Editorial

This edition of The South African Journal of Sports Medicine is devoted to the biennial SASMA Conference. Its contents consists of over 65 abstracts that represent the free communications that have been presented at the Conference. Publication of all the free communications in this Journal is a first for the Journal, as well as the South African Sports Medicine Association (SASMA). A number of important points come to mind.

Firstly, this is the largest number of free communications yet presented at a SASMA Conference. This indicates that South African Sports Scientists and Sports Medicine Practitioners are willing and able to conduct and present their research. For any growing organization this surely is a healthy sign that there is interest and ability despite many constraints, including financial support for research which unfortunately seems to dwindle.

Secondly, the Journal was in a position to publish the proceedings for the first time. This means that a research abstract can now be referenced in a scientific Journal. I am sure that this will encourage research and presentations at future SASMA Conferences.

Thirdly, tribute must be paid to the investigations who will present their research findings at the Conference for their high quality research. It is encouraging to page through the abstracts and come across many high quality research projects that surely will stand their ground in any International meeting. Many of these studies document novel concepts, treatment modalities and scientific findings. My congratulations to all those who spent endless hours in laboratories and clinics.

This effort must rate as one of the best ways to promote this country to the somewhat 15 International scientists who will attend the Conference. I am indeed proud to be a member of SASMA, and one of the many South African Sports Medicine practitioners.

Dr M P Schwellnus
Co-Editor: South African Journal of Sports Medicine
HI-TECH THERAPY for supporting occupational and physiotherapy

Kine-tech multi function computerised rehabilitation unit.

The most effective lower extremity rehabilitative, strengthening and stretching tool on the market!

1. Over 90% of all back injuries occur at the base of the spine.
2. Most back supports ride up leaving the base of the spine unsupported.
3. Saunders supports won't ride up and provide continual back support where it's really needed most.
4. To effectively support the base of the spine, a back support must fit around the pelvis as well as the lower back.
5. Back supports increase intra-abdominal pressure to decrease the loading on the spine by as much as 25%.

Johannesburg: Tel. (011) 706-7420/1
Cape Town: Cell. (083) 653-2221
Durban: Tel. (031) 21 7797
CONTENTS

ABSTRACTS SUBMITTED FOR PRESENTATION

PRESENTING AUTHOR

1. Basson CJ
2. Beira B
3. Boston V
4. Branfield AS
5. Buntman A
6. Carter R
7. Chantler I
8. Coleman K
9. Coleman K
10. Cook I
11. Coopoo Y
12. Crous L
13. Derman EW
14. Derman EW
15. Derman EW
16. Du Plessis A

TITLE

Personality and mood states in addicted and non-addicted runners and non-exercisers
Sternocleidomastoid muscle: Mimic of migraine type headaches, dizziness and neurological fallout in post-traumatic athletes
Applied Kinesiology for sportsmen
Are asthmatics fit to scuba dive?
Intravascular dehydration and changes in blood pressure seen during ultradistance marathon running
Model for the prediction of optimal stroke mechanisms in swimmers
Cardiac drift during incremental rowing tests
Exercise tolerance and skeletal muscle function in patients with carcinoma: Effects of exercise training?
Exercise intolerance and skeletal muscle (SM) abnormalities in patients with chronic obstructive airways disease (COAD)
Endurance ratios and total work: Are they valid measures of fatigue resistance?
Physiological profiles and the establishment of norms for under 21 Provincial rugby players in Natal.
The effect of Scheuermann's disease on the total body biomechanics
Comparative effects of Zopiclon and loprazolam on hand-eye co-ordination and physical performance in athletes
The effects of acebutolol on exercise tolerance, skeletal muscle recruitment and fuel substrate utilisation during exercise of varying intensities
Knowledge attitude, and nutrient intake of elite sportsmen and women (19-25 years old) in Potchefstroom

continued on page 4

The Editor
The South African Journal of Sports Medicine
PO Box 115, Newlands 7725

PRODUCTION
Andrew Thomas

PUBLISHING
Glenbarr Publishers cc
Private Bag X14
Parklands 2196
Tel: (011) 442-9759
Fax: (011) 880-7898

ADVERTISING
Marika de Waal/Andrew Thomas

REPRODUCTION
Output Reproduction

PRINTING
Hectors

Reparil-Gel
on-the-spot-pain relief

The views expressed in individual articles are the personal views of the Authors and are not necessarily shared by the Editors, the Advertisers or the Publishers. No articles may be reproduced without the written consent of the Publishers.
| 17. Du Plooy W | The carnitine status of athletes preparing for an ultra-marathon of 90km |
| 18. Du Toit E | The force absorption and rebound characteristics of cricket batting pads |
| 19. Du Toit E | The effect of a low intensity aerobic exercise program on patients using antidepressants |
| 20. Foreman S | Pollution, water contact and “Dusi-guts” |
| 21. Futre-Peters E | Low post-race markers of lipid peroxidation in ultramarathon runners with high anti-oxidant status |
| 22. Govender S | Effects of high intensity exercise on lymphocyte DNA and plasma vitamin C |
| 23. Hattingh HJB | A conservative approach of Grade II and III lateral ligament ankle injuries |
| 24. Hattingh HJB | Delayed muscle soreness in sprint athletes |
| 25. Hawley J | Effect of carbohydrate supplementation on muscle glycogen content and utilisation during one hour cycling performance |
| 26. Heystek MJ | Profile of injuries at the Duzi canoe race |
| 27. Hinrichs MJ | The response of heart rate and blood lactate concentration to continuous increments 1 running speed |
| 28. Holtzhausen LM | Annual incidence and risk factors for rock climbing injuries in South Africa |
| 29. Holtzhausen LM | Anatomical distribution and nature of rock climbing injuries in South Africa |
| 30. Holtzhausen LM | Electromyographic analysis of upper limb musculature during rock climbing |
| 31. Hughes G | The effect of a static stretch duration and frequency on hamstring musculotendinous flexibility |
| 32. Hughes G | The effect of a single static stretching session on hamstring musculotendinous flexibility over 24 hours |
| 33. Hulse B | Effects of sustained high intensity interval training (HIT) on exercise performance, skeletal muscle and cardiac function in cardiac rehabilitation patients |
| 34. Hulse B | Integrated electromyographic (IEMG) activity and cardiovascular response in patients with lower back pain (LBP): Effect of sleep surface |
| 35. Khan A | Metabolic cost of trampoline exercise in relation to treadmill exercise at comparable heart rates |
| 36. Kiessig M | Fusafungine reduces symptoms of URTI in runners after a 56km race |
| 37. Kotras H | The effectiveness of a mental skills training program for Eastern province Academy cricketers |
| 38. Lategan L | The prevalence of Anabolic Steroid use in adolescents in South Africa |
| 39. Lawther B | Isokinetic strength training of the quadriceps femoris by means of electrical stimulation |
| 40. Macfarlane PW | The energy cost of running in filed hockey is greater when dribbling a ball |
| 41. Mars M | Mood and performance of cricketers during an International tour |
| 42. Mars S | Community based cardiac rehabilitation programmes - a pilot project |
| 43. Matske KOP | Infra-red laser: An in vitro dosimetry study |
| 44. Matseke KOP | The risk of Human Immunodeficiency Virus (HIV) transmission in boxing |
| 45. Moller F | The effect of low-dosage, long-term creatine monohydrate supplementation on the performance of cyclists |
| 46. Nicol J | Electromyography and serum electrolytes during recovery from exercise associated muscle cramping |
| 47. Nicol J | Serum electrolyte concentration and hydration status in runners with exercise associated muscle cramping |
| 48. Noakes TD | Pseudoephedrine is without ergogenic effects during prolonged exercise |
| 49. Olivier S | Institutional Review Boards and Scientific Progress |
| 50. Oosthuys T | Rate of plasma lactate clearance during passive recovery from high intensity exercise |
| 51. Ramathesele JR | The epidemiology of injuries in South African Senior School soccer players |
| 52. Scheepers K | The effect of endurance training on hypothalamic 5-hydroxytryptamine (5-HT) receptor function |
| 53. Schwellnus M | Abnormal patterns of knee medio-lateral deviation are associated with patellofemoral pain in cyclists |
| 54. Schwellnus M | Correcting lower limb kinematics decreases patellofemoral pain in cyclists |
| 55. Sibbald H | The effect of prophylactic dose of flurbiprofen on muscle damage and cardiovascular variables during submaximal exercise |
| 56. St Clair Gibson A | Cardiac performance in veteran squash players and runners during a routine stress ECG, Squash and Running |
| 57. St Clair Gibson A | Energy Expenditure of a non-contact boxing training session compared to submaximal treadmill training |
| 58. Stretch R | The heart rate response of cricket umpires to on-field events |
| 59. Terblanche E | An analysis of the HR-Vo2 relationship during free-range exercise in the laboratory |
| 60. Terblanche S | Effect of prophylactic dose of flurbiprofen on muscle damage and cardiovascular variables during submaximal exercise |
| 61. Van Heerden J | Morphology and intrinsic injury risk in schoolboy rugby |
| 62. Van Heerden J | Muscular “Fitness” and intrinsic injury risk in schoolboy rugby |
| 63. Viljoen D | The effect of URTI on exercise performance in distance runners |
| 64. Viljoen D | The treatment of Plantar Fasciitis and achilles tendonitis by maintaining ankle dorsiflexion using a night splint |
| 65. Vorana N | Recovery techniques: A comparison of rest, stretching and massage |
| 66. Weston A | Skeletal muscle enzyme activities in African distance runners |
1 PERSONALITY AND MOOD STATES IN ADDICTED AND NON-ADDICTED RUNNERS AND NON-EXERCISERS

CJ Bisson, SJ Anderson, R Farman.
University of Natal, Psychology Department, Pietermaritzburg, South Africa.

The research aimed to examine differences in personality and mood states in terms of negatively addicted and non-addicted marathon runners, using non-exercisers as a control group. Opportunity sampling was used to select 49 regular marathon runners, and 34 non-exercisers. Runners were assigned to a non-addicted and addicted group based on their scores on the Negative Addiction Scale of Balley and Balley. All subjects were required to complete a biographical questionnaire, the POMS and the MCMI. Data was analysed using ANOVA, discriminant function analysis. The results indicated the following: The POMS Vigno sub-scale (a measure of energy and positive affect), revealed a group difference, with non-exercisers displaying muscle deficits for two exercise groups. Global mood was found to be more disturbed for the non-exercisers than for the non-addicted runners. Although negatively addicted runners suggested a trend towards higher mood disturbance, this failed to reach statistical significance.

The scores on the MCMI revealed group differences for a number of personality dimensions (avoidant, dependent and schizotypal), as well as for clinical symptom dimensions (anxiety and dysthymia). Taken together the results suggest that runners with high negative addiction to running may manifest a strong tendency towards discrete personality trait pathology that may contribute to their not having the positive mood benefits of running and exercise. Implications for intervention in sport psychology aimed at modifying and accommodating such personality traits are discussed, as are suggestions for more refined research in the area of negative running addiction.

2 STERNOCLEIDOMASTOID MUSCLE: MIMIC OF MIGRAINE TYPE HEADACHES, DIZZINESS AND NEUROLOGICAL FALLOUT IN POST TRAUMATIC ATHLETES

Dr Brad Beira M. Tech: Chiropractic

In the absence of hard neurological and orthopaedic findings in patients who present with migraine type headaches with associated visual disturbances, nausea and dizziness following a fall of any sporting nature, the reader is well advised to palpate the sternocleidomastoid muscle (SCM) for myofascial trigger points. The SCM has both a sternal and clavicular division. Pain referred from active trigger points in the sternal division may radiate downwards over the upper part of the sternum. Homolateral distribution arching over the cheek, into the maxilla, over the supraorbital ridge and deep within the orbit originates from the midline of this division. Discomfort may be experienced in the external auditory meatus on the ipsilateral side. The quality of this pain is described as a deep ache. Retropharyngeal pain may also be reported. Trigger points in the upper portion of the sternal division refer pain into the occipital ridge behind the ear, to the vertex of the scalp with associated scalp tenderness. In addition to the nociceptive stimuli, excessive lacination, redefining of the conjunctiva, apparent piosis with normal papillary size and reactivity and visual disturbances occur on the homolateral side as a result of autonomic reactivity of this muscle division. Visual disturbances include not only blurring but also dimming of perceived light intensity and sometimes maxillary stimulation. Myofascial trigger points in the mid level of the clavicular division refer pain that extends across the forehead to the other side. The upper part of this division refers pain deep into the homolateral ear and the posterior auricular region. Poorly localized pain may be experienced in the ipsilateral nolar and check area. Photophobia, postural dizziness and less often vertigo result from proprioceptive myofascial feed back in this division. Syncope following sudden turning of the head may result. Discernible may occur separately from or be associated with the postural dizziness. Sudden falls or ataxia may result. Nausea is commonly accompanying. Trigger point examination including methods of palpation may be used to cover, Inteviewive measures include ischamtic compression, toe and stretch techniques, intramuscular injection. The findings and contraindications of each technique may be covered. Excess stimulation in treatment sessions and at home, postural modifications and activity stress procedures to conclude.
5 INTRAVASCULAR DEHYDRATION AND CHANGES IN BLOOD PRESSURE SEEN DURING ULTRADISTANCE MARATHON RUNNING

AJ Buntman, R Carter and G Mitchell. Department of Physiology. University of the Witwatersrand, Medical School, Johannesburg, South Africa

Exercise associated collapse (EAC) is caused by post-exercise hypotension. The hypotension is traditionally thought to result from either intravascular volume depletion or venous pooling. To assess these possibilities 8 male athletes (age 41 ± 7; mean ± SD) were evaluated before and after an ultradistance marathon for changes in blood and plasma volumes and changes in systolic blood pressure (SBP), diastolic blood pressure (DBP) and mean arterial pressure (MAP). Change in blood and plasma volume was estimated using changes in haematocrit and haemoglobin concentration. SDV, DBP and MAP were significantly lower after the race compared to pre-race values (141.3 ± 10.5 vs 106.4 ± 12.2 mmHg, 75.3 ± 7.4 mmHg vs 62.8 ± 11.2 mmHg and 91.8 ± 8.8 mmHg vs 76.6 ± 9.6 mmHg; P<0.05). Neither plasma volume nor blood volume was significantly changed (plasma volume increased by 1.4 ± 12.8%; blood volume decreased by 1.9 ± 3.9%). Mean cell volume was significantly decreased (88 ± 2.5 fl vs 87.1 ± 2.3 fl; p<0.05), indicating an intracellular to extracellular volume shift. Total body water (TBW), body mass and body mass index (BMI) were all significantly lower after the race. Serum osmolality remained unchanged. There were no statistically significant correlations between changes in plasma volume or in blood volume, and changes in blood pressure. This study indicates that athletes who collapse at the end of ultradistance races do so as a result of post-exercise hypotension secondary to venous pooling, and not as a result of intravascular volume depletion.

