

Aberystwyth University

# BASES 2010 Annual Student Conference

Abstract Booklet

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## **Symposia and workshops**

### **Presenting yourself as a sports and exercise science professional**

Clarke, R<sup>1</sup>, & Packer, N. T<sup>2</sup>.

<sup>1</sup>*Business for Business, and* <sup>2</sup>*Robert Clarke Fitness Centre*

Robert Clarke is a fitness coach, personal trainer, life coach, co-author and the owner of the Robert Clarke Fitness Centre in Swansea. He has over 30 years experience of coaching and has worked with over 300,000 people. He is also the co-inventor of the first computerised balance measured stretch machine, a tool designed for rehabilitation and fitness. It is called SIRA (Sports Injury Rehabilitation Assistant) and is the very first of its kind in the world - a balanced, measured, mechanical stretching machine. It is patent pending in 168 countries.

In this session, 'Presenting Yourself as a Sports and Exercise Science Professional', Robert will tell the story of his journey through starting his own business and the opportunities along the way and will motivate the audience to achieve their goals!

Nigel T Packer has been an Internet Marketing Consultant for the last ten years, and he uses his extensive knowledge and broad range of experience to enhance his clients' businesses. He has assisted businesses in a broad range of sectors and scale, helping them to: develop their products and strategies with a focus on the needs of the customer; use the internet as both a tool and medium for business promotion and profitability; improve customer engagement with clients' websites; and increase visitors, sales and ultimately profitability.

Nigel's contribution to the session will look at how to use the internet to get the best for your business, and look at social networking and promoting yourself.

## **Networking**

Neal. P.

*Aber-Bangor Skills Centre*

Pamela Neal is an experienced business mentor and coach, recognised for her services to enterprise in 2008 through a Queen's Award – one of only 10 individual awards made each year in the UK for enterprise promotion. She has helped to plan, start and grow many businesses over the last 7 years in her free-lance capacity. Previous to becoming self-employed, she was Director of a successful Business Management Consultancy practice, and has also worked in a managerial capacity in large organisations – Marks & Spencer, Cadbury Schweppes and Wander Foods. Pamela now specialises in coaching people who want to start in business, and business owners and managers to 'raise their game'. She is part of the Bangor University Management Centre team delivering Strategic leadership programmes, and also the Welsh Assembly Government's Workforce Development Programme Advisory team.

The Networking Session will give a short insight in to where you might have networking encounters, what you can do to make the most of even a 30-second encounter, and how you can do it.

## **Collaborative sport & exercise science ‘in action’**

Payne, S.  
*Aberystwyth University*

Collaborative sport and exercise science is a thoroughly beneficial activity, but its many rewards are experienced by too few. This session has been organised to provide an insight into the collaborative process and all its facets, from conception and initiation, through to completion and reflection. A diverse collection of invited speakers have been assembled to contribute to this session, and as such, it should appeal to all students irrespective of their sport and exercise science discipline. Two of the four presentations will actually be delivered by multiple speakers, highlighting the idea that the collaboration need not end at the same time as the project! It is anticipated that delegates will leave the session with an enhanced appreciation of the reasons for entering into collaborative undertakings, hints as to how to make it happen, and ultimately, lessons learned and pitfalls to avoid. Attendees will hopefully be inspired to consider collaboration when planning future research and practice, and to see the value of then feeding these experiences back to our community at future conferences and workshops. What follows is a very brief taster of the talks you will hear, so please attend the session on Thursday morning for the ‘Full Monty’!

## **Internships: Collaboration between academic and non-academic departments**

Richard Metcalf, Mhari Neish, & Mark Ross  
*Heriot-Watt University, Edinburgh*

Three very promising practitioners will talk about how they delivered scientific support to athletes belonging to a Club Performance Program established by their institution’s Centre for Sport and Exercise and Sport Union. Designing, executing, and evaluating this internship program requires close partnership between many parties, and today’s presentation will uncover these links using the familiar context of inter-university sport to do so.

## **Multi-organisation research and practice**

Kerry Clarke  
*University of Northampton*

Public health and wellbeing are a topical issue, and Kerry’s presentation will demonstrate the intricacies of combining work and research in this field. On a day-to-day basis, Kerry operates in tandem with the local NHS trust, county council, community, and the private sector, making for a unique perspective on the pros and cons of collaboration!

## **Cross-disciplinary research**

Eleanor Quested  
*University of Birmingham*

Eleanor will describe a collaborative investigation that she undertook as part of her PhD research. The study examined the role of motivational processes in the manifestation of dancers' cognitive appraisals and hormonal and emotional responses to performance stress. This study involved combining the efforts and expertise of a team of sport and exercise psychologists and behavioural immunologists. Eleanor will describe the key developmental lessons she learned whilst completing this project including working cross-disciplinarily to integrate often divergent ideas, writing a successful grant application, and collecting and analysing very different forms of data.

**Inter-institutional, international, staff-student collaboration**

Emily Oliver<sup>1</sup>, Lauren Mawn<sup>2</sup>, Créde Sheehy-Kelly<sup>2</sup>, & James J. Bell<sup>2</sup>

<sup>1</sup>*Aberystwyth University* & <sup>2</sup>*Bangor University*

This presentation will focus on the diverse collaborations and experiences of four student members of the Institute for the Psychology of Elite Performance (IPEP). Collaborations with the English Cricket Board (examining leadership and mental toughness), the Royal Air Force (examining stress and performance), and a GB ski team will be discussed. The speakers will focus on how these partnerships arose and have developed, the importance of being proactive, as well as their own reflections on the process of collaborating as part of a staff-student organisation.

## Accepted abstracts

### Active gaming increases energy expenditure and HOMA-IR in healthy individuals

Abate, M.

*University of Westminster*

Looking back even in primitive society, physical activity was as important then as it is now, often performed as cultural dance. The American College of Sport Medicine's (ACSM) minimum recommendation is 30 min of moderate intensity physical activity on most days, however in a modern society adherence to exercise remains low. Physical inactivity is one of the major contributing factors to modern day chronic diseases including coronary heart disease, obesity, type 2 diabetes and some site specific cancers. With the exception of dietary modifications, it has been proposed that there is "no single intervention with greater promise than physical exercise to reduce the risk of virtually all chronic diseases simultaneously" (Booth et al., 2000: *Journal of applied physiology*, **88**, 774 - 787). Active gaming has been shown to increase energy expenditure in adolescents (Graves et al., 2007: *British Medical Journal*, **335**, 1282 - 1284), although no work has investigated the effects of active gaming on insulin sensitivity. Owing to the digital generation, Nintendo have designed an active gaming which have an appealing nature to the modern day society. Therefore the purpose of this study was to investigate the effect of active gaming on insulin sensitivity and energy expenditure. Seven healthy male individuals (age:  $24.5 \pm 3.21$  years; body mass:  $68.9 \pm 6.82$ kg; height:  $1.77 \pm 0.04$ m; body mass index:  $22.13 \pm 2.22$ ) acted as subjects for the study and gave written informed consent (in compliance with the University of Westminster ethics committee regulations) to participate in the study. Subjects performed two trials; 1) 30 min rest and 2) 30 min of active gaming. Energy expenditure was measured throughout using online breath-by-breath (Cortex, Biophysik GmbH, Germany). VCo<sub>2</sub> and VO<sub>2</sub> were used to calculate Respiratory exchange ratio (RER) and resulting values used determine energy expenditure. Fasting venous blood samples and fingertip samples were drawn before, immediately after and 24 hrs post each trial for measuring insulin sensitivity using the Quantitative insulin sensitivity check (QUICKI), Homeostasis model assessment of insulin resistance (HOMA-IR) and fasting insulin sensitivity index (FISI) methods. HOMA-IR improved in Wii gaming from baseline ( $0.96 \pm 1.74$ ) to 24 hr ( $0.7 \pm 1.24$ ) ( $P=0.012$ ).

## Investigating the negative effect of self-efficacy on golf putting performance

Adamoulas, M.S.<sup>1</sup> & Beattie, S.J.<sup>2</sup>

*Bangor University*<sup>1</sup> and *Institute for the Psychology of Elite Performance – Bangor University*<sup>2</sup>

Self-efficacy, the belief in one's capability to master a task, is fundamental to social cognitive theory (Bandura, 1986: *Journal of Clinical and Social Psychology*, 4, 263-268) which predicts a positive relationship between self-efficacy and performance. Abundant previous research supports this assumption. However, perceptual control theory (Powers, 1973: *Behaviour: The control of perception*. Chicago: Aldine), which considers the relations of self-efficacy and personal goals with performance, stresses that self-efficacy can, in some cases, have a negative relationship with performance. When looked at within a person over time, Vancouver et al. (2001: *Journal of Applied Psychology*, 86, 605-620) found that performance had a positive effect on self-efficacy, but that self-efficacy had a negative effect on subsequent performance. The task used in their study was criticised for being based on guesswork and thus not allowing efficacy beliefs to develop over time (Bandura & Locke, 2003: *Journal of Applied Psychology*, 88, 87-99.). This study aimed to test Vancouver and colleagues (2001) findings in a lab based golf putting task which allowed for learning to occur over time. 56 novice golfers completed the task. They putted a total of 200 balls over ten trials (20 per trial) up an inclined slope. The first two trials were practice and the remaining eight experimental. A self-efficacy questionnaire measuring self efficacy strength and magnitude was completed after the first trial and all subsequent trials thereafter. Performance recorded successful putts in each trial. Multilevel modelling was used to analyse the results at the within-person level. At the between-person level of analysis, self-efficacy strength ( $r = .6.73$ ) and magnitude ( $r = .6.71$ ) were positively correlated with performance. At the within-person level, past performance had a significant positive relation with self-efficacy magnitude [ $t(55) = 1.94, p = .05$ ] and self-efficacy strength [ $t(50) = 3.76, p < .01$ ]. At the same level of analysis, results showed that self-efficacy had a significant negative relationship with performance. The results offer additional support to Vancouver et al's (2001) findings, in a skill based learning task. Future research should examine learning over a longer period of time, given that this study only addressed learning over a period of 200 putts, as the negative effects of self efficacy may be more evident in earlier stages of skill development, when an individual lacks mastery beliefs.

## **The effects of muscle-damaging leg exercise on repeated sprint performance using a non-motorised treadmill**

Agu, J.

*Department of Sport and Exercise Sciences, University of Chester*

Research into the effects of exercise-induced muscle damage (EIMD) on intermittent sprint activity is somewhat equivocal. Furthermore, while the non-motorised treadmill (NMT) provides a useful and reliable tool for assessing repeated sprint performance (Sirotic and Coutts, 2008: *Journal of Science and Medicine in Sport*, 11, 500-509), no studies to date have investigated the effects of EIMD on sprint running parameters using the NMT. Therefore, the purpose of this investigation was to assess the effects of EIMD on repeated sprint performance using the NMT. Following ethical approval, eight moderately trained sports science students participated in the study (age,  $20 \pm 1.5$  years; stature,  $1.80 \pm 0.9$  m; body mass,  $77.8 \pm 19.6$  kg). Perceived muscle soreness, isokinetic peak torque of the knee flexors and extensors at 60 and 240 deg·s<sup>-1</sup>, and sprint running performance during  $6 \times 6$  s sprints using a non-motorised treadmill (NMT) were recorded at baseline, and then at 24, 48 and 72 h following  $10 \times 10$  squats at 80% of body mass. Repeated measures ANOVA revealed a main effect for time for perceived muscle soreness, with values higher than baseline at all time intervals following squatting exercise ( $P < 0.05$ ). Furthermore, knee extensor peak torque at 60 deg·s<sup>-1</sup> was significantly reduced from baseline at 24 and 48 h ( $P < 0.05$ ). Peak running speed was reduced from baseline at 48 and 72 h following squatting exercise ( $P < 0.05$ ). However, while the rate of fatigue between the repeated sprints was reduced over time, values were not significantly different from baseline ( $P > 0.05$ ). The observation that peak sprint running speed is impaired for at least three days following muscle damaging exercise is consistent with the preferential damage of type II muscle fibres following EIMD. Consequently, these findings further demonstrate the benefit in the periodisation of training in the days following heavy strength training with regards to sports of an intermittent nature.

## Physiological responses to a triathlon swim-training session wearing a wetsuit versus a trisuit.

Allwork, D. & Myers, S.  
*University of Chichester*

During open-water triathlons it is mandatory for competitors to wear a wetsuit if the water temperature is below 14°C for a 1500 m swim and 16°C for swims over 3001 m (British Triathlon Federation, 2010). Above these temperatures competitors can opt to wear an all-in-one costume (trisuit) for the whole event. Hausswirth and Brisswalter (2008: *Sports Medicine*, 38, 881-891) suggested that wearing a wetsuit, compared to a swimsuit, during swim performance, reduces metabolic load allowing the athlete to swim faster. Whilst wetsuits may be advantageous during competition, if worn when training they may inadvertently decrease the intensity of a coached session thereby reducing its effectiveness. This study compared the physiological responses to a typical swim training session when wearing a wetsuit and a trisuit. Ten triathletes (five women, mean  $\pm$  SD, age  $33 \pm 12$  years, height  $175 \pm 11$  cm, body mass  $67.9 \pm 11$  kg, body fat  $10.6 \pm 5\%$ ) completed in a crossover design, 1 week apart, 20-minute training sessions (5 min front crawl, 10 min kickboard and pull-buoy drills, 5 min front crawl) in a swimming flume (water temperature 15°C, velocity, crawl 0.73, drills 0.55 m.s<sup>-1</sup>) wearing a wetsuit (WS) or a trisuit (TS). Sessions were preceded by a 5-min warm-up and completed with 1 min intervals between components. Heart rate (HR) and rating of perceived exertion (RPE) were measured at five-minute intervals, blood lactate (Bla) pre- and 3-minutes post-session and average stroke rate (SR) in the first five minutes of testing. Data were compared using paired t-tests. Compared to the TS sessions overall HR (WS  $139 \pm 10$  beat.min<sup>-1</sup> vs. TS  $152 \pm 7$  beats.min<sup>-1</sup>,  $P < 0.01$ ) and RPE (WS  $14 \pm 1$  vs. TS  $17 \pm 1$ ,  $P = 0.03$ ) were lower in the WS sessions. The SR was also lower in the WS sessions (WS  $53 \pm 4$  strokes.min<sup>-1</sup> vs. TS  $57 \pm 2.0$ ,  $P = 0.04$ ). Post-session Bla values increased for both conditions ( $P < 0.05$ ), but showed no difference between conditions. Our findings suggest that both the physiological response and perceived exertion are lower when completing a training session wearing a wetsuit, agreeing with those of Hausswirth and Brisswalter (2008) and Trappe et al., (1996: *International Journal of Sports Medicine*, 17, 111-114) for maximal swimming performance. This information is of importance to coaches who should take account what the triathlete is wearing when setting the intensity of a session.

## Prediction of maximal oxygen uptake using rating of perceived exertion during arm crank exercise in able-bodied and individuals with poliomyelitis

Al-Rahamneh, H.,<sup>1</sup> Faulkner, J.,<sup>2</sup> Byrne, C.,<sup>1</sup> & Eston, R.<sup>1</sup>  
*University of Exeter, UK<sup>1</sup> and Massey University, New Zealand<sup>2</sup>*

The ratings of perceived exertion (RPE) obtained during submaximal exercise are a valid means of predicting maximal functional capacity in healthy, able-bodied individuals (Eston et al., 2005: *European Journal of Applied Physiology*, **94**, 221-227). The aim of the current study was to assess the utility of the RPE to predict maximal oxygen uptake ( $\dot{V}O_{2\max}$ ) during arm ergometry in able-bodied participants and those with poliomyelitis. Sixteen able-bodied (9 men, 7 women) and 15 participants with poliomyelitis (8 men, 7 women) completed an arm crank exercise test to volitional exhaustion, which comprised of a ramp protocol with increments of 15 W.min<sup>-1</sup> and 6 W.min<sup>-1</sup> for able-bodied men and women, respectively; and 9 W.min<sup>-1</sup> and 6 W.min<sup>-1</sup> for men and women with poliomyelitis, respectively. The prediction of  $\dot{V}O_{2\max}$  was calculated by extrapolating the sub-maximal RPE and  $\dot{V}O_2$  values by linear regression to RPE<sub>20</sub> - the theoretical maximal RPE. Differences between predicted and measured  $\dot{V}O_{2\max}$  were assessed by ANOVA. For the able-bodied participants, there were no significant differences between measured and predicted  $\dot{V}O_{2\max}$  from the three sub-maximal ranges of the RPE (RPEs prior to and including RPE 13, 15 and 17,  $P > 0.05$ ). For the participants with poliomyelitis (men and women), the  $\dot{V}O_{2\max}$  predicted from RPEs prior to and including RPE 13 was significantly higher than measured  $\dot{V}O_{2\max}$  ( $P = .035$ ). The 95% Limits of Agreement (LoA) (bias  $\pm 1.96 \times SD_{\text{diff}}$ , ml·kg<sup>-1</sup>min<sup>-1</sup>) for RPE 13, 15 and 17 ( $-2.8 \pm 13.9$ ,  $-0.5 \pm 10.0$  &  $-0.2 \pm 8.0$  ml·kg<sup>-1</sup>min<sup>-1</sup>, respectively) were lower than the respective values of the poliomyelitis participants ( $5.7 \pm 18.6$ ,  $1.7 \pm 12.1$  &  $1.7 \pm 9.3$  ml·kg<sup>-1</sup>min<sup>-1</sup>, respectively). Analysis of the consistency of the predictions revealed higher intra-class correlations (ICC) for predicted versus measured  $\dot{V}O_{2\max}$  for the able-bodied participants than individuals with poliomyelitis for each RPE (RPE, ICC; 13, 0.70; 15, 0.85; 17, 0.91; cf. 13, 0.61; 15, 0.78; 17, 0.84, respectively). This study has shown that the estimation  $\dot{V}O_{2\max}$  from submaximal RPE during arm ergometry is generally more accurate in able-bodied participants in comparison to those with poliomyelitis.

## **The effects of a coach's gaze pattern and speech volume on athletes' initial impressions of coaching competency**

Ambrose, E. & Greenlees, I.  
*University of Chichester*

The volume at which people speak, and the amount of eye contact which people engage in during social interactions, have been shown to influence the impressions that others form of them and how competent they are perceived to be (e.g. Pittam, 1990: *The Journal of Social Psychology*, **130**, 81-87; Droney & Brooks, 1993: *The Journal of Social Psychology*, **133**, 715-722). However, no research has examined the extent to which such information sources influence how athletes perceive their coaches. Therefore, the present study aimed to examine the effects of gaze patterns and speech volume on athletes' initial impressions of a coach's competency. Following institutional ethical approval, 80 Basketball players (mean age  $21.19 \pm 4.06$  years; competitive experience  $7.08 \pm 4.89$  years) viewed two film clips (clips lasted ~35 seconds). Each clip showed a coach introducing a training drill. Both coaches had identical clothing and equipment, and were of similar stature. The first coach (control; 21 year old male Soccer coach) was instructed to speak at conversation volume and not focus gaze direction intentionally. All participants viewed the same footage of this coach. The second coach (experimental; 22 year old male Cricket coach) was viewed by participants introducing the drill in one of four conditions: 1) 90% gaze/loud speech, 2) 10% gaze/loud speech, 3) 90% gaze/quiet speech, 4) 10% gaze/quiet speech. Gaze was manipulated by instructing the coach to look at the camera for specific periods of time, and speech volume was manipulated by instructing the coach to speak with significantly more or less volume, depending on the condition. To ensure that the nature of the drill was sport specific and identical for all conditions, coaches recited a memorised script. After watching each coach, participants completed an adapted Coaching Competency Scale (Myers *et al.*, 2006: *Research Quarterly for Exercise and Sport*, **77**, 451-463). A series of two-way (gaze by speech volume) ANOVAs indicated that when the coach displayed 90% gaze, he was perceived to possess more technical competence ( $P=0.0005$ ), more game strategy competence ( $P=0.0005$ ), more motivation competence ( $P=0.0005$ ), and more character building competence ( $P=0.0005$ ). The ANOVA's also indicated that when the coach used loud speech, he was perceived to possess more technical competence ( $P=0.0005$ ), more game strategy competence ( $P=0.0005$ ), more motivation competence ( $P=0.0005$ ), and more character building competence ( $P=0.0005$ ). These results provide further support for the notion that a coach's verbal and non-verbal communication influences how they are perceived by athletes.

## **Effects of wrist cooling upon pacing during a 10 mile time trial in hot conditions.**

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Exercise in the heat can only be maintained for a limited period of time until a critical core temperature of approximately 40°C is attained (Barwood et al. 2009: *European Journal of Applied Physiology*. **107**: 385-396) and exercise is terminated. Pre-cooling has been shown to improve intermittent sprint performance in the heat (Castle et al, 2006: *Journal of Applied Physiology*, **100**(4) pp 1377-1384) through the lowering of starting core temperature, allowing a greater rate of heat storage. However the pre-cooling process can be lengthy and awkward to administer. Continuous extraction of heat through the wrists using cool packs is a more practical cooling strategy and has been shown to increase aerobic endurance (Grahn et al. 2005: *Journal of Applied Physiology*. **99**: 972-978). Despite the apparent ergogenic affect of cooling during exercise in the heat, little research exists on the effect of this strategy on self-paced exercise in the heat. The aim of the study was to establish whether the introduction of ice packs on wrists would affect power output over the ten mile (16.1km) time trial (TT). Furthermore, to identify whether the ice packs would mitigate changes in core temperature or muscle temperature. With University Ethical approval seven male games players completed four testing sessions on separate days. Following a completion on a maximal incremental test and a 10 mile TT familiarisation, participants completed two self-paced 10 mile TT in 30 °C with or without ice packs placed on their wrists in a counter balanced, cross over design. Within each TT, core and muscle temperature, sweat rate, HR, and power output were measured continuously. B[La] was taken every 4 km and participants were asked to shout out RPE and TSS every kilometre. Differences between the conditions were analysed using two-way ANOVA with repeated measures. Significance was accepted at  $p < 0.05$ . Testing is ongoing. It is hypothesised that the administration of ice packs will allow the maintenance of a higher mean power output for the same rate of core temperature increase as the control condition. Furthermore, using ice packs, participants will produce faster TT times, but in the absence in any difference in muscle temperature.

## **Muscle activation of the dominant and non-dominant arms in forward paddling for novice and experienced male kayakers**

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There has been limited biomechanical analysis in kayaking; with only one study using EMG to identify differences in muscle activation between novice and experienced kayakers (Trevithick *et al.*, 2007: *Journal of Electromyography and Kinesiology*, **17**, 74-79). An imbalance in muscle activation between the dominant and non-dominant arms in kayaking has yet to be investigated but may cause ineffective technique or injury (Heinrichs, 1991: *National Strength and Conditioning Association Journal*, **13**, 26-36). The aim was to compare muscle activation of the dominant and non-dominant arms of novice and experienced kayakers, as well as comparing the two groups (novice and experienced). It is hypothesised that there will be greater muscle activation in the dominant arm of novice kayakers but that this difference will not be present in more experienced performers. Following ethical approval, nine male participants were recruited (aged  $20.5 \pm 2.5$  years) into two groups: novice (n=5) and experienced (n=4). Participants completed two 10s sprints on a kayak ergometer. Following skin preparation, bipolar, active surface electromyography (EMG, Biometrics Datalog) was recorded in the anterior and posterior deltoid and the trapezius on both arms. Raw EMG data was rectified and integrated to identify total muscle activation; to identify peak activity the EMG data was also processed using RMS for the three muscles. Following normality checks, a one-way ANOVA showed significant differences for peak and total posterior deltoid activity between novice and experienced kayakers (peak, experienced: 1.97 mV; novice: 3.46 mV;  $F=5.55$ ;  $P=0.03$ ; total, experienced: 2.43 mV; novice: 5.45 mV;  $F=9.48$ ;  $P=0.01$ ). As hypothesised no significant difference was seen in peak or total EMG activity between the dominant and non-dominant arms of experienced kayakers for any of the muscles tested ( $P > 0.4$ ). However, no difference was seen between the dominant and non-dominant arms of novice kayakers for any of the muscles tested ( $P > 0.47$ ), rejecting the experimental hypothesis. This result suggests that muscular asymmetry may not be a problem in kayaking. The results identified a significant increase in EMG muscle activity in the posterior deltoid in novice kayakers when compared to experienced kayakers. It could be suggested that experienced kayaking technique is demonstrated by lower, controlled muscle activation in the posterior deltoid. Future research should continue to investigate differences between novice and experienced kayakers in other muscles (e.g. latissimus dorsi).

