences were recorded between 96% and 100%TH. Biomechanically, both iliac crest and greater trochanter vertical displacement (mm) increased significantly ($P<0.001$) at 104%TH compared with 96% and 100%TH; in addition, ankle and knee angle (degrees) both became more extensor with increasing seat height. An analysis of %TH induced changes (%TH) at each STA studied revealed no significant interaction ($P>0.05$) between STA and %TH for the parameters measured. This study concurs with previous reports that optimum seat height lies between 96% and 100%TH. During submaximal cycling, optimum seat height appears to be independent of STA over the measured range.

Incidence of sports injuries at two south Dublin accident and emergency departments

C CONDON, M O'BRIEN, P PLUNKETT, G KEYES
Human Performance Laboratory, Trinity College, Dublin 2, Ireland

Aim: To identify the current use of A&E departments by patients with sports related injuries, their management and treatment. *Methods*: Data collection was by questionnaire, given to each patient in the waiting area, and a retrospective review of all A&E files during the 3 month period of the study. A χ^2 test was used to compare the incidence and distribution of the injuries across sports and for comparison with previous studies. *Results*: During the study period, 6.5% of patients attended the A&E departments with sports related injuries (n = 675), of whom only 155 (23%) completed the questionnaire. The age, sex, and sports activity profile were similar to previous studies done in the last 10 years.[1 2] The majority of the injuries occurred in soccer players (419), rugby (44), Gaelic games (42), and basketball (28). Highest recorded incidence (187) was for soft tissue injuries to the knee and ankle. Only 29 injuries required admission. 124 required review, 108 were referred to the fracture clinic, and 26 were referred directly for physiotherapy. Most of the injuries were treated with analgesics and RICE. *Conclusions*: Early and more frequent referrals for physiotherapy and advise on treatment and rehabilitation in the form of information cards would promote an earlier return to sport.

1 Burke P, Buckley N, McShane D, O'Conner P. Sports injures and the Casualty department. *Ir Med J* 1983;**76**:127–9.
2 Murphy A, Margin C, Plunkett P, O'Conner P. Sports injuries and the accident and emergency department—ten years on. *Ir Med J* 1992;**85**: 30–3.

Effects of endurance training on ventilation, blood lactate, and plasma potassium during incremental exercise

T A J WOODS, J H BRENNAN, E S WALLACE, M H MURPHY
Human Performance Laboratory, University of Ulster, Jordanstown, Co Antrim, N Ireland

Aim: To discover if 5 weeks' endurance training causes a dissociation between the ventilation and lactate thresholds, and whether changes in ventilation are parallelled by alterations in plasma potassium concentration (K^+). *Methods*: Ten untrained subjects (aged 26, SD 2 years) performed a 20 watt min^{-1} cycling test to determine maximum oxygen consumption ($\dot{V}O_2max$), maximum workload, and maximum ventilation (V_Emax). Ventilatory equivalents for O_2 and CO_2 were used to identify two ventilation thresholds (Tvent), and an initial rise in blood lactate above baseline and a subsequent more abrupt increase identified the lactate thresholds (Tlac). Blood lactate, plasma K^+ and pH were measured from arterialised venous samples. Subjects cycled for 30 minutes three times/week at 70% $\dot{V}O_2max$ during which steady state blood lactate concentrations (every 3rd session) and heart rate were measured. *Results*: After training, increases occurred in $\dot{V}O_2max$, maximum workload, and V_Emax ($P < 0.01$), and in both Tlac and Tvent thresholds ($P < 0.01$). The first and second Tvent did not differ ($P > 0.01$) from the first and second Tlac respectively, before and after training. Significant correlations ($P < 0.001$) were found for V_E *v* K^+ before (0.996) and after training (0.995), and similarly for V_E *v* blood lactate (0.987 and 0.997). Training heart rate ($P < 0.01$) and blood lactate ($P < 0.05$) decreased significantly by the 6th training session. *Conclusions*: Tvent and Tlac occurred simultaneously before and after training despite alterations occurring in both, suggesting a cause and effect relationship. V_E and K^+ experienced similar training induced changes; therefore K^+ may be a causal factor in the ventilatory threshold.