6 MODEL FOR THE PREDICTION OF OPTIMAL STROKE MECHANICS IN SWIMMERS

Dr Roderick Carter. Department of Physiology, University of the Witwatersrand, Johannesburg, South Africa

The speed of forward propulsion in any medium is determined by the product of stroke/stride frequency (SF) and stroke/stride length (SL). SF and SL are inversely related. Individual swimmers attain optimal swimming speed through unique combinations of SF and SL, dependent on both physical and physiological factors. Most swimmers select this combination subconsciously. It may be advantageous for both training and competition to be able to determine the optimal combination of SF and SL for an individual swimmer. A mathematical model is proposed in which the results of simple field tests may be used to predict the ideal combination of SF and SL, which result in peak swimming speed (PSS). Maximum effort sprints at variable SFs and SLs are timed over a known distance. A regression equation is determined for the SF:SL relationship (the “performance line”) describing the swimmers unique biomechanical characteristics. A line of equal gradient (the “peak performance line”) is constructed through the data point with the greatest positive deviation from the “performance line”. Differentiation of the equation defining the area of a rectangle subtending the “peak performance line” to maximise the area of the rectangle yields the individual swimmer’s FSS, and hence the optimal combination of SF and SL. The proposed model may be of value in providing swimmers with guidelines for determining their unique optimal stroke mechanics.

7 CARDIAC DRIFT DURING INCREMENTAL ROWING TESTS

I Chantler and R Carter. Department of Physiology, University of the Witwatersrand, Johannesburg, South Africa

Traditionally, laboratory rowing tests utilise incremental protocols with workloads varying between 1 and 8 minutes. The heart rates achieved in the tests are used to provide training guidelines for the athletes. In this study, heart rates were determined at the heart rate if insufficient time elapses during each step for a physiological plateau to be attained. Thirteen elite rowers (ten males and three females) underwent an incremental rowing test on a Concept II ergometer at 4 different workloads (low intensity, low-moderate intensity, moderate to high intensity and very high intensity). At all workloads heart rates were significantly lower after the race compared to pre-race values (131.3 ± 10.5 vs 106.4 ± 12.2 mmHg; P<0.05). Neither plasma volume nor blood volume was significantly changed (plasma volume increased by 1.4 ± 12.8%; blood volume decreased by 1.9 ± 3.9%). Mean cell volume was significantly decreased (88 ± 2.5 fl vs 87.1 ± 2.3 fl; p<0.05), indicating an intracellular to extracellular volume shift. Total body water (TBW), body mass and body mass index (BMI) were all significantly lower after the race. Serum osmolality remained unchanged. There were no statistically significant correlations between changes in plasma volume or in blood volume, and changes in blood pressure. This study indicates that athletes who collapse at the end of ultradistance races do so as a result of post-exercise hypotension secondary to venous pooling, and not as a result of intravascular volume depletion.

8 EXERCISE TOLERANCE AND SKELETAL MUSCLE FUNCTION IN PATIENTS WITH CARCINOMA: EFFECTS OF EXERCISE TRAINING

KL Coleman; M Emm; TD Noakes; A Smith; EW Derman UCT, Sports Science Institute of SA, Cape Town, South Africa

This study examined changes in exercise performance and skeletal muscle (SM) structure and function in 6 patients with carcinoma (Ca) following a 12wk training programme, immediately after completion of chemotherapy treatment. Prior to, and after the 12wk training programme, patients underwent i) graded exercise to exhaustion on a cycle ergometer for determination of peak oxygen consumption (VO2 peak) and peak workload (WLpeak) ii) isometric and isokinetic tests of SM strength and endurance iii) SM biopsies for light and electron microscopy analysis. Results were compared with those obtained from a sedentary, age and gender matched control group (C) tested on initiation of the study. Before training, VO2 peak (24.74 ± 2.39 vs 33.02 ± 4.74 ml/kg/m; p<0.05) was lower in patients with cancer (Ca) when compared with C. However WLpeak (147.50 ± 21.33 vs 185 + 25.25 W; p=NS) was not significantly different between groups. Peak torque generated in the quadriceps (PKTQ) corrected for lean thigh volume (LTV) (44.28 ± 4.45 vs 44.88 ± 5.24 Nm/L; p=NS) and total power (TP) in a 60 second isometric test of SM endurance (25.67 ± 6.31 vs 40.45 ± 8.1 W; p=NS) were not significantly different between groups, however TP tended to be lower in the patients with Ca (p=0.08). SM biopsies performed on the Ca group confirmed the phenomenon of cardiac drift during steady-state rowing tests lasting between 3 and 6 minutes. However, no significant further drift in heart rate occurs between the 6th and 8th minutes of an 8-minute stage, indicating a physiological plateau.

SPORTS MEDICINE MARCH 1997
Patients with COAD commonly experience fatigue and exercise intolerance which is thought to be due to pulmonary factors. However, few studies describe both the structural and functional status of SM in patients with COAD. This study examines 10 patients with moderate to severe COAD and 6 healthy controls for structural and functional abnormalities.

The patients were divided into four categories: 1) patients with obesity (n = 21); 2) endurance sports (n = 25); 3) strength/sprint sports (n = 10); and 4) non-participants (n = 33). The dependent variable being total work performed in the 20 repetitions (TW20) in a 60 sec isokinetic test (2113.08 ± 978.86 ± 364.19 J; p < 0.001) were all lower in patients with COAD. Furthermore, TW20 and peak blood lactate (5.29 ± 1.25 vs 10.71 ± 0.35 p < 0.001) were lower in patients with COAD when compared with C. Peak torque achieved during a 90 second isometric test was not different between groups (169.92 ± 21.82 vs 217.75 ± 24.17 N; p < 0.05) before or after correction for lean thigh volume (LTV) when TW20 was corrected for LTV values tended to be different between groups (766.73 ± 101.24 vs 978.80 ± 114.78 J/L; p < 0.05). Profound histological and ultrastructural abnormalities were found in all SM biopsies from patients with COAD. Abnormalities included: Type II fibre atrophy, Type I fibre hypertrophy, necrotic fibres and diffuse mitochondrial abnormalities. These data support the hypothesis that severe SM structural abnormalities are present in patients with COAD (i) and functional abnormalities are present in tests of SM endurance in patients with COAD (ii) and (iii) these SM structural and functional abnormalities may play a role in exercise intolerance in patients with COAD.

The purpose of this investigation was to evaluate popular methods for determining in vivo skeletal muscle (quadriceps) concentric fatigue resistance (FR) on an isokinetic dynamometer. The study was divided into two parts. Part 1: The records of one hundred and four patients (88 M, 22 F) were analysed retrospectively. All patients had been tested on a Cybex 340 dynamometer. The protocol included 4 serial repetitions at 60/°, and 20 serial repetitions at 180/°, for unilateral knee ext/flex. Only the results of the uninvolved limbs were analysed. Patients were placed into four categories: 1) endurance sports (n = 21); 2) strength/sprint sports (n = 10); and non-participants (n = 33). The dependant variable being total work performed in the 20 repetitions (TW20). PTQ (N.m) 60/° (P00), PTQ (N.m) 180/° (P180) correlated significantly (p < 0.01) in all groups (0.6244-0.8763) and/or (0.1989-0.3919) respectively. Endurance ratio (ER) did not correlate significantly (p = 0.05) in any group (0.008-0.3919). Multiple linear regression (MLR) for pooled data found Sample 1 and 2 explained 98.70% of the variation in TW20. Part 2: Fourteen patients (7 M, 7 F) were recruited and tested according to the above protocol and an additional protocol- 10 sets of 10 repetitions @ 180/°, with 8 seconds between sets. A logarithmic function [Joules = A + B.log (Set number)] was used to obtain a FR measure (B); gradient and strength measure (A; y-intercept). B and A correlated significantly (p < 0.01) with P00 (0.9513 and 0.8886-0.9499 respectively). Identical correlation patterns as for the retrospective analysis were found. MLR for both protocols, found Sample 2 (Joules) explained 99.47% of the variation in TW20. Furthermore, B and A explained 92.79% of the variation in TW20. Total work for 100 repetitions could be predicted by B and A (0.9927%). These data suggest firstly that the popular measures of FR, ER, is not a valid measure of the resultant work performed in 20-100 repetitions, by itself, is not a measure of fatigue resistance. Thirdly, the use of correct terminology is advocated.
Despite publicity of the side effects and possible dangers of various medications on the athlete during prolonged vigorous exercise, it is beleived that medications are still widely prescribed immediately prior to sporting events. The purpose of this study was to determine the patterns of prescribing medications by team physicians during the 1996 African Cup of Nations Soccer Tournament. As part of the FIFA & IOC drug testing procedure, the team physicians of the 15 teams were asked to complete a questionnaire prior to each match. Each of the 16 squad members was listed and any medications prescribed prior to the match, injury or illness, were taken per rectum in the 72 hr period preceding the match was declared by the physician. 82 matches involving 544 player/match exposures occurred during the tournament. Non-steroidal anti-inflammatory medications (NSALDS) were the most commonly prescribed medications (31%) of players having ingested these agents in the period prior to the match. Of the NSALDS diclofenac was the most common (19%), followed by ibuprofen (6.5%), indomethacin (3%), piroxicam (2.7%) & aspirin (0.7%). 11% of players ingested paracetamol and 2% ingested piroxicam. Pre-match preparations in both groups 3.8% of players were ingesting antibiotic medications. Vitamin and mineral supplement-ation was also very common with 30% of players ingesting a multivitamin, 11.7% ingesting creatine, 4% ingesting magnesium supplementation, 5.6% ingesting insulin, 3% ingesting guarana, 1% ingesting synephrine, 0.4% ingesting iron supplementation, 0.2% vitamin C and 0.2% chromium picolinate. Other medications declared included nasal decongestants (1.8%), anti-diarrhoea medication (1.3%), laxatives (0.4%), anti-histaminics (0.4%) and hydrocortisone cream (0.4%). At four occasions diclofenac and paracetamol was prescribed for the entire squad twice daily for the three day period between matches. At seven occasions more than one NSAID was prescribed for a player. These results suggest: i) prescribing habits vary greatly prior to competition; ii) NSALD and analgesic use/abuse is very common during international soccer competition; iii) medications are not without significant side effects; improved dissemination of knowledge regarding the use of these agents should be directed at both the team physicians and players.

18 THE EFFECTS OF ACBUTELOL ON EXERCISE TOLERANCE, SKELETAL MUSCLE RECRUITMENT AND FUEL SUBSTRATE UTILIZATION DURING EXERCISE OF VARYING INTENSITIES


Previous research has indicated that ingestion of beta-blockers adversely affect the exercise performance tolerance of physically active hypertensive patients. It has been postulated that this effect is due to altered metabolic response to prolonged submaximal exercise. The effects of acbutelol (A), a betal-selective blocker with intrinsic sympathomimetic prop-erties, on exercise responses during muscle function and metabolism during prolonged exercise are unknown. In a double blind placebo (P) controlled trial, we determined the effects of A (400 mg daily for 7 days) in 7 healthy volunteers on i) cardiorespiratory, ii) plasma lactate ([La], glucose [G], and free fatty acid concen­trations ([FFA]) and iii) skeletal muscle electronomyographic activity (EMG) during incremental submaximal exercise at 30, 50, and 70% of their relative Peak Power Output (PPO) at 15, 30, and 45 minutes respectively. Thereafter workload was increased every minute by 15 Watts to exhaustion to measure PPO. During submaximal exercise, subjects showed significant differences in heart rate (HR) and systolic blood pressure (SBP) (p < 0.01) A vs P. Following ingestion of P, subjects achieved significantly (p<0.05) higher PPO in contrast to A. [La] concentrations between treatments were not different; however lower concentrations of [G], (p < 0.05) of 0.3 ± 0.2 vs. 4.5 ± 0.2 mmol/l were found at rest and during exercise, [FFA] concentrations at rest, 12 min and 21 min were similarly lower following ingestion of A (p < 0.05; vs P). No significant difference was found in total carbohydrate (CHO) oxidation, glucose oxidation, and estimated muscle glycogen. Changes between treatments were observed in rate of perceived exertion and integrated EMG activity after 30 minutes of submaximal exercise. These findings suggest that i) A is effective in decreasing SBP and HR during submaximal exercise, ii) exercise tolerance is decreased following ingestion of A, iii) both A and (even in low doses) have a similar effect on the metabolic responses during A. iv) CHO oxidation is decreased following ingestion of A. However, CHO oxidation during exercise is unaltered following ingestion of A.

16 KNOWLEDGE ATTITUDE, AND NUTRIENT INTAKE OF ELITE SPORTSMEN AND -WOMEN (19-25 years old) IN POCHESTROOM

Anna du Plessis, PU for CHE, Potchefstroom, RSA.