## The influence of pacing strategy and event duration on O<sub>2</sub> uptake kinetics and exercise performance

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Exercise initiated using a fast-start (FS) pacing strategy has been shown to enhance short-duration exercise performance by accelerating  $\dot{V}O_2$  on-kinetics (Jones *et al.*, 2008: *Scandinavian Journal of Medicine and Science in Sports*, **18**, 615-626). The purpose of this investigation was to determine whether pacing strategy and event duration interact to determine exercise performance and the potential mechanisms by which any performance gains are manifest. Seven recreationally active males (mean  $\pm$  SD: age  $21 \pm 2$  yr; height  $180 \pm 6$  cm; body mass  $80 \pm 8$  kg) volunteered to participate in this ethically approved study. Each participant completed 3 and 6 min cycle trials initiated using an even-start (3-ES; 6-ES; constant work rate); fast-start (3-FS; 6-FS; a work rate that was initially 10% greater than ES but declined to 10% below ES); or the opposite (slow-start; 3-SS; 6-SS) for the first half of the trial; with the performance of an all-out sprint during the final minute of each trial. All trials were completed in a randomized cross-over design and the data were analysed with a one-way repeated measures ANOVA. The overall  $\dot{V}O_2$  kinetics was accelerated in 3-FS ( $35 \pm 6$ -s) and 3-ES ( $41 \pm 10$ -s) compared to 3-SS ( $55 \pm 14$ -s) and in 3-FS compared to 3-ES ( $P < 0.05$ ) with similar adjustments in  $\dot{V}O_2$  kinetics observed in the 6 min trials. The total sprint work done was enhanced in the 3-FS ( $22.2 \pm 3.9$  kJ  $P < 0.05$ ) compared to 3-ES ( $20.7 \pm 3.5$  kJ) and 3-SS ( $20.5 \pm 4.1$  kJ) trial; while sprint performance was similar in the 6 min trials irrespective of the pacing strategy imposed (6-FS:  $20.1 \pm 4.9$  kJ; 6-ES:  $20.1 \pm 4.6$  kJ; 6-SS:  $19.9 \pm 4.5$  kJ;  $P > 0.05$ ). These data demonstrate that the 3-FS trial provoked faster  $\dot{V}O_2$  kinetics and an improved exercise performance when compared to 3-ES and 3-SS. The faster  $\dot{V}O_2$  kinetics in 3-FS would be expected to spare the finite anaerobic reserves and reduce the accumulation of fatigue-inducing metabolites; facilitating an improved end-sprint performance. As the event duration was increased; however; the faster  $\dot{V}O_2$  kinetics in 6-FS appears to have been offset by the greater initial metabolic perturbation such that exercise performance was not altered. These data demonstrate that the pacing strategy interacts with the event duration to determine whether faster  $\dot{V}O_2$  kinetics improves exercise performance.

## **The efficacy of the theory of planned behaviour in predicting adherence to self-initiated exercise change across an individual's stage of change and demographic variables**

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The theory of planned behaviour (TPB) is a leading theoretical model of universal social behaviour (Rhodes and Courneya, 2005: *Behavioural Medicine*, 34, 85-93). There is a wealth of research providing support to the efficacy of the TPB and its constructs as a predictor of exercise intentions and behaviour; however far less research is available regarding the theories ability to predict long-term maintenance to exercise (Armitage, 2005: *Health Psychology*, 24, 235-245). The TPB has been combined with the Transtheoretical model's stages of change to identify differences in the predictive characteristics of the various constructs at different stages in behaviour change (Nguyen et al., 1997: *Journal of Community Health*, 22, 233-246). However despite this, current studies on the TPB have focused on individuals already actively attempting exercise change. Self-change attempts are also characteristically different from external exercise interventions (Trottier et al., 2009: *Behaviour Therapy*, 40, 164-170). This area may have been previously neglected by TPB research due to difficulties identifying and contacting those in the contemplation phase. The New Year is a time when many people resolve to change unhealthy behaviours, with the most prevalent resolutions relating to exercise, making the beginning of the year an important period for studying individuals contemplating or beginning attempts to alter physical activity levels (Norcross et al.; 2002: *Journal of Clinical Psychology*, 58, 397-405). The present study attempted to assess the TPB constructs across the different stages of change from within the transtheoretical model during self-initiated exercise change. Research has also suggested that there may be differences in the efficacy of the theory's constructs across populations (Blanchard et al., 2007: *Journal of American College Health*, 56, 341-346; Marcus et al., 2000: *Health Psychology*, 19, 32-41), thus this investigation additionally examined whether the TPB behaviour operates homogeneously across demographic variables. Participants were recruited from a convenience sample of workers from within a workplace. Ethical approval for this study was granted by a university committee. The *International Physical Activity Questionnaire* was used to measure current exercise levels; participants were also asked about their future exercise intentions, demographic information and the TPB was measured with standard items. Twenty-nine participants completed the first round of questionnaires and a second phase of questionnaire will be completed following a 6 week interval as this has been shown to be a key timescale for developing exercise habits (Armitage, 2005: *Health Psychology*, 24, 235-245).

## **The effect of highlight music videotapes upon the levels of self-efficacy, intrinsic motivation and game performance of university basketball players**

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Highlight videos combined with music have been shown to improve perceived athletic performance (Templin and Vernacchia, 1995: *The Sport Psychologist*, **9**, 41-50). However, research is limited on the effect of highlight music videos on psychological mechanisms such as intrinsic motivation and self efficacy. The aim of this study was to investigate the effect of highlight music videotapes on levels of self efficacy, intrinsic motivation, and perceived game performance of University basketball players. Ethical approval was granted by the institution prior to commencing the study and informed consent was gained from participants. Participants were four male University basketball 1st team players aged between 19-23 years. A highlight music video tape was made for each participant from footage of training and matches. Music that accompanied the videos were self selected as recommended by Bishop *et al.* (2007: *Journal of Sport and Exercise Psychology*, **29**, 584-607). Highlight video lengths corresponded to the length of the participants chosen song, and videos made use of slow motion effects. Affirmations outlined in preliminary questionnaires were also included. A single-case-multiple-baseline-across individuals design was implemented allowing participants to act as their own control (Kendall *et al.*, 1990: *Journal of Sport and Exercise Psychology*, **12**, 157-166). A minimum of 3 weeks baseline data was collected for each participant who completed a modified Cognitive State Anxiety Inventory-2 and modified Sport Motivation Scale before each game. Each participant chose a performance measure, which they evaluated after each game using a performance Likert scale. When the intervention was introduced, each participant watched their personal highlight video prior to completing the two pre performance questionnaires. A maximum of six weeks intervention data was collected. After nine weeks, participants completed a social validation questionnaire to provide feedback on the effectiveness of the intervention (Greenlees and Thelwell, 2003: *The Sport Psychologist*, **17**, 318-337). Data was analysed using visual inspection procedures as recommended by Martin and Pear (1996: *Behavior Modification: What It Is and How To Do It* (5<sup>th</sup> edition). Englewood Cliffs, NJ: Prentice-Hall Inc.). Participants two and four showed a positive mean difference of 1.7 and 2.8 respectively from baseline to intervention for perceived performance. Participants one, two and four showed a positive mean difference of 0.2, 0.12 and 0.66 respectively for intrinsic motivation. Participants one, two, three and four showed a positive difference of 0.39, 0.11, 0.89 and 0.77 respectively for the direction of self-efficacy. Participants two, three and four showed a positive difference of 0.3, 0.19 and 0.39 respectively for the intensity of self-efficacy. From the results it can be partially concluded that, the intervention of music highlight videos can be mediators of perceived performance, intrinsic motivation and self-efficacy. The findings from the current study support previous research from Templin and Vernacchia (1995).

## **Peroneal weakness as a risk factor for lateral ankle sprain: A prospective study**

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Lateral ankle ligament sprains are the most common form of injury to occur within sport. Excessive inversion moment, when the foot is in a plantar-flexed and inverted position, can cause sprains and tears to the lateral collateral ligaments resulting in time loss from participation and financial burden to the individual, sport and health service. A number of intrinsic and extrinsic risk factors have been considered but general consensus regarding proposed risk factors for this injury remain to be seen. During this mechanism the peroneals function as a dynamic stabiliser and are vital when static stabilisers are vulnerable. Research has found a relationship co-exists between peroneal weakness and lateral ankle sprains, however prospective literature is lacking. The aim of this study was to determine prospectively whether peroneal strength and lifestyle factors can be used as a predictor of ankle sprains. With ethical approval from school of social sciences and law, active sports participants (n=25) were recruited for the study. The Biodex system 3 isokinetic dynamometer, considered to be the gold standard in measuring muscle force and torque, was used to obtain bilateral inversion and eversion ankle strength variables including peak torque (NM), peak torque normalized for bodyweight, and concentric/eccentric inversion and eversion strength ratios (%). Testing was conducted concentrically followed by concentric and eccentric contraction combined at recognised speeds of 30°/sec and 120°/sec, containing 5 repetitions each (Kaminski *et al.*, 2003: *British Journal of Sports Medicine*, **37**, 410-415). Lifestyle factors comprising alcohol consumption and smoking habit were also recorded. Injuries will be reported to the researcher and assessed in the Teesside University sports injury clinic. The overall incidence rate for ankle sprains is expected to exceed 15% (Willems *et al.*, 2005: *American Journal of Sports Medicine*, **33**, 415-423). The data will be grouped by injury versus non-injury. It is expected that individuals with lower strength measures are at an increased risk of sustaining lateral ankle sprains. A logistic regression model combining risk factors will be developed and used to predict non-injured and injured groups. Further research will require longitudinal studies with larger populations to evaluate the accuracy of the model and its reliability as a possible screening tool for future intervention studies. The ability to predict ankle sprains based on muscle weakness provides a clinically relevant indicator that can be used to reduce the risk of future ankle sprains.

## **Ergogenic effect of low doses of caffeine on visual choice reaction time during cycling performance**

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Competitive cycling is frequently performed at different exercise intensities. Whilst cycling at light to moderate exercise intensities has been shown to facilitate motor skill performance, this is not reflected at heavier exercise intensities, with performers becoming fatigued and less responsive to stimuli. Independently, caffeine has been shown to increase alertness and arousal as well as eliciting improved performance with as little as  $3 \text{ mg}\cdot\text{kg}^{-1}$  body mass (BM) (Bridge and Jones, 2006: *Journal of Sports Sciences*, **24**, 433-439). However, no studies to the knowledge of the author have researched how the ergogenic effects of caffeine can affect stimulus response in conjunction with high intensity exercise. The purpose of the study was to discover whether low doses of caffeine could reduce visual choice reaction time (VCRT; Lafayette Instrument Company: Indiana, USA.) during high intensity cycle performance, and minimise the effects of fatigue. Following ethical clearance from the Health, Exercise and Sports Science programme, eight non-habitual caffeine users ( $\bar{x} \pm \text{SD}$ ), age  $21.25 \pm 2.75$  years, body mass  $72.80 \pm 12.80$  kg, stature  $178.71 \pm 10.09$  cm, volunteered for the study and completed informed consent. A 24 h caffeine cessation period preceded each performance test. Participants would then either consume 200 mg caffeine (agreed with reports by Bridge and Jones, 2006) (caffeine group) or white flour tablet (placebo group) 45 min prior to exercise in a single-blind randomised cross-over design. The performance protocol required each participant to exercise on a Monark cycle ergometer (Monark Ergomedic 874E: Helsinki, Finland) for 15 min at ventilatory threshold. Following a four minute active recovery, each participant performed a 15 min maximum performance ride (Jenkins *et al.*, 2008: *International Journal of Sport Nutrition and Exercise Metabolism*, **18**, 328-342). Baseline measurements of VCRT, heart rate, oxygen consumption ( $\dot{V} \text{ O}_2$ ) and ratings of perceived exertion (RPE) were obtained and then at three minute intervals throughout exercise. 8 paired T-tests examined changes in VCRT between the two conditions with a Bonferroni adjustment. A statistical significance level of .007 was set with partial eta-squared ( $\eta^2_p$ ) used to measure the size of the caffeine effect. There was no statistical significant difference in VCRT between caffeine and placebo trials in the first 15 min at VT, however, the last reaction test within the final minute of exercise at self selected pace showed a major significant difference in VCRT ( $t_{(7)} = 3.757$ ,  $P = .007$ ). In conclusion, at low intensity steady state exercise, caffeine does not have a major ergogenic effect on VCRT. Conversely, at high intensity exercise when close to volitional fatigue, performers VCRT did not diminish with the presence of caffeine compared to placebo where reaction times became increasingly slower.

## **Relationship between team cohesion and collective efficacy among female soccer players**

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The purpose of the present study was to examine the relationship between team cohesion and collective efficacy among female soccer players. Bandura (1997: *Self-Efficacy: The exercise of control*. New York: Freeman) suggested that collective efficacy has important implications for sports teams; especially in sports that require high levels of interaction and interdependence. Following Bandura's suggestion, research has taken a particular focus on the relationship between cohesion and collective efficacy. Zaccaro *et al.* (1995: In *Self-efficacy; adaptation and adjustment*, edited by J. Maddux. New York: Plenum) proposed that group cohesion can contribute to a team's sense of efficacy. A positive relationship between team cohesion and collective efficacy was found in a study that examined rugby union teams (Kozub & McDonnell; 2000: *Journal of Sport Behavior*, **23**; 120-129). More specifically; group integration-task (GI-T) was a slightly better predictor than individual attractions to the group-task (ATG-T);  $r = .36$  and  $.34$  respectively. Kozub and McDonnell also noted that the two social dimensions of cohesion did not add significantly to the prediction of collective efficacy. In the present study; it was hypothesised that all GEQ subscales would be significant predictors of collective efficacy and that the GEQ task subscales would emerge as the strongest predictors of collective efficacy when compared to the social subscales. Participants were female athletes ( $N = 30$ ) on a University soccer squad. Two questionnaires were administered to the participants; the Group Environment Questionnaire (GEQ) was completed in the last training session prior to a British Universities and Colleges (BUCS) quarterfinal match, and the Collective Efficacy Questionnaire (CEQ) was completed an hour prior to the quarterfinal match. Following screening of the data and appropriate tests for parametric assumptions, a standard linear regression was used to predict collective efficacy from the four subscales of the GEQ. The results have yet to be analysed and will be included in the resubmission of the abstract following blind review. My supervisor Dr Costas Karageorghis will provide written confirmation that the results will be ready in time to meet the resubmission deadline.

## Is the incidence of plateau at $\text{VO}_{2\text{max}}$ associated with individual psychological traits?

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The concept of maximal aerobic power ( $\text{VO}_{2\text{max}}$ ) has allowed physiologists to assess the boundaries of human cardio-pulmonary physiology. It has previously been suggested that elite athletes are more prone to displaying a maximal effort during incremental testing, as displayed by a plateau in  $\text{VO}_2$  despite a continued rise in workload in comparison to less active counterparts, this being attributed to the psychological traits they show such as competitiveness and determination (Doherty et al., 2003: *European Journal of Applied Physiology*, 89, 619-623). Therefore the purpose of this study was to address the association between psychological traits and the incidence of plateau at  $\text{VO}_{2\text{max}}$ . Following University institutional ethics approval 8 recreational runners (mean  $\pm$  SD), age  $23.9 \pm 5.0$  years body mass  $82.8 \pm 9.4$  kg and stature  $180.9 \pm 9.4$  cm undertook four gradient-based incremental trials to volitional exhaustion on a pre-calibrated treadmill for determination of  $\text{VO}_{2\text{max}}$ . During all trials  $\text{VO}_2$  was recorded on a breath-by-breath basis. The initial test acted as a familiarisation trial with the following three being experimental, during which the participant's heart rate (HR) was projected onto a screen in front of them every 30s for the duration of the test. The HR was randomly altered in two of these trials by  $\pm 10$  bpm of the actual HR response. The pace of life index was completed prior to each trial as a measure of personality type along with the competitive state anxiety inventory (CSAI-2) and the thought occurrence questionnaire for sport (TOQS). Initially the  $\text{VO}_{2\text{max}}$  data of 8 participants has been analysed using the criteria of establishing a plateau,  $\Delta\text{VO}_2 < 50\text{ml}\cdot\text{min}^{-1}$  over the final 2 consecutive 30s samples along with pre-established secondary criteria (Astorino, 2000: *Journal of Exercise Physiology-online*, 3, 1-12), after which correlations were used to test the association between personality type and plateau incidence. Results showed a non-significant correlation ( $p \geq 0.05$ ) between personality type scores and  $\Delta\text{VO}_2$ .  $41.6\text{ ml}\cdot\text{min}^{-1}$ ,  $-26.0\text{ ml}\cdot\text{min}^{-1}$  and  $57.9\text{ ml}\cdot\text{min}^{-1}$  for the actual, +10 bpm and -10bpm trials, respectively. It can therefore be suggested that personality type has no association to the incidence of plateau at  $\text{VO}_{2\text{max}}$  suggesting that the plateau response is more likely to be physiologically than psychologically derived. Further analysis will be made on the other traits measured which are expected to show a similar result as personality.

## **Effects of protein (PRO) inclusion in carbohydrate (CHO) drinks when consumed 50 minutes prior to a cycle to exhaustion**

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In the past eight years, research studies suggests that endurance performance can be further enhanced by consuming a carbohydrate and protein (CHO-PRO) supplement when compared to a carbohydrate-only supplement (CHO) (Ivy, Res, Sprague & Widzer, 2003: *International Journal of Sport Nutrition and Exercise Metabolism*, **36**, 382-395; Saunders, Kane & Todd, 2004: *Medicine and Science in Sports and Exercise*, **7**, 1233-1238). However, the practical implications of these studies are held back by the following limitations: (a) the rate of CHO ingestion was less than the optimal rate for high level endurance performance of 1.0-1.2 g·min<sup>-1</sup> (Jeukendrup, 2004: *Nutrition*, **20**, 669-677), and (b) the performance test (exercise time to fatigue) did not mimic the way in which athletes typically compete (i.e., a race in which a fixed distance or set amount of work is performed as quickly as possible) (Van Essen & Gibala, 2006: *Medicine and Science in Sports and Exercise*, **38**, 1476-1483). The purpose of this study was to determine whether the inclusion of protein into a carbohydrate drink would improve endurance performance, when compared to a carbohydrate drink and a non-energetic sweetened placebo (PL) in a performance-simulated test. Ten male university students (age: 21 ± 3 years, height: 175.3 ± 3 cm, weight: 74.3 ± 5 kg,  $\text{V}_{\text{O}_2 \text{ peak}}$ : 40 ± 3 l/min) performed a cycle to exhaustion on three occasions separated by 7 days. In a double-blinded, placebo controlled, repeated measures crossover study, participants ingested CHO-PRO, CHO, PL at a rate of 500 ml 50 min before exercise and 500 ml during exercise with no temporal, verbal, or physiological feedback. Data analysed included distance travelled, time to exhaustion, blood glucose and blood lactate levels. All these values were governed by which drink each participant was given. Statistical analyses include a one way repeated measures ANOVA with a post hoc comparison. The main ANOVA will identify if there are any significant difference between the drinks when looking at each dependent variable. Following on from the main ANOVA is the pairwise comparison which will show where the significance actually lies. This will allow any further conclusions for use in the future. In conclusion, ingesting CHO 50 minutes before and during exercise, will improve time to exhaustion, allowing them to travel a further distance. However adding PRO to CHO drink will provide no additional performance benefit during a task that involved the athletes to travel the longest distance possible before exhaustion set in.

## Inspiratory loading does not influence lactate recovery kinetics during recovery from intense exercise

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Chiappa *et al.* (2008: *Medicine & Science in Sports & Exercise*, **40**, 111-116; 2009: *European Journal of Applied Physiology*, **106**, 297-303) have recently shown accelerated lactate clearance with the application of a 15 cmH<sub>2</sub>O inspiratory load during recovery from intense exercise. However, our laboratory only observed such an effect following a period of inspiratory muscle training (Brown *et al.* 2010: *Medicine & Science in Sports & Exercise*, In Press). Therefore, to investigate this further, we examined the effects of a 15 cmH<sub>2</sub>O inspiratory pressure-threshold load on lactate recovery kinetics during recovery from intense exercise. Six active male participants completed two maximal incremental cycling tests (20 W min<sup>-1</sup> starting at 0W), of identical duration (16.19 ± 1.22 min, maximal power = 313 ± 21 W), followed by a 20 min recovery period comprising either passive recovery (PR) or breathing through a inspiratory pressure-threshold load of 15 cmH<sub>2</sub>O (IPTL). Respiratory variables were measured breath-by-breath and blood samples were taken from a dorsal hand vein during the recovery period and analysed for blood lactate concentration ([lac]<sub>B</sub>) every 2 min, and blood gases (pH and PCO<sub>2</sub>) every 4 min. Heart rate (HR) was measured, and arterial oxygen saturation (SpO<sub>2</sub>) estimated, every 2 min during recovery. Individual [lac]<sub>B</sub> recovery curves were fitted with a bi-exponential time function using an iterative non-linear regression technique. Data were analysed using ANOVA for repeated measures and paired t-tests where appropriate, with statistical significance accepted at P < 0.05. Maximal oxygen uptake was not different between PR (4.20 ± 0.49 L·min<sup>-1</sup>) and IPTL (4.04 ± 0.37 L·min<sup>-1</sup>). No difference in peak [lac]<sub>B</sub> was observed between PR (11.27 ± 2.53 mmol·L) and IPTL (10.97 ± 2.28 mmol·L). Results suggest that the slow velocity constant describing blood lactate disappearance was not different between PR and IPTL. Blood gases, HCO<sub>3</sub><sup>-</sup> ventilatory responses, HR and SpO<sub>2</sub> were also similar between trials. In conclusion, a 15 cmH<sub>2</sub>O inspiratory pressure-threshold load did not influence lactate recovery kinetics following intense exercise. These findings are consistent with our recent observations (Brown *et al.*, 2010) but again contradict those of Chiappa *et al.* (2008). An explanation for these discrepancies is not readily forthcoming, thus this provides an attractive avenue for further investigation.

## **Post activation potentiation, and differences in Wingate performance in anaerobic and aerobic athletes during two recovery times.**

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Post activation potentiation (PAP) involves applying a sub maximal exercise stimulus prior to a competitive performance as means to enhance power output and performance. Whilst the mechanisms are unclear, it has been previously suggested PAP occurs most within type IIa or type IIb muscle fibre types. On this basis, endurance athletes may be expected to exhibit less PAP than in anaerobic athletes. Endurance training has been shown to increase maximum shortening velocity of type I fibres. Hamanda *et al.* (2000: Postactivation potentiation in endurance-trained male athletes. *Medicine and Science in Sport and Exercise* **32**, 403–411) state PAP is amplified in highly trained endurance athletes and moderately trained weight trainers. Increased PAP may improve endurance performance by reducing motor unit firing rates and offsetting low frequency fatigue. The study's hypothesis is that PAP will have a greater effect on Power athletes, and endurance athletes will maintain all or some of the potentiating effect during the 15 minute trial. The purpose of this study was to identify effects of PAP and any differences between athlete types. With institutional ethical approval, 9 adult male endurance and 9 power athletes were recruited to participate in 3 randomized experimental conditions; 7 and 15 minute recovery conditions post 5 x 85% 1 rep max (RM) back squats, and Control (without 5 x 85% RM), each followed by a 30 second Wingate test. During each condition, participants performed a 5-minute warm-up on a cycle, and 5 x 50% RM back squats using Olympic weights. Blood lactate was taken via a capillary sample using a automatic lancet device at the beginning and 7.5 minutes post Wingate. A mixed 2-way ANOVA within subject design will be used to assess' differences between the groups and to test changes at various time points. A level of  $p < 0.05$  will be selected to indicate statistical significance. During Wingate trials measures recorded include each participants absolute peak power (PP), time to PP (TPP), and mean PP output (MPO) at 30, 15, 10 and 5 seconds, and fatigue index (FI). The results aim to highlight differences between athlete type (endurance/power) and recovery times, and whether during the 15 minute recovery endurance athletes will sustain all or some of the potentiating effect.

## The use of music as a motivational aid during physical education

Benyon, S.