Physiological implications of moderate altitude training (1640 m) on sea level endurance performance in elite distance runners

D M BAILEY†, B DAVIES†*, L ROMER*, G GANDY‡
*† School of Applied Sciences, University of Glamorgan, S Wales; * British Olympic Medical Centre, Northwick Park Hospital, Middlesex; ‡ Loughborough University, Loughborough, Leicestershire.*

Aim: To determine the effects of moderate altitude training on sea level endurance performance in a group of national standard distance runners. *Methods*: 10 elite runners, (EXP) were tested 17 days before a 4 week sojourn to an altitude of 1640 m in S Africa, (PRE) and 20 d following their return to sea level, (POST). 12 elite runners continued training at sea level (CON) and were tested at the same times as the EXP group. Each athlete performed a continuous incremental treadmill test to exhaustion ($\dot{V}O_2max$) which was followed by a 3 min recovery jog at 5 km h^{-1} (REC). Three repetitions of 1000 metres with a 2 min inter-repetition recovery time were conducted on the following day (TRK). *Results*: Four athletes from the EXP group developed stress fractures at altitude and were not included in the overall analysis There were no differences in the following selected dependent variables between PRE and POST testing for the two groups: $\dot{V}O_2max$ [EXP PRE = 5.15 (SD 0.95) *v* POST = 5.10 (0.59) L min^{-1} and CON = 4.43 (0.95) *v* 4.43 (0.86) L min^{-1}], REC whole blood lactate [EXP = 8.18 (1.76) *v* 8.64 (2.06) mmol L^{-1} and CON = 8.24 (1.73/0 *v* 8.84 (1.43) mmol L^{-1}], and REC HR [EXP = 130 (21) *v* 123 (14) b min^{-1} and CON= 119 (17) *v* 116 (14) b min^{-1}]. The EXP TRK running times were slower during POST testing [173 (3) *v* 176 (4) s, $P < 0.05$] whereas CON TRK times remained unchanged [179 (19) *v* 179 (17) s]. *Conclusions*: Endurance training under conditions of hyperbaric hypoxia (PO_2 = 135 mm Hg) did not provoke an erythropoietic stimulus to significantly activate haemopoiesis [EXP PRE haemoglobin = 15.3 (0.7) *v* day 19 at altitude = 15.5 (1.0) *v* POST = 15.4 (0.7) g dl^{-1} and CON PRE = 15.1 (1.0) *v* POST = 14.8 (1.1) g dl^{-1}]. This may explain why sea level endurance performance following altitude training was not improved in a group of elite runners with normal serum ferritin stores [PRE = 52 (28) ng ml^{-1}].

BASM education programme

The foundation course of this programme is the **Introductory Sports Medicine Course** which is designed for chartered physiotherapists and doctors with an interest in sports medicine. It is also suitable for professionals in related of healthcare. The curriculum is multidisciplinary and has a wide focus, including sessions on health benefits, exercise training principles, children and elderly in sport, exercise physiology, sports nutrition, CPR, and resuscitation. Sporting injuries and their management are also covered. Five days PGEA approval in Health Promotion and Disease Management are given for this course.

The interdisciplinary **Intermediate Sports Injury Course** concentrates on the proper examination of normal joints with regard to the diagnosis and management of sports specific injuries. There is a strong focus on the coaching and training involved in a variety of sports. Five days PGEA approval in Health Promotion and Disease Management are given for this course.

The **Practical Sport and Medicine Course** held at Club La Santa, Lanzarote, has a curriculum that varies each year. Delegates and families are welcome. This course further develops the practical examination and sporting themes of the Intermediate Course. Physiological training principles are also reviewed and the course makes use of the coaching staff from the complex to gain practical skills and knowledge of a number of different sports. Individual GPs have gained PGEA approval for this course.

In response to many requests received, an **Advanced Sports Nutrition Course** is being run for the first time. It is suitable for everyone who has previously attended the BASM Introductory Course or an appropriate alternative. Two days PGEA approval in Health Promotion have been given for this course.

Forthcoming courses

General Sports Medicine Course Lilleshall Hall National Sports Centre	**13-18 April 1997**
Intermediate Sports Injury Course, part two (new course)	**13-18 July 1997**
General Sports Medicine Course Lilleshall Hall National Sports Centre	**21-26 September 1997**
General Sports Medicine Course Lilleshall Hall National Sports Centre (Residential)	**19-24 April 1998**
Intermediate Course: Sports Specific Injury Management and Normal Examination of Joints, part 2 (new course) Lilleshall Hall National Sports Centre (Residential)	**12-17 July 1998**
General Sports Medicine Course Lilleshall Hall National Sports Centre (Residential)	**20-25 September 1998**
Practical Sport and Medicine Course Club La Santa, Lanzarote (Residential)	**1-8 October 1998**

For further details, application forms and membership enquiries, please contact the Education Office at British Association of Sport and Medicine, c/o The National Sports Medicine Institute, Medical College of St Bartholomew's Hospital, Charterhouse Square, London EC1M 6BQ (tel 0171 253 3244; fax 0171 251 0774).

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