Little is known about knowledge, attitude and nutrient intakes of South African sportsmen and women, while nutrient supplementation is thought to be highly underutilized. This cross-sectional study including 143 subjects, knowledge and attitude were investigated by means of validated questionnaires. Nutrient intakes were measured by means of a validated food frequency questionnaire. Nutritional status was determined by the physical activity index as well as anthropometric measurements. A pilot study (n=10) was conducted to determine the reliability of all instruments used. The results indicated that 80% of the subjects reflected inadequate diet-related knowledge; only 8.5% subjects reflected a positive attitude towards diet and 85% were taking dietary supplements. Most of the subjects did not meet their recommended diet allowances. Their nutrient intakes were characterized by elevated protein, fat and cholesterol intakes, as well as inadequate carbohydrate intakes. This dietary pattern was related to inadequate micronutrient intakes. Anthropometric deviations from published normal ranges occurred more frequently among male sports participants. Therefore, this study indicated that elite young sportsmen and women manifested inadequate nutritional intakes on inadequate knowledge and negative attitudes towards sports nutrition. The prominent "compensatory" role of supplements, underlined the highly underutilized role of dieticians and the high risk of suboptimal performance and health hazards, even among elite sportsmen and women in this study.
17 THE CARNITINE STATUS OF ATHLETES PREPARING FOR AN ULTRAMARATHON OF 90 KM
Du Plooy WJ, Kahler CP, *Kennedy R.
Department of Pharmacology and **Human Nutrition, Medunsa, South Africa.

Carnitine supplementation before or during exercise failed to show any improvement in exercise performance in humans. A deficiency of carnitine can affect their exercise performance. Although data is available for normal subjects, resting athletes none is available for athletes training for a running endurance event of 90 km. The aim of this study was to assess the carnitine status of such athletes over a 45-week period. Ten athletes volunteered for the assessment. A group of 10 sedentary individuals served as controls. Blood samples for total carnitine, acetyl carnitine, free carnitine, cholesterol, triglycerides and related parameters were collected every 8 weeks up to 2 weeks prior to the event. Body mass index and percentage body fat were also measured. Questionnaires reflected medication, disease and training were collected weekly. The percentage body fat of two athletes with the highest kilometre training distance decreased with 12 and 13% respectively. The bound carnitine (acetyl carnitine fraction) remained constant in the control group. Thus, a study was conducted to compare the efficiency to absorb impact forces, as well as the rebound characteristics of four types of cricket batting pads (P1, P2, P3 and P4) at four impact velocities: Slow-medium (S1), Fast-medium (S2), Fast (S3) and Express (S4). The impact forces were measured using the drop test (Nigg 1990) where a weighted ball was dropped vertically onto the surface of the batting pads with the vertical forces measured by a Kistler piezoelectric multicomponent force platform type 9281 A1. The rebound characteristics were determined by measuring the horizontal distance (m) the ball rebounded off the pad when delivered from a bowling machine at the four velocities. A two-way analysis of variance, with Tukey's method of multiple comparison, was used to test for significant differences (P<0.05) between the pads at the four impact velocities. When evaluating the impact forces it was found that P1 provided significantly less protection than all the other pads at the four velocities with the exception of similar results to P4 at S2. Further, at S1 and S3, P2 was significantly better than P3 and P4 and was significantly better than P4. At S2, P2 was significantly better than P2 and P4. At S3, P2 was significantly better than P4. At S4, P2 and P3 showed similar results which were significantly better than P4. When comparing the rebound characteristics, the results showed significant smaller rebound distance for P1 at all the velocities. The differences in the force absorption and rebound characteristics were due to the differences in the structure and composition of the protective part of the batting pads. The results show an inverse correlation between the ability to absorb force and the rebound distance after the ball has struck the pads, something that the manufacturers need to address.

18 THE FORCE ABSORPTION AND REBOUND CHARACTERISTICS OF CRICKET BATTING PADS
DE du Toit*, R Stretch**, and T Edwards*
*Department of Human Movement Science, University of Port Elizabeth
**Sport Bureau, University of Port Elizabeth

Impact injuries in cricket, although not reaching alarming proportions, are on the increase. The cricket player needs to ascertain the demands on acyl transport during oxidative metabolism, but it is unclear which degree of carnitine deficiency would impede endurance performance.

19 THE EFFECT OF A LOW INTENSITY AEROBIC EXERCISE PROGRAM ON PATIENTS USING ANTIDEPRESSANTS
DE du Toit*, S Roux**, and N Hurt**
Department of Human Movement Science, University of Port Elizabeth
Department of Biochemistry, University of Port Elizabeth

Determining the effectiveness of aerobic exercise in the control of the adverse effects of use of antidepressant medication is due to the common complaint of cognitive decline associated with pharmacological treatment for major affective disorders (Garland, Remick and Zis, 1988; Russ and Ackerman, 1988; Rant and Duke, 1991 and Stamm, 1992). The aerobic exercise program for the subject on antidepressant medication must be non-adaptive with regards to intensity, frequency and duration of training. The aims of this study were to determine the capabilities of the subjects is a certain path to nonadherence (Brownell, 1984). Factors such as, insulin, cholesterol levels and metabolic rate which effect body composition were taken into consideration, while the skinfold, circumference and mass measurements were monitored to determine the effectiveness of aerobic exercise. The intensity of the exercise program was determined according to the workload corresponding to a respiratory quotient of just below 0.85. The duration of the aerobic exercise session was 35 minutes and performed 3 times per week over a period of 12 weeks. The heart rate decreased consistently (P<0.05), while the blood pressure remained relatively stable. The mean insulin levels of the experimental group decreased through significantly 90 minutes after glucose ingestion over the 12 weeks, but the corresponding decrease in the control group increased. All the patients exhibit higher than normal total cholesterol and LDL levels. The study of benefit since the exercise group had a mean loss of 0.986 mmol/l for cholesterol and 0.007 mmol/l for LDL, while the non-exercise group had a mean increase of 0.05 mmol/l for cholesterol and 0.04 mmol/l for LDL. Over 12 weeks the control group displayed a constant increase in skinfolds for the triceps, subscapula and medial calf. This emphasizes that the mass gain is an increase in adipose tissue. The non-exercising group also showed an increase of 4.286 cm around the waist over this period. The waist-to-hip ratio increased consistently from 0.94 to 0.97 in the non-exercising group while the waist-to-hip ratio for the exercising group remained constant. This emphasizes the positive effects of low intensity aerobic exercise for patients utilising antidepressants.

20 POLLUTION, WATER CONTACT AND "DUSI GUTS"
Foreman S and Mars M. Dept. of Physiology, University of Natal Medical School, Durban, South Africa.

The Msindusi canoe marathon has always been associated with post race illness, "Dusi Guts". Severe flooding in Pietermaritzburg in the week preceding the 1996 race raised facal coliform counts in the river to high levels. There appeared to be a higher than usual incidence of race associated illness and infection. The aims of this study was to determine the incidence of illness and infection, the relationship of water contact with illness, and to provide guidelines for participants of future Dusi's raced in flood years. Four weeks after the race, a questionnaire was sent to all competitors, (149) and infected wounds (113) being most common. 20% of all respondents required treatment by a doctor. There was no difference in the incidence of illness or infection between those who fell out of their canoes during the race and those who did not, nor was there a relationship between the number of weeks paddler fell out and subsequent illness. Relative canoeing experience and competitive grading were also not related to illness. While the A grade paddlers fell out significantly less often than the E grade paddlers (P< 0.0001) there was no difference in the incidence of illness in the grades. The facal coliform levels in the race days were up to 30 times higher than the level deemed high risk, in South Africa and 150 higher than the levels set by the European Economic Community. E. coli counts repeated at the same sites during the race showed large daily variation. The acceptability of water for recreational purposes in South Africa is set at 8 illnesses per 1000 swimmers. For this race the index was 4600/1000 participants and 600/1000 competitors who fell out during the race. In summary, in flood years, there is an almost 80% chance of suffering some form of illness when purchasing water for recreational purposes. The ratio of race related illness and infection, the relationship with the use of waste by canoers, the change in incidence and the effect of non-adherence on drug treatment. The pollutant and washing out effect of rain during the race makes pre-race prediction of pollution levels very difficult. Further studies are required to compare these findings with non flood race years.
21 LOW POST-RACE MARKERS OF LIPID PEROXIDATION IN ULTRAMARATHON RUNNERS WITH HIGH ANTI-OXIDANT STATUS.

EM Patte-Peters*, RD Anderson**, AJ Theron**, TJ Noakes. *Division of Physical Education, University of Witwatersrand, Johannesburg **Institute for Pathology, Department of Immunology, University of Pretoria ***MRC Bioenergetics of Exercise Unit in the Sport Science Institute of South Africa, Medical School, University of Cape Town

Previous studies conducted by our group have shown a significantly reduced post-race infection incidence following supplementation with anti-oxidant nutrients during the three weeks prior to the 1996 Comrades Marathon. Ten successful participants (9 men, 1 woman. X age: 34±11 yrs) in the 1996 Comrades Marathon were monitored 18hrs before and within one hour following completion of the 90 km running event in order to establish their post-race anti-oxidant status and relate this to markers of immediate post-race free radical production and the incidence of infection symptoms occurring during the post-race fortnight. Twenty-four hour pre-race dietary recalls and analyses of intakes nutritional supplements revealed a mean total daily Vit C intake of 40±578.4mg on the day preceding the race, while plasma Vit C levels rose significantly (p<0.05) from 16.5 (±2.9) pre-race to 21.9 (±5.0)ug.mL-1 post-race. Pre-race plasma Vit E levels (X=8.89±1.38mg.mL-1) failed to show a consistent rise or fall following completion of the 90 km event, whereas pre-race beta-carotene levels (X=94.6±28.5mg.mL-1) dropped significantly (p<0.05) to 28.1 (±8.9)mg.mL-1 post-race. It is not conceivable an absolute post-race neutrophilia (X=86.3%) in each of the subjects, quantification of lipid peroxidation levels by colorimetric measurement of methylene blue in serum samples revealed little evidence of the accumulation of free radical post exercise. This marker of lipid peroxidation rates did not rise significantly (p>0.05). The significant, but small rises in C-Reactive Protein (from 1.3±2.4mg.L-1 pre-race to 3.4±2.2mg.L-1 post race) indicate lesser inflammatory response than previously reported in the literature. Only one subject reported symptoms of Upper Respiratory Tract Infection during the post-race fortnight. This study reveals a possible protective effect of high pre-race plasma anti-oxidant status against previously reported free radical damage following participation in prolonged competitive running events.

22 EFFECTS OF HIGH INTENSITY EXERCISE ON LYMPHOCYTE DNA AND PLASMA VITAMIN C.

Govender SN, Buus S, Westona A, Chuuturgoon A, and Mars M. Department of Physiology, Faculty of Medicine, University of Natal, Durban, South Africa

Hartmann et al. recently described a chance observation of DNA strand breaks in lymphocytes following short duration, high intensity exercise to exhaustion in 1 of 3 subjects of differing fitness levels. If this is a consistent finding in trained individuals it may provide further insight into changes in immune status with overtraining. The aim of this study was to determine the relative frequency of DNA strand breaks in lymphocytes in trained individuals following a single bout of exercise to exhaustion, and to examine associated changes in plasma vitamin C concentration. Eleven subjects in regular training were subjected to a ramped treadmill run to exhaustion. They were asked not to exercise for 48 hours preceding the test and for 48 hours after the test. Venous blood samples were collected before and immediately after exercise, and 24 hours and 48 hours after exercise. Vitamin C concentration was determined by the 2,4-dinitrophenylhydrazine method while the single cell gel electrophoresis (SCGE) assay was carried out on all blood samples to determine DNA strand breaks. Immediate post exercise samples showed DNA damage in lymphocytes of all subjects as evidenced by fluorescent strands of DNA outside the cell. DNA strand breaks were observed in subsequent samples. In the pre-exercise sample, DNA was visualised as a central core whereas in all samples taken after exercise, DNA was found located around the periphery, or confined to one pole of the cell. Vitamin C levels showed a significant decrease immediately after exercise which returned to baseline levels after 48 hours. This did not correlate with DNA damage. In summary exhaustive high intensity exercise produced changes in DNA in lymphocytes lasting 48 hours in all subjects. The different pattern of DNA distribution observed in lymphocytes following exercise has not previously been reported. Further studies are required to determine the fate of the lymphocytes, do they die or do they undergo a reparative process, and is this damage the same in all lymphocyte subsets?

23 A CONSERVATIVE APPROACH OF GRADE II & III LATERAL LIGAMENT ANKLE INJURIES.

JHB Hattingh, Dr JI Hugo. Potchefstroom, S.A.

Research project over a three year period was done on grades II and III lateral ligament injuries of the ankle. The aim of the study was to establish a standardized, dynamic, conservative multi-disciplinary rehabilitation regime. The program followed consisted of standard treatment and covered the phases from the onset of the injury until the patient returned to competitive sport. The study included 216 patients, 156 male and 60 female, of ages varying between 16 and 40 years with the mean age 22.7 years. Sports background: hockey, rugby, squash, netball, cricket, track and field. Criteria of acceptance: first injury, no fractures, Brustrom grades II-III, intact inferior tibiofibular joint, medial ligament intact, injury seen by the medical team within 48 hours. After thorough initial examination the patient during the first 48 hours was to address swelling, immobilize the ankle and relieve pain.

Rehabilitation by means of both physiotherapy and biokinetik. During the first phase we mainly addressed swelling, pain and activity. In the second phase the emphasis was on mobility. The aim of third phase was to clear the injured joint and to prepare the patient to return to competitive sport. At the end of the third phase the patient had to pass a sport-specific fitness test. During the study the following complications one noted: 11 gutter syndromes and four medial tarsal syndromes. Ten weeks post-injury the patients underwent a final examination where six patients still complained of pain in the ankle during exercise. They were all referred to an orthopedic surgeon and eventually all underwent ankle orthoscopy. Of the six, four were diagnosed as suffering from medial tarsal syndromes and two from gutter syndromes. The most important outcome of this study was the fact that 97.9% of the patients returned to competitive sport after six weeks.