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Music has been widely used to accompany exercise and athletic activity and has been used to enhance the psychological state of participants (Mohammadzadeh *et al.*, 2008: *Physical Education and Sport*, **6**, 67-74) and reduce the heart rate response during exercise (Yamahita *et al.*, 2006: *Journal of Sports Medicine and Physical Fitness*, **46**, 425-430). The aim of the study was to determine the influence of music on intermittent maximal exercise performance. Thirty male participants aged 11-12 years performed 3 standardised circuit sessions (randomized order: fast-tempo; slow-tempo; without music). The subjects were blind to the purpose of the study. Heart rate (Activio Sport Systems, AB Sweden) was recorded for the duration of the circuit session. A focus group was held with 9 of the participants to examine the effects of the condition on the circuit sessions. One-way ANOVA revealed no significant differences in HRmax ( $F_{[2, 69]} = 2.931, P = 0.061$ ) or average heart rate ( $F_{[2, 69]} = 0.074, P = 0.929$ ) between conditions. There was however a trend for mean HRmax to be higher in the fast-tempo session ( $202 \pm 16 \text{ b.min}^{-1}$ ) compared to the slow-tempo ( $197 \pm 11 \text{ b.min}^{-1}$ ) and no music sessions ( $193 \pm 9 \text{ b.min}^{-1}$ ). Mean heart rate was similar in all three conditions ( $159 \pm 17 \text{ b.min}^{-1}$ ;  $160 \pm 9 \text{ b.min}^{-1}$ ;  $158 \pm 17 \text{ b.min}^{-1}$ ) for fast-tempo, slow-tempo and without music, respectively. These data show that music does not significantly alter the heart response (HRmax and HRmean).

## The effects of relative age on physical and physiological performance characteristics in youth football

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In youth sport, birth-date positioning has significant implications for future success. First quarter born children will have a six-twelve month developmental advantage over a fourth quarter, comparatively age grouped peer. This increases likelihood of selection onto talent identification programmes and elite level success. Late-born (LB) children often experience underachievement, restricted opportunity, and discontinuation (Figueiredo *et al.*, 2009: *Journal of Sports Sciences*, **27**(9), 883-891). This phenomenon is particularly evident in football and is identified as the “Relative Age Effect” (RAE). Findings suggest that early-born (EB) players possess advanced biological maturation, anthropometry and physical precocity. At what age the RAE is most pertinent or what specific underlying physiological variables account for such biases is unclear, as most RAE research is atheoretical, focusing on effects rather than causes. A recent study (Carling *et al.*, 2009: *Scandinavian Journal of Medicine and Science in Sport*, **19**, 3-9) focused on RAEs during field-based testing, but no work has been conducted from a laboratory setting. Therefore it was this study’s purpose to investigate RAEs and physiological performance during football simulated activity. Subjects were anthropometrically assessed, completed a modified Cycling Intermittent Sprint Protocol (mCISP) consisting of 15, 6 s sprints against a resistance of  $7.5\% \cdot \text{bm}^{-1}$ , interspersed with 120 s active recovery, and performed field-based protocols (40-m sprint, Bangsbo (1994) repeated sprint, multi-stage fitness test). Saliva assessment was used to identify circulating testosterone levels. 35 (male) subjects [mean  $\pm$  SD] age  $14.2 \pm 0.7$  y; height  $165 \pm 8.2$  cm; body mass  $54 \pm 8.5$  kg participated in the study. Subjects were separated into six-month groups (EB or LB) based on birth-date. Ethical approval was granted by the University Ethics Committee. Significant differences ( $P < 0.05$ ) were observed when comparing EB and LB peak power (PPO) and mean power outputs (MPO) (absolute and relative). EB subjects had significantly higher inter-sprint MPOs and PPOs for 15 of 15 and 13 of 15 sprints respectively. EB subjects significantly outperformed LB subjects in the 40-m sprint. Borderline significance was observed for height and fat free mass ( $P = 0.11$ ). EB subjects outperformed LBs in all physical and physiological tests although statistical significance was not observed for circulating testosterone levels (EB & LB =  $1.552$  pg/mL,  $1.507$  pg/mL  $P = 0.7$ ), weight ( $P = 0.3$ ), Bangsbo repeated sprint performance ( $P = 0.3$ ), or multistage fitness test ( $P = 0.5$ ). This study suggests that EB individuals are often more physically mature than their LB counterparts. EB performers benefit from athletic anthropometry, with higher capabilities for PPO and speed production. Coach awareness of RAEs should be raised, with provisions made for LB players to express their talents in developmentally equitable environments.

## **The influence of segmentation & self selected music on performance on the Wingate anaerobic test (WAnT).**

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Music can be used as a major source of motivation and inspiration within the realms of sport and exercise (Simpson and Karageorghis, 2006: *Journal of Sports Sciences*, **24**, 1095-1102). However, Crust (2004: *Perceptual Motor Skills*, **98**, 985-991) believes that during exercise participants will benefit more from listening to music they select themselves as it is indicative of real life situations. In addition to selecting their own music track, recent research refers to segmentation which can positively aid performance if athletes can coordinate a burst of energy with a specific motivational segment of a music track (Priest and Karageorghis, 2008: *European Physical Education Review*, **14**, 347-366). Limited research exists regarding the influence of self selected music on maximal performance, and to the authors' knowledge the effect of segmenting musical tracks has not been investigated. The purpose of this study was to identify whether listening to self selected music improves performance on the WAnT. The Health, Exercise & Sport Science Programme Ethics Committee approved the study. Nineteen trained males (age =  $21.3 \pm 1.9$  yrs, stature =  $184.4 \pm 6$  cm, body mass =  $80.6 \pm 11.5$ kg; mean  $\pm$  SD) with no anaerobic cycling background, completed informed consent prior to commencing the study. Conditions included in the study were a self selected music group (SELF), researcher selected music (RES) and a no music group (CONTROL). Participants completed all conditions in a randomised order. Before every trial a five minute warm up was administered proceeded by the fly wheel resistance being set at 0.075kg per kg of body mass following a known protocol (Inbar *et al.*, 1996: *The Wingate Anaerobic Test*. Champaign, IL: Human Kinetics). Participants undertook a mandatory two minute post test active cool down on the ergometer. The variables measured were Maximum Power (MP), Minimum Power (MIP), Average Power (AP) and Fatigue Index (FT). A one way repeated measures ANOVA was used to compare the conditions. A Tukey Post Hoc test was applied to the data. Mauchley's Test of Sphericity set at  $\alpha .05$  identified that Sphericity could be assumed. There was a significant difference regarding MP between the SELF and CONTROL conditions ( $F_{(2, 36)} = 3.301, P = .048$ ). No other significant differences were found between the conditions or parameters. This may suggest that self selected music may be a way to increase resultant maximum power output during performance of brief high intensity exercise.

## Can the use of visually stimulatory interventions elicit altered plateau responses at $\text{VO}_{2\text{max}}$ ?

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The  $\text{VO}_2$  plateau, despite an increase in the exercise intensity, is the primary criteria for the determination of  $\text{VO}_{2\text{max}}$ . The Central Governor as suggested by St. Clair Gibson et al. (2003: *Journal of Sports Medicine*, 3, 167-176) reassesses central-neural responses demonstrating a level of teleoanticipatory control. It can therefore be postulated that awareness of the sensations of fatigue, coupled with an alteration in the perceived exertion may alter the occurrence of a plateau in  $\text{VO}_2$  at  $\text{VO}_{2\text{max}}$ . Therefore the purpose of this study was to assess whether changing the perceived exertion during an incremental exercise test to exhaustion may alter the occurrence of a  $\text{VO}_2$  plateau. Following University ethics approval, 8 trained runners (mean  $\pm$  SD) age 23.9yrs  $\pm$  5.0, mass 82.8kg  $\pm$  9.4, stature 180.9cm  $\pm$  9.4 completed four gradient-based  $\text{VO}_{2\text{max}}$  tests, 0.5%  $\cdot 30\text{s}^{-1}$  at a constant speed of 10kph  $\pm$  1. The initial trial was for familiarisation while the remaining three trials involved manipulation of the participant's heart rate which was project in front of them, -10 bpm (HR-L), +10 bpm (HR-H) and actual recorded HR values (HR-A). During all trials  $\text{VO}_2$  was recorded on a breath by breath basis. Statistical analysis was conducted by analysing the last two consecutive 30s  $\text{VO}_2$  samples to establish whether a plateau response had been recorded. Exercise time to exhaustion was also assessed. The plateau criteria was based on a rise in  $\text{VO}_2 \leq 50\text{ml min}^{-1}$ , secondary criteria were also established. Provisional results of this study (based on 8 participants) suggest that there is a significant difference between  $\square \text{VO}_2$  during the final 60s of the HR-H and HR-L tests ( $p = 0.031$ ) despite time to exhaustion (603.2  $\pm$  72.82s, 575.77  $\pm$  111.09s, 576.26  $\pm$  119.69s) remaining non-significant over all tests ( $p > 0.05$ ). However a non-significant difference was observed for  $\Delta \text{VO}_2$  during the final 60s of the test between HR-A and HR-H ( $p = 0.067$ ) and HR-A and HR-L ( $p = 0.572$ ). Although there was a non-significant difference in the incidence of plateau between tests ( $p = 0.239$ ) the percentage of plateau responses produced were HR-L 50%, HR-A 75%, and HR-H 87.5%. These preliminary results suggest that the incidence of plateau response at  $\text{VO}_{2\text{max}}$  is partially regulated by a level of teleoanticipatory control. We would therefore contend that the low incidences reported in the literature may be a manifestation of central regulatory command acting in response to the perceived exertion of the participant although further analysis is needed of both the sub-maximal and maximal  $\text{VO}_2$  responses.

## **A qualitative exploration into the transaction of competition stress and emotion**

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The purpose of the current study was to illuminate the transactional stress process and the more recent cognitive-motivational-reaction-theory of emotions (Lazarus, 1999: *Stress and Emotion: A New Synthesis*. New York: Springer) by illustrating the sequential stages of a stressful transaction and the temporal factors that contribute to competition stress and emotion. Three cricket players aged between 17-22 years (M age= 20.5, SD = 2.38) were selected to participate in the study based on their age and current competitive level. Structured reflective journals were administered across the competitive season allowing each participant to reflect on their experiences during five competitive fixtures. Each participant was subsequently interviewed and asked to expand on the sentiments reported in their journals. All data was analysed via analytic induction and verified via member checking and researcher reflexivity. The results of the present study indicate that athletes do, indeed, go through a stressful 'process' eliciting a variety of emotional responses unique to that instance in time which, in turn, can have severe consequences to performance. In addition, the results highlight the cycles of appraisal that young cricketers progress through that often occur concurrently throughout a stressful encounter. Finally, the results demonstrate self-confidence and perceptions of control as key regulators of the stress process in relation to the emotions young cricketers experience and their resultant impact on performance. The findings of the present study indicate that young athletes require a variety of different coping strategies in order to facilitate effective coping whilst in the midst of a stressful transaction. Further, coaches and sports psychologists should focus on helping athletes maintain high perceptions of control and self confidence immediately prior to, during, and post competition to help protect athletes against the potential adverse affects of their stressful experiences on current and prospective performance. Future research should endeavour to repeat the current investigation by exploring the stress process holistically in order to gain a more comprehensive understanding of athletes' stressful experiences in competition across a variety of different sports.

## Effects of manipulating the motivational climate during exercise classes

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A central focus of exercise participation is to enhance the participant's perceptions of competence, satisfaction and long-term motivation (Newton et al., 2000: *Journal of Sports Sciences*, **18**, 275-290). The purpose of this study was to investigate the effects of manipulating the motivational climate during exercise classes to be mastery oriented on exercisers' achievement goal orientations and perceptions of the motivational climate. The present study aimed to extend extant work in exercise psychology by discovering the effects of employing one element of Epstein's (1989: *Research on Motivation in Education*, **3**, 259-295) TARGET teaching structures in an exercise setting. A total of 21 female exercisers were involved in the study over a period of four weeks. Phase one of the study consisted of the researcher observing classes with reference to a Climate Manipulation Checklist (Roberts et al., 1999: *Learning Experiences in Sport Psychology*. Champaign IL: Human Kinetics), allowing the researcher to establish which elements of the TARGET teaching structures were currently employed during the exercise classes. During phase two, 10 exercisers participated in the mastery intervention programme (experimental group) which implemented the Evaluation element of Epstein's (1989: *Research on Motivation in Education*, **3**, 259-295) TARGET teaching structures during exercise classes, while 11 exercisers were involved in regular exercise classes where no elements of TARGET were employed (control group). At pre- and post-test, all participants completed two questionnaires: the Task and Ego Orientation in Sport Questionnaire (Duda and Nicholls, 1992: *Journal of Educational Psychology*, **84**, 290-299) and the Perceived Motivational Climate in Sport Questionnaire-2 (Newton et al., 2000: *Journal of Sports Sciences*, **18**, 275-290) to assess achievement goal orientations and perceptions of the motivational climate, respectively. Data analysis is currently being completed. Paired sample *t*-tests may reveal significant increases in the exercisers' task orientations, and significant increases in the exercisers' perceptions of a mastery climate as a result of experiencing the mastery intervention programme. These findings may suggest that self-evaluation in exercise classes increases the participants' task goal orientations and perceptions of a mastery climate.

## Reflecting through resonance

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Resonance is a powerful process that can empower athletes to take control over the day-to-day feel of their own lives and their performance (Newburg *et al*, 2002: *Journal of Applied Sport Psychology*, 14, 249-267). Previous research has focused on the application of resonance with the elite performer. The purpose of my study was to further previous research by investigating the experience of Resonance with a club-level (non-professional) cyclist and to reflect on the experience as perceived by the athlete and researcher. An intervention study was carried out over a period of three months, comprising five (two-hour) in-depth, phenomenological interviews in conjunction with a daily reflective journal. The interviews were audio-recorded then later transcribed using the four components of the Resonance Performance Model, *Dream; Preparation; Obstacles* and *Revisiting the Dream* (RPM; Newburg *et al*, 2002) as a guide for deductive analyses (Doell *et al*, 2006: *Athletic Insight*, 8, 32-51). Inductive analysis and performative analysis were also used in order to further examine the data obtained (Sparkes & Smith, 2009: *Psychology of Sport & Exercise*, 10, 279-288). Results showed that the athlete had difficulty grasping the central *Dream* concept as being how he wanted to feel, as opposed to his long-term goal. However, his self-awareness increased as a result of the intervention process and an improved ability to cope with obstacles and life challenges was perceived by the athlete. This presentation will focus on the story of the athlete as told, using quotes of his reflections. The process of reflection, inherent to Resonance, will be discussed as an important concept for achieving personal excellence, in the applied world.

## What factors influence golf shot outcome? Classical statistical analysis vs. heuristic possibilities

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Kinematic research of the golf swing has focused on significant differences based on handicap with an assumed subject base homogeneity. Within these studies, invariably, shot outcome has not been quantified. The aims of this study were to analyse group homogeneity, then investigate whether kinematic differences exist based on shot quality, using classical statistical methods compared to Data Mining methodology (C5.0, PASW Modeller). Nine golfers (handicap: mean 1.4 s = 2.44) each performed 50 drives into a Kevlar screen. Informed consent was obtained in accordance with University ethics guidelines. Shot scores were calculated using a VectorPro launch monitor (Accusport, USA). Good/bad shots were designated as those  $\pm 1$  s from the mean. Kinematic data were captured at 500Hz (Qualisys, Sweden), 64 retro-reflective markers were tracked to define a 14 segment 6-DOF model (Visual 3D, C-motion, USA). Events were defined as initiation (INIT), start (ST), mid-backswing (MBS), top (TOP), mid-downswing hands (MDH), mid-downswing club (MDC) and contact (CON). Post data-cleaning, 436 shots remained for analysis. TOP-CON lateral CoG shift (mean  $-0.11\text{m}$  s =  $0.037\text{m}$ ) and shoulder rotation (mean  $118^\circ$  s =  $15.25^\circ$ ) were selected for 2-step cluster analysis to assess group homogeneity. Four clusters were clearly defined and validated by k-means analysis. Good/bad shots within clusters were analysed using two-way ANOVA with Bonferroni adjustment. 18 variables associated with shoulder, torso and pelvic rotation at events, and 10 associated with weight transfer and stance were investigated. Significance was set at  $P < 0.05$ . Significant differences between shots were only found in Cluster1, these being pelvic-torso angle (CON) and shoulder-torso angle (MDC). Two clusters were further analysed using C5.0., the Neural Network ranks variables based on information gain and reducing entropy, discovering hidden patterns of information, (mean  $\pm$  s), Cluster1- low rotation ( $93.87 \pm 2.71^\circ$ ) with low lateral CoG shift ( $-0.077 \pm 0.008\text{m}$ ), Cluster3- high rotation ( $131.04 \pm 2.39^\circ$ ) with high lateral CoG shift ( $-0.151 \pm 0.021\text{m}$ ). Three variables in Cluster1 were ranked in order of importance by the network, pelvic-torso angle and shoulder-torso angle (CON), shoulder-torso angle (ST). Although nothing significant was found using classical analysis in Cluster3, C5.0 discovered important variables related to shot outcome to be, weight distribution (ST), pelvic-LAB angle (MDC) with minor influences of pelvic-torso and shoulder-torso angles (MBS). Results suggest homogeneity of subject base should be analysed in future studies. Classical statistical analysis should be combined with heuristic analytical tools in sequential sporting motion to aid sports scientists and coaches in performance analysis.

## **A preliminary investigation into the effect of lower limb compression garments on performance and muscle activity**

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One particular area of development in sport clothing has been the use of compression garments to improve performance (Kraemer et al., 1998: *Sports medicine training and rehabilitation*, **8**, 163-184). Literature in this area has principally focused on vertical jump tests with the wearing of compression shorts demonstrating improved jump performance (Kraemer et al., 1996: *Journal of strength and conditioning research*, **10(3)**, 180-183) and increased comfort (Doan et al., 2003: *Journal of sports sciences*, **21**, 601-610). However, no research investigating whether the contraction of the muscle is affected when wearing compression garments have been carried out. It might be that these garments affect fibre alignment and subsequent level of contraction and is therefore a worthy area of investigation. The aim of this study was to determine the effect of compression shorts on muscle activity whilst carrying out a maximal vertical jump. With institutional ethic approval, a study was conducted on five male participants (28.4 years  $\pm$ 5.7). The participants were fully familiarised with the countermovement jump protocol and carried out jumps in two test conditions: wearing loose fitting football shorts (FS) and wearing compression shorts (CS). All tests were carried out on the same day and 5 maximal jumps were carried out under each condition. Jumps were performed on a Kistler 9851 piezoelectric force platform (Kistler, Hook, UK) and EMG data was recorded at 500 Hz using a telemetric belt and receiver (MIE Medical Research Ltd). Muscle activity from the biceps femoris (BF), vastus lateralis (VL), rectus femoris (RF) and vastus medialis (VM) were recorded and the EMG analysis conducted using MyoDat version 6.47 (MIE Medical Research Ltd.) Analysis of the EMG data focused on the peak deceleration phase (preparation for jumping) and acceleration phase (jumping) for each of the quadriceps muscles and the one peak of the BF. The force platform analysis focused on jump height and peak force at take off. This showed little difference in jump height between conditions (CS 0.250m, FS 0.247m) but that there was increased force at take off for CS compared to FS (2525.7N (3.04BW) and 2344N (2.78BW) respectively). Initial conclusions indicate that wearing compression shorts reduces the contraction level of all three quadriceps muscles in the deceleration phase. The ratio between deceleration and acceleration phases was larger for all 3 quadriceps muscles under the CS condition. The BF muscle produced a reduced contraction when wearing CS when normalised for MVC.

## Inspiratory loading at different intensities does not influence lactate recovery kinetics following intense exercise

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Chiappa *et al.* (2008: *Medicine & Science in Sports & Exercise*, 40, 111-116) have shown accelerated lactate clearance with the application of a 15 cmH<sub>2</sub>O pressure-threshold inspiratory load during recovery from intense exercise. However, Brown *et al.* (In Press: *Medicine & Science in Sports & Exercise*) only observed an effect following a period of inspiratory muscle training when the inspiratory muscles were working at a lower relative intensity. Therefore, we examined whether lactate recovery kinetics are influenced by the magnitude of inspiratory load applied during recovery from intense exercise. Six active male participants completed three maximal incremental cycling tests (20 W·min<sup>-1</sup> starting at 0W), of identical duration (mean ± SD: 16.20 ± 1.22 minutes, and 313 ± 21 W), followed by a 20 min recovery period comprising either passive recovery (PR) or breathing through an inspiratory pressure-threshold load of either 10 or 20 cmH<sub>2</sub>O (IPTL10 and IPTL20, respectively). Respiratory variables were measured breath-by-breath and arterialised venous blood samples were taken from a dorsal hand vein during the recovery period and analysed for blood lactate concentration ([lac]<sub>B</sub>) every 2 min, and blood gases (pH and PCO<sub>2</sub>) every 4 min. Heart rate (HR) was measured, and arterial oxygen saturation (SpO<sub>2</sub>) estimated, every 2 min during the recovery. Individual [lac]<sub>B</sub> recovery curves were fitted with a bi-exponential time function using an iterative non-linear regression technique. Data were analysed using ANOVA for repeated measures, with statistical significance accepted at P < 0.05. Maximal oxygen uptake was not different between PR (4.22 L·min<sup>-1</sup>), IPTL10 (4.39 l·min<sup>-1</sup>) and IPTL20 (4.17 l·min<sup>-1</sup>). Peak [lac]<sub>B</sub> was similar in PR (11.5 ± 2.4 mmol·L<sup>-1</sup>) IPTL10 (11.8 ± 2.7 mmol·L<sup>-1</sup>) and IPTL20 (11.5 ± 2.3 mmol·L<sup>-1</sup>). The low velocity constant ( $\gamma_2$ ) describing blood lactate disappearance was not significantly different between trials (PR: 0.055 ± 0.055 ·min<sup>-1</sup>; IPTL10: 0.113 ± 0.087 ·min<sup>-1</sup>; IPTL20: 0.043 ± 0.037 ·min<sup>-1</sup>). Blood gases, ventilatory responses, HR and SpO<sub>2</sub> were also similar between trials. In conclusion, inspiratory pressure-threshold loads of 10 and 20 cmH<sub>2</sub>O failed to influence lactate recovery kinetics following high-intensity exercise. Why inspiratory loading accelerates lactate clearance in some (Chiappa *et al.* 2008), but not all (present study; Brown *et al.* 2009), subjects, is therefore unclear and warrants further exploration.

## **A phenomenological study of the transitional experiences of professional footballers**

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The transition from elite-sport is recognised as one of the most traumatic and problematic experiences a sportsperson has to endure during their lifetime. For the most part research in this important area of sport psychology has been established through the study of individuals in a wide range of sporting domains other than professional football. Whilst it is acknowledged that such research has helped to provide a broad understanding of transition in sport; as a whole it fails to highlight the specificities which are deemed both unique to professional football and indeed individual professional players. Therefore the main aim of this study is to provide a much needed understanding of the sport-career transitions of professional footballers. It is strongly argued that by exploring such individual experiences a more enriched understanding of the transitional experiences specific to professional football will be achieved. Such an increased understanding may lead to recommendations for professionals associated within the field of football; and therefore; aid the interventional requirements aimed at improving the career and post-career requirements of professional footballers. The proposed study will look to target a cross-section of professional footballers, in the transition of contract cessation (and thus facing the possibility of career transition). Subsequently the research will be developed using a phenomenological methodology which will look to elicit the players own experiences of their football transition. The analysis will be qualitative in nature and will use a combination of semi-structured interviews, photo-voice technique, and personal diaries to explore the footballer's experiences in detail. The presentation will provide a summary of the aforementioned research; and should appeal to a wide research audience. Whilst drawing upon contemporary and historical sports transition literature; I will aim to provide a strong rationale for the study in relation to the reasons for its application. Additionally; I will present an overview of the intended research design that will include information on the chosen methodology; sampling strategy; and study procedure. The presentation will then provide an understanding of how the study will contribute to our current knowledge in this area of sports transition. The researcher will also provide an indication of how the study could be used pragmatically in the future to help professional footballers during similar transitions.

## **Do physical activity beliefs differ between age and gender for 13-16 year olds?**

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Participation in physical activity is a key component of a healthy lifestyle, influencing growth and development, weight control, development of a healthy cardiovascular system as well as an improvement in psychological well-being (Hamilton, K., and K.M. White, 2008: *The Journal of Sport and Exercise Psychology*, 30, 56-74). Participation in physical activity is also important in developing positive behaviours that can transfer into adulthood. In 2005, only 28% of adolescent girls and 44% of adolescent boys were shown to be meeting the recommended 60 minutes of physical activity per day guidelines (Eaton, 2006. United States, 2005 MMWR Surveillance Summary, 55(5), 1-108). The purpose of this study will be to assess the physical activity beliefs of adolescents to identify whether age and gender affects these beliefs. The beliefs can then be directly applied to interventions to improve the physical activity participation levels of adolescents. A total of 90 participants aged between 13 and 16 years of age (Mean 14.4) have volunteered to take part within this study. The sample group has been divided firstly into gender, and further into school year groups (Years 9, 10, 11). The participating school is in the South East of England during the academic year of 2008-2009. All participants completed an adapted 'Theory of Planned Behaviour' Questionnaire (Ajzen, 1991: *The Journal of Organizational Behaviour and Human Decision Processes*, 50, 179-221) although the three main themes of identifying behavioural, control and normative beliefs have been adapted from (Trinh *et al.*, 2008: *The Journal of Social Behaviour and Personality*, 36(1), 77-86). The study also used interviews to gain a qualitative approach to the collection of data. Although data is still being analysed using SPSS (Version 10.0), the analysis will involve a multivariate analysis of variance (MANOVA) and a REGWQ Post-hoc Tests.