24 DELAYED MUSCLE SORENESS IN SPRINT ATHLETES.

JHB Hattingh. University of Pretoria, PU FOR CHE

In this study the appearance of delayed muscle soreness was determined after repetitive sprint events in male and female athletes. The effect of post-exercise sports massage on the athletes’ lower limbs was also evaluated. Kinesiology studies were done on day 1 and 5 after the events by making use of the “Akeron” isokinetic apparatus as well as the Bussau Padama to evaluate the torque in the 90°Ankle flexion phase. Despite power and reaction time. Flexibility studies were also done with the stretch apparatus. Delayed muscle soreness was established in a mild form, but only in specific muscle groups, namely the prime movers in sprint running. Sports massage was advantageous, but also more to the prime movers. The massage technique as applied in this study seems to be advantageous to sprint athletes in improving their performance.
This study compared the effects of supplementing the normal diets of 6 trained cyclists with additional carbohydrate (CHO) on muscle glycogen utilisation during a 1 h cycle time-trial (TT). Using a random crossover design, subjects consumed either their normal diet (NORM) for 3 d (426 ± 137 g CHO (5.9 ± 1.5 g kg\(^{-1}\) body mass, BM) or additional CHO (SUPP) to increase their intake to 661 ± 76 g CHO (9.3 ± 0.7 g kg\(^{-1}\) BM). SUPP elevated muscle glycogen content from 459 ± 83 to 565 ± 62 mmol kg\(^{-1}\) d.w. (P<0.05). However, despite the increased pre-exercise muscle glycogen stores, there was no difference in the distance cycled during the TT (40.41 ± 1.44 km vs. 40.18 ± 1.76 km h\(^{-1}\) for NORM and SUPP respectively). During NORM, muscle glycogen declined from 459 ± 83 to 175 ± 64 mmol kg\(^{-1}\) d.w., whereas with SUPP the corresponding values were 565 ± 62 and 292 ± 113 mmol kg\(^{-1}\) d.w. Accordingly, both muscle glycogen utilisation (277 ± 64 vs. 273 ± 114 mmol kg\(^{-1}\) d.w.) and total CHO oxidation (109 ± 20 vs. 165 ± 30 g kg\(^{-1}\) min\(^{-1}\) for NORM and SUPP respectively) were similar. The results of this study show that when well-trained subjects increase the CHO content of their diet for 3 d from 6 to 9 g kg\(^{-1}\) BM, there is only a modest increase in muscle glycogen content. As supplementary CHO did not improve TT performance, we conclude that CHO loading has no beneficial effect for performance for athletes who compete in intense, continuous events lasting 1 h. Furthermore, the substantial muscle CHO reserves at the termination of exercise indicate that muscle glycogen depletion does not determine fatigue at this exercise intensity and duration.

26 PROFILE OF INJURIES AT THE DUSI CANOE RACE
Dr MJ Heystek, REK Kirkby. Department of Family Medicine, University of Pretoria.

The Dusi Canoe race is a three day endurance event over 120 km. The medical support consisted of a medical tent at the end of each stage and 3 field stations on the route next to the river. The main objective of this study was to describe the type of injuries sustained by the participants during this event. A prospective descriptive study was undertaken at the 1997 Dusi. Each participant who reported to the medical tent or field station were included in this study. Over the 3 days 220 participants were treated, 128 the first day, 74 the second day and only 18 on the last day. The most frequent encountered problems were: 1) abrasions on the hands, arms and legs (n = 55) 2) muscle spasms of the neck, shoulders and back (n = 44) 3) tendonitis (n = 14) 4) cramps n (13) 5) ankle ligament injuries (n = 11). The most serious injuries were a suspected ankle fracture and a big laceration over the popliteal area. The injuries (n = 11). The most serious injuries were a suspected ankle fracture and a big laceration over the popliteal area. Over the 3 days 220 participants were treated, 128 the first day, 74 the second day and only 18 on the last day. The most frequent encountered problems were: 1) abrasions on the hands, arms and legs (n = 55) 2) muscle spasms of the neck, shoulders and back (n = 44) 3) tendonitis (n = 14) 4) cramps n (13) 5) ankle ligament injuries (n = 11). The most serious injuries were a suspected ankle fracture and a big laceration over the popliteal area. Over the 3 days 220 participants were treated, 128 the first day, 74 the second day and only 18 on the last day. The most frequent encountered problems were: 1) abrasions on the hands, arms and legs (n = 55) 2) muscle spasms of the neck, shoulders and back (n = 44) 3) tendonitis (n = 14) 4) cramps n (13) 5) ankle ligament injuries (n = 11). The most serious injuries were a suspected ankle fracture and a big laceration over the popliteal area. Over the 3 days 220 participants were treated, 128 the first day, 74 the second day and only 18 on the last day. The most frequent encountered problems were: 1) abrasions on the hands, arms and legs (n = 55) 2) muscle spasms of the neck, shoulders and back (n = 44) 3) tendonitis (n = 14) 4) cramps n (13) 5) ankle ligament injuries (n = 11). The most serious injuries were a suspected ankle fracture and a big laceration over the popliteal area.

28 ANNUAL INCIDENCE AND RISK FACTORS FOR ROCK CLIMBING INJURIES IN SOUTH AFRICA
Holzhausen L-M, Parry C, Constant D, Schwellnus M. University of Cape Town Medical School, South Africa.

The aim of this study is to determine the composition of the climbing population in South Africa, the prevalence of injury amongst this population and some of the possible risk factors for injury. Data collection, by means of a self-administered questionnaire, addressed the climbers' personal details, grade/experience of climbing; the hours of climbing done; climbing style/technique; training sessions; and warm-up and stretching activities. Climbers also reported on any injuries sustained during the period January 1992 to December 1992 that could be attributed to their climbing. Two hundred and seven climbers (male 87.4% and female 12.6%) responded (response rate 21%). The annual incidence of injury was 41.7%. Bivariate analyses of injured climbers (I) versus non-injured climbers (N) indicated a significant difference (P<0.05) in those who climb at grades >96 (I = 8, N = 21 climbers); climb more days per month (I = 9, N = 6 days); climb more hours per day on weekdays (I = 2, N = 1 hrs); do more hard rock (sport) climbing (I = 60, N = 32%); do more overhang climbing (I = 18, N = 11 hrs on formal training (I = 18, N = 11 hrs); do more outdoor training on rock (I = 31, N = 11%); and spend more time on warm-up (I = 7, N = 4 min) and stretching exercises (I = 3, N = 4 min). Discriminant analysis identified four variables that could distinguish between the injured and non-injured groups: grade of climbing < 20 (Wilkes'\(\Lambda\) = 0.847, p = 0.0000), formal training on outdoor rock face (Wilkes'\(\Lambda\) = 0.783, p = 0.0000), days per month spent climbing (Wilkes'\(\Lambda\) = 0.744, p = 0.0000), and percent of time spent on hard rock (sport) climbing (Wilkes'\(\Lambda\) = 0.724, p = 0.0000). These four variables correctly classified climbers as having sustained injuries in 72.8% of cases. In conclusion we have found the annual incidence of South African climbing injuries to be 41.7% a figure in keeping with other highly competitive sports. More experienced climbers, climbing at higher grades, more often per week and per month, on more off-the-vertical, overhanging outdoor rock walls are more likely to sustain injury.
The aim of this study was to investigate the anatomical distribution, nature, mechanism and severity of injuries in rock climbers. Questionnaires were mailed to eighty-five climbers who had indicated in an initial survey that they had sustained injuries attributable to a climbing activity. Fifty-one climbers (60%) reported a total of 85 injuries. The anatomical distribution of these injuries was as follows: digits (42%); elbow (11%); shoulder and ankle (7% each); arm, foot and back (4.7% each); forearm (9.5%); vertebral column, pelvis, thigh, knee, wrist and hand (2.4% each). The nature of these injuries was of sudden onset in 60% of cases and of gradual onset in 40% of cases. Very few sudden onset injuries represented fractures (8%) or dislocations (5%). These bony injuries were sustained during falls from the climbing surface. The majority of injuries were reported as muscle strains and tears, ligament sprains, and tendonitis. Sixty-seven percent of climbers with sudden injury indicated that a specific climbing move could explain the mechanism of injury. Severity of these injuries, as assessed by climbing days lost, averaged 58 days (std = 84, range = 0 - 400 days). We conclude that injuries sustained whilst climbing affect mainly the upper limb (78%) with the digits (32%) and the elbow (11%) predominating. They are more likely to be acute than chronic injuries and more commonly involve soft tissues than bones. In most cases of sudden onset injury, the mechanism of injury can be explained by a specific climbing manoeuvre. The range of injury severity is very wide with most injuries averaging 7 weeks in lost climbing days. This figure is in keeping with time to healing for most soft tissue injuries.

Multiples linear regression analysis was done to determine whether or not significant relationships existed between the grip type and level of muscle activity and the type of wall (overhang or vertical) that was climbed. In the first analysis the interaction between muscle and wall (25 terms) was added to the model, 46% (r=0.678) of the variance of the dependent variable could be accounted for (F=5.44, df=39 and 287, p<0.001). When the climber-muscle interaction (25 terms) was added to the model, 46% (r=0.678) of the variance of the dependent variable could be accounted for (F=5.44, df=39 and 287, p<0.001). This suggests that differences in technique between different climbers are possible even when the same grip is used. When muscle-grip interaction (54 parameters) was also added to the model, 56% (r=0.749) of the variance of the dependent variable could be accounted for (F=7.57, df=14 and 287, p<0.001). The interaction between muscle and wall made no meaningful improvement to the model. In conclusion, high levels of electrical activity were found in the forearm muscles under all conditions tested. The regression analysis revealed that forearm muscle EMG in rock climbing is influenced by the type of grip used, the muscle being sampled, the individual climber and the wall.
The aim of this study was to determine the retention of increased range of motion (ROM) over 24 hours after a single static stretching session of 30 seconds duration and repeated 3 times. Hip joint ROM (in degrees), using surface EMG activity to determine the end-point, was measured before the stretching session, immediately after the stretching session, and at 1, 2, 3, 4, 5, 6, 12 and 24 hours after the stretching session. Analysis of results showed a significant difference (p<0.05) between the pre-stretch ROM (92 ± 12') immediately after (106 ± 12') and at 1 (108 ± 12'), 2 (104 ± 13'), 3 (104 ± 11') and 4 hours (103 ± 11') post stretch. A significant difference (p<0.05) was also found between the immediate post stretch ROM (106 ± 12') and the 12 (94 ± 12') and 24 hours (93 ± 12') post stretch measurements. These findings indicate that increased ROM after the optimum static stretching session was retained for only 4 to 6 hours. In conclusion, this study indicates that after a static stretching session (30 seconds x 3 repetitions) the increased ROM is retained for up to 6 hours only. Stretching programs, using the static stretching technique, should therefore be modified so that stretching sessions are conducted 3 to 4 times per day.

This study compared the effects of the addition of a 10 wk HIT session, n=9), to continued conventional aerobic exercise @ 50-70% VO2max (CONT; n=10), for 3 to 4 times per day. The aim of this study was to determine the retention of increased range of motion (ROM) over 24 hours after a single static stretching session of 30 seconds duration and repeated 3 times. Hip joint ROM (in degrees), using surface EMG activity to determine the end-point, was measured before the stretching session, immediately after the stretching session, and at 1, 2, 3, 4, 5, 6, 12 and 24 hours after the stretching session. Analysis of results showed a significant difference (p<0.05) between the pre-stretch ROM (92 ± 12') immediately after (106 ± 12') and at 1 (108 ± 12'), 2 (104 ± 13'), 3 (104 ± 11') and 4 hours (103 ± 11') post stretch. A significant difference (p<0.05) was also found between the immediate post stretch ROM (106 ± 12') and the 12 (94 ± 12') and 24 hours (93 ± 12') post stretch measurements. These findings indicate that increased ROM after the optimum static stretching session was retained for only 4 to 6 hours. In conclusion, this study indicates that after a static stretching session (30 seconds x 3 repetitions) the increased ROM is retained for up to 6 hours only. Stretching programs, using the static stretching technique, should therefore be modified so that stretching sessions are conducted 3 to 4 times per day.

The aim of this study was to determine the retention of increased range of motion (ROM) over 24 hours after a single static stretching session of 30 seconds duration and repeated 3 times. Hip joint ROM (in degrees), using surface EMG activity to determine the end-point, was measured before the stretching session, immediately after the stretching session, and at 1, 2, 3, 4, 5, 6, 12 and 24 hours after the stretching session. Analysis of results showed a significant difference (p<0.05) between the pre-stretch ROM (92 ± 12') immediately after (106 ± 12') and at 1 (108 ± 12'), 2 (104 ± 13'), 3 (104 ± 11') and 4 hours (103 ± 11') post stretch. A significant difference (p<0.05) was also found between the immediate post stretch ROM (106 ± 12') and the 12 (94 ± 12') and 24 hours (93 ± 12') post stretch measurements. These findings indicate that increased ROM after the optimum static stretching session was retained for only 4 to 6 hours. In conclusion, this study indicates that after a static stretching session (30 seconds x 3 repetitions) the increased ROM is retained for up to 6 hours only. Stretching programs, using the static stretching technique, should therefore be modified so that stretching sessions are conducted 3 to 4 times per day.

We have recently shown that patients with chronic LBP have decreased IEMG activity of the erector spinac"muscles, lower heart rates (HR) & increased perception of comfort (ROC) when lying on a locally designed, 3-degree contoured, lumbar body support (LBS) compared with a regular flat surface mattress (CM). In order to determine a mechanism for these effects, we studied patients with LBP after an acute, random order, 30 min exposure to 4 sleep surfaces: LBS, CM, a low density, flat, Egg Box Foam Mattress (EBM) and a Polycellure-Shape Mould (PM). At the time of the study the LBS patients were divided into 2 groups: i) LBS, EBM & CM (n=10) & ii) LBS, PM & CM (n=10). Each patient acted as his/her own control. Recordings of IEMG activity, HR & ROC were measured at 5 min intervals for each patient. At baseline, patients were included only if deep palpation of the erector spinac muscle elicited pain. After acute exposure to the LBS, average HR (± 13 b/min over the 30 min period (58.72 ± 3.87; b/min; P<0.05), but was unchanged for the EBM and CM groups (68.83 ± 4.02; b/min) & (68.82 ± 3.78; b/min). Average ROC reported after acute exposure to the LBS was significantly improved (1.86 ± 0.33; P<0.05), compared to the two control groups. After exposure to the EBM (4.22 ± 0.43) & CM (4.6 ± 0.67). Average IEMG measurements were significantly reduced on the LBS (3.83 ± 0.76; b/min; P<0.05) compared to the CM (13.81 ± 2.16; b/min) and EBM (16.44 ± 2.50; b/min). ii) After the second group of patients had performed their HIT, they were switched to LBS, EBM or CM and received similar interventions to those given in the first group. The primary aim of this study was to investigate the effect of the height of leg lift at a given, commonly used step rate. Subjects (n=15) were divided into three groups: i) CM; ii) EBM and iii) LBS, with all groups undertaking a familiarisation session prior to completing the test. Workloads on the treadmill were 100, 120, 160 and 200 steps/ min with a 15cm leg lift and a final workload at 120 steps/min with a 90° leg lift, with pace maintained by metronome. The first workload was maintained for 5 mins and all subsequent workloads for 3 mins, with recordings made for analyses in the last 30 sec of each workload. Five treadmill workloads were selected for each subject to give a similar range of heart rates to those achieved on the mini-trampoline. Immediately after the 5th workload, subjects undertook a trampoline exercise session of 30 seconds duration and repeated 3 times. The aim of this study was to investigate the effect of the height of leg lift at a given, commonly used step rate. Subjects (n=15) were divided into three groups: i) CM; ii) EBM and iii) LBS, with all groups undertaking a familiarisation session prior to completing the test. Workloads on the treadmill were 100, 120, 160 and 200 steps/ min with a 15cm leg lift and a final workload at 120 steps/min with a 90° leg lift, with pace maintained by metronome. The first workload was maintained for 5 mins and all subsequent workloads for 3 mins, with recordings made for analyses in the last 30 sec of each workload. Five treadmill workloads were selected for each subject to give a similar range of heart rates to those achieved on the mini-trampoline. Immediately after the 5th workload, subjects undertook a trampoline exercise session of 30 seconds duration and repeated 3 times. The aim of this study was to investigate the effect of the height of leg lift at a given, commonly used step rate. Subjects (n=15) were divided into three groups: i) CM; ii) EBM and iii) LBS, with all groups undertaking a familiarisation session prior to completing the test. Workloads on the treadmill were 100, 120, 160 and 200 steps/ min with a 15cm leg lift and a final workload at 120 steps/min with a 90° leg lift, with pace maintained by metronome. The first workload was maintained for 5 mins and all subsequent workloads for 3 mins, with recordings made for analyses in the last 30 sec of each workload. Five treadmill workloads were selected for each subject to give a similar range of heart rates to those achieved on the mini-trampoline. Immediately after the 5th workload, subjects undertook a trampoline exercise session of 30 seconds duration and repeated 3 times. The aim of this study was to investigate the effect of the height of leg lift at a given, commonly used step rate. Subjects (n=15) were divided into three groups: i) CM; ii) EBM and iii) LBS, with all groups undertaking a familiarisation session prior to completing the test. Workloads on the treadmill were 100, 120, 160 and 200 steps/ min with a 15cm leg lift and a final workload at 120 steps/min with a 90° leg lift, with pace maintained by metronome. The first workload was maintained for 5 mins and all subsequent workloads for 3 mins, with recordings made for analyses in the last 30 sec of each workload. Five treadmill workloads were selected for each subject to give a similar range of heart rates to those achieved on the mini-trampoline. Immediately after the 5th workload, subjects undertook a trampoline exercise session of 30 seconds duration and repeated 3 times.
36 FUSAFUNGINE REDUCES SYMPTOMS OF UPPER RESPIRATORY TRACT INFECTIONS (URTI) IN RUNNERS AFTER A 56KM RACE
MI Schmelling, M Schwellnus, T Nelies, FACSM, M Keswez, WA Dermer, FACSM, T Nelies, FACSM, University of Cape Town, South Africa.

The effect of Fusafungine, a topical anti-inflammatory/antibacterial nasal/oral spray, on the incidence of symptoms of upper respiratory tract infections (URTI) in the 9 days following a 56 km running event was studied. Male runners (n=96) with a 42km tune-up were recruited. Prior to the race, subjects were instructed to use the medication (4 sprays into each nostril and the throat 4 times daily) and then randomly allocated to either a group receiving Fusafungine (F=48) or a placebo (P=48) in a double blind manner. Subjects completed a daily logbook detailing symptoms, e.g., runny nose (RN), blocked nose (BN), sore throat (ST), and all upper respiratory symptoms (URTS = RN+BN+ST), in the 2 days before the race, the first 3 days after the race, and the 4-9 days after the race. All the symptomatic subjects underwent medical evaluation. Throat swabs and viral cultures were taken. No athlete with symptoms had a positive bacterial or viral culture. The incidence of symptoms (%) in the F and P group was as follows:

<table>
<thead>
<tr>
<th>Day</th>
<th>BN</th>
<th>RN</th>
<th>ST</th>
<th>UR</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3</td>
<td>10</td>
<td>11</td>
<td>9</td>
<td>19</td>
</tr>
<tr>
<td>0-9</td>
<td>17</td>
<td>16</td>
<td>15</td>
<td>9</td>
</tr>
<tr>
<td>4-9</td>
<td>11</td>
<td>18</td>
<td>11</td>
<td>8</td>
</tr>
</tbody>
</table>

There was a decreased incidence (%) in URTS in the F group (P=17%; P=40%: *p<0.05) in the period Day 0-3 after the race, with a tendency for the nasal symptoms to be lower (P=99%; P=23%; *p=0.08) in the same period. In summary, post-race URTS are not of infective origin (viral or bacterial) and their incidence can be reduced by a topical anti-inflammatory agent. Hence, post-race URTS are likely the result of an inflammatory and not an infective process. Supported by Servier Laboratories SA (Pty) Ltd.

37 THE EFFECTIVENESS OF A MENTAL SKILLS TRAINING PROGRAMME FOR EASTERN PROVINCE ACADEMY CRICKETERS
B Kotzé,*, L Slogrove**, G Robertson* and R Stretch**
*Department of Psychology, University of Port Elizabeth, South Africa **Department of Human Movement Studies, University of Port Elizabeth, South Africa ***Sport Bureau, University of Port Elizabeth, South Africa

A major doctrine of Sport Psychology is that sport performance is strongly determined by mental skills. This study evaluated the effectiveness of a mental skills training programme on the self-reported 'knowledge of', importance placed on and 'use of' six mental skills: goal-setting, concentration and attention, arousal and anxiety control, visualization and imagery, confidence, and pre-, during and post-game activities, i.e., 'ideal performance state' (IPS), in a sample of male cricket academy players (n=14). Selected non-academy players formed a comparison group (n=12). The Academy players participated in a six-week mental skills training programme, which involved one of the six mental skills each week. During each session the particular skill was defined and explained by the coaches, followed by a practical exercise, where the players were guided through the application of the skill. The players also completed assessments before and after the programme. The two groups did not participate in the programme, but also completed assessments on two separate occasions. Overall, the results suggest that the programme was instrumental in changing the 'knowledge of' ratings most consistently across the mental skills, while rated importance or 'use of' ratings. Knowing more about the mental skills and even acknowledging their importance in cricket, may not necessarily be sufficient in order to lead to enhancement in performance. Therefore, cricketers need to be encouraged to practice using their mental skills consistently and regularly. It may prove beneficial to integrate the mental skills with the physical and technical practice, in order to increase the 'use of' mental skills in cricket performance. The comparison group did not show any significant increase in any of the mental skills, which suggests that it was the programme that was instrumental in changing certain ratings.

38 THE PREVALENCE OF ANABOLIC STEROID USE IN ADOLESCENTS IN SOUTH AFRICA
MI Lambert, M Schwellnus, T Tittlestad, University of Cape Town Medical School

Twenty-six schools were randomly selected from all the schools in 2 geographical regions (A and B). A questionnaire was administered to 2912 adolescents (17-19 years) from these schools to determine the prevalence of anabolic steroid (AS) use and to test their knowledge on AS assessed by a score obtained in response to 8 questions on AS. Complete data were obtained from 2896 (97.4%) adolescents in the 2 regions (A, n=1361; B, n=1475). The prevalence of AS use in all the adolescents was 1.4%. The prevalence of use was higher in region B (2.2%) compared to region A (0.6%) (p<0.005) and in boys (2.8%) compared to girls (0.7%) (p<0.001). When the group was subdivided, the highest prevalence of AS used occurred in boys who competed in the first team (3.8%). The score (maximum of 8) obtained by all sports participants in the knowledge test (mean ± SD) was low (2.7 ± 1.6). The score was higher in boys (2.9 ± 1.6) than girls (2.5 ± 1.8) (p<0.05) and sports participants (2.7 ± 1.6) compared to non-participants (2.2 ± 1.6) (p<0.01). In conclusion, this study highlights the problem of AS use in schoolboys, shows regional differences in AS use and a poor knowledge of AS in all the groups.

39 ISOKINETIC STRENGTH TRAINING OF THE QUADRICEPS FEMORIS BY MEANS OF ELECTRICAL STIMULATION
Leech P, Loos J, Lourens A, van Wyk G, Cilliers J, Biokinetics Department, 1 Military Hospital, South African Medical Services, Pretoria, South Africa

The primary aim of the study was to investigate the strengthening of the quadriceps femoris muscle group by means of an isokinetic NMES training programme. 21 subjects, with an average age of 22.55 years, participated in the study. A Cybex 340 dynamometer was used to measure extension torque at 0.5°, 60°, 180° and 240° s⁻¹ before and after the NMES training period consisting of 10 sessions. The subjects were divided into groups: Group A (who received isokinetic NMES training) and Group C (who served as a control group). In addition, each individual had a designated “treatment” and “control” leg: the “control” leg served as an extra control for determining the effect of the isokinetic NMES training programme. Independent and dependent t tests revealed that 10 sessions of isokinetic NMES training of the quadriceps femoris, resulted in statistically significant knee extension torque improvements in Group A (for the treatment leg, at 0.5° (18.2%), 60° (20.7%), 180° (17.4%), and 240° (14.7%), respectively. Group A's "treatment" leg showed a significant (p<0.05) improvement in the post-treatment condition of 6.2%, even though it received isokinetic NMES was developed which proved to be viable as a strength training modality for the quadriceps femoris muscle group. The isokinetic NMES training programme at 60° s⁻¹ resulted in significant improvements in both isometric and isokinetic knee extension torque (p<0.05).
The physiological demands of field hockey, which employs a unique posture while playing the ball, have mainly been inferred from studying athletes running in the upright posture. In this study, resting pulmonary function was assessed. Added to both the upright and the semi-crouched dribbling posture in eleven male and ten female elite field hockey players. In addition, the players completed a 4 minute run on the treadmill at 10, 12 and 14 km/hr for the men, and 8, 10 and 12 km/hr for the women, whilst both dribbling a ball and maintaining a semi-crouched posture during normal running. The metabolic and ventilatory responses to normal running and to dribbling a hockey ball in the semi-crouched position were evaluated in order to establish the additional physiological strain imposed by this compromised posture. The semi-crouched posture significantly reduced resting pulmonary function in both the men and the women (FVC 0.9 ± 0.2 vs 6.3 ± 1.21 in males, and 4.1 ± 0.6 vs 4.2 ± 0.6 in females; PEF 11.1 ± 2.2 vs 11.8 ± 2.7 l/s in males, and 8.7 ± 1.7 vs 9.1 ± 1.6 l/s in females; P<0.05). Dribbling increased energy expenditure above levels observed in normal running for both the men and women at each speed (e.g. 532 ± 1.0 vs 476 ± 2.3 kcal/min in males, and 439 ± 2.0 vs 308.2 ± 3.2 ml.kg⁻¹.min⁻¹ at the high speed; P<0.001). Heart rate was significantly higher while dribbling at each speed (e.g. 190 ± 6 vs 177 ± 7 beats/min in males, and 189 ± 11 vs 178 ± 12 beats/min in females, at the high speed; P<0.001). Maximal ventilation was significantly higher while dribbling relative to orthodox running at each speed (e.g. 180 ± 5 vs 107 ± 15 l/min in males, and 109 ± 14 vs 82 ± 13 l/min in females, at the high speed; P<0.001). This study has shown that the compromise in pulmonary function detected in the dribbling posture at rest results in a lower physiological performance of hockey players executing dribbling skills on the treadmill. Furthermore, running in the dribbling posture is far more physiologically costly than orthodox running. The additional strain that the players experience in this peculiar posture must be incorporated in the predictions of the energy cost of competitive match-play hockey.

Objectives: An attempt was made to determine whether the mood state of cricketers and the team as a whole could contribute to the extremely variable performance which was noted on previous occasions. Methods: A modified questionnaire based on the Profile of Mood States (POMS) was administered by interview to each player individually on most mornings of a six-week cricket tour. Categories assessed were Anxiety, Depression, Fatigue, Vigour, Relaxation, Soreness, Homesickness, Boredom and Frustation. Results: Anxiety scores showed short-term trends and were match-related. Higher scores were associated with better performance. Confusion scores appeared to reflect the level of learning and success on tour, rather than predict performance. Depression scores were also more a result of events than a predictor. Fatigue was also related to match history. Vigour did not mirror fatigue, but was low on rest days. Relaxation scores were higher during rest periods, but also at the end of the match when performance was lower. Soreness scores did not increase during the tour, but individual variation was evident, due usually to injury. Homesickness scores showed a rising trend, exacerbated on the rest days. Boredom was lowest at the beginning and highest on rest days. Some individual Frustation scores were high at certain times, and the team score was high during a period of poor performance and prior to another period of poor performance. Conclusions: Teams touring abroad face stresses that are different from what they and their management are used to at home. This study highlights the importance of the general public as such as rest days and motivation which can be taken into account in managing team morale and strategy on a particular tour. Other scores may predict performance and give early warning of a dip in form.