## **Comparison of identification of and provision for gifted and talented pupils in mainstream and independent schools.**

Burke, B.

*University of Chester*

The provision for, and identification of gifted and talented pupils within Physical education has emerged specifically within mainstream schools following Excellence in Cities (1999: *Excellence in Cities*. London: DfEE) and recently Physical Education, School Sport and Young People (PESSYP), in addition, able sports performers and pupils within independent schools appear to be consistently identified and provided for within school sport particularly. The aim of this study therefore is to investigate whether independent schools follow any gifted and talented policy, and/or identify and provide opportunities for pupils with PE and school sport. Comparisons will then be drawn with a mainstream school. Two schools were selected for this study in order to compare the impact of the differing education systems regarding gifted and talented performers comprising of one independent school and one mainstream specialist sports college school. Four teacher from each school were selected as participants totally eight in all. Semi structured interviews were conducted. The primary benefit of using such a method was the researchers' opportunity to shed light on the complexity of the participant's feelings and experiences in relation to issues such as their own background, working environment and impact of the school ethos upon gifted and talented provision and identification. The findings reveal that both schools draw on a very narrow range of resources such as sport performance in school sport and best performers in lessons to identify talented pupils. This highlights a refusal or reluctance to follow any official or school based gifted and talented policy on their part. In addition it appears that both mainstream and independent schools place a high emphasis on external links with coaches to improve their talented pupils' performance. Whilst it appears that both schools involved in the study do value the ethos and benefits of curricular physical education, the financial and school based pressures results in the need to market their respective schools to potential pupils and parents. This means that sporting tradition along with past success in order to attract new pupils appeared to take precedence of wide ranging provision for actual and potential gifted and talented performers within school PE. In relation to this issue, this study concludes from the findings that Physical Education appears to be losing out to school sport. The study recommends that gifted and talented in P.E needs to be developed in relation to current policy so that teachers are able to meet the needs of all gifted and talented pupils and subsequently differentiate between P.E and school sport.

## **The effect of the British winter temperature and deception on cycling time trial performance**

Burrows, C., Mauger, A., Castle, P.  
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Noakes et al. (2004: *British Journal of Sports Medicine*, 38: 511-514) argue that exercise performance is regulated by a central governor (CG) that also prevents catastrophic physiological failure. Although the CG is a topic of debate within exercise physiology, the use of deception has improved exercise performance (Paterson and Marino, 2004: *Perceptual Motor Skills*, 3, 1011-1026) and may be supportive of the CG model. The deception is proposed to 'trick' the CG into upregulating the pacing strategy of exercise performance. This study aims to investigate whether deception of ambient temperature will enhance exercise performance in the British winter cycling season. With university ethical approval, seven routinely active males (mean  $\pm$  sd, age, height, body mass,  $VO_2$ max, *data is currently being collected*) will perform three, self-paced 10 km cycling time trials (TT) in ambient temperatures of 3°C (average temperature for British winter), 15°C (average temperature for British summer) and a deceived condition with a real temperature of 3°C, but where subjects are told it is 7°C (deceived temperature). Relative humidity will be constant at 50% in all conditions that will be conducted in a randomized order, seven days apart. Time trial times will be recorded and used for performance and rectal temperature will be monitored continuously and recorded every two minutes. Ratings of perceived exertion, thermal comfort and heart rate will also be measured every two minutes. Data analysis will be performed using two way repeated measures ANOVA with Tukeys post hoc test to identify where significant differences ( $P < 0.05$ ) are, when necessary. Results have not yet been obtained. It is expected that subjects will complete the trial faster in the deceived 7°C temperature than in the non-deceived 3°C temperature. This discussion will be added once results have been obtained.

## **The effect of warm-up and half-time re-warm-up on core body temperature and multi-directional sprint performance in soccer**

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In professional soccer, it is often the case that little or no physical activity is performed at half-time, perhaps to time constraints or as an attempt to recover. Consequently, this is likely to lead to significantly decreased body temperatures, in players, at half-time. Soccer players usually endure an initial warm-up for ~30-40 minutes prior to a match. However, even at the highest level, they are often only sitting, standing or walking in unknown quantities during half-time (Mohr et al., 2004: *Scandinavian Journal of Medicine and Science in Sports*, **14**, 156-162). Studies have examined top-class soccer, identifying players to perform significantly less high-intensity running at the onset of the second half when compared with high-intensity running in the first half (Krustrup et al., 2001: *Journal of Sports Sciences*, **19**, 881-891; Krustrup et al., 2002: *Journal of Sports Sciences*, **20**, 861-871; Mohr et al., 2003: *Journal of Sports Sciences*, **21**, 519-528). Such findings suggest the normal resting routines during the entirety of the half-time interval are not optimal preparations for the second half of play, as resting has been strongly associated with a decline in muscle temperature ( $T_m$ ) (Bangsbo et al., 2006: *Journal of Sports Sciences*, **24**, 665-674; Mohr et al., 2004). There are, however, limited findings for core body temperature ( $T_c$ ) and its relationship with multi-directional sprint performance (i.e. a simulated field test for match play activity). The purpose of this research study was to investigate the effects of a half-time re-warm-up routine on  $T_c$  values and multi-directional sprint performance in soccer matches, particularly in the early stages of the second half. MMU Cheshire Ethical Committee approval was awarded and complied with requirements from the football club. Ten male professional football players (age:  $19 \pm 3$  years; body mass:  $75 \pm 9$  kg; height:  $175 \pm 12$  cm) consumed a CoreTemp Ingestible sensor ~2 hours before a simulated 11-a-side soccer match. Sprint performance and  $T_c$  were measured before the initial warm-up, after the initial warm-up, at the onset of half-time and immediately after the half-time period. Heart rate (HR) was monitored throughout, to maintain control of warm-up and re-warm-up intensity (~60-70  $VO_{2max}$ ). Participants undertook two conditions, with half-time re-warm-up (RW) and without a half-time re-warm-up (CON). Results should indicate that maintained  $T_c$  does promote repeated sprint performance. Statistical analyses include a 2-way ANOVA with repeated measures followed by a correlation calculation. In conclusion, assuming the hypothesis has been accepted, meaningful conclusions can be drawn for raised  $T_c$  from a re-warm-up at half-time promoting subsequent sprint performance. However, although raised  $T_c$  is one indicator of a productive warm-up, isolated muscle temperature ( $T_m$ ) data may be more sensitive. Future research might include isolated  $T_m$  measurements and multi-directional sprint performance to further validate data from both this study and that of Mohr et al. (2004).

## **Preliminary field validation of a cycling time trial model**

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A model has been developed using Matlab software (The MathWorks Inc, Natick, MA) for the purpose of optimising cycling performance. An optimisation proposed in the literature suggests that over an undulating course, a variable power strategy will reduce completion time compared to the same mean power deployed as a constant power strategy (Swain, 1997: *Medicine and Science in Sports and Exercise*, **29**, 1104-1108; Atkinson *et al.*, 2007: *Journal of Sports Sciences*, **25**, 1001-1009). The purpose of the study was to conduct a preliminary assessment of the model's fidelity by generating model predictions for a constant and variable power strategy and comparing the latter with the variable power strategy applied in the field. The 'out-leg' gradient and track of the 2008 UK Women's National 10 mile time trial competition were digitised in advance of the competition and loaded into the model. A single competitor who had finished within the top 10 the previous year agreed to participate in the study and the model was initialised with the participant's mass and aerodynamic profile. An optimum power profile was generated that minimised completion time within the constraints of 255 W mean power and 325 W maximum power which represent the participant's typical performance. The participant was familiarised with the optimum power profile and attempted to apply that profile in the competition. Time, power, speed and cadence were recorded at 1 Hz using an SRM power meter. Model simulations predicted an optimised time of 736 s which represented a 14 s (1.9%) time saving compared to a constant power strategy. The target power profile was closely followed by the participant (root mean squared error of 26 W) resulting in an actual time of 744 s and a model error level of 1.1%. Completion of the course at a constant power for comparison with the model prediction was not possible although it was noteworthy that the participant's finishing position improved by five places compared to the previous year when a largely constant power strategy had been employed. The modelled time saving was consistent with the 1.6% and 2.3% saving reported in the studies cited above. In conclusion, the investigation provides initial support for the efficacy of a variable power strategy and the accuracy of the predictive model. However, a further controlled field trial with a representative sample of competitive cyclists is required to confirm these findings.

## Coping with viewing sports injury: The use of associative and dissociative coping strategies

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Research has indicated the negative psychological impact of sustaining an athletic injury (Sideris; 1996: *Stress and Health*, 22, 315-327). However it may also be proposed that injury is not only stressful for the injured athlete; but may also impact those who witness the injury occurrence (O'Neill; 2008: *Journal of Clinical Sport Psychology*, 2, 278-292). To reduce the stressful impact of witnessing injury an athlete may cope by using either an associative or a dissociative attentional strategy. An associative strategy focuses attention inward on sensory input such as heart rate; breathing rate; muscle tension and pain (Scott et al.; 1999: *The Sport Psychologist*, 13, 57-68). Alternatively; a dissociative strategy focuses externally on distracting stimuli (Masters & Ogles; 1998: *The Sport Psychologist*, 12, 253-270). The aim of the current study was to ascertain which attentional strategy would result in lower stress reactivity when viewing athletic injury. Participants were 40 male and female Sport Science students from the University of Chichester. Participants were required to watch 2 slideshow presentations; one that consisted of graphic sports injury photos and another that consisted of normal sporting photos. In order to assess whether participants were coping with a stressor heart rate variability (HRV) was assessed using electrocardiography (ECG). HRV is the balance between the cardiac sympathetic and vagal efferent activity of the heart, a decreased HRV is said to represent a physiological and psychological balance, indicating effective coping (Bernton et al.; 1997: *Psychophysiology*, 34, 623-648). Participants were fitted with 3 electrodes to obtain an ECG trace. An initial 3 minute baseline trace was taken, then a 1 minute trace while watching a slideshow. A mid-baseline measure was then taken for 3 minutes followed by another 1 minute trace during the alternative slideshow. Participants completed the *Attentional Focusing Questionnaire* (AFQ) (Brewer et al., 1996: *Applied Research in Coaching and Athletics Annual*, 11, 1-14) after the 8 minute ECG trace to ascertain the attentional style employed and perception of psychological distress. No participants used a predominantly dissociative style. Participants were split into 3 groups: high, mid and low associators. Paired samples t-tests were then performed on High Frequency (HF), Low frequency/High Frequency (LF/HF) ratio as well as average HR data for both the low and high associator groups between the baseline and midbaseline data as well as the injury and normal slideshow data, no significant differences were found ( $p < 0.05$ ). However, correlations between associative score and distress score were moderate ( $r = 0.594$ ). These results suggest that when viewing sports injury a highly associative strategy may cause greater perceptions of psychological stress than a low associative strategy, although neither associative strategy caused a marked increase in physiological stress. These findings suggest that when witnessing sports injury the athlete should be discouraged from adopting an associative strategy.

## **What visual stimuli do premier league university cricket batsmen use to anticipate ball delivery?**

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Bowling speeds for fast bowling range between 75 - 100mph, with batsman having <0.5 seconds to react after release of the ball. To cope with fast deliveries it is suggested that batsman should identify advanced cues to prolong viewing time. These cues would enable them to better anticipate the ball trajectory and thus make quicker and more accurate shot selections. It is proposed that one of the features distinguishing between batting ability is cue identification. Authors suggest that elite batsman focus on more essential cues, whilst novice batsmen use a range of cues. To date the author is unaware of any research using an eye tracker to identify exactly what cues top order and lower order batsmen use to make decisions. The purpose of this study was to identify specific cues employed by top order and lower order batsmen when facing a fast paced bowler. Ten right handed batsmen from a premier university cricket team were divided by the coach into top order (TO; n=5) and lower order (LO; n=5) cricket batsman. Video footage of six fast bowls was collected with two cameras; the first collecting footage in front of the stumps where the crease is dissected by the leg stump resembling the view seen by the batsman. This was used to identify what cues the participant watched prior to release of the ball. The second camera, which was located behind the stumps, was used to identify the pitch of the ball; this footage was not shown to the participant. The footage was edited to include the run up and stopped at point of release. Participants were fitted with an IVIEW X<sup>TM</sup> Hed eye tracker (SMI, Berlin) which recorded their foveal vision as they watched the video footage 5 meters away on a projected screen. This data was analysed using Observer XT software (Tracksys, Nottingham) to identify fixation points every 0.04seconds. After each bowl participants were instructed to plot where they thought the ball would pitch on a grid, and identify their choice of shot. Initial results suggested that TO batsmen spent significantly greater time viewing a predicted release point than LO batsmen. However, TO batsmen appeared no more able to predict pitch placement than LO batsmen warranting further research in this area.

## Left ventricular myocardial strain and strain rates in sub-endocardial and sub-epicardial layers before and after a marathon race

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Understanding of the transient “cardiac fatigue” after prolonged exercise has progressed largely in line with technical developments in non-invasive imaging (George et al., 2005: *The Journal of Physiology*, 569, 305-313; Scott et al., 2009: *Medicine and Science in Sports and Exercise*, 41, 25-33). Tissue-Doppler and 2D speckle tracking-derived strain and strain rate has facilitated the assessment of LV myocardial deformation in longitudinal, radial and circumferential planes (Lorch et al. 2008: *Journal of the American Society of Echocardiography*, 21, 1207-1215) but has not previously interrogated different ventricular wall depths where fibres may be orientated differently. Therefore, the aim of the current study was to use 2D speckle tracking to assess myocardial deformation in sub-endocardial and sub-epicardial layers of the left ventricle (LV) wall before and after running a marathon. Methods: Echocardiography scans were performed on 14 male, non-elite runners (mean  $\pm$  SD age,  $32 \pm 10$  years) who completed the 42.2 km London marathon. Para-sternal short axis and apical 4-chamber view images were recorded. Peak longitudinal, radial and circumferential strains, peak systolic and early diastolic strain rates in the sub-endocardial and sub-epicardial wall were analysed off-line. Circumferential rotation in basal and apical LV scans was used to calculate torsion. Data was analysed using repeated measures *T*-tests. Significance was set at  $P \leq 0.05$ . Results: Pre-race strain and strain rates were generally greater in the sub-endocardial layer of the LV wall. After race completion, a mixed pattern of change was observed with a significant reduction in sub-epicardial radial strain ( $32.6 \pm 12.5$  to  $20.3 \pm 9.6\%$ ) and sub-endocardial circumferential strain ( $-26.9 \pm 3.6$  to  $-23.7 \pm 4.1\%$ ) at the apex. Rotation was not altered at either the apical or basal levels and thus torsion was not changed significantly in either the sub-endocardium ( $6.72 \pm 3.46^\circ$  to  $5.67 \pm 4.98^\circ$ ) or the sub-epicardium ( $3.48 \pm 2.68^\circ$  to  $3.01 \pm 3.23^\circ$ ). Strain rates and rotation rates were only sporadically altered post-race. Conclusion: There are differences in deformation characteristics between the sub-endocardium and sub-epicardium at baseline, and the limited changes observed post-race were not specific to any region or depth of the LV wall.

## Does inspiratory muscle fatigue limit maximal swimming performance?

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Inspiratory muscle fatigue (IMF) has been demonstrated following short-term high-intensity exercise to volitional fatigue; as evidenced by decrements in maximal inspiratory pressure (MIP), representative of a reduction in inspiratory muscle strength (Voliantis et al., 2001: *Medicine and Science in Sport and Exercise*, 33, 803-809). However very little of this work can be extrapolated to swimming performance, because of the unique supine body position and hydrostatic pressures involved in this activity. Therefore the purpose of this research was to determine whether IMF occurs during swimming and would limit maximal swimming performance. Twelve experienced swimmers (male = 4, mean  $\pm$  SD age, weight and height;  $20.9 \pm 2.7$ ,  $67.6 \pm 7.7$  kg,  $169 \pm 8$  m) who gave informed consent following University ethical approval took part in the study. After a familiarisation session, participants performed, in a randomized order, a 200 m freestyle race-paced swim with prior IMF, and on another occasion; an identical swimming exercise without prior IMF (control; C). Prior IMF was induced by incremental pressure threshold inspiratory loading, initiated at 60% of MIP, and increased by 10% of MIP every 3 minutes. MIP (cmH<sub>2</sub>O) was assessed after each incremental 3-minute stage and the IMF protocol was discontinued when subject's MIP fell below 80% of baseline values, or until they could no longer reach the target pressure to achieve inspiration through the pressure threshold device (mean  $\pm$  SD loaded breathing time,  $10.5 \pm 3.72$  min). MIP (measured from residual volume), peak inspiratory flow (PIF), forced vital capacity (FVC) and forced expiratory volume in 1 s (FEV<sub>1</sub>) were assessed using spirometry, before, and immediately after the 200 m freestyle swim. Performance time, stroke rate (cycle.min<sup>-1</sup>) and stroke length (m.cycle<sup>-1</sup>) were measured per 50m sections of the two swims. A 2-way repeated measures ANOVA was used to determine differences between and within the two conditions. Performance time (C:  $161.9 \pm 24.3$  s; IMF:  $163.3 \pm 24.5$  s), split times, stroke rate (C:  $36.1 \pm 2.3$  cycle.min<sup>-1</sup>; IMF:  $36.4 \pm 2.2$  cycle.min<sup>-1</sup>) and stroke length (C:  $2.01 \pm 0.3$  m; IMF:  $1.97 \pm 0.2$  m) were not significantly different between trials. After the swimming bout, MIP significantly decreased in both trials, however this decrease was significantly greater in the IMF condition (C: 19.92 cmH<sub>2</sub>O; IMF: 25.3 cmH<sub>2</sub>O) ( $p < 0.05$ ). These results confirm that IMF occurs during a 200 m swim. A greater fatigue in the inspiratory muscles, does not affect a 200 m swim performance further.

## The effects of inspirational and preferred music on motivation and 5km running performance

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In sports and exercise science, music has been found to be beneficial as an external stimulus, in capturing attention, lifting spirits, generating emotions, changing or regulating mood, evoking memories, increasing work output, reducing inhibitions and encouraging rhythmic movements (Terry & Karageorghis, 2006: *Psychology bridging the Tasman: Science, culture and practise-proceedings of the 2006 Joint Conference of the Australian*). Music has also been shown to benefit performance by making athletes more motivated (Atkinson et al., 2004: *International Journal of Sports Medicine*. **25**: 611-615). However research has yet to apply motivational theory to examine the specific factors affected by music. The aim of the present study was to use a framework modelled by Self-determination theory (Deci, E. L., & Ryan, R. M. (1985: *Intrinsic motivation and self-determination in human behavior*. New York: Plenum) to assess the effects of motivational music and preferred music on: 1) a 5 kilometre run performance; 2) motivational regulation and needs satisfaction; and 3) attention shift (associative/dissociative). Following Aberystwyth University ethics approval, a panel of volunteers (n=6; mean age= 23.16, s= 3.06) rated 22 tracks using the Brunel Music Rating Inventory-2 (BRMI-2) to select 10 tracks rated as highly motivational. Participants were 12 male athletes (n=12; mean age=21.45, s= 3.23) who gave informed consent before participating. All participants completed three 5km trials under randomised conditions of motivational music, preferred music and a no-music control. During each trial, Heart Rate (HR) and Rating of Perceived Exertion (RPE) were recorded every 1km, and affect and attention style were recorded every 2 minutes. Post-trial measures included the Situational Motivational Scale (SIMS) and autonomy and competence subscales. One-way repeated ANOVAs will examine between conditions differences in performance, intrinsic motivation, autonomy and competence. It is expected that the athletes will perform significantly better during the preferred music trial than the inspirational trial, and in the inspirational trial compared to the control trial. It is suggested that this will be due to increased feelings of autonomy (due to choice of music) leading to greater task enjoyment and effort investment. It is expected a similar pattern of between condition differences will be observed for intrinsic motivation. Lastly it is expected that the attentional shift will occur later when music is present, as music will help resist associative thoughts. Data collection is still ongoing.

## **The effect of Lucozade versus a self made isotonic sports drink on cycling time trial performance in the heat**

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This study will determine the effect of Lucozade Sport against a self made isotonic sports drink on endurance cycling in a hot humid environment. Maughan and Terrados (1995: *Journal of Sports Sciences*, 13, 55-62) found that when core temperature is elevated, sweat loss increased, which led to a greater cardiovascular drift and premature fatigue during prolonged exercise. Therefore, maintaining hydration and replenishing the body of loss of water, electrolytes and sodium chloride is important (Brouns et al. 1998: *International Journal of Sports Medicine*, 19, 56-60). Coso et al (2008: *Applied Physiology Nutrition Metabolism*, 33, 290-298) supports this, as drinking carbohydrate-electrolyte solutions during prolonged exercise in heat improved thermoregulation. A self made sports drink with 6-8% carbohydrate which is similar to Lucozade Sport may be a cheaper and more accessible alternative. It is hypothesised that there will be no significant difference in sports performance and thermoregulation between a self made sport drink and the commercial brand of Lucozade Sport. With University ethical approval eight female subjects with an endurance training background (mean  $\pm$  sd; age, height, body mass, and  $VO_2$  max data is currently being collected) completed two, 45 min cycling time trials (TT) in hot, humid conditions (30°C and 50% humidity). The study is double blinded, and 2 hours prior to the TT, subjects will drink 1 litre of either the self made sports drink, or Lucozade Sport. Hydration status will be assessed by urine refractometry. Heart rate and core temperature will be monitored and recorded every 2 minutes and a sweat patch will be applied to the subject's medial inferior border of the trapezius for analysis of sweat content. During the TT subjects will be allowed to drink ad libitum, and the times of drinking and amount of consumption will be recorded. Once the TT is complete, distance covered and the fluid consumption will be calculated and the sweat patches will be analysed for sodium chloride concentration. After the TT the subject's recovery will be monitored until heart rate and core temperature return to resting values. The same protocol will be applied at the same time of day, 7 days later, with the alternative sports drink ingested. The data will be analysed via a two-way repeated measures ANOVA and Tukey's post Hoc test when significant differences are found. Data Collection is currently ongoing. The expected results are that there will be no significant difference in sports performance and thermoregulation, suggesting Lucozade Sport can be reproduced at home and at a lower cost. Lucozade base their marketing on the two factors science and taste, therefore the data collected for time and volume of fluid consumed will be used to compare differences between the two TT. If no significant differences are found this suggests that the taste of the self made isotonic sports drink did not impact on the frequency and volume of fluid consumed.

## **Perceived leadership behaviour as a predictor of contextual motivation among collegiate track and field athletes: a self-determination theory perspective**

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Self-determination Theory (SDT) posits that the impact of social factors on motivation is mediated by perceived satisfaction of the innate psychological needs of competence, autonomy, and relatedness (Ryan & Deci., 2000: *American Psychologist*, 55, 68-78). According to Ryan and Deci, SDT can be used to further understand why individuals choose to participate and remain in an activity along a continuum of self-determined behaviour; that is from the most non-self-determined motivation (amotivation), to the most self-determined motivation (intrinsic motivation). Using SDT as a guiding framework, this study sought to establish whether perceived leadership behaviour is predictive of athletes' perception of contextual motivation. Male and female athletes ( $N = 30$ ), aged 18 to 24 years from Brunel University Athletics Club were administered two psychometric instruments: the Leadership Scale for Sports (LSS; Chelladurai & Saleh., 1980: *Journal of Sport Psychology*, 2, 34-45) which assessed athletes' perceptions of their coach's behaviour and the Sport Motivation Scale (SMS; Pelletier, Fortier, Vallerand, Tuson, Briere & Blais., 1995: *Journal of Sport & Exercise Psychology*, 17, 35-53) which measured the athletes' motivation towards participation in track and field. Data were checked for outliers and for normality using standard skewness and kurtosis ( $z > \pm 1.96$ ). Subsequently, a series of standard linear regression analyses revealed that perceived leadership behaviour of coaches (training and instruction, democratic behaviour, autocratic behaviour, social support and positive feedback) did not significantly ( $P < .05$ ) predict contextual motivation among collegiate track and field athletes. Thus, the present findings do not provide support for the SDT posit that perceived satisfaction of an individual's needs for competence, autonomy and relatedness in an activity will enhance their enjoyment of it. It is recommended that the study be repeated with a larger sample size; this may yield findings that are more in line with theoretical predictions.

## Acute effects of heavy-loaded and light-loaded squats on drop jump performance

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Optimal strength and power are vital to sport performance. Resistance exercise may enhance performance of subsequent plyometric exercise, defined as complex training (e.g. Baker, 2003: *Journal of Strength and Conditioning Research*, **17**, 493-497). This phenomenon, known as post activation potentiation (PAP), was observed through counter movement jumps (CMJ) (Comyns et al., 2006: *Journal of Strength and Conditioning Research*, **20**, 471-476). However, a CMJ is a slow stretch shortening cycle (SSC) exercise. The present study investigated whether resistance exercise would effect fast SSC performance. After receiving institutional ethical approval, ten physically active males (mean age=20.9,  $s=1.5$ , years; height=183.1,  $s=5.7$ , cm; body mass=81.2,  $s=9.6$ , kg) with at least two years experience in weight lifting and plyometric training (mean 4.5,  $s=1.7$ , years) and a one-repetition maximum (1-RM) back squat of at least 1.5 times their own body mass (1-RM times body weight, mean 1.77,  $s=0.2$ ) attended four independent sessions separated by 7 days. The first session served for familiarization and to determine subject's 1-RM for the back squat. Order of testing sessions was randomized and counter-balanced between subjects. During the three testing sessions, subjects performed 3 sets of 5 repetitions of the back squat either non-loaded (control condition), 30% 1-RM (light-loaded) or 85% 1-RM (heavy-loaded). Subjects were given 4 minute recovery between sets. Immediately after the final set 3 consecutive drop jumps (DJ) were performed off a 30 cm box on to a jump mat. Jump performance was assessed using 5 dependent variables: contact time (CT), jump height (JH), power, and electromyography (EMG) root mean-square for the vastus medialis (VMrms) and vastus lateralis (VLrms). A series repeated measures analyses of variance (ANOVA) was conducted to determine whether there was a difference ( $P < 0.05$ ) in the 5 dependent variables between the light, heavy and non-loaded squat conditions. Where significant differences had occurred was identified through subsequent post hoc tests (paired sample t-tests). Results showed an increase in JH (mean=0.34,  $s=0.06$ , m) and muscle activity (VMrms, 116%; VLrms, 120%) post heavy-loaded squats and a decrease in JH (mean=0.27,  $s=0.03$ , m) and muscle activity (VMrms, 62%; VLrms, 53%) post light-loaded squats compared to the control condition (mean=0.31,  $s=0.05$ , m). Heavy-loaded squats solicit PAP and therefore improve drop jump performance. In contrast, light-loaded squats caused a deficit in post drop jump performance compared to the control condition. The implications of this study may influence the choice of plyometric exercise used in complex training.

## **The relationship of a modified agility t-test with stretch-shortening cycle and straight sprint acceleration**

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There is an inconsistency in the understanding of stretch-shortening cycle and acceleration characteristics in the change of direction speed component of agility. The modified agility t-test is a contemporary protocol recently established as reliable and quantifies change of direction speed and its components. The purpose of the present study was to explore the relationship of the stretch-shortening cycle and straight sprint acceleration components of agility using the modified agility t-test. After receiving ethics approval, twenty-eight male team-sport athletes (Mean  $\pm$  SD; Age: 20.6  $\pm$  0.8 years; Stature: 179.8  $\pm$  6.3 cm; Body Mass: 82.0  $\pm$  8.7 kg) attended two sessions. In the first session a squat jump (SJ), countermovement jump (CMJ), and a rebound jump (RBJ) were recorded using a timing mat system, where flight time, jump height, contact time and reactive strength index (jump height/contact time) were computed. The second session comprised of a 20 m straight sprint (20mSS), with a 10 m split, and a modified agility t-test (MAT) which were both measured using timing gates. The best and mean scores from three trials were used for further analysis. Significant correlation coefficients ( $r$ ) were found between the MAT and SJ, CMJ and RSI ( $r = -0.52, p < 0.01, r = -0.44, p < 0.05$  and  $r = -0.58, p < 0.01$ , respectively). However even though these relationships were significant in all instances there was a low amount of common variance (all  $<33\%$ ). Interestingly, acceleration (10mSS and 20mSS) did not significantly correlate with the MAT protocol ( $r = 0.24$  and  $r = 0.38$ , respectively). Results show that acceleration is not related to CODS, while strength (SJ), slow SSC (CMJ) and fast SSC (RBJ) do have some relationship to CODS performance. This suggest that by improving jump height while reducing contact time i.e. through plyometric and sprint training, will improve CODS performance if implemented by a coach appropriately.

## Combining global positioning and geographical information systems to investigate distance ran over the course of an urban marathon footrace.

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Global positioning system (GPS) is gaining widespread acceptance as a mean of monitoring locomotion of athletes engaged in outdoor sports. However, previous reliability studies that looked at this technology mostly involved exercise bouts over relatively short distances, and data pertaining the extent to which built environment could affect satellite signal transmissions are limited. In the present study, we employed a geographical information software (GIS) to investigate both the magnitude and sources of measurement error affecting GPS measures of distance when competing in a 42.195 km, mass-participation, urban marathon. Following institutional ethics approval, nineteen volunteers completed the race wearing a commercially available GPS receiver (Polar G3, Polar Electro Oy, Kempere, Finland) switched into non-differential mode, with positional coordinates and corresponding time stamp of measurement logged every 5 sec. Distance covered between GPS-recorded waypoints ( $dGPS_{\text{raw}}$ ) was first calculated post-race using the GIS (Google Earth 5.1.3533.1731, Google Inc., Mountain View, USA) algorithm. Running paths were then individually processed against the virtual route of the race ( $dGIS$ ) to verify positional validity and to account for signal noise ( $dGPS_{\text{multipaths}}$ ) as well as for extra-distance ( $dGPS_{\text{stops}}$ ) covered during refreshment stops (i.e.  $dGPS_{\text{corrected}}$ ). Virtual beacons were positioned at 10% distance intervals along the geocoded official route to evaluate agreement between  $dGIS$  and corresponding values for both  $dGPS_{\text{raw}}$  and  $dGPS_{\text{corrected}}$ , using the Bland & Altman's limits of agreement (LoA) method. Mean systematic bias for  $dGPS_{\text{raw}}$  throughout the race was more than twice that of  $dGPS_{\text{corrected}}$  (i.e. 0.950 km *versus* 0.435 km, respectively;  $P < 0.001$ ). Improvement in agreement following correction procedures was also accompanied by a 64% reduction in the width of the 95% LoA (from -0.883–2.784 km for  $dGPS_{\text{raw}}$  to -0.220–1.090 km for  $dGPS_{\text{corrected}}$ ). Finally,  $dGPS_{\text{multipaths}}$  and  $dGPS_{\text{stops}}$  were found to amount to  $0.647 \pm 0.908$  km (0.020–3.472) and  $0.165 \pm 0.350$  km (0.005–1.412), respectively – where values are expressed as mean  $\pm$  SD (range). Our results suggest that occurrence of signal noise is elevated when non-differential GPS is used within proximity of tall buildings. Consecutive impairments observed in the determination of distance between affected waypoints can nevertheless be corrected for using GIS technology, thus potentially offering significant improvements for performance analysis purposes. Remaining bias between criterion and GPS-derived measures of distance during mass-participation marathon footraces is likely to reflect both technological (i.e. GPS limitations) and biological (i.e. individual deviations from the shortest running route) error components.

## Motivational climate as a predictor of the intensity and direction of precompetition anxiety

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Motivational climates have been found to influence affective states in physical activity (Ntoumanis & Biddle., 1999: *Journal of Sports Sciences*, 17, 643-665). The nature of precompetition anxiety and how it relates to different motivational and cognitive variables has also been observed; nonetheless, research that has examined whether performance and mastery climates can influence the intensity and interpretation of anxiety symptoms using the CSAI-2 has failed to find any direct links (Ntoumanis & Biddle., 1998: *Research Quarterly for Exercise and Sport*, 69, 175-187). Accordingly, the purpose of this study was to identify whether mastery climate would be a positive predictor of the direction scores of cognitive and somatic anxiety and whether performance climate would be a positive predictor of the intensity of cognitive and somatic anxiety. With institutional ethics approval, 28 male soccer players from a local club, mean age  $22 \pm 4$  years, completed the Perceived Motivational Climate in Sport Questionnaire-2 (PMCSQ-2, Newton *et al.*, 2000: *Journal of Sports Sciences*, 18, 275-290) to assess participants' perceptions of the motivational climate and the revised Competitive State Anxiety Inventory-2 (CSAI-2r; Cox *et al.*, 2003: *Journal of Sport & Exercise Psychology*, 25, 519-533) with a directional scale, to assess the intensity of precompetition anxiety and self-confidence as well as the direction of anxiety. Participants were administered the PMCSQ-2 immediately prior to their training session and the CSAI-2r immediately after their session. Although the CSAI-2r measures self-confidence, the present researchers were only concerned with the intensity and directional subscales of anxiety. Data were checked for outliers and for normality using standard skewness and kurtosis ( $z > \pm 1.96$ ). Two univariate outliers were identified and deleted as was one multivariate outlier. The results demonstrated that mastery climate significantly predicted precompetition somatic anxiety intensity (Adj.  $R^2 = 0.214$ ,  $F_{2, 24} = 2.376$ ,  $P < 0.05$ ). No significant ( $P < .05$ ) predictions were found for the other CSAI-2r subscales. Although the present findings lead to a rejection of the research hypothesis, there is tentative evidence that a mastery motivational climate is associated with lower somatic anxiety intensity levels.

## **Changes in affect and future exercise intentions as a result of exposure to a regular exercise programme using the Wii-Fit.**

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Approximately 60% of the population fail to achieve recommended levels of physical activity to accrue health benefits (World Health Organisation, 2004: *Global strategy on diet, physical activity and health*: World Health Organisation). In an attempt to increase activity, the Department of Health and Human Services (1996: *Physical activity and health: A report of the Surgeon General*. Atlanta: US Department of Health and Human Services, Centres for Disease Control and Prevention, National Centre for Chronic Disease Prevention and Health Promotion) called upon the entertainment industry to be creative and demonstrate that being active can be fun. This has been an aim of Nintendo who developed the Wii-Fit, which is an interactive exercise game. The literature however on interactive gaming is sparse and has focused on energy output with little or no attention being paid to psychological factors that might increase continued use, nor implications of this for exercise promotion. Therefore, this research study had two aims. First, to track changes in affect and second to explore intentions to exercise as a result of regular exposure to programmed exercise. Seven sedentary women used a Wii-Fit for eight 30 minute sessions across three to five weeks. On-going measurements of affect were plotted on the circumplex model, after recommendations from Ekkekakis and Petruzello (1999: *Sports Medicine*, **5**, 337-374) to measure exercise associated affect. On average all the participants moved towards a positive valence pre – to post exercise but fluctuations in valence were evident during exercise sessions. After the final session the participants were interviewed about their future exercise intentions. A thematic analysis of this data found that five participants intended to change their exercise behaviour but at four-week follow up only two had changed their behaviour. In conclusion, exercise using the Wii-Fit appears to have a differential impact upon affect between individuals and an eight session programmed use of the Wii-Fit was not enough to increase the likelihood of exercise uptake in this sample of sedentary women.

## **A comparison between TRIMP and session RPE during steady state exercise.**

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Banister's (1991: *Physiological testing of elite athletes*, edited by H. Green & J. McDougal. Campaign. IL. Human Kinetics) training impulse (TRIMP) has been successfully applied as a marker of training load during training and competition (Padilla, 2000: *Medicine and Science in Sports and Exercise*, **33**, 796-802). The simplicity of the session RPE method suggests the practical value of the technique in quantifying training load. Session RPE has compared favourably with some of the more complex physiological methods of quantifying training load (Foster et al., 2001: *Journal of Strength and Conditioning Research*, **15**, 109-115). To avoid excessively high scores from low intensity long duration exercise Stango et al. (2007: *Journal of Sport Sciences*, **6**, 629-634) employed a weighting system based on a typical blood lactate profile. The aim of this study was to explore the relationship between TRIMP and session RPE during steady state exercise. With ethical approval physically active males (n = 9) performed an incremental step test to determine heart rate (HR) zones in relation to blood lactate profiles, resting HR and a ramp test were performed to identify maximal HR (HRmax). Participants performed 3 sub maximal (12 km/h for 30 min; 9 km/h for 40 min, 7.2 km/h for 50 min. Distance covered 6 km) sessions on a treadmill, where HR was recorded and session RPE was obtained 30 minutes post exercise. The TRIMP (Stango et al., 2007) and session RPE values (Foster et al., 2001) were then calculated. Data collection and analysis is ongoing.

## **Sports participation: Is the coach a negative influence?**

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The importance of encouraging the balance between physical and mental health through the use of sports participation has become increasingly apparent (Evans, 2008: *Australasian Parks and Leisure*, 44-48). Sport is seen universally to challenge countless health problems, including obesity as current figures show that 65% of all adults and 16% of children in the UK are overweight and obese (Hedley et al., 2004: *Journal of the American Medical Association*, 291, 2847-2850). Sports participation can encourage and facilitate the development of many fundamental life skills, including dedication, commitment, leadership and time management, yet sports coaches, who you expect to have a positive influence on participation, have been cited as reasons for drop out (Weiss & Williams, 2004: *The why of youth sport involvement: A developmental perspective on motivational processes*. In M. R. Weiss (Ed.), *Developmental sport and exercise psychology: A lifespan perspective*. Morgantown, WV: Fitness Information Technology). Therefore, with these factors in mind, it is essential for a sports coach, as a role model, to maximise the positive experiences associated with sports involvement in order to uphold, increase and develop sports participation. The purpose of this study was to establish the extent of the influence sports coaches have when a participant decides to dropout of sports participation. Qualitative research will determine the reason(s) why people cease participation in sport, and whether it is the sports coach who is cited as the major influence for dropout. The information provided for continued involvement in sports participation will also be examined in order to provide coaches with an understanding of both the positive and negative attributes they bring to their coaching sessions. Three hundred participants, who are either current sports participants or are currently not participating in sports, aged between 18 and 24 years (mean=19.71 years) volunteered to take part in this study, from twelve first year undergraduate degree courses being held at a University on the South Coast of England during the academic year of 2009-2010. The data was collected through the administration of an adapted Sports Participation Patterns Questionnaire (Toms et al., 2009), which has been developed to determine the influences sports coaches have upon levels of sports participation. All data will be kept anonymous and confidential. Statistical analysis of the data will be completed using the computer software SPSS (Version 10.0), including the assessment of descriptive statistics and a two-way Chi-square test. Early indications from this study show that the influences from the sports coach for dropout are of a non-significant value, although data has yet to be finalised.

## **An examination into the 4 W's of goal setting in elite junior sailing: What, where, when and why**

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The use of goal setting in sport psychology has been a popular area of research (Filby and Maynard, 1999: *Journal of Applied Sport Psychology*, **11**, 230-246). It is a technique used in applied mental skills training to create a positive psychological state and enhance athletic performance. Recent literature recommends that goal setting is a principal psychological skill at all levels of sport. However, it has been proposed that there is still a lack of conformity within research regarding the use and effects of goal setting. Literature suggests that this incongruence may be the result of methodological limitations including task complexity, the types of goals that participants are asked to use and the absence of efficient control groups. Research proposes that goal setting is sport specific as differences exist between the needs of sports (Munroe-Chandler *et al*, 2004: *Journal of Sport Behaviour*, **27**, 58-74). Whilst there appears to be understanding and application of goal setting in many main stream sports the author is unaware of any literature examining goal setting in sailing. Therefore, it is difficult to generalise existing research and apply it to competitive junior sailors. The purpose of this study was to investigate and gain an understanding of the four W's of goal setting by National level competitive junior dinghy sailors. Specifically the study aims to explore 'What' goals sailors set, 'Where' they use goal setting, 'When' goals are set and 'Why' goal setting is used. Participants in this study were a squad of performance sailors ( $N=12$ ) aged  $12 \pm 2$  years, who compete at British National level and International junior sailing events. Ethical approval was acquired from the Centre of Health, Exercise and Sport Science ethics committee, participants all volunteered for the study and informed consent was obtained. The investigation used a qualitative triangulation approach to generate data. The data was collected via goal setting diaries, semi-structured focus group interviews and overt observations over a five month period at all National training camps and competitions held during this time-frame. Data is being analysed using inductive and deductive content analysis and will be presented in hierarchical trees. Results demonstrate inconsistency and inefficiency of goal setting practice. The most frequently reported goals used by the squad were short term outcome goals. Within the squad, higher ranked sailors used goals more frequently, used a more balanced multi goal setting approach and set more difficult goals. Goal setting was used in training by coaches who set squad goals. Goal setting was most commonly used in competition where goals were used as focus strategies in pre-competition routines. Participants reported using goal setting because they were told to by coaches and parents. There is still significant work to be done on goal setting with sailors and coaches in elite junior dinghy sailing.

## Perceived motivational climate as a predictor of feelings of relatedness among professional male soccer players

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From a Self-determination Theory perspective (Sarrazin, Boiché & Pelletier, 2007, *Intrinsic Motivation and Self Determination in Exercise and Sport*, edited by M. S. Hagger & N. L. D. Chatzisarantis. Champaign, IL: Human Kinetics), the coaching climate should ideally satisfy feelings of autonomy, competence and relatedness. Individuals who have their need for relatedness satisfied are considered securely connected to members of a social group. It has been postulated that a task-involving climate promotes feelings of belongingness as well as satisfaction of the need for relatedness (Ntoungamis, 2001: *British Journal of Educational Psychology*, 71, 225-242). Contrastingly, an ego-involving climate, which emphasises inter-individual comparison, is thought to undermine an individual's perception of feeling closely connected to others (Reinboth & Duda, 2006: *Psychology of Sport and Exercise*, 7, 269-286). The purpose of the present study was to explore whether the results from previous studies (e.g., Sarrazin et al., 2001: *European Journal of Sport Science*, 1, 1-9) could be generalised to elite male athletes. It was hypothesised that perceptions of a task-involving climate would positively predict feelings of relatedness, and that perceptions of an ego-involving climate would not significantly predict relatedness. Participants were 25 male professional soccer players aged 16-33 years (mean age = 21.8,  $s = 5.8$  years) who played for the same club (mean years playing at the club = 3.3 years). After participants had given their consent, they completed the Perceived Motivational Climate in Sport Questionnaire-2 (PCMSQ-2; Newton *et al.*, 2000) prior to a training session. Following the training session, participants completed the Need for Relatedness Scale (Richer & Vallerand, 1998: *Revue Européenne de Psychologie Appliquée*, 48, 129-137). Standard skewness and kurtosis values were computed and revealed that the variables were within an acceptable range ( $\leq \pm 1.96$ ). Subsequently, a linear regression analysis revealed that the perceived motivational climate factors were nonsignificant ( $P < .05$ ) predictors of feelings of relatedness. Perceived motivational climate explained only 3.1% of the variance in relatedness scores ( $R^2 = .031$ ). The nonsignificant findings might be attributed to the small sample size employed and possible the lack of stability within the team; participants varied greatly in the length of time for which they represented the club. Accordingly, close relationships and subsequent feelings of relatedness may not have developed to a sufficient degree.

## **The relationship between the stretch-shortening cycle and sprint performance**

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Sprinting is a fundamental mediator between successful and unsuccessful team sport performance. The relationship between sprint and stretch-shortening cycle (SSC) performance demonstrates conflicting findings across the literature. The purpose of this study was to clarify any relationship between SSC performance variables that distinguish the most important contributors to successful sprinting. Establishing such relationships would help to inform sprint training. Twenty six male team sport (Mean  $\pm$  SD: Age:  $20.7 \pm 0.8$  years; Body Mass:  $82.0 \pm 9.1$  Kg; height  $179.6 \pm 6.5$  cm) students were recruited to perform two sessions. The first session (SSC) included squat jumps (SJ), countermovement jumps (CMJ), rebound jumps (RBJ) and 25 sub maximal hops (HOPS) all performed on a mobile contact mat. This enabled measurement of flight time, contact time, jump height and calculation of the reactive strength index (RSI). Hopping was performed at 2.5Hz and enabled relative and absolute vertical leg stiffness to be computed. The second session comprised of a 40 m sprint (splits at 10 and 20 m) through timing gates. The best of three trials was put through statistical analysis except for HOPS where an average of 10 consecutive hops was used. Squat jump ( $r = -0.568$ ) and CMJ ( $r = -0.462$ ) were significantly related to 40 m sprint performance ( $p > 0.05$ ). Relative stiffness ( $r = -0.468$ ) and RSI ( $r = -0.513$ ) were significantly related to 20 m sprint time ( $p > 0.05$ ). All paired variables had a standard error of estimate  $< 2.5\%$ , but common variance equated to  $< 50\%$ . Although components of the SSC were significantly related to sprinting, all correlations were moderate or weak with low common variance. The relationships between some variables may help to inform testing and training, however, it is clear all tests reflect unique qualities of performance.

## **Organizational stressors in amateur sport: A coach perspective**

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It has been established that many organizational stressors experienced by elite athletes can be aligned within four categories: environmental issues; personal issues; leadership issues, and; team issues (Woodman & Hardy, 2001: *Journal of Applied Sport Psychology*, **13**, 207-238; Fletcher & Hanton, 2003: *The Sport Psychologist*, **17**, 175-195). It remains unclear however, whether coaches experience the same range of stressors. It has been argued that the effectiveness of coaches will increase if their sources of stress are addressed (Thelwell, Weston, Greenlees & Hutchings, 2008: *Journal of Sport Sciences*, **26**, 905-918), and thus it is surprising that few studies have investigated this topic. Thelwell et al. (2008) and Levy, Nicholls, Marchant and Polman (2009: *International Journal of Sports Science & Coaching*, **4**, 31-45) provide the notable exceptions. Both studies have found that elite coaches experience a range of environmental, administrative, leadership, personal and team stressors which differ from those of the athlete. Nevertheless, it is evident that more research is needed to extend this literature. With this in mind, the present study aimed to investigate the organizational stressors of amateur coaches. Based on Fletcher and Hanton's interview guide (2003), semi-structured interviews were conducted on six amateur coaches across a variety of sports (including athletics, tennis, golf, football and rugby), with data analysed through inductive content analysis. Results indicated that whilst the organizational stressors experienced by amateur coaches align with the categories identified by Thelwell et al. (2008) and Levy et al. (2009), new stressors within each category emerged. These included limited time for training, inadequate facilities and being poorly equipped to deal with athletes' parents.

## Sources of organizational stress within amateur sports performers

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The organizational stress literature is dominated currently by investigations within the elite sport setting (e.g., Woodman & Hardy, 2001: *Journal of applied sport psychology*, **13**, 207-238; Fletcher & Hanton, 2003: *The Sport Psychologist*, **17**, 175-195; Hanton, Fletcher & Coughlan, 2005: *Journal of Sport Sciences*, **23**, 1129-1141). However, little research attention has been directed towards organizational stress within amateur sport. To date, Mellalieu, Neil, Hanton and Fletcher (2009: *Journal of Sport Sciences*, **27**, 729-744) provide the notable exception, when they examined competitive and organizational stressors within both elite and non-elite sport. They found that overall, both elite and amateur athletes face a similar range and number of organizational stressors, although additional research is required to examine further and verify these findings. As such, the current study investigated the sources of organizational stress perceived by amateur athletes within a range of sports. Based on an adapted version of Fletcher and Hanton's (2003) interview guide, data were collected via semi-structured interviews with 8 amateur athletes across a variety of sports (including athletics, badminton, basketball, cricket, football, netball, swimming and tennis), and were analyzed via inductive content analysis. As expected, the results indicated that amateur athletes experience many similar organizational stressors to those identified by elite athletes; however a number of new stressors emerged including training times, the demands of committee roles, a lack of sports science support and limited coach availability.

## Two dimensional video analysis of the ball carrying technique and posture in elite and amateur hockey players

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Field hockey is a fast and dynamic sport characterised by actions involving low body positions such as hitting, slapping, pushing, tackling and ball carrying. Previous research has shown a high frequency of back injuries within field hockey, attributed to the low crouched posture placing increased physiological strain on the body (Murtaugh, 2001: *Medicine and Science in Sports and Exercise*, 33, 201-207). Trunk flexion has been identified as a prominent risk factor for lower back pain. (Punnett *et al.*, 1991: *Scandinavian Journal of Work, Environment and Health*, 17, 337-346.). Subsequently, the constant flexed position in which the ball is carried during both training and match play may be a critical factor in explaining the prevalence of lower back injury. The purpose of this study was to compare postural differences within the ball carrying technique between elite and amateur players, considering specifically the differences in angular displacement through flexion and extension of the knee, hip and trunk. Ball positioning, hand positioning and vision was also compared using qualitative analysis. Eighteen injury free male field hockey players participated in the study (age:  $19.8 \pm 2.7$  years, height:  $1.79 \pm 0.08$  m, and mass:  $73.5 \pm 9.8$  kg and playing experience  $6.4 \pm 4.2$  years). Eight were elite players who had been or were currently involved in national league teams and/or their regional or national squads. The other ten were amateur players playing in local league teams. Two cameras (Mini DV Camcorder, Canon MV890, Sample rate 50Hz) captured the ball carrying technique, recoding in the sagittal and frontal planes. The video footage was then analysed in Quintic Biomechanics 9.03 v14. Back injury was reported in 38.9% of the sample, 50% of the amateur players reported back injury, 40% of which was lower back. Trunk, hip and knee flexion were all significantly larger ( $P > 0.05$ ) in the elite players. This was achieved through a lower centre of mass, and rotation in the thoracic vertebrae due to a lower right hand increasing control on the ball. This would suggest that the elite players' postures during ball carrying increases their injury risk through considerable trunk flexion coupled with rotation of the vertebrae. These findings propose a need for hockey clubs and coaches to incorporate core strength and stability training into their training programmes to help limit the risks associated with playing in such a flexed posture.