In the South African Indian population over 45 years of age, approximately 50% of deaths "from all causes" are due to diseases of the circulatory system. In a large random sample from Durban's Indian population, 48% of people over the age of 15 years were found to have ECG changes. Coronary heart disease accounts for 28% of all deaths in the medical wards of one of Durban's major hospitals. With increasing intervention surgery and angioplasty there are a large number of patients who are candidates for cardiac rehabilitation programmes. A review of the rehabilitation programmes in the Durban Functional Region revealed that there are about 35 Indians attending. Analysis of the data for the one and a half years of this study, revealed the following factors: lack of knowledge of the medical practitioners of the benefits of rehabilitation and of the services available, practitioners' fear of losing the patient, family pressure on the patient to not exercise as it is considered dangerous, inappropriate sitting and timing of rehabilitation programmes, and the fear of losing disability grants if rehabilitated. With this in mind, discussions were initiated with the local community leaders in Phoenix. After initial scepticism, a partnership was entered whereby the community would provide facilities, and volunteers from the Phoenix community would provide a tertiary rehabilitation programme. The local doctor's guild was initially supportive of the idea, but they did not offer their time. The volunteers undertook training in CPR, exercise prescription and monitoring, and programme management. General community interest was raised by phone in programmes on the community radio, Radio Lotus, and additionally promoted by the public service is free, and there is no budget. All incidental costs such as printing etc have been borne by donation from the local community. The programme has been running for 3 months and is growing. There are requests from other Indian communities to start similar projects in their areas, and project committees are being established.

Low intensity laser therapy is a popular treatment modality used to enhance wound healing. A commonly used commercially available low intensity infra-red laser is the superluminous diode based Gallium Aluminium Arsenide laser, 880nm. There is however little scientific evidence to support both its efficacy and optimal dosage. The literature on the use of laser is confounded by a lack of standardisation of the measurement of dosage with respect to dosage which has been expressed in terms of power, power density or energy density. There are few dosimetry studies using infra-red laser directly on fibroblasts. The aim of this pilot study was to investigate the effect of different doses of infra-red laser on fibroblast activity in cell culture. Human fibroblasts were cultured, and confluent fibroblast cells were trypsinized and resuspended in culture medium to give a measured cell count of 1 x 10⁶ cells/ml. 100ml of cell suspension and 200ml of culture medium were titrated into each well of a 96 well microtiter plate. The plate was then incubated 37°C for 24 hours. Ten of the twelve well channels were irradiated on three consecutive days at energy densities of 0.2, 0.4, 0.6, 0.8, 1.5, 2.3, 3 and 5 J.cm⁻². Each well was irradiated individually. The two end channels of eight wells each were not irradiated and served as controls. On the day after the last treatment cell viability was measured using the MIT assay, which is an indicator of mitochondrial enzymatic activity. The optical density of each well was measured spectrophotometrically at a wavelength of 595 nm with a reference wavelength of 680nm. Analysis of variance showed a significant dose effect of laser activity at different doses (P=0.004). Post hoc testing revealed a significant difference in activity at different doses (P=0.004). Post hoc testing revealed a significant difference in activity at different doses (P=0.004). Post hoc testing revealed a significant difference in activity at different doses (P=0.004). Post hoc testing revealed a significant difference in activity at different doses (P=0.004). Post hoc testing revealed a significant difference in activity at different doses (P=0.004). Post hoc testing revealed a significant difference in activity at different doses (P=0.004). Post hoc testing revealed a significant difference in activity at different doses (P=0.004).
44 THE RISK OF HUMAN IMMUNODEFICIENCY VIRUS CONTACT WITH BLOOD OR BLOOD PRODUCTS

Sports participants that engage in contact sports such as boxing, are therefore at risk to transmission of HIV in boxing is dependent upon the following factors: i) the seroprevalence of HIV infection in boxers, ii) the risk of an open bleeding wound in a boxing bout, and iii) the risk of contact between the boxers. The aim of this study was to determine the risk of transmission of HIV during a boxing bout. Assuming that the risk of contact between two boxers is 100%, and that the risk of transmitting the virus when open bleeding wounds make contact is 5% (similar to that of a needlestick injury), then the risk of transmission was firstly determined by the seroprevalence of HIV in professional boxers in South Africa, and secondly to calculate the incidence of open bleeding wounds in professional boxers in South Africa. The nature of the bleeding wounds was also studied, as well as current precautions that boxers and support staff use in and around the ring. In the first study, medical records, in particular the HIV status, in the year after compulsory HIV testing was introduced at routine medical examination, were obtained from all the professional boxers in South Africa (with approval of the SA Boxing Board of Control). A total of 30 professional boxers were assessed, the seroprevalence rate was 9%. In the second study, video clips of 30 professional boxing bouts were studied. During each bout, the following data were obtained: the presence of an open bleeding wound, and the amount of bleeding, the location of blood, and the activity taken by cornermen. In 14 out of 30 bouts, an open bleeding wound was sustained by a boxer (46.7%). All the injuries were in the face/head (100%), and most injuries were lacerations (54%), followed by contusions (21%), abrasions (6.5%) and others (15%). The amount of bleeding was classified as mostly present but not flowing (49%), flowing by fast flowing and dripping off (25%), slow flowing and not dripping (20%), and no bleeding visible (9%). The blood contaminated the following: boxing gloves (31%), towels (26%), skin (19%), ring or matting (10%), cornermen (8%), and referee (6%). Actions taken by cornermen were attempts to stop bleeding (40%), washing with water (27%), wiping but no attempt to stop bleeding (25%), and no action (8%). The risk of HIV transmission in South African boxers during one bout was therefore calculated as follows: seroprevalence (0.09) x the risk of an open bleeding wound (46.7%) x the risk of contact (9%) = 0.0021 (1 in 476 bouts). Professional boxing in South Africa therefore carries a significant risk of HIV transmission. Preventative measures to decrease the risk of HIV transmission should include education of boxers and support staff on risk of contamination, and appropriate action of contaminated material.

45 THE EFFECT OF LOW-DOSAGE, LONG-TERM CREATURE MONOHYDRATE SUPPLEMENTATION ON THE PERFORMANCE OF CYCLISTS

Francis Miller, Wayne Viljoen, Pauline Nicewondt, Jacques Rousseau, Department of Sport Sciences, Technikon Pretoria, Pretoria, South Africa

Previous studies on creatine monohydrate concentrated on the effect of high-dosage, short-term supplementation on athletic performance. This study examined the effect of low-dosage (3g/day), long-term (12 weeks) creatine monohydrate supplementation on blood lactate accumulation, power output and fatigue. Eleven well-trained male cyclists performed repeated bouts of the 30-second Wingate anaerobic test. Finger-sample measurements for blood lactate were taken at rest and after each of the three bouts of maximal cycle ergometry. Peak power output, average power output, total work and power-drop were computed. No significant differences were recorded in power output or drop in power during the whole administration period. Creatine supplementation led to a significant increase in power-drop during all three exercise bouts (p < 0.001; µg 0.009; µg 0.0289) and a significant decrease (p < 0.001) in blood lactate accumulation. There were no significant differences (p = 0.001) in the risk of viral transmission between boxers, as (0.53) = 0.0021 (1 in 476 bouts). Professional boxing in South Africa therefore carries a significant risk of HIV transmission. Preventative measures to decrease the risk of HIV transmission should include education of boxers and support staff on risk of contamination, and appropriate action of contaminated material.

46 ELECTROLYTE CONCENTRATIONS AND HYDRATION STATUS IN RUNNERS WITH EXERCISE ASSOCIATED MUSCLE CRAMPING (EAMC)

J Nicol, MP Schwellnus, TD Noakes, MRC/UCT Biomechanics of Exercise Research Unit, University of Cape Town, RSA.

The aim of this study was to relate baseline integrated surface electromyographic (BIEMG) activity and serum electrolyte concentrations (SEC) to clinical recovery in runners with EAMC. Subjects were runners presenting with acute severe calf cramps to walk EAMC after a 80 km race, (n = 11). Controls for the SEC (C, n = 11) were runners matched for age, gender and finishing time who completed the 80km race without EAMC. Controls for the BIEMG (C, n = 7) were runners with no EAMC after a 85 km run. BIEMG activity was measured while subjects walked at self-selected comfortable velocity (40%) on both legs before the start of the race (T0) and after recovery (60 minutes later) (T60) during periods when the runners were not experiencing a spontaneous muscle contraction (BIEMG) and ii) in the C group in the Q and G muscles after the race (T60) and 60 minutes later (T90). EMG data were expressed as % change in BIEMG (To to T90). The % decrease (mean SO) (TD to T90) in BIEMG for the E group (82 (5)) was significantly greater (p < 0.05) than the C group (12 (47)). The results of blood samples collected for measuring SEC (mean SO) on admission (To) and 60 minutes later (T60) in the E and C groups are depicted in Table 1.

Table 1: Serum electrolyte concentrations (mean SO) during recovery from EAMC

<table>
<thead>
<tr>
<th>SEC</th>
<th>To</th>
<th>E group</th>
<th>C group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ca++</td>
<td>2.7 (0.4)</td>
<td>2.1 (0.4)</td>
<td>2.8 (0.4)</td>
</tr>
<tr>
<td>Mg++</td>
<td>0.7 (0.1)</td>
<td>0.6 (0.1)</td>
<td>0.7 (0.1)</td>
</tr>
<tr>
<td>Na+</td>
<td>142 (3)</td>
<td>142 (3)</td>
<td>142 (3)</td>
</tr>
<tr>
<td>K+</td>
<td>4.3 (0.8)</td>
<td>4.0 (0.8)</td>
<td>4.8 (0.8)</td>
</tr>
<tr>
<td>Osm</td>
<td>283 (8)</td>
<td>284 (8)</td>
<td>283 (8)</td>
</tr>
</tbody>
</table>

* p < 0.05, E vs C group at To: ** p < 0.05, To vs T90 for C group

These results indicate that runners with EAMC have greater BIEMG activity than control runners during the next race period ii) decreases in BIEMG activity are associated with recovery from EAMC, iii) there is no relationship between SEC and other recovery from EAMC of BIEMG and iv) that differences in serum K+ and Na+ between E and C are not of clinical significance. Supported by the Sports Medicine Research Fund of the University of Cape Town.

47 SERUM ELECTROLYTE CONCENTRATIONS AND HYDRATION STATUS IN RUNNERS WITH EXERCISE ASSOCIATED MUSCLE CRAMPING (EAMC)

J Nicol, MP Schwellnus, TD Noakes, Sports Medicine, MRC/UCT Biomechanics of Exercise Research Unit, University of Cape Town, RSA.

The aim of this study was to determine whether acute EAMC in distance runners is related to changes in serum electrolyte concentrations (SEC) and hydration status (HS). A cohort of runners (N = 44) participating in a 56 km race all with a history of EAMC were recruited. Body weight was measured and blood samples for blood glucose (BG), SEC, serum osmolality (Osm), Harnoglaubin and lactocenta were collected from all the runners 30 min before the race (T0) and immediately on completion of the race (To). Samples for SEC and Osm were also collected 60 min (T60) after the race. The cohort was divided into a group of controls (C, n = 21) who suffered from EAMC during the race, and a group with no EAMC (N, n = 23). Both groups had similar [mean (SD)] age (years) [42 (8) vs 43 (7)], pre-race BW (kg) [73 (8) vs 78 (11)], and race finishing times (min) [284 (5) vs 284 (7)]. Runners with EAMC were treated only with rest, passive stretching and oral fluids, and all had recovered by T60. SEC (mmol/l) BIEMG/mm/l, Osm (mmol/l) and hydration status calculated as % change in BW (% BW) and % change in plasma volume (% PVC) were compared in the E and N groups using ANOVA (Table 1).

Table 2: Blood glucose and serum electrolytes in the E and N group at To and T60.

<table>
<thead>
<tr>
<th>SEC</th>
<th>To</th>
<th>E group</th>
<th>C group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ca++</td>
<td>4.7 (0.3)</td>
<td>4.7 (0.3)</td>
<td>4.8 (0.3)</td>
</tr>
<tr>
<td>Mg++</td>
<td>0.7 (0.1)</td>
<td>0.7 (0.1)</td>
<td>0.7 (0.1)</td>
</tr>
<tr>
<td>Na+</td>
<td>142 (3)</td>
<td>142 (3)</td>
<td>142 (3)</td>
</tr>
<tr>
<td>K+</td>
<td>4.0 (0.8)</td>
<td>4.0 (0.8)</td>
<td>4.0 (0.8)</td>
</tr>
<tr>
<td>Osm</td>
<td>284 (8)</td>
<td>284 (8)</td>
<td>284 (8)</td>
</tr>
</tbody>
</table>

There were no significant differences in the SEC, BG and Osm between the E and N groups.
This study was designed to measure whether a single dose of 120 mg pseudoephedrine ingested 120 minutes before exercise influences performance during 1 hour of high intensity exercise. The effects of exercise on urinary excretion of the drug were also studied. Ten healthy male cyclists were tested on two occasions, separated by at least 7 days, using a randomly assigned, double-blinded, placebo-controlled, crossover design. Exercise performance was tested during a 40 km trial on laboratory cycle ergometer and skeletal muscle function was measured during isometric contractions. On a third occasion, subjects ingested 120 mg pseudoephedrine but did not exercise (Control - C). Pseudoephedrine did not influence either time trial performance (58.1 ± 1.4 vs 58.7 ± 1.5 min; Mean ± SEM: drug (D) vs placebo (P) or isometric muscle function. Urinary pseudoephedrine concentrations (114.3 ± 27.5 vs 85.4 ± 13.1 μg/ml; p < 0.5) were significantly increased one hour after exercise (D vs C). In three subjects, plasma pseudoephedrine concentrations were not influenced by exercise. Only these subjects showed increased urinary pseudoephedrine excretion during exercise. We conclude that a single therapeutic dose of pseudoephedrine did not have a measurable ergogenic effect during high intensity exercise of 1 hour duration. But plasma drug concentrations and urinary excretion were altered by exercise. These findings have practical relevance to doping control regulations in international sporting competitions.
52 THE EFFECT OF ENDURANCE TRAINING ON HYPOTHALAMIC 5-HYDROXYTRYPTAMINE (5-HT) RECEPTOR FUNCTION

K Sheepe, M Lambert, J du Bouisson, T Noakes and W Deeman, University of Cape Town and Sports Science Institute of South Africa.