## **The effect of intermittent hypoxic exposure (IHE) and hydration status on a self-paced 3,000m time trial**

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Sufficient exposure to altitude or intermittent hypoxic exposure (IHE) increases erythropoietin and red blood cell mass (Levine, 2002: *High Altitude Medicine and Biology*, **3**, 177-193). Improvements in 3km time of up to 2.3% have been recorded after 3 weeks of IHE (Hamlin *et al.* 2007: *Journal of Sport Sciences*, **25**, 431-441). Hypohydration of >2% body mass loss has been seen to reduce muscular endurance by 15% (Montain *et al.* 1998: *Journal of Applied Physiology*, **88**, 1889 - 1894), as well as heart rate, stroke volume and RPE (Cheuvront *et al.* 2005: *Journal of Applied Physiology*, **99**, 1972-1976). The purpose of the study is to identify whether IHE improves 3km running time and whether these beneficial effects are negated by the detrimental effects of hypohydration. Eight unacclimatised, moderately trained individuals (mean  $\pm$  SD) aged  $21 \pm 1$  yrs, body mass  $68.5 \pm 7$ kg, and height  $171.4 \pm 9$ cm completed two self-paced [Euhydrated and Hypohydrated (2% body mass loss)] 3 km time trials before and after a 3 week intervention. Subjects were instructed to achieve the fastest time possible. Control group (C) received no intervention during the 3 weeks whilst the hypoxic group (H) undertook the IHE protocol (Three 90 min exposures to  $FIO_2=0.15$  a week for 3 weeks) (Katayama *et al.*, 2003: *High Altitude Medicine and Biology*, **4**, 291-304). HR,  $SAO_2$ , RPE and expired gas were measured every 5 mins as well as the final 3 km time. Throughout the hypoxic exposures heart rate,  $SAO_2$  and Lake Louise Questionnaire scores were measured every 15 mins. Haemoglobin and haematocrit measures were taken pre and post the 3 week intervention. Significance level was  $p < 0.05$ . Paired *t*-tests were conducted to attribute for the influence of IHE and hydration on the subjects. No significant change in haematological status was recorded. 3,000m running time was greater in hypohydrated ( $14.73 \pm 3.04$  mins) than euhydrated trials ( $13.72 \pm 2.54$  mins) ( $t = 2.5$ ,  $p < 0.039$ ). No significant improvement was attained from the IHE protocol (Pre IHE  $12.55 \pm 0.9$  mins, Post IHE  $12.43 \pm 0.82$  mins). Three weeks of IHE has minimal effect on 3000m running time. Decline in performance with hypohydration negates any effect of IHE and should be of greater importance to the athlete.

## **The effects of multi-joint resistance exercise and workload on post-exercise hypotension**

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Blood pressure (BP) disorders constitute a major public health problem, and are associated with coronary heart disease, myocardial infarction and other pathological conditions (Simao et al., 2005: *Journal of Strength and Conditioning Research*, **19**, 853-858) It has been suggested that physical activity causes an acute decline in BP, namely post-exercise hypotension (PEH), and is considered as a non-pharmacological option for preventing and treating BP disorders (Farinatti et al., 2009, *Journal of Strength and Conditioning Research*, **23**, 2487-2492) in hypertensive populations. Although limited, the research into the effects of resistance exercise on PEH is conflicting. Studies reporting relationships have prescribed high training volumes for all muscle groups (Fisher, 2001; *Journal of Strength and Conditioning Research*, **15**: 210-216). Conversely, other studies (Simao et al., 2005, *Journal of Strength and Conditioning Research*, **19**, 853-858) using low-to-moderate volumes and single/multi-joint exercises, have concluded that exercise volume or workload has no affect on the magnitude of the PEH response. Therefore, the purpose of this study was to examine the effects of combining multi-joint resistance exercises with moderate volume on PEH in a normotensive population. Following ethical approval and informed consent, eight recreationally trained sport and exercise science students (mean age=23, s=5.6 years, mean height=174, s=11.2 cm, mean weight=79, s=21.1 kg) were randomly selected to participate in this study. Participants were assessed over 3 separate days: Condition 1, baseline measures; Condition 2, lower body- front squat exercise (FSE) using 6 sets of 10 repetitions of a 12 repetition maximum (12RM) protocol; Condition 3, upper body- bench press exercise (BPE) using 6 sets of 10 repetitions of a 12RM protocol. The 12RM was determined during condition 1. Each condition was conducted 72 hours apart to account for fatigue effects. Blood pressure was assessed before and every 10 minutes after exercise for 1 hour. A one-way repeated measures ANOVA revealed no significant differences ( $p>0.05$ ) between systolic and diastolic blood pressure, and mean arterial blood pressure across all conditions. The results suggest that the exercise volume prescribed in this study was not high enough to induce a PEH effect in normotensive sport and exercise science students. However, the extent to which these results may be applied to hypertensive populations is uncertain.

### **Case study: Strength and conditioning provision in a university women's soccer team with reference to injury occurrence.**

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Soccer players require a high level of physical, technical and tactical skill, achieved through training (Mujika *et al.*, 2009: *Journal of Sports Sciences*, **27**, 107-114). Due to the growing popularity of women's soccer, there has developed an increased focus on injury prevention strategies within the sport (Faude *et al.*, 2005: *The American Journal of Sports Medicine*, **33**, 1694-1700). However, the scientific literature predominately concerns injury occurrence in men's soccer. The purpose of this case study was to provide a reflective account of the scientific observations and the challenges when providing sports science and prehabilitation support to a university women's soccer team. During the 2009-10 BUCS soccer competition season, lower extremity flexibility scores were measured using the Movement Dynamics Goniometer scale of 1-5AU (Giles, 2008: *An Introduction to Athletic Development, Movement Dynamics UK Limited*) and squat measurements were taken using the Functional Movement Screen scale of 1-3AU (Cook, 2003: *Athletic Body in Balance: Optimal Movement Skills and Conditioning for Performance, Leeds; Human Kinetics*), for players in the Teesside University Women's Football Club (Mean  $\pm$  Standard Deviation: 20  $\pm$  1.3 years, 162  $\pm$  5.5m, 62.5  $\pm$  13kg). All muscle injuries of the lower extremity were documented by team sports therapists. Information on players' previous injuries and the amount of time spent in training and matches and the reason and duration for any absences were recorded. Screening results demonstrated low ankle (2.8  $\pm$  0.7AU) and hamstring (2.4  $\pm$  1.9AU) flexibility with poor squatting ability (1  $\pm$  1.2AU). From the 25 members of the training squad, there were eight injuries (7 ankle, 1 tibial stress fracture) reported that resulted in a least one match or training session being missed. The high incidence of ankle injuries and low flexibility scores would suggest that more players may be at risk of lower leg injuries (Witvrouw *et al.*, 2003: *The American Journal of Sports Medicine*, **31**, 41-46). Further evidence suggests that players who sustained ankle injuries became injured following periods of inactivity i.e. mid-season breaks, or whilst players were fatigued. In response a strength and conditioning intervention was applied to increase fitness and reduce injury (Faude *et al.*, 2005). During the study, motivation of the players, attendance and adherence to training provided an obstacle that was difficult to overcome and may have resulted in poor fitness scores. By improving conditioning through increased fitness and injury prevention, fewer injuries may occur (Faude *et al.*, 2005).

## **How does the addition of orthotic insoles effect power output and displacement in ergometer cycling?**

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In cycling, in-shoe orthotics may have the potential to provide support to the foot, allowing the best possible functioning position to take place, as such refining a greater efficiency in power output. The use of the in-shoe orthotics can be found to have a great effect on the displacement within a cyclist's positioning during performance. This effect may be constructive or detrimental to the power output and will be dependent on the cyclist as an individual athlete. The aim of this study was to test the medial/lateral displacement of the Qualysis markers (Qualisys Track Manager, Medical AB, Sweden) identified on bony landmarks including greater trochanter, medial and lateral knee, gastrocnemius, medial and lateral ankle, calcaneous and 1st and 5th metatarsal. This was tested with the utilisation of either orthotic insoles provided and cut by a professional body, or the original insoles of the participants cycling shoes. Alongside the comparison in displacement, the average power output (wattage) was monitored and recorded. Ten cyclists, varying in experience participated in two randomised trials, both 20 minutes (min) duration of maximal effort on a Schoberer Rad Meßtechnik (SRM, Germany) rig. The landmarks were labelled using specialist software (Qualisys Motion Manager, Qualisys Medical AB, Sweden) and the deviations of the bony landmarks on the medial/lateral axis were analysed using a paired sample t-test (SPSS 14). Results showed that the greatest medial/lateral displacement derived from the knee, significant differences in variation were not found with the use of orthotics, nor were there any significant differences found in performance output. In conclusion, the addition of cycling specific orthotic insoles has failed to demonstrate a significant enhanced effect on performance, however the results do show some positives for certain individuals.

## **Ratings of perceived exertion in chronic kidney disease: Oxygen delivery and utilisation**

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Chronic Kidney Disease (CKD) is associated with a decreased quality of life, decreased exercise capacity and increased fatigue (Phrommintikul *et al.*, 2007: *The Lancet*, 369, 381-388). Anaemia, causing reductions in haemoglobin (Hgb) concentration is recognised as the key variable in the onset of fatigue. However recombinant erythropoietin (EPO) treatment and normalization does not restore  $\text{VO}_2$  peak values (Sangkabutra *et al.*, 2003: *Kidney International*, 63, 283-290).

Consequently assumptions are made regarding compensatory adaptive mechanisms such as adjusted cardiac output (Wallman *et al.*, 2004, *Medicine & Science in Sport & Exercise*, 36, 1682-1688), which remains unproven. Increased lactate levels identified in CKD patients in comparison to healthy controls suggests deficiencies in aerobic work capacity (Peterson *et al.*, 2009: *Nephrology Dialysis Transplantation*, 24 (9), 2882-2888). Decreased muscle mitochondrial  $\text{O}_2$  utilisation indicates deficiencies within the oxygen delivery & utilisation chain (Wallman *et al.*; 2004). The studies proposed purpose is to evaluate exertional fatigue in CKD patients and identify deficiencies within the oxygen delivery and utilisation chain. With ethical approval 18 CKD patients and 18 matched healthy control subjects will undertake a sub-maximal cycling protocol with workloads corresponding to ADL's, expressed in METs. Completion of the SF36 instrument, the FACT-F fatigue subscale and the Positive and Negative Affect Schedule (PANAS) will assess the effect of CKD on everyday functioning and psychological states as these may contribute to fatigue. Blood gas determination and lactate concentration analysis will be followed by surface electromyography, muscle tissue oxygenation status via Near Infrared Spectroscopy (NIRS),  $\text{VO}_2$ ,  $\text{C O}_2$  production, Respiratory Exchange Ratio (RER), arterial Hb saturation, heart rate, stroke volume, cardiac output (Q), blood pressure and peripheral resistance, blood flow, muscle oxygen consumption and RPE. The purpose being to give a clear indication of significant differences in the oxygen delivery and utilisation chain between CKD patients and healthy controls. Paired sample *t*-tests will be used to compare questionnaire results and matching variables. Physiological variables will be analysed using a two way repeated measures ANOVA. Appropriate post-hoc tests will acknowledge statistical significance at  $P < 0.05$ . RPE is hypothesised to be significantly higher in CKD patients compared to controls. Principle physiological differences, specifically cardiovascular mechanisms (Tarnag, 2007: *The Journal of the Chinese Medical Association*, 70, 424-429), muscle oxygen utilisation (Sangkabutra *et al.*, 2003), anaemia, reduced oxidative delivery and deconditioning (Wallman *et al.*, 2004, *Medicine & Science in Sport & Exercise*, 36, 1682-1688) may enhance the increased sense of fatigue in CKD patients.

## **The effects of anxiety upon performance for school children during interschool football matches**

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The number of occasions in which a competitive situation could cause anxiety within children will increase as the child grows older and matures into adulthood (Lee, 1993: *Coaching children in sport: Principles and practice*. London: E & FN SPON). Through a child's development, they will be faced with more frequent evaluation, social comparison and experiences of failure across their school years, including sport and physical education. Anxiety within the child will continue to develop and this may be at detriment to their overall athletic performance. (Hill and Wigfield, 1984: *The Elementary School Journal - Volume 85, Number 1*, p 105 - 126). Some individuals will be more anxious than others because of the individual's genetic make-up but the understanding of how this affects athletic performance is still unclear (Jarvis, 2006: *Sport Psychology: A Students Handbook*. East Sussex: Routledge). However, it has previously been hypothesised that high levels of worry will interfere with the cognitive processing and the ability to keep attention on the task in hand, anxious individuals will divide attention between the task and the thoughts of negativity in which the individuals would be undergoing (Damon and Eisenberg, 1998: *Handbook of Child Psychology, 5<sup>th</sup> edition*. Canada: John Wiley and Sons). The purpose of this study was to investigate the effects of anxiety within secondary school aged children participating in representative football at interschool competitions. A total of 55 male athletes across school years 7, 8, 9, 10 and 11 within a state funded secondary school on the South coast were assessed using both the CSAI-2 for the participants' cognitive and somatic state anxiety and state self-confidence levels and the SCAT tests for their cognitive anxiety levels. Both tests were administered one hour prior to competition for both Home (CSAI-2, n= 55, SCAT, n= 55) and Away (CSAI-2, n= 55, SCAT, n= 55) fixtures. The players within the school team are of mixed ability. Additionally, in order to collect valid results the CSAI-2 should be administered before the SCAT (Martens *et al.*, 1990: *Competitive anxiety in sport*. Leeds: Human Kinetics). Results will be analysed using SPSS software (Version 10.0) and a one way ANOVA, a paired t-test and an independent t-test will be performed with statistical significance set at ( $p=0.05$ ). As research is ongoing, early indication suggests that the results of this study are leading to the hypothesis.

## Cricket bowlers' gaze patterns influences how they are perceived and the confidence of opposing batsmen

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The amount of time an individual spends looking at or making eye contact with another individual has been proposed to be a sign of dominance and power (Hall *et al.*, 2005: *Psychological Bulletin*, **131**, 898-924). Research in social interaction contexts has shown that individuals who maintain eye contact are perceived to be more competent and dominant than those who do not (Napieralski, *et al.*, 1995: *The Journal of Social Psychology*, **135**, 273-280). However, little research has examined whether eye contact has a similar effect in sport. Greenlees *et al.* (2008: *Journal of Sports Sciences*, **26**, 569-576) showed that footballers who used 90% gaze at an opponent were perceived more positively than footballers using 10% gaze. However, this study can be criticised as it only compared two extreme levels of gaze. The purpose of this study was therefore to investigate the effect of eye gaze using a wider range of durations (10%, 50% and 90%). Following institutional ethical approval, thirty two amateur cricket batsmen (mean  $\pm$  s; age  $24.4 \pm 8.8$  years) years viewed video clips of three different male bowlers (age  $28.6 \pm 4.2$  years; body mass  $86.6 \pm 6.8$  kg; height  $181.9 \pm 3$  cm; cricketing experience of  $20 \pm 2$  years) each performing one of three gaze durations (10%, 50% and 90%). The clips were filmed in an indoor setting and consisted of the target bowler: (a) walking back to the end of their run-up, (b) bowling one delivery (start of run-up to end of follow through), (c) turning around (at which point the clip ended). All clips were between 40 and 45 seconds long. The clips were filmed from the perspective of a batsman walking to the crease, taking guard and receiving a delivery. After each clip participants were asked to complete questionnaires about (a) their perceptions of the bowler, (b) their expectancies of the bowler's quality of delivery and (c) their ability to score a certain amount of runs in one over against the bowler. Analyses of variance revealed significant effects for; perceptions of bowler ( $P < 0.001$ ); bowler's accuracy ( $P < 0.001$ ); bowler's pace ( $P < 0.001$ ); and batsmen's expectancies of success ( $P < 0.001$ ). Post-hoc analyses indicated that bowlers were perceived more positively in the 90% condition than the 50% and 10% conditions, and more positively in the 50% condition than the 10% condition. These findings indicate that eye gaze impacts the way in which bowlers are perceived.

## **The effects of set volume on lumbar extension strength in recreationally trained men using the MedX lumbar extension machine.**

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Current lumbar strength training research is limited, as the strength development effects of multiple set training on the lumbar extension muscles of recreationally trained males has not been investigated. Such information is critical since the development of lumbar extension strength is important for the prevention and rehabilitation of low back pain (Durall and Manske 2005: *Strength and Conditioning Journal*, **27**, 64-72). Scientific research from the American College of Sports Medicine (ACSM) and the National Strength and Conditioning Association (NSCA), indicates that multiple sets produce optimal strength developments in recreationally trained males. The purpose of this study was to determine whether the current MedX lumbar extension machine (Ocala, Florida) single set protocol enabled recreationally trained males to develop optimal strength gains in the lumbar extension muscles when compared to a multiple set protocol. Participants completed PARQs and gave informed consent prior to study participation. Ethical approval was obtained from the Centre for Health, Exercise and Sport Science Programme Ethics Committee. Recreationally trained males ( $n=26$ ) (age  $21 \pm 6$ yr, stature  $176.9 \pm 27$ cm, mass  $76.9 \pm 32$ kg, resistance training experience  $3.5 \pm 8$ yr) were randomly assigned to 1 of 3 groups, 1 set ( $n = 9$ ), 3 set ( $n = 8$ ) or the control group ( $n = 9$ ). Training was conducted once a week for 6 weeks, consisting of performing dynamic lumbar extensions to volitional fatigue (Smith et al. 2008: *Journal of Orthopaedics*, **5**). All participants completed pre and post maximum isometric strength tests at 7 angles, through a  $72^\circ$  degree range of motion. The only variable differing between the two training groups was the amount of volume (sets) completed each week. Statistical significance was set at  $P \leq 0.05$  with a Bonferroni adjustment. ANOVA and post hoc Tukey HSD tests were conducted to ascertain the results. Significant strength developments ( $P \leq 0.05$ ) were made at  $12^\circ$  ( $F(2, 26) = 4.591$ ,  $p = 0.021$ ),  $36^\circ$  ( $F(2, 26) = 6.116$ ,  $p = 0.007$ ),  $48^\circ$  ( $F(2, 26) = 6.918$ ,  $p = 0.004$ ) and  $72^\circ$  ( $F(2, 26) = 8.134$ ,  $p < 0.002$ ) in the 3 set group and at  $36^\circ$  ( $F(2, 26) = 6.116$ ,  $p = 0.007$ ) and  $72^\circ$  ( $F(2, 26) = 8.134$ ,  $p = 0.002$ ) in the 1 set group. The strength developments made did not significantly differ between the training groups ( $P \geq 0.05$ ). The results support the current MedX single set protocol, adding to a growing number of studies contradicting the ACSM and NSCA. In conclusion, the present study suggests that a single set volume can produce optimal strength developments in the lumbar extension muscles of recreationally trained males.

## **The effect of Ericksonian hypnosis on activation states in a professional footballer**

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This paper reports a case study of an intervention based on the presuppositions outlined in the use of hypnosis by Milton Erickson, in a professional performance environment. The intervention took place over a ten-week period during the competitive football season between January and April 2009 with a follow up interview in June 2009. Data collection comprised open-ended interviews, Competitive State Anxiety Inventory-2 (Martens, Burton, Vealey, Bump & Smith, 1990: *Competitive anxiety in sport*. Champaign, IL: Human Kinetics), Mental Preparation Profile (Hardy, Jones & Gould, 1996: *Understanding psychological preparation in sport*. Chichester, West Sussex: Wiley), and utilisation of subject and author diaries kept throughout the period of the intervention. Data analysis was conducted according the principles of grounded theory (Glaser & Strauss, 1967: *The discovery of grounded theory*. Chicago, IL: Aldine). The subject was a professional footballer reporting an inability to experience appropriate levels of activation at the beginning of games in order to perform optimally. Many of the factors that contributed to the achievement of positive performance states were extrinsic (for example; good reactions to skills by the crowd). Post-intervention, the athlete reported significant improvements in his ability to control and maintain activation pre- and during performance as well as increased focus, confidence and satisfaction, despite several external difficulties during the period that the intervention took place. The athlete reported improved performance and temperament toward the end of the intervention achieving man of the match in one game. The study highlighted the possible value of non-standardised delivery of hypnosis as well as the value of client-led approaches in psychological intervention over time.

## Media portrayal of obesity

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One of the major contributors to body dissatisfaction and eating disturbance is the internalisation of ideal body images in the media (Thompson, J. K. & Stice, E. 2001: *Current Directions in Psychological Science*, 10, 181-183). Internalisation of media images refers to adoption of the socially defined ideals presented by the media as a personal standard (Jones, D. C., Vigfusdottir, T. H., & Lee, Y. 2004: *Journal of Adolescent Research*, 19, 323-339). Although distinctly different body ideals for males and females are presented in the media, it is suggested that both males and females are influenced by these (McCabe, M. P., & Ricciadelli, L. A. 2003: *Journal of Youth and Adolescence*, 32, 105-113; Smolak et al., 2001: *International Journal of Eating Disorders*, 29, 216-223). Previous research has demonstrated that there is existing bias towards thin individuals and negative portrayals of obese persons and that there is an underrepresentation of overweight and obese individuals in the media (Greenberg et al., 2003: *American Journal of Public Health*, 93, 1342-1348). However, the majority of studies have examined TV and magazine portrayals as opposed to newspaper when analysing media sources. The aim of this study is to examine the portrayal of overweight and obesity in the media. Four broadsheet and four tabloid newspapers from every week between July 2008 and July 2009 will be analysed using thematic content analysis to examine their portrayals of overweight and obesity. Preliminary results demonstrate that both broadsheet and tabloid newspapers portray the condition negatively. Themes that emerge through data analysis and their implications on internalisation of the media's negative portrayal of overweight and obesity will be discussed.

## **Investigating the effectiveness of implicit versus explicit learning for the lab-based training of novice goalkeepers**

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The purpose of this study was to see if an implicit training strategy was better than an explicit strategy with regard to learning anticipatory responses. Implicit learning is defined as the acquisition of a motor skill without acquiring explicit knowledge about how to perform the skill. Implicit learning has been suggested to be more robust under stressful conditions; for example; a penalty shootout (Liao and Masters; 2001: *Journal of Sport Sciences*, **19**, 307-319). A limitation of previous research such as Poulter et al. (2005: *Human Movement Science*, **24**, 345-361) is that it used a verbal response or a joystick movement. This has led to criticisms of the work as the responses may not be transferable to the actual game environment. This study addressed these issues by constructing a mock goal and having participants dive to where they believed the ball was going to go. Ethical approval was granted prior to participation. Two groups of 12 participants were used for the study (insert mean age and sd of ppts). The implicit group were asked to gauge ball speed once the ball had been kicked. The explicit group were given coaching points on the areas of the body that would be the richest in information to help determine direction of the penalty. Participants had to view footage of penalty kicks that had been occluded at foot-ball contact. Following this they had to dive to where they believed the ball was going to end up. A timing device was also set up that was started when the clip started and stopped once the participant had reacted to the clip and struck a ball. Two measures were taken from this, response time and response accuracy. The study was conducted over a two week period with two sessions a week and a retention test at the end. The data collection is on-going and the data will be analysed using two 2 way mixed ANOVAs. The application of new techniques which are more sport specific will lead to a greater chance of positive transfer between the lab based setting and the field.

## Induced hypotension or hypertension facilitates a change in blood lactate levels in healthy males during exercise

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Variations in blood pressure (BP) are corrected by the baroreflex, with this reflex control maintained during exercise by moderating sympathetic outflow that mediates change in cardiac output (Q) or total peripheral resistance (TPR) (Raven et al., 2006: *Experimental Physiology*, **91**, 37-49). The purpose of this study was to manipulate BP during exercise (through changing skin blood flow) in order to investigate whether changes in TPR, and therefore muscle vascular resistance, would alter the metabolic response to exercise. With institutional ethics approval, 8 physically active male subjects, (mean  $\pm$  s) age  $20 \pm 1$  years, body mass  $74.3 \pm 9.9$  kg, and stature  $176.3 \pm 6.7$  cm, completed a  $\dot{V}O_{2\max}$  test to volitional exhaustion, a familiarisation protocol, and 3 randomized experimental trials. Familiarisation and experimental trials involved 5 minutes baseline measurements, 5 minutes of forearm cooling/heating/ambient air (thermo-neutral), and 15 minutes semi-recumbent cycling at 60%  $\dot{V}O_{2\max}$ . Baseline lactate, BP, skin blood flow and skin temperature were measured for 5 minutes following 10 minutes passive relaxation. Participants immersed their left forearm in either cold water (10°C), hot water (42°C), or ambient air (21°C) for 5 minutes whilst stationary. Whilst maintaining immersion, subjects then completed 15 minutes semi-recumbent cycling at 60%  $\dot{V}O_{2\max}$ . Pulsatile digital BP (Portapres, TNO, Amsterdam), skin blood flow (Laser Doppler flowmetry, Perimed, Stockholm), and skin temperatures (Skin thermistors, Grant, Cambridge) were measured throughout testing. Blood lactate, brachial artery BP, and water temperature were measured at 5 minute intervals throughout testing. Repeated measures ANOVA was completed to determine the effect of changes in skin blood flow on BP, and the consequence of this on blood lactate measurements. Statistical significance was defined as  $P < 0.05$ . There were significant differences in skin blood flow ( $P = 0.038$ ) (51.13PU [laser Doppler perfusion units] [cooling] vs. 87.13PU [heating] vs. 55.29PU [control]) which were associated with a significant change in mean arterial pressure (100.64mmHg [cooling] vs. 110.32mmHg [heating] vs. 123.51mmHg [control]) ( $P = 0.029$ ) during exercise. Blood lactate was lower in the cooling trial versus the heating trial (5.4mM [cooling] vs. 7.0mM [heating] vs. 7.3mM [control]) ( $P = 0.052$ ). These data suggest that blood lactate levels were lowest in the condition that provoked the lowest BP response. This infers that blood lactate levels may be reduced secondary to reduced vasoconstriction in skeletal muscle.

## Sodium bicarbonate ingestion and repeated swim sprint performance

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Muscle fatigue can greatly affect sporting performance and one of the proposed contributing factors of fatigue is the accumulation of  $H^+$  during high intensity exercise. Presently it is unclear how far  $H^+$  accumulation directly affects skeletal muscle contraction, however it may still be assumed that maintenance of the acid-base balance is beneficial during exercise. Research has provided evidence that the ingestion of sodium bicarbonate ( $NaHCO_3$ ) prior to exercise positively improves the buffering capacity, in turn limiting  $H^+$  accumulation. The purpose of the present investigation was to observe the ergogenic potential of  $0.3 \text{ g}\cdot\text{kg}^{-1}$  body mass of sodium bicarbonate ( $NaHCO_3$ ) in competitive, non-elite swimmers using a repeated swim sprint design that eliminated the technical component of turning. Six male ( $181.2 \pm 7.2$  cm stature;  $80.3 \pm 11.9$  kg weight;  $50.8 \pm 5.5 \text{ ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$   $VO_2\text{max}$ ) and eight female ( $168.8 \pm 5.6$  cm stature;  $75.3 \pm 10.1$  kg weight;  $38.8 \pm 2.6 \text{ ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$   $VO_2\text{max}$ ) swimmers completed two trial conditions ( $NaHCO_3$  (*BICARB*) and  $NaCl$  placebo (*PLAC*)) implemented in a randomized (counterbalanced), single blind manner, each separated by one week. Swimmers were paired according to ability and completed eight, 25 m front crawl maximal effort sprints each separated by 5 s. Blood acid-base status was assessed pre-ingestion, pre- and post-swim via capillary finger sticks, and total swim time was calculated as a performance measure. Total swim time was significantly decreased in the *BICARB* compared to *PLAC* condition ( $p = 0.04$ ), with the *BICARB* condition resulting in a 2% decrease in total swim time compared to the *PLAC* condition ( $159.4 \pm 25.4$  s vs.  $163.2 \pm 25.6$  s; mean difference = 4.4; 95%CI = 8.7 – 0.1). Blood analysis revealed significantly elevated blood buffering potential pre-swim (pH: *BICARB* –  $7.48 \pm 0.01$ , *PLAC* –  $7.41 \pm 0.01$ ) along with a significant decrease in extracellular  $K^+$  (*BICARB* –  $4.0 \pm 0.1 \text{ mmol}\cdot\text{L}^{-1}$ , *PLAC* –  $4.6 \pm 0.1 \text{ mmol}\cdot\text{L}^{-1}$ ). The findings suggest that  $0.3 \text{ g}\cdot\text{kg}^{-1}$   $NaHCO_3$  ingested 2.5 hours prior to exercise enhances the blood buffering potential, and may positively influence swim performance.

## **Training adaptations and the effects of playing load within training cycles of a professional rugby union season**

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The multifaceted playing environment in modern professional Rugby Union places much emphasis upon strength and power, both of which must be trained whilst under considerable playing loads. Pre-season training with the absence of game time develops baselines of strength and power but there is debate as to whether these levels can be maintained (Argus et al. 2009: *Journal of Strength and Conditioning Research*, 23, 1583–1592). In-season adaptations must occur in less intense concurrent training environments limiting direct specificity or isolation and it is increasingly considered that the playing and contact load of players will also effect adaptation. Not only is little published in relation to these adaptations to training within rugby union but furthermore team sports at an elite level as a whole (Mujika, 2007: *International Journal of Sports Physiology and Performance*, 2, 221-222). Therefore the intention of this study is to identify relationships between strength and power adaptations in conjunction with the effects of playing and contact load. Forty one male professional rugby union players (Age:  $26 \pm 5$  yrs; Body mass:  $102 \pm 13$  kg; Stature:  $185 \pm 8$  cm) were monitored following institutional ethical approval. Estimated 1RMs were recorded for back squat, bench press, and pull ups at the climax of seven weeks of pre-season training and five subsequent training cycles (~1 month each). Additional Peak Power values were recorded with jump squats using a linear position transducer calibrated to a known distance (1 m) at similar seasonal intervals. All playing load and contacts were recorded by the team statistician. Mean group data suggests a positive relationship exists between power and increased playing load with contacts having no effect. A similar relationship is apparent prior to cycle 5 (wk16) for squat 1RM although this then declines with further increases in playing load and contacts. No relationship is found with pull up values although an inverse relationship is apparent with regard to bench press. Trends in individual player data are not as evident suggesting that these are masked through presentation of mean group data. This study highlights the complexities inherent in performing team sport research. Any variation in recorded values of any of the lifts or jump squats can be related to multiple factors in addition to playing load and contacts such as injury and emphasis of training cycles. This corroborates inconsistencies within previous studies (Baker, 2001: *Journal of Strength and Conditioning Research*, 15, 172–177) thus preventing definitive understanding of relationships of adaptations within an active team environment.

## Effect of calcium supplementation on fat oxidation and endurance running performance

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Increased fat oxidation has the potential to spare muscle glycogen and thereby improve endurance capacity (Hawley *et al.*, 1998: *Sports Medicine*, **25**, 4, 241-257). Nutritional strategies that can increase fat oxidation without detriment to muscle glycogen levels appear attractive. High calcium ( $\text{Ca}^{2+}$ ) diets ( $\sim 1400 \text{ mg} \cdot \text{d}^{-1}$ ), have been shown to induce higher rates of fat oxidation compared to low  $\text{Ca}^{2+}$  diets ( $\sim 500 \text{ mg} \cdot \text{d}^{-1}$ ) during negative energy balance (Melanson *et al.*, 2005: *Obesity Research*, **12**, 2102-2122). However, acute calcium supplementation does not increase fat oxidation during or enhance exercise performance (White *et al.*, 2006: *International Journal of Sport Nutrition and exercise Metabolism*, **16**, 565-579). With 61% of males and 89% of females aged 19-24 in the UK consuming less than  $1000 \text{ mg} \cdot \text{d}^{-1}$  (Food Standards Agency, 2003: *The National Diet and Nutrition Survey*, **3**) there may exist a possibility to enhance health and exercise by increasing calcium intake. The aim of this study was to investigate whether  $\text{Ca}^{2+}$  supplementation increases fat oxidation during steady-state exercise and improves subsequent running performance. Following ethical approval, six recreationally active males (age  $20 \pm 1$  years, body mass  $74.0 \pm 7.5$  kg, stature  $180.8 \pm 3.9$  cm, questionnaire assessed habitual  $\text{Ca}^{2+}$  intake  $422 \pm 131 \text{ mg} \cdot \text{d}^{-1}$ ; mean  $\pm$  SD) completed two trials in a randomised, double-blind, placebo controlled crossover design. Trials consisted of a 60-min treadmill run at  $\sim 60\% \dot{V}\text{O}_{2\text{max}}$  followed by a five kilometre self-paced time trial supplemented for 1 week prior to testing with  $600 \text{ mg} \cdot \text{d}^{-1}$  of  $\text{Ca}^{2+}$  citrate or maltodextrin (placebo). A washout period of  $\geq 1$  week was employed between trials. Expired air and finger prick blood samples were taken during the 60 minute steady-state run along with heart rate and rating of perceived exertion (RPE). Fat oxidation was determined via non-protein respiratory exchange ratio (RER). Two-way repeated measures analyses of variance were employed to determine differences in fat oxidation, RER, blood lactate and glucose concentrations, energy expenditure, heart rate and performance time. Statistical significance was set at  $P \leq 0.05$ .  $\text{Ca}^{2+}$  supplementation elicited a non-significant increase in fat oxidation during exercise of  $16 \pm 5\%$  ( $P = 0.145$ ). Mean RER ( $P = 0.278$ ), blood lactate ( $P = 0.822$ ) and glucose ( $P = 0.962$ ) concentrations, along with energy expenditure ( $P = 0.456$ ), heart rate ( $P = 0.595$ ) and five kilometre performance time ( $P = 0.228$ ) were unaffected by  $\text{Ca}^{2+}$  supplementation. RPE was higher with  $\text{Ca}^{2+}$  supplementation ( $P = 0.012$ ). In conclusion, fat oxidation and endurance running performance were not significantly affected by 1 week calcium supplementation. Notwithstanding this, the low observed power (57%) for fat oxidation could be corrected by increasing the sample size which may alter the statistical significance.

## Perceived motivational climate as a predictor of state flow in amateur soccer players

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According to achievement goal theory, individuals have a disposition to develop one of two goal orientations, termed *ego and task orientations* (Nicholls, 1989: *The competitive ethos and democratic education*. Cambridge, MA: Harvard University Press). Flow is described by Jackson and Eklund (2002: *Journal of Sport & Exercise Psychology*, 24, 133-150) as an optimal psychological state in which the athlete is completely immersed in the process of performing a skill. In order to address a gap in the literature, the purpose of the present study was to examine the degree to which perceived motivational climate could predict retrospectively-assessed flow among a group of amateur, male soccer players. The sample consisted of a squad of 32 male soccer players aged 17-20 years. Prior to a training session, participants were administered the Perceived Motivational Climate in Sport Questionnaire-2 (PMCSQ-2; Newton & Duda, 1993: *Journal of Sport & Exercise Psychology*, 15 [Suppl.] S59). Upon completion of the training session, they were administered The Flow State Scale-2 (FSS-2), developed by Jackson and Eklund. Following appropriate screening and a range of diagnostic tests, standard linear regression analyses were used to predict each of the nine dimensions of flow from the two PMCSQ-2 subscales. A series of standard linear regressions was used to analyse the data. No significant ( $P < .05$ ) predictions were found; the two PMCSQ-2 subscales did not predict the nine FSS-2 subscales. Reasons for the lack of support for the research hypothesis may include an insufficient number of participants which would render the analysis underpowered. Furthermore, limitations in the study design relating to the "snapshot" approach should be acknowledged. In assessing a psychological state such a flow, future research might employ experimental and longitudinal designs in order to more accurately identify causal relationships.

## The effect of foot posture index on knee loading during dynamic cutting manoeuvres

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Several studies have found retrospectively that in subjects who have sustained a non-contact Anterior Cruciate Ligament injury (ACL) there is a higher incidence of low arch foot type (Hertel *et al.*, 2004: *Journal of Sports Science and Medicine*, **3**, 220-225). However the influence of foot type on lower extremity mechanics in side cutting has yet to be explored despite it having been found that in side cutting increased knee abduction is associated with increased rearfoot pronation (McLean *et al.*, 2005: *American Journal of Sports Medicine*, **36**, 1008-1016). The purpose of this study was to explore the effect of foot type, as measured by the Foot Posture Index (Redmond *et al.* 2006: *Clinical Biomechanics*, **21**, 89-98) on knee and hip kinematics and kinetics during a side cutting manoeuvre. 17 male subjects were recruited who were active in dynamic sports activities and were divided for foot type into high arch (n=3, aged  $22 \pm 1.5$  yrs), normal arch (n= 8, aged  $26 \pm 6.5$  yrs) and low arch (n=6, aged  $26 \pm 6.5$  yrs). A 3D motion analysis system (240Hz) and force platform (1920Hz) were used to collect hip and knee kinematics and kinetics. The dynamic tasks of shod straight running, 30 and 60 degree cutting were counterbalanced. Statistical analysis of the parametric data was undertaken in SPSS using mixed model ANOVA and Pearson's correlations and of non-parametric data using the Kruskal-Wallis tests and Spearman's correlations. A significantly decreased mean knee flexion angle was found in all subjects with low foot arch type across all conditions during the first 20% of foot contact ( $P=0.010$ ) compared to normal arched subjects. Foot type correlated significantly with knee flexion ( $r=0.589$ ,  $p<0.05$ ) and hip flexion ( $r=-0.599$ ,  $p<0.05$ ) for the 30 degree cut. No significant differences in knee and hip kinematics and kinetics were found in the transverse or frontal planes. Our findings suggest that a sagittal plane mechanism of increased ACL loading in participants with low arch foot type may exist as lower knee flexion angles lead to increased ACL loading. However it is not known if the  $9^\circ$  decrease in knee flexion angle is clinically significant as a risk factor for ACL injury. Further research is currently being undertaken to support these implications with increased numbers of participants across all foot types.

## Motivational climate as a predictor of fear of failure among adolescent county- and regional-level tennis players

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There has been a dearth of research concerning fear of failure within the sport context and consequently, there has been a recent call for additional work in this area (Sagar, 2009: *Sport and Exercise Psychology Review*, 1, 5-15). Although the relationship between goal orientations and fear of failure has been explored in the sporting domain (Conroy & Elliot, 2004: *Anxiety, Stress and Coping*, 3, 271-285), researchers have yet to examine the direct relationship between motivational climate and fear of failure. Accordingly, the purpose of the present study was to investigate the degree to which perceived motivational climate could predict fear of failure among county- and regional-level tennis players ( $N = 30$ ), aged 13 to 16 years. It was hypothesised that the perceived motivational climate would be a significant predictor of fear of failure. Participants were British nationals from a tennis club in the east of England. On average, players trained three days per week, with one of five tennis coaches and had been playing tennis for 8.5 years. Participants completed the *Perceived Motivational Climate in Sport Questionnaire-2* (PMCSQ-2; Newton et al., 2000: *Journal of Sports Sciences*, 18, 275-290) prior to a training session and the *Performance Failure Appraisal Inventory* (PFAI; Conroy et al., 2002: *Journal of Applied Sport Psychology*, 14, 76-90) following the same training session. Data were checked for outliers and normality using standard skewness and kurtosis ( $z > \pm 1.96$ ). Subsequently, a standard linear regression analysis revealed that motivational climate strongly predicted fear of failure (Adj.  $R^2 = 0.788$ ,  $F_{2, 28} = 52.98$ ,  $P < 0.001$ ). More specifically, mastery climate was a negative predictor of fear of failure ( $\beta = -4.813$ ,  $P < 0.001$ ). Performance climate did not significantly predict fear of failure, nonetheless it came close to being a significant positive predictor ( $\beta = 1.995$ ,  $P = 0.057$ ). It was concluded that a mastery climate should be encouraged as it has a possible prophylactic effect with reference to fear of failure among adolescent county- and regional-level tennis players.

## **Assessment of the accelerometer data from the Nintendo Wii™ controller for measuring vertical jump performance**

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The use of vertical jump performances as an assessment technique of athletic ability and improvement is well-established. However, field-based assessments have shown limited reliability and validity, compared to each other and benchmark criteria. Accelerometers offer an additional opportunity for in-field vertical jump assessment. However, little work has been done to assess the feasibility of this approach. The purpose of this study was to compare information obtained from an accelerometer found in a Nintendo Wii controller with force platform. Accelerometer and force platform data were collected simultaneously for a single subject who performed ten squat jumps with a five minute recovery between each jump. Jump height was calculated from flight time data and peak power output derived from this. The results showed no significant differences in the calculated jump height or peak power output between the two systems. While further work on validation across a wider of range of subjects, and cross validity of testing methods are recommended, accelerometers may be a useful tool for measuring jump height and power output outside of a laboratory setting.

## **Quantifying visceral fat using Dual Energy X-ray Absorptiometry (DEXA) and Magnetic Resonance Imaging (MRI) in women**

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More than half of the adult population in England are overweight or obese (Health Survey for England; 2006). Obesity and abdominal obesity in particular is associated with growing rates of health risks (Fox et al., 2007: *Circulation*; 116; 39-48; Despres et al.; 1996: In *Human body composition* edited by Roche; A. F.; Heymsfield; S. B.; & Lohman; T. G. Leeds: Champaign; IL: Human Kinetics). The precise assessment of visceral fat is very important (Kulberg et al.; 2009: *The British Journal of Radiology*; 82; 123 - 130). However; magnetic resonance imaging (MRI) or computed tomography (CT) techniques provide such assessments at high cost (Genton et al.; 2002: *Nutrition*; 18; 66 - 70). The aim was to develop a feasible method of visceral fat examination using DEXA in combination with anthropological data. Following a Devon and Torbay Research Ethics Committee approval 48 healthy white women took part in the study. DEXA and MRI data from 49 participants were collected. Participant's mean age was 49.2 years (SD= 13.1) and the mean BMI was 25.8 (SD = 6). There were 5 specific DEXA and 3 specific MRI regions of interest (ROI). Statistical analysis: SPSS version 15.0 was used to calculate stepwise and hierarchical regression; Pearson's correlation coefficient; t-tests; and limits of agreement. In all analyses; an alpha level of  $p < 0.05$  was set a priori. All 5 DEXA ROI's were highly correlated with MRI measurements. The best visceral fat predictor was DEXA ROI 1 with combination of age variable. The inter-individual reliability for MRI data and DEXA data was good. DEXA ROI 1 in combination with an age variable can be used as a predictor of visceral fat measurement by MRI in white women confirming results from previous studies (i.e. Kamel et al.; 2000: *Obesity Research*; 8 (1); 36-42). However a larger sample with a wider population and analyses of different subgroups (i.e. BMI) are needed to further explore this method.

## Comparison of two survival strategies following unplanned cold water immersion

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Following an unplanned immersion there is conflict between advice given to remain stationary and await rescue (Royal Life Saving Society of Canada, 1997) and the natural urge to swim to safety. The failure to get rescued in a reasonable time frame may panic a victim into trying to swim to safety (e.g. to shore or a life raft). This delayed swimming may put them at greater risk of swim failure occurring and reduce their absolute strength and manual dexterity to such an extent that if they were to reach a life raft they may not be able to operate it. This study compared effects of two post-immersion strategies, a) swim immediately and b) wait then swim. Ten subjects (5 women, mean  $\pm$  SD, age  $24 \pm 7$  years, height  $175 \pm 9$  cm, body mass  $74 \pm 12$  kg), all strong swimmers, completed a baseline session, where a best measure for hand grip strength was recorded and they practised swimming in the flume, and two experimental sessions: cold water immersion (water temperature  $13^{\circ}\text{C}$ , velocity  $0.8 \text{ m}\cdot\text{s}^{-1}$ ) and post-immersion a repeat hand grip test. Upon immersion subjects, following a crossover design, either swam immediately (SWIM) or sat with their hands and head above water for 15 min before swimming (SIT). Time to swim failure was recorded when subjects were unable to maintain momentum. Core temperature (gastrointestinal pill) and heart rate (HR) were monitored throughout, and a standardised clothing ensemble was worn (thermal long sleeve top and tights and socks). Data were analysed using paired t-tests. Swim failure occurred sooner in the SIT condition (SIT  $270 \pm 154$  vs. SWIM  $621 \pm 297$  s,  $P < 0.01$ ) at a mean distance swum approximately 55% lower than the SWIM condition (SIT  $216 \pm 123$  vs. SWIM  $496 \pm 238$  m,  $P < 0.01$ ). Heart rates during the swim were no different between conditions. Core temperatures were also no different during the swim, but post-immersion were lower in the SIT condition (SIT  $35.1 \pm 0.3$  vs.  $35.5 \pm 0.6^{\circ}\text{C}$ ,  $P < 0.01$ ). Grip strength post-immersion was reduced in both conditions compared to baseline (Baseline  $39.6 \pm 13.6$ , SIT post  $35.2 \pm 12.9$ , SWIM post  $33.8 \pm 13.4$  kg,  $P < 0.01$ ) and to a greater extent for the SWIM condition ( $P = 0.04$ ). Our findings suggest at this water temperature if victims judge swimming to safety is achievable they should commence this as soon as possible after immersion.

## Chain resistance and kinetic alterations on barbell velocity during the bench press exercise

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Combining a variable resistance (VR) with more traditional resistance exercise (TRE) has become increasingly popular amongst athletes and strength coaches as a method of training. Coker *et al.* (2006: *Journal of Strength and Conditioning Research*, **20**(4), 887-891) reported that variable resistances change the external load and training stimulus, thereby altering the force-velocity profile of a repetition. Consequently, improvements in strength and power, increases in velocity during the concentric phase (McMaster *et al.* 2009: *Strength and Conditioning Journal*, **31**(1), 50-64) and overload at the top portion of the lift due to improved leverages (Simmons, 1999: *Powerlifting USA*, **22**, 26-27) have been observed. However, studies have also reported no changes in kinematic and kinetic variables (Berning *et al.*, 2008: *Journal of Strength and Conditioning Research*, **22**(2), 390-395). The purpose of this study therefore was to investigate the combined effects of TRE and chains on barbell velocity during the concentric phase of the bench press. Following ethical approval and informed consent, seven resistance trained sport science students (age mean, 21.5,  $s = 0.6$  years; mass mean, 67.0,  $s = 14.8$  kg; height mean, 172.0,  $s = 9.3$  cm; 1- repetition maximum (1-RM) bench press, 58.4,  $s = 31.8$  kg) volunteered for this study. Participants performed single, maximal effort repetitions of the bench press during 2 testing sessions using the following loading conditions: Session 1, baseline measures; Session 2, condition 1- 60% of 1-RM TRE; condition 2- 60% of 1-RM TRE plus an additional 20% of chains (VR1); condition 3- 60% of 1-RM TRE plus an additional 35% of chains (VR2). Sessions were conducted 72 hours apart to account for fatigue effects. A ballistic measurement system (Fittech, Australia) calculated kinematic and kinetic variables. A one-way repeated measures ANOVA revealed significant differences in peak velocity ( $p = 0.002$ ) and peak force ( $p = 0.001$ ) between TRE and the VR conditions. Further analysis revealed these differences lay between all 3 loading conditions. No significant differences ( $p > 0.05$ ) were found in peak power and peak rate of force development and the TRE and VR loading conditions. The study concluded that combining chains with TRE may allow for acute augmentations in power measures by enabling athletes to lift explosively and heavy within the same repetition, and maybe beneficial to resistance trained athletes involved in sports where both high forces and velocities are desired. Coaches however must acknowledge the limitations in chain training until conclusive evidence is presented.