Previous studies indicate that the serotonergic nervous system plays an inhibitory role in the central control of pain during prolonged exercise. Researchers have also demonstrated a down-regulation of 5-HT receptor function in elite endurance trained subjects, compared to sedentary controls. This study examines the effect of exercise training on 5-HT receptor function in 7 recreational athletes (T) who underwent training, and compared it to 7 control subjects (C). Prior to and after a 5 month exercise training programme, subjects underwent a 12 hour fast and baseline blood sample was drawn for determination of serum prolactin concentration ([Pr]). Subjects then ingested 60mg of Buspirone, a partial 5-HT 1A receptor agonist. Serial blood samples for [Pr] were drawn every 30 minutes for a period of 4 hours. The [Pr] response to Buspirone challenge was determined, thus providing an indication of 5-HT receptor sensitivity. Average AUC ([Pr] concentration before training were similar in T (915±316 vs 700±258 Iu/min/L) and after (842.6±439 Iu/min/L vs 504.5±87.4 Iu/min/L). After training a significant reduction in MLD (mm; mean ± SD) was achieved by MW (15±8; p<0.0001) and RS (19±9; p<0.0005) but not by LW, IR, or ER. Once corrected to the most linear pattern using the most effective method of correction (lowest MLD), all 18 cyclists performed a 30 minute cycling test at predetermined work loads (125W, 180W, 200W) after 3 training periods (T1 = 4 weeks training with no correction, T2 = 4 weeks training with correction, T3 = 4 weeks training with correction removed). During each test, pain experienced was plotted every minute using a visual analogue scale (VAS: 0-10). * = no pain, 10 = unbearable pain). Total pain (TP) (pain units) was calculated as area under the pain vs time graph. TP (mean ± SD) was decreased after the T2 period (19±23), compared to after the T1 (42±40) or the T3 (49±42) period (p<0.0004). Cyclists also recorded daily pain (VAS: 0-10) during training in each 4 week period (T1, T2, T3). Pain recorded daily during training (PDP) was calculated for T1, T2, and T3. PDP (mean ± SD) was decreased during T2 (1.4±12), compared to T1 (3.0±1.7) or T3 (2.2±1.5)(p<0.002). In conclusion, i) cyclists with PFP exhibiting excessive MLD of the downstroke can be corrected to a more linear pattern using minor biomechanical modification, and ii) once corrected, PFP during cycling decreases. Supported by the Sports Medicine Research Fund of the University of Cape Town.

53 ABNORMAL PATTERNS OF KNEE MEDIO-LATERAL DEVIATION (MLD) ARE ASSOCIATED WITH PATELOFEMORAL PAIN (PFP) IN CYCLISTS

J Milligan, M Schwulens FACSM, TD Noakes FACSM, Sports Medicine, UCT.

The aetiology of PFP in cyclists is not well understood. The aim of this study was to document the relationship between PFP and abnormal patterns of knee movement during cycling. Eighteen cyclists were recruited and eighteen (E) cyclists were subjected to training (E) for a period of 8 weeks. Eighteen controls (C) were also subjected to the intervention. Conclusion: This study shows i) there is a trend towards an up-regulation of hypothalamic 5-HT receptor function after training in recreational endurance athletes; ii) differences seem to occur in the response of the serotonergic system to endurance training in elite, compared with recreational athletes.

54 CORRECTING LOWER LIMB KINEMATICS DECREASES PATELOFEMORAL PAIN (PFP) IN CYCLISTS

E Van Zyl, M Schwulens FACSM, TD Noakes FACSM, University of Cape Town.

In cyclists with PFP abnormal oval (O) or Figure-of-8 (F) patterns of knee movement during the downstroke in cycling resulting in excessive medio-lateral deviation (MLD), have previously been documented using 2D video analysis. Using 5 different methods (15mm medial forefoot wedge (MW), 5mm lateral forefoot wedge (LW), 5° internal foot rotation (IR), 5° external foot rotation (ER), a raised saddle (RS=110% previous height)) to correct abnormal knee movement (MLD>10mm) was tested in 15 cyclists (62 ± 9 years, mean ± SD) (O=12; F=9). A significant reduction in MLD (mm; mean ± SD) was achieved by MW (15±8; p<0.0001) and RS (19±9; p<0.0005) but not by LW, IR, or ER. Once corrected to the most linear pattern using the most effective method of correction (lowest MLD), all 18 cyclists performed a 30 minute cycling test at predetermined work loads (125W, 180W, 200W) after 3 training periods (T1 = 4 weeks training with no correction, T2 = 4 weeks training with correction, T3 = 4 weeks training with correction removed). During each test, pain experienced was plotted every minute using a visual analogue scale (VAS: 0-10). * = no pain, 10 = unbearable pain). Total pain (TP) (pain units) was calculated as area under the pain vs time graph. TP (mean ± SD) was decreased after the T2 period (19±23), compared to after the T1 (42±40) or the T3 (49±42) period (p<0.0004). Cyclists also recorded daily pain (VAS: 0-10) during training in each 4 week period (T1, T2, T3). Pain recorded daily during training (PDP) was calculated for T1, T2, and T3. PDP (mean ± SD) was decreased during T2 (1.4±12), compared to T1 (3.0±1.7) or T3 (2.2±1.5)(p<0.002). In conclusion, i) cyclists with PFP exhibiting excessive MLD of the downstroke can be corrected to a more linear pattern using minor biomechanical modification, and ii) once corrected, PFP during cycling decreases. Supported by the Sports Medicine Research Fund of the University of Cape Town.

55 POST MATCH ECG CHANGES IN VETERAN SQUASH PLAYERS - IS IT A PROBLEM?

Sibbald H, Weston A, Naaidoo DP, and Mars M. Depts. of Physiology, and Medicine, University of Natal Medical School, Durban, South Africa.

Veteran’s squash has a large following in South Africa. Participation in high intensity sports by competitors over the age of 45 years is considered potentially hazardous, and squash is considered to have a relatively high risk of associated sudden death during or following play. In a study by Northcote, 7/21 subjects in a group aged 53 - 69 years showed significant electrocardiograph (ECG) changes in the hour after play. The aim of this pilot study was to determine the frequency of post match ECG changes in squash players over the age of 45 years, who participate in league squash. Eighteen volunteers were studied. Their ages ranged from 45 to 84 (mean 49 ± 3 yrs). Resting ECG’s were obtained before play. During match play, heart rate was recorded using heart rate monitors. On completion of the match, subjects were immediately fitted with Holter monitors and their ECG’s recorded for the hour after play. The data from the Holter monitors were downloaded by an independent technician and read by a cardiologist, blinded to the study. The matches were played at an average of 87% of predicted maximum heart rate (PMHR), with an average of 44 % of match play occurring at above 90 % of PMHR. The mean maximal heart rate achieved during play was 160 ± 14 b/min (99% of PMHR). ANOVA showed no difference between intensity of games, there was however a significant difference between the hardest and the easiest game. (p< 0.0001) No abnormalities were noted in the recorded ECG’s. This study confirms that veterans squash players play at a high intensity. The failure to demonstrate post game ECG changes may be due to the sample size, but it may also suggest that those who continue to participate actively in veteran’s squash have selected themselves out as a relatively low risk group on the basis of being physically fit and having had no previous symptoms of cardiac problems. Further studies are required to compare exercise stress test ECG’s with post match ECG changes.
56 CARDIAC PERFORMANCE IN VETERAN SQUASH PLAYERS AND RUNNERS DURING A ROUTINE STRESS ECG, SQUASH AND RUNNING
A St Clair Gibson, J Perold, GA Watermeyer, JA Hawley, MI Lambert, TD Noakes. Exercise Science Unit, University of Cape Town, Cape Town, SA.

The aim of the study was to assess the relationship between cardiovascular performance in a routine stress ECG and during field testing in veteran squash players and runners. Ten veteran league squash players (LSP), 10 social squash players (SSP), 10 league runners (LR), 10 social runners (SR) and 10 sedentary individuals (SED) were recruited for the study. All subjects filled a lifestyle questionnaire, underwent a complete medical examination and performed a routine stress electrocardiogram (ECG). The sport playing groups subsequently underwent heart rate monitoring during their specific sport activity on two separate occasions. There were no differences in age, stature and medical history between the groups. The SED group had a significantly higher percentage body fat (p < 0.05), mass (p < 0.01) and resting heart rate (p < 0.01) than the LR group. Although there were no significant differences between the mean heart rate attained during the field test and the maximal heart rate attained during the ECG test, a highly significant difference occurred between the maximal heart rate attained in the field and maximal heart rate attained during the ECG test for all groups (p < 0.01). The maximal heart rate during exercise is significantly higher than that attained during a routine stress-ECG test. This finding was not sport specific or related to level of competitiveness among sports participants. Caution thus should be exercised when asking all patients to exercise freely on the basis of a routine stress-ECG.

57 THE ENERGY EXPENDITURE OF A NON-CONTACT BOXING TRAINING SESSION COMPARED TO SUBMAXIMAL TREADMILL RUNNING
A St Clair Gibson, B Bellinger, R Oelofse, MI Lambert. UCT Exercise Science Unit, University of Cape Town, Cape Town, SA.

The aim of this study was to determine the energy expenditure of a one hour non-contact boxing training session and to compare these results to the energy expenditure of a more conventional recreational activity such as running. Eight healthy males, accustomed to non-contact boxing training, were recruited for the study. Subjects underwent 8 tests; (i) A boxing training session in the laboratory during which energy expenditure was measured continuously using indirect calorimetry (BOXL), (ii) A boxing training session in a boxing studio during which heart rate was measured continuously (BOXS), and (iii) an incremental running test on the treadmill during which energy expenditure was measured continuously. The energy expenditure during 60 minutes of BOXL ranged between 2519 and 3079 kJ (2821 ±190 kJ). Seven of the 8 subjects had higher heart rates during BOXL compared to BOXS, suggesting that the subjects exercised at a slightly higher intensity during BOXL, possibly because of the "one on one" supervision. The average running speed on the treadmill at which the subjects arrived at a similar energy expenditure was 9.2±0.8 km/hr.

58 THE HEART RATE RESPONSE OF CRICKET UMPIRES TO ON-FIELD EVENTS
R Stretch*, J Tyler** and S Bassett***
* Sport Bureau, University of Port Elizabeth
** Department of Statistics, University of Port Elizabeth
*** Department of Human Movement Studies, University of Port Elizabeth

This study assessed the differences between the heart rate responses, recorded every 15 seconds, of 6 provincial and 4 international umpires to on-field events during limited-overs cricket matches. Specific on-field events investigated included appealing, the umpires resulting decisions and any other tasks the umpire had to make such as calling a no-ball or a wide, were recorded. The results showed that the international umpires (IU) rated the on-field decisions less stressful compared to (PU), who showed a far greater variance with regard to LBW, catch, run-out and wide-ball decisions. Tachycardia occurred before the match resulting in a high mean (±SD) heart rate (IU: 102.0 ±19.9 beats min⁻¹; PU: 97.5 ± 11.1 beats min⁻¹), corresponding to approximately 60% of estimated maximal heart rate. Similarly mean heart rates for the first innings (IU: 101.8 ±12.8 beats min⁻¹; PU: 99.7 ± 13.5 beats min⁻¹) and second innings (IU: 99.5 ± 8.9 beats min⁻¹; PU: 100.2 ± 10.1 beats min⁻¹) were found. Differences (D) of heart rate (beats min⁻¹) between the heart rate of IU and PU prior to decision making were significant at all sessions and the first session (101.3 ±12.0 beats min⁻¹) of the first innings was significantly less (p < 0.05) than the corresponding difference (D = 7.5 beats min⁻¹) prior to the first innings (95.3 ± 7.9 beats min⁻¹) and during the first session (102.8 ± 11.4 beats min⁻¹) of the second innings. A significant difference (D = 0.0 beats min⁻¹; PU D = -6.0 beats min⁻¹; p < 0.05) occurred between the difference between the mean heart rate for the second (IU: 97.0 ± 6.7 beats min⁻¹; PU: 101.2 ± 9.2 beats min⁻¹) and the third (IU: 97.0 ± 5.2 beats min⁻¹; PU: 98.2 ± 11.4 beats min⁻¹) sessions of the second innings, illustrating greater variation for the inexperienced umpires. The PU showed greater, although non-significant, variations to an appeal at the time of the decision, 15s post decision and 30s post decision, with both tachycardia and bradycardia occurring. Heart rate data of an IU during an international hat-trick (three wickets in three balls) showed anticipatory tachycardia. It can be concluded that the heart rate response of the umpires to on-field events indicate that they are under tremendous psychological pressure, with international umpires, although umpiring at a higher level, better able to handle these pressures.

59 AN ANALYSIS OF THE HR-Vo2 RELATIONSHIP DURING FREE-RANGE EXERCISE IN THE LABORATORY.
E Terblanché and JA Wessels.
Department of Medical Physiology, University of Stellenbosch, PO Box 19063, Tygerberg, Cape Town.

Laboratory estimates of heart rate are often used by coaches and athletes to identify field training intensities. This approach, however, assumes that the relationship between heart rate (HR) and oxygen consumption (Vo2) remains constant under all conditions. It has been shown that no such representation of field performances during laboratory testing cannot necessarily be based on this assumption, simply because the mode of exercise appear to be the same.1 It was the aim of this study to determine the HR-Vo2 relationship for different modes of free-range cycling in the laboratory. Fifteen cyclists (fit and unfit) between the ages of 18 and 26 volunteered to participate in the study. They performed a 30 km time trial (TT) on a computer controlled cycle ergometer, using a laboratory simulation of field cycling. During this test the cyclist could select and change the gear ratio and pedal frequency at will. Both HR and Vo2 were monitored continuously and these results were compared to the cyclists' physiological responses during a progressive, incremental exercise test to exhaustion. Although there was a linear relationship between HR and Vo2 during simulated field cycling and the maximal exercise test, there were significant differences in the intercepts (102 ± SEM 6.6 b/min vs 66 ± SEM 3.7 b/min; 10.5 ± SEM 0.3 kg vs 8.3 ± SEM 0.2 kg; p < 0.01) of the 30 km TT and progressive, incremental exercise tests. These results indicate that standard laboratory exercise tests underestimate the "normal working limits" of cyclists during free-range cycling and that extrapolation of laboratory results to field exercise should be done with caution.


SPORTS MEDICINE MARCH 1997 19
60 EFFECT OF PROPHYLACTIC DOSE OF FLURBIPROFEN ON MUSCLE DAMAGE AND CARDIOVASCULAR VARIABLES DURING SUBMAXIMAL EXERCISE.

Terblanche S, Noakes TD and Lambert M

Bioenergetics of Exercise Research Unit, Sport Science Institute of South Africa, Cape Town, South Africa.

Aim: To determine the effect of an prophylactic dose of flurbiprofen on muscle damage, soreness and cardiovascular variables during submaximal exercise in recreational athletes.

Methods: 19 Male recreational athletes (age 28 ± 12 years; X ± SD) were recruited for the study. Subjects underwent a V02peak and peak treadmill running speed (PTRS) test three days before the first submaximal test and 72 hours after the induction of delayed onset muscle soreness (DOMS). Twelve hours before the submaximal test and every 12 hours thereafter until the end of the experiment, subjects were placed in identical patches with 40mg of flurbiprofen (TransAct; n = 10), or identical patches without drug (Placebo; n = 9), on their quadriceps muscles. Subjects ran for 15 minutes at 75% PTRS during which cardiovascular variables were measured and blood was collected. Thereafter DOMS was induced by a series of eccentric muscle contractions. The submaximal test was repeated 24 and 48 hours after DOMS was induced. Results: Pain, assessed subjectively, increased Similarly in both groups. Pain, measured with a pressure probe, was significantly higher in Placebo than TransAct at 24 and 48 hours after the induction of DOMS (p < 0.03). Blood lactate concentration increased significantly higher in Placebo than TransAct immediately after the submaximal test compared to TransAct even before the induction of DOMS (p < 0.05). Serum cortisol concentration was not different significantly throughout the experiment. There was a significant increase in lactate and heart rate in both groups with no significant difference between the groups. Both groups significantly increased in RPE during the submaximal test. Results: Significant pain, assessed subjectively, increased Similarly in both groups. Pain, measured with a pressure probe, was significantly higher in Placebo than TransAct at 24 and 48 hours after the induction of DOMS (p < 0.03). Blood lactate concentration increased significantly higher in Placebo than TransAct immediately after the submaximal test compared to TransAct even before the induction of DOMS (p < 0.05). Serum cortisol concentration was not different significantly throughout the experiment. There was a significant increase in lactate and heart rate in both groups with no significant difference between the groups. Both groups significantly increased in RPE during the submaximal test.

61 MORPHOLOGY AND INTRINSIC INJURY RISK IN SCHOOLBOY RUGBY

HJ van Heerden, Department Human Movement Science, University of Zululand, RSA

Thus far epidemiological research has exposed typical extrinsic injury risks of rugby. However, well controlled studies on potential risks that are intrinsic to the individual have been absent. This study thus focused on morphological “fitness” as an intrinsic actiological risk factor in schoolboy rugby injuries. A well-defined population of high school rugby players (N=105) aged 13-17 years were monitored utilizing a prospective injury data collection program until thev developed an injury which was subsequently identified by ANOVA contrasting preparticipation morphological profiles of injured players with those of the non-injured controls. Results for injured vs non-injured players indicated a significantly (p<0.05) greater stature (176.9 ± 8.6 vs 172.0 ± 8.7 cm); body mass (69.7 ± 11.8 vs 63.9 ± 15.6 kg); lean body fat (13.9 ± 3.1 vs 17.9 ± 6.6%), respectively. Individual somatotype component variations in endomorphy (2.4 ± 0.9 vs 2.9 ± 1.5); mesomorphy (4.8 ± 1.0 vs 4.9 ± 1.2); and ectomorphy (2.4 ± 1.2 vs 1.4) did not differ significantly (p>0.05). In conclusion the data suggests that morphological differences among high school rugby players appears to predispose rather than preclude from injury whilst somatotype is independent from injury risk.

62 MUSCULAR “FITNESS” AND INTRINSIC INJURY RISK IN SCHOOLBOY RUGBY

EJ van Heerden, Department Human Movement Science, University of Zululand, RSA

Thus far epidemiological research has exposed typical extrinsic injury risks of rugby. However, well controlled studies on potential risks that are intrinsic to the individual have been absent. This study thus focused on morphological “fitness” as an intrinsic actiological risk factor in schoolboy rugby injuries. A well-defined population of high school rugby players (N=105) aged 13-17 years were monitored utilizing a prospective injury data collection program until thev developed an injury which was subsequently identified by ANOVA contrasting preparticipation morphological profiles of injured players with those of the non-injured controls. Results for injured vs non-injured players indicated a significantly (p<0.05) greater mean grip strength (70.5 ± 6.5 vs 64.9 ± 9.2 kg/kg <0.01); muscle power (15.3 ± 1.4 vs 14.9/kg<0.001); and running agility (6.0 ± 0.4 vs 7.1 ± 4, 0.001). Gross range of motion variations in the shoulders (2.4 ± 0.3 vs 2.5 ± 0.3) did not differ significantly (p>0.05), but gross low-back/hamstring flexibility scores (3.2 ± 1.2 vs 2.9 ± 1.1) were significantly higher (p<0.05) among the exposed (injured) group. In conclusion the data suggests that superior morphoskeletal fitness among high school rugby players appears to predispose rather than preclude from injury.
CONFIRMING OBSERVATIONS USING DIFFERENT MODES AND INTENSITIES OF EXERCISE.

Soreness than stretching. Further studies are required to equally beneficial in reducing fatigue, massage may be beneficial in reducing fatigue. While massage and stretching were shown to be muscle soreness than stretching (P < 0.001). Results: Based on the fatigue index, significantly more fatigue recovery techniques were used. The presence of pain on palpation and the extent of tissue swelling were determined by the researcher on the same days. The subjects were required to wear the orthotic during the night, to refrain from training and the use of any other therapy. On days 0, 7 and 14 the severity of pain experienced on arising was recorded on a scale of 1 to 10. The presence of pain on palpation and the extent of tissue swelling were determined by the researcher on the same days. The results show that in both groups who used the night splint, there was a significant reduction (p< 0.001) in the pain experienced on arising on both days 7 and 14. Moreover, 86.8% of those with plantar fasciitis and 49.7% with achilles tendinosis were able to walk pain free by day 14. However, most still experienced pain on palpation of the injured site and more than half of those with achilles tendinosis continued to exhibit marked tissue swelling on Day 14. In both control groups there was no decrease in the degree of pain experienced on rising, nor in the presence of pain on palpation, by the end of the study period. The results suggest that the use of an anterior fitting night splint significantly aids recovery from chronic repetitive strain injuries of the lower limb.

RESULTS: BASED ON REST, STRETCHING AND MASSAGE.

Rapid and adequate recovery from exercise facilitates subsequent performance and reduces the associated symptoms of tiredness, fatigue and lethargy. This study compares the effects of three recovery techniques, rest, stretching and massage in delaying fatigue during repeated bouts of dynamic exercise, and investigates the relative effects of rest, massage and stretching on delayed onset muscle soreness. Method: 18 male subjects were randomly allocated to one of six groups. Subjects performed 5 repetitions of as many heel raises as possible in 45 seconds. Each repetition was followed by a recovery technique used for the three minutes between repetitions. This was repeated weekly, until each group had had all three recovery techniques. A fatigue index was calculated from the difference in the number of repetitions from stage 1 to 5 and this was expressed as a percentage. Muscle soreness ratings were assessed at 12 - 36 hours after each session. An orthogonal 6 x 3 Latin square design was used to take into account possible training effect and the possible influence on the outcome of the sequence in which the recovery techniques were used.

CONCLUSIONS: Rest was shown to be the least effective recovery technique. While massage and stretching were shown to be equally beneficial in reducing fatigue, massage may be superior to stretching, as it is associated with less muscle soreness than stretching. Further studies are required to confirm these observations using different modes and intensities of exercise.
REFERENCES

Alii 11 13
Anderson R 21
Anderson SJ 1
B Constance 28
Bassett S 58
Basson CJ 1
Bein B 2
Bellinger B 57
Benga N 13
Boston V 3
Brooksfield AS 4
Bridger B 30
Bultman AJ 5
Bus S 22
C Parry 28.29
Calder S 14
Carter R 5.6.7.40.50
Chanter L 7
Chutargoon A 22.43
Coleman KL 8,9
Cook I 10
Crous L 12
Dennis S 14, 25
Derman EW 8, 9, 13, 14.15, 33, 34, 36, 48, 52
Du Buisson J 52
Du Plessis A 16
Du Plooy WJ 17
Du Rand J
Du Toit 18, 19
Edwards T 18
Evans M 8, 9
Evans A 48
Fairman R 1
Foreman S 20
Gabriels G 48
Geils K 1
Goeden AM 11
Gorender SN 22
Grobeler L 14
Hattingh JH 23, 24
Hawley JA 14, 25, 56
Heystek MJ 26
Hirner M 27
Holzhanssen L 28, 29, 30
Hughes HI 31, 32
Huys JJ 23
Hulse BL 83, 34
Hurr X 19
Kahler CP 17
Karanizak O
Kemmers R 17
Khan A 35
Kiesig M 36
Kirkby RC 26
Kottras H 37
Lambert EY 33
Lambert MJ 38, 82, 56, 57, 60
Latgeg L 39
Lawther B 40
Loos JH 30
Lourens A 39
Macfarlane PW 41
Mars M 20, 22, 35, 42, 43, 55, 65
Mars S 43
Matske KOP 13, 44
Milligan J 53
Mitchell G 5
Moller F 45
Mathers B 46
Maitland DP 55
Nicol J 46, 47
Nieuwoudt P 45
Novaky TD
8, 9, 14, 21, 25, 33, 34, 36, 48, 47, 52, 53, 54, 56, 60, 66
O Shaughnessy K 30
Oelofse R 57
Olivier S 49
Oosthuysen T 50
Otto W 19
Palmer G 25
Pepler J 56
Peters EM 21
Raine R 9
Ramathesele JR 51
Robertson G 37
Rossouw J 45
Roux S 19
Schepers K 52
Schwarz P 13
Schwellnus MP
13, 14, 28, 30, 31, 32, 36, 38, 44, 46, 47, 51, 53, 54, 63
Sibald H 55
Slogrove L 37
Smith A 8
Smith P 48
St Clair Gibson A 14, 34, 56, 57
St Clair-Smith C 9
Striech R 18, 37, 58
Stubbbs J 36
Terblanche E 59
Terblanche S 60
Theron AJ 21
Titlestad S 88
Tubbridge T 27
Trichard C 14
Tyler J 58
Van Heerden BJ 61, 62
Van Wyk GJ 39
Van Zyl E 54
Viljoen D 63, 64
Viljow W 45
Viranna N 65
Watermeyer GA 56
Wessels JA 59
Westen A 22, 35, 55, 66
Zambrasis M 14
Tired of Hotels?

In the heart of Camps Bay this beautiful villa invites you to share its panoramic sea & mountain views. Treat yourself & your overseas visitors to the privilege & luxury of this outstanding villa in an exceptionally quiet street above the Bay Hotel. Sundowners can be waiting on ice for your arrival. Simply relax and enjoy watching the sun setting over the sea. Introduce your visitors to a traditional South African braai or order the menu of your choice to be delivered to you at Msangasanga.

SPECIAL CORPORATE OFFER
Upstairs & downstairs each with own lounge, dining room + kitchen

* **Downstairs:** 2 bedrooms (both en suite) sleeps 4 • R800 pd.
* **Upstairs:** 3 bedrooms (3 baths 2 en suite) sleeps 6 • R1200 pd.
  or 5 Bedrooms (5 baths 4 en suite) • R2000 pd.

• Villa serviced daily
• Braai facilities
• 10 min to Waterfront
• Secure parking for 4 cars
• Swimming pool
• Catering services available
• Phone + fax facilities
• Laundry service
• Close to beach, shops & theatre

For further information: Tel: 27 - (0)11 442-9759 • Fax: 27 - (0)11 880-7898
Physiotherapists converge on Cape Town

Cape Town will host two important international congresses during April 1997. The first is the International Congress of the South African Society of Physiotherapy, from 31 March to 3 April, and the second is the Congress of the International Private Practitioners' Association. The IPPA is a division of the World Confederation for Physical Therapy.

More than 300 physiotherapists will attend the SASP Congress, coming from countries as far afield as Finland, America, Zimbabwe, Canada and Australia. Several countries in Europe are represented. Contributors from fourteen countries will present papers on physiotherapy research. Community physiotherapy services are strongly represented in research papers by the 43 South African contributors, which also cover a wide variety of interests ranging from fetal movement studies to the causes of falling in the elderly.

Cape Town is a fitting venue for the congresses, as the South African Society of Physiotherapy (SASP) has its origins in a group who met in Cape Town in 1921 to form an association. The SASP itself was established in 1925 and is a founder member of the World Confederation for Physical Therapy. Cape Town is bidding to host the 14th Congress of the World Confederation in 2003.

The theme of the Congress is Physiotherapy in Progress and the main fields covered are education, research, quality assurance, community physiotherapy, neurological rehabilitation and orthopaedic manipulative therapy. The organisers have been fortunate in attracting five internationally renowned keynote speakers. David Butler of the University of South Australia will speak in the field of orthopaedic manipulative therapy, which relates to conditions of the vertebral column and joints. Patricia Davies, the author of several well-known books, is the guest speaker on neurological rehabilitation. Professor Ruth Grant, of the University of South Australia, and Professor Katherine Shepard of Temple University, Philadelphia, will speak on key issues in education and research respectively. The Royal Netherlands Association for Physiotherapy has sponsored the fifth keynote speaker, Joost van Eijkeren, as part of a twinning programme between themselves and the SASP which is committed to promoting quality assurance programmes in physiotherapy.

For further information please contact Sally Elliott:
Tel: (021) 406-6381
Fax: (021) 448-6263
Email: sally@medicine.uct.ac.za