## **An investigation into the effect of cleat configuration on subtalar joint position and subsequent performance in soccer**

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Different soccer boot cleat configurations have been shown to affect both injury and performance, through changes in the kinematics of the lower extremities, caused by changes to the translational and rotational forces created. The Subtalar joint has an important role during gait and other dynamic movements such as cutting, however no previous studies have examined the influence of Subtalar joint alignment on performance in soccer. The aim of this study was to examine the effect of cleat configuration on subtalar joint position, and the subsequent performance in soccer. It was hypothesised that the cleat configuration that minimised subtalar joint range of movement by the greatest measure would consequently improve performance through an improved joint efficiency at the ankle complex. With institutional ethical approval, ten male university soccer players will complete three randomised trials in three pairs of firm ground soccer boots (moulded studs, bladed studs and moulded studs and wedges), over two tests measuring sprint / acceleration and agility. Calcaneal movement will be recorded on the third left foot strike on the acceleration test, and the left foot medial cut on the fourth turn of the agility test. Values for calcaneal eversion and inversion will be used as an estimate of subtalar joint position, and subsequently analysed using Quintic Biomechanics (9.03 v14). Performance will be measured as the time taken to complete the tests using Brower timing gates. A repeated measures ANOVA will be used to examine the significance in data between cleat types for both performance and calcaneal movement, and a Pearsons Correlation to examine the relationship between performance and calcaneal movement. Three of the ten participants have so far been tested. Preliminary results suggest that the hypothesis will be rejected, with an increase in performance in both tests (2.00s, 2.04s & 2.18s, and 7.22s, 7.32s & 7.46s) coinciding with a larger angular range of movement (19.37°, 10.58° & 9.74°, and 21.08°, 17.64° & 15.67°). This may be caused by an increased horizontal component of the joint moment, a result of larger calcaneal angles occurring as the leg moves medio-laterally. Furthermore, results demonstrate that the optimal boot differs between the participants, highlighting that other cognitive factors may affect performance. It is expected that cleat configuration will be shown to have an effect on Subtalar angular range of movement, and that manipulation of the cleat configuration will consequently affect both performance and potential for injury.

## Optimising performance in the heat, an acclimation and pre-cooling study: Do the benefits add up?

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Fatigue occurs earlier at higher environmental temperatures, but can be delayed after a period of acclimation, or by pre-cooling. Heat acclimation relies upon increased exposure to hyperthermia, promoting adaptations including decreased exercising heart rate, perceived exertion and core temperature (Nielsen, 1998: *International Journal of Sports Medicine*, **19**, 154-156). Pre-cooling reduces the body's core temperature, promoting enhanced heat storage and decreasing metabolic and cardiovascular strain (Lee, 1995: *Journal of Applied Physiology*, **76**, 1971-1976). Although evidence exists to support the use of these interventions individually, the combined effect of both strategies on performance in the heat remains untested. Therefore the purpose of this study was to examine the effects of pre-cooling heat acclimated subjects before hyperthermic exercise. With ethical approval, 20 unacclimated healthy males completed an incremental cycle test to establish peak power output (PP). Each subject then performed a baseline performance trial, consisting of 5 km steady-state cycling at 70% PP, followed by a 5 km time trial, in an environmental chamber (30°C, 50% relative humidity). Heart rate (HR), thermal sensation (TS), skin temperature (T<sub>sk</sub>) and core temperature (T<sub>c</sub>) were measured throughout. Subjects were then randomly assigned to one of four groups; control (CG), pre-cooling only (PC), heat acclimation only (HA) and a group exposed to both heat acclimation and pre-cooling (HAPC). HA and HAPC subjects acclimated on 4 occasions in a 10 day period, for 30 minutes exercising at 70% PP in an environmental chamber (30°C and 50% relative humidity). PC and CG subjects performed the same exercise regime in ambient conditions. All subjects repeated the performance trial after the acclimation period. PC and HAPC subjects were pre-cooled via whole-body water submersion (15°C) for 20 minutes, prior to the cycling exercise. Initial descriptive data for HA and HAPC groups indicate that performance time was improved by 11.9% and 9.49%, respectively following the interventions. Mean steady-state exercise HR was reduced by 6.1% following HA and by 14.2% in the HAPC group. Mean body temperature during steady-state exercise decreased by 2.5% and 9.8% in the HA and HAPC groups, respectively. TS during exercise was lower after acclimation in the HAPC group (TS rating decreased from 6.1 to 4.8) but unchanged in the HA group. These preliminary data suggest that the combination of acclimation and pre-cooling may reduce both cardiovascular and thermal strain during performance in the heat above that of acclimation alone. Further data collection will help substantiate these findings.

## A time-motion analysis of elite female handball match play

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The ability to perform maximal short-duration sprints intermittently during a game is an integral fitness component of team sports (Reilly et al., 1976: *Journal of Human Movement Studies*, **2**, 87-97). Due to the nature of intermittent sprinting when countering and defending, accurate documentation of sprint activity may be highly important to players and coaches within handball. The purpose of the project is to collect baseline data as to the type, frequency and duration of movements of elite female handball players. Time-Motion analysis is used to assess the physical demands of different sports (Beck & O'Donoghue, 2004: *Performance Analysis of Sport*, **6**, 150-55). A growing number of studies have used time-motion analysis to examine a range of sports including Netball (Loughran & O'Donoghue, 1999: *Journal of Human Movement Studies*, **36**, 37-50), Gaelic games (O'Donoghue et al., 2004: *International Journal of Performance analysis of Sport*, **4** (2) 42-49) and Field Hockey (Huey et al., 2001: *Performance Analysis, Sports Sciences and Computers*, 29-34). However, Handball has not previously been studied in this way. Existing time-motion studies have also reported differences between playing positions. However, these sports are played on larger playing areas and different playing surfaces. The movement patterns from the outfield players (backs; centre backs; wingers and pivots) will be examined. This study is only concerned with the movements of outfield players. A minimum of 2 players per position will be analysed (two teams). The movement categories have been classified based on previous movement classifications (Williams & O'Donoghue 2005: *Journal of Human Movement Studies*, **49**, 315-331 and Bloomfield et al., 2004: *International Journal of Performance Analysis of Sport*, **4** (2), 20-31). With institutional ethics approval and agreement from the NGB, one match was recorded using a mini DV camcorder positioned in the mid-point of the handball court with a fixed field of vision approximately 20 metres above the court in the grandstand and 15 metres from the site of play. Data will be collected post-match using Trak Performance Software from Sports Tec International. Statistical analysis will be conducted using Cohen's effect size (Cohen, 1988: *Statistical Power Analysis for the Behavioural Sciences* (2nd edition) London : L. Erlbaum Associates). Cohen suggested that effect size may be the most meaningful analysis for comparing data obtained from small, uneven groups. Effect sizes >0.8 represent large treatment differences. The 'Specific movement expectancy' is that pivots will engage in shooting or sprinting significantly less than the backs or wingers however will pass significantly more. The wingers and backs will also spend significantly more time 'end to end' engaging in high intensity activities such as sprinting; jostling and shooting.

## **The effects of heat and ingestion of carbohydrate drinks on decision making in combat troops**

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The effects of dehydration are well known, as are its effects on performance, and the importance of hydration status has been researched and reinforced by multiple studies. (Cian et al., 2000: *Journal of Psychophysiology*, **14**, 29-36; Szinnai et al., 2005: *American Journal of Physiology-Regulatory Integrative and Comparative Study*, **289**, 275-280) Due to the energy requirements of high energy careers and sports the inclusion of carbohydrate (CHO) in drinks has become common and is a proven method of performance enhancement in sport (Winnick et al., 2005: *Medicine and Science in Sport and Exercise*, 306-315; Grego et al., 2005: *International Journal of Sports Medicine*, **26**, 27-33). CHO has also been tested as a method to enhance cognition in sporting situations and situations requiring quick decisions due to the effects of carbohydrate on the Central Nervous System (Winnick et al., 2005), though there have been no beneficial effects found. There is presently little research into how the consumption of CHO drinks affects cognition in extreme heat. Due to the British Army's present deployment locations and involvement in the Middle Eastern theatre of war investigation of the possibility that CHO ingestion during fluid consumption may improve decision making abilities in simulated situations is important. Therefore, the aims of this study are to examine the effects that consuming a 24% CHO drink or 100% H<sub>2</sub>O drink have on decision making during exercise in extreme heat. 8-12 male Officer Training Cadets will be placed in an environmental chamber in two conditions ("Normal" 21°C/45% humidity and "Hot" 35°C/35% humidity, representing conditions in Kabul, Afghanistan). The exercise consists of a 3.6 km walk in 1 hour at a set intensity in full uniform, including Kevlar helmet and 30 kg Bergen, with 500 ml of fluid for consumption during the 1 hour period. RPE and heat sensation scales will be administered throughout along with measures of core temperature using a rectal thermometer. Subjects will then be removed from this environment to perform a Stroop test to assess their decision making. Results will be analysed to determine the effects of CHO ingestion on decision making. Data collection is presently ongoing though preliminary findings show that CHO causes no improvement in decision making skills.

## **An anthropometric comparison between Chinese and Caucasian swimmers and badminton players**

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The prerequisites of athlete success in most sports rely, to some extent, upon physical capabilities, and anthropometric characteristics. Anthropometric variations between ethnicities such as Chinese and Caucasian athletes may establish structural characteristics and physiques that have aided previous Olympic sporting success. The purpose of this study was to investigate the anthropometric and body composition differences between Caucasian and Chinese swimmers and Caucasian and Chinese badminton players to identify specific morphological characteristics that could be considered advantageous for success in competition. This comparative study received ethical approval, with a four-group cohort design of 20 male and 20 female participants (age  $19.95 \pm 1.79$  years, stretch stature  $172.19 \pm 7.59$  cm and mass  $67.03 \pm 7.59$  kg). All participants were anthropometrically measured at 17 sites by two International Society for the Advancement of Kinanthropometry (ISAK) trained researchers. A restricted profile adhering to ISAK protocol was used. Data analysis was checked for parametric assumptions before a MANOVA was conducted. Two measures (Waist girth-  $P=0.035$  and Sum of 6 Skinfolds-  $P=0.05$ ) stood out as indicators of ethnic differences: These were prominent in the badminton males. When looking at the derived data, when ethnicity and sport were taken as single factors, no significant differences in holistic body composition were apparent ( $F= 1.455_{,9, 24} P = 0.221$ ;  $F = 1.886_{,9, 24} P = 0.104$ ) respectively. When considering ethnicity and sport together, multivariate analysis identified a significant difference ( $F= 3.717_{,9, 24} P = 0.005$ ) but no other combination of factors elicited a significant difference. When examining ethnicity and sport together, the univariate findings revealed significant difference in the following raw measures: iliac crest ( $F= 5.186_1, P=0.030$ ), supraspinale ( $F= 4.433_1, P=0.043$ ), abdominal ( $F= 4.312_1, P=0.046$ ), front thigh ( $F= 14.380_1, P=0.001$ ), arm girth relaxed ( $F= 4.460_1, P=0.043$ ), waist girth ( $F= 4.392_1, P=0.044$ ), and femur breadth ( $F= 6.290_1, P=0.017$ ). Differences in derived measures were significant in BMI ( $F= 4.045_1, P=0.05$ ), Endomorphy ( $F= 4.652_1, P=0.039$ ), Ectomorphy ( $F= 7.985_1, P=0.008$ ), and sum of 8 skin folds ( $F= 6.557_1, P=0.015$ ). This comparison identified a significant anthropometrical difference between ethnicities in male badminton players. Visual analysis of fat pattern and somatotype also revealed clear differences across ethnicities. It could be concluded that the anthropometrical differences are linked to the success of Chinese badminton players in previous Olympic medal tables.

## The effect of hydration status on oxidative stress markers in trained male cyclists

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Oxidative stress and hydration are both believed to increase muscular fatigue during exercise; however it is unknown whether one affects the other, or whether there may be a cumulative affect when both conditions are present. The purpose of this study was to investigate the effects of exercise in the heat in either a euhydrated or dehydrated state on oxidative stress markers. 7 healthy male trained cyclists (power output (W) at lactate threshold (LT):  $197 \pm 17.9$  W) completed 90 min cycling exercise at 95% LT followed by a 5 km time trial (TT) in four different randomized conditions: heat dehydration (HD), heat euhydration (HE), ambient dehydration (AD) and ambient euhydration (AE). All trials were completed in an environmentally controlled heat chamber (heat conditions:  $33.9 \pm 0.9^\circ\text{C}$ ; ambient conditions:  $23.0 \pm 1.0^\circ\text{C}$ ). Venous blood was obtained pre and post trial and analyzed by assay for total (TGSH) and oxidized glutathione (GSSG), thiobarbituric acid reactive substances (TBARS), and total antioxidant capacity (TAC) using commercially available assay kits. Heat shock protein (HSP) 72 and heme oxygenase-1 (HO-1) were analyzed in monocytes using an established biochemical assay. Repeated measures ANOVA was conducted and significance was accepted at  $p < 0.05$ . There were no significant interaction effects (condition x time) for either TGSH ( $F = 0.766$ ,  $p = 0.57$ ) or GSSG ( $F = 3.88$ ,  $p = 0.112$ ). Similarly, there were no significant interaction affect for TBARS ( $F = 1.81$ ,  $p = 0.42$ ) or TAC ( $F = 1.0$ ,  $p = 0.46$ ), although there was a trend for TGSH ( $F = 4.42$ ,  $p = 0.08$ ) and TAC ( $F = 9.3$ ,  $p = 0.06$ ) to increase post TT. There was a significant main effect for time for HSP72 expression, with an increase in monocytes post exercise ( $F = 13.46$ ,  $p = 0.01$ ). HO-1 expression was not altered in monocytes ( $F = 1.42$ ,  $p = 0.44$ ) Although cellular stress was not significantly different between trials, the HD condition resulted in a significant decline in 5 km TT performance compared to all other conditions ( $F = 7.0$ ,  $p < 0.01$ ; HD:  $514.9 \pm 9.9$  s, HE:  $489.3 \pm 12.4$  s, AD:  $495.2 \pm 16.6$  s, AE:  $478.1 \pm 14.6$  s). Dehydration did not have a significant impact on oxidative stress markers during exercise in the heat. However, the combined stress of both heat and dehydration had a negative effect on cycling time trial performance.

## **The role of music in influencing the efficiency of the run-walk transition in human locomotion**

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Listening to music whilst exercising is thought to have significant benefits for exercisers. A number of different mechanisms have been proposed to explain this, and its effect on their movement patterns. 1) Fast, loud music may have an energizing affect by increasing arousal and motivation causing an individual to work harder. 2) People are able to synchronize their movement with music over a broad range of tempi reducing motor variability. 3) Music may also provide a distraction from the physical sensations of effort, thereby increasing the point at which motor output is suppressed. However, research rarely examines these hypotheses together and measures of exercise are not always sensitive enough to differentiate between these effects. Therefore the purpose of this study is to evaluate these three competing mechanisms by examining how different auditory conditions affect the efficiency and stability of human locomotion when economy is stressed (i.e. during the run-to-walk transition). Ten participants will begin by running on a treadmill set to 2.5m/s, the speed will decrease to 2.0, 1.5, 1.0m/s every 3 minutes. Participants will repeat this procedure under 5 different auditory conditions (music, distraction [audio book], arousal [motivational speaking], synchronisation [metronome] and control [silence]) in a random order. A gas sample will be taken in the first 30 seconds in the final minute of each treadmill speed condition. RPE, heart rate, stride length and stride frequency will be measured in the final 30 seconds of this minute. Post exercise, the participants will complete the Feeling State Inventory (Gauvin and Rajeski, 1993: *Journal of Sport and Exercise Psychology*, **15**, 403-423). ANOVA will be used to examine the effect different auditory conditions have on gait economy. If music has an arousing effect on exercisers it is expected that performance in the music and arousal (motivational speaking) conditions will be significantly different to distraction (audio book), synchronisation (metronome) and control (silence). If music has a distracting effect on exercisers it is expected that performance in the music and distraction conditions will be significantly different to arousal, synchronisation and control. Finally, if music synchronises exercisers movements with the beat of the music, then it is expected that performance in the music and synchronisation (metronome) conditions will be significantly different to arousal (motivational speaking), distraction (audio book) and control (silence). The results of this study could have implications such as promoting running economy and adherence to exercise programmes across a range of abilities.

## **An interpretative phenomenological analysis of the intended and actual use of psychological skills by runners in the Flora London Marathon 2009**

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Research on the psychological aspects of non-elite marathon running has focused mainly on multidimensional coping strategies, rather than the specific psychological skills necessary to finish 26.2 miles in a specified time. No previous research has attempted to compare intended and actual use of psychological skills by marathon runners to achieve personal best times, which this study did in relation to the 2009 Flora London Marathon. Three runners (two experienced, one novice) classed as amateur in running ability participated. All had a projected or existing finish time of less than three and half-hours. As a phenomenological study, the subjective value and meaning of “success” was defined by each participant (all stated a specific finish time). Semi-structured interviews were conducted with each participant two weeks prior to the event about the psychological skills and strategies they intended to employ on the day, based on their experience and training. A follow up interview within two weeks of the marathon captured the race experience to see if the runners used the strategies and skills previously stated. Interpretative Phenomenological Analysis (Smith and Osborne, 2008: *Qualitative Psychology: A Practical Guide to Research Methods*. London: Sage) was used to analyse the interview data. The IPA yielded six master themes and twenty-four sub-themes. Findings showed the more experienced runners were closer to stated intention than the novice. No-one fully implemented all strategies and skills as outlined pre-race. The only participant to achieve both target and Personal Best times matched closest to their stated intentions. All participants reported pre-race anxiety about fatigue and slowing between miles 15 to 19. Pre-race, runners anticipated using breathing techniques and imagery to regulate arousal in order to focus concentration to maintain an even pace and running style. Fatigue was seen as inevitable, leading to decreased concentration. Psychological skills cited to overcome fatigue included positive self-talk, associative and dissociative techniques. Confidence came from adherence to training schedules and prior experience. Actual anxiety experienced resulted from negative self-talk from fatigue and the realisation that target times would not be met. Participants used skills including positive self-talk, associative and dissociative strategies, goal re-evaluation and mental toughness. All achieved personal best times. Understanding how psychological skill use is implemented via a longitudinal study over a full training schedule (including competition runs of different distances, e.g., 10Ks and half marathons) is recommended for future research to better understand intended versus actual skills use.

## Evaluating the effectiveness of an intervention designed to increase collective efficacy in association football teams

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Collective efficacy has been positively related with effort, persistence, goal selection, cohesion and performance in sport (see Ronglan, 2007: *The Sport Psychologist*, 21, 78-93). It has been suggested that making efficacy beliefs visible to teams and individuals may, in turn, enhance collective efficacy. Nonetheless, very few studies have evaluated interventions intended to increase a team's collective efficacy (Heuze *et al.*, 2007: *The Sport Psychologist*, 21, 383-399). The aim of this study was to develop and implement an intervention designed to increase a team's collective efficacy as well as players' self-efficacy. With institutional ethics approval, 34 male association football players (Age: mean = 20.3 years; Experience: mean = 9.7 years) from three teams took part in the study. Participants completed both the Collective Efficacy Questionnaire for Sports (CEQS) and an association football-specific self-efficacy measure 2 days prior to a match. In their spare time, they then performed a task in their spare time wherein they had to consider each of their team-mate's best sporting attributes, and detail them in an e-mail to the first author. On the morning of competition participants completed both CEQS and self-efficacy measures again. They then received a copy of the positive statements written by their team-mates, presented anonymously. Participants completed the CEQS and the self-efficacy questionnaire for a third time after reading the statements. Data were checked for outliers and then normality using standard skewness and kurtosis ( $z > \pm 1.96$ ). A single-factor, repeated-measures MANOVA was used to examine any changes in collective efficacy and self-efficacy across the three waves of data collection. The MANOVA results indicated that the intervention had a significant positive effect upon collective efficacy and self-efficacy measures (Pillai's Trace = 0.868,  $F_{12,22} = 12.086$ ,  $P < 0.001$ ,  $\eta_p^2 = 0.87$ ) and the independent variable manipulation accounted for 87% of the variance in the dependent variables. Follow-up univariate analysis showed that each collective efficacy and self-efficacy measure significantly increased as a consequence of the intervention ( $P < 0.001$ ). It was concluded that the intervention used in this study was an effective means by which to increase collective efficacy within a team as well as players' self-efficacy.

## **Effects of taping on joint position sense, range of motion and balance in female netballers.**

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Lateral ankle sprains (LAS) are among the most common injuries, which occur during athletic activities (R.J. Garrick & R.K. Requa, 1988: Epidemiology of foot and ankle injuries in sports. *Clinician and Sports Medicine*, **7**, 29-36). Taping is among the most common methods used in an effort to decrease re-injury (M.J. Callaghan, 1997: Role of ankle taping and bracing in the athlete. *British Journal of Sports Medicine*, **31**, 102-108). The aim of the present study was to ascertain the effects of taping on 10 female participants [aged 20.4 yr (SD 2.1), height 161.2 cm (SD 8.3) and weight 61.48 kg (SD 7.4)] sub-talar's range of motion (ROM), joint position sense (JPS) and balance. Participants ROM, JPS and balance were tested with the dominant ankle taped and un-taped. In both taped and un-taped conditions participants were tested and then performed 10 minutes of netball activities, including figure of eight speed and agility drills, prior to testing ROM, JPS and balance again. Differences between independent variables were tested by a two-way ANOVA for all dependant variables. A Post hoc Bonferonni was used to analyse whether there were any differences between independent variables. There was a significant difference between tape and un-taped on ROM and balance  $p < 0.05$ . No significant difference was found between JPS in the taped and un-taped condition  $p > 0.05$ . These findings indicate that taping may be beneficial in restricting ROM however, taping may not be able to withstand the forces exerted on the ankle during athletic activities.

## **Endurance capacity in humans after six sessions of sprint interval training (SIT) in hypoxia.**

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Sprint interval training (SIT) is a time-efficient method to improve skeletal muscle oxidative capacity and exercise performance when compared to continuous aerobic training (Burgomaster et al, 2005: *Journal of Applied Physiology*, **98**, 1985-1990). During repeated sprints,  $\text{VO}_2$  is elevated during recovery to replenish myoglobin stores, resynthesize creatine phosphate, metabolize lactate and remove intracellular inorganic phosphates. Balsom et al (1994, *Journal of Scandinavian Physiology*, **152**, 279-285) state that oxygen availability is directly associated with accumulation of anaerobic metabolites in sprint training. It is therefore hypothesised that oxygen availability affects the aerobic contribution to ATP resynthesis during work periods and rate of PCr resynthesis during recovery periods of SIT. By applying the added stress conditions of hypoxia during SIT, aerobic contribution during recovery would be strained, consequently inducing additional cardio-vascular performance gains. The purpose of this study was to identify whether SIT in hypoxia ( $\text{FiO}_2$ : 0.15) improves aerobic capacity in comparison to normoxic SIT ( $\text{FiO}_2$ : 0.2093). With institutional ethics approval 12 subjects (mean $\pm$ SD), age  $20.1 \pm 0.7$  years, body mass  $72.8 \pm 11.7$  kg and stature  $175.4 \pm 8$  cm, completed aerobic capacity testing pre and post SIT using a  $\text{VO}_2$ max incremental exercise test and a time to exhaustion (TTE) trial (80%  $\text{VO}_2$ max). Haemoglobin and hematocrit were measured to identify haematological changes. Subjects were matched and randomly assigned to one of three groups [Control (C); Normoxic (N); Hypoxic (H)]. The 30sec Wingate anaerobic tests were interspersed with 4 min rest, while the number of sprints performed progressed over the six sessions, from four to seven sprints. A two-way mixed design ANOVA was performed to examine changes in baseline measures between conditions. Statistical significance was set at  $p < 0.05$ . There were no haematological differences for either condition.  $\text{VO}_2$ max ( $f = 73.06$ ,  $p < 0.01$ ) and TTE ( $f = 25.33$ ,  $p < 0.01$ ) improved over time, though there was no significant improvement in  $\text{VO}_2$ max (C =  $102.65 \pm 22.08\%$ , N =  $116.87 \pm 9.38\%$ , H =  $111.63 \pm 4.87\%$ ) or TTE (C =  $88.31 \pm 35.68\%$ , N =  $177.47 \pm 26.92\%$ , H =  $140.03 \pm 9.94\%$ ) between conditions. Two weeks of hypoxic SIT causes no greater improvement in human endurance capacity than normoxic SIT. The additional strain on aerobic metabolism with hypoxia from repeated maximal intensity exercise, did not promote further cardiovascular performance gains.

## **Muscle strength & power phenotypes: Polygenic profile similarity limits skeletal muscle performance.**

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Human skeletal muscle produces force and power to initiate movements for activities within our daily lives (Knuttgen, H. G., & Komi, 2003: Basic considerations for exercise. In *Strength and Power in Sport (2nd Edition)* edited by P.Komi.Oxford: Blackwell). In terms of muscle strength and power, besides environmental factors, there is a genetic component. Twin studies have shown the heritability of muscle strength to range from 32-60% in various muscle phenotypes. Commonly phenotypes are accepted to be polygenic in nature (Roth, 2007: *Genetics primer for exercise science and health*. Champaign: Human Kinetics), yet how the relevant polymorphisms combine to influence muscular strength in individuals and populations is unclear. Therefore, the purpose of the study was to determine a polygenic profile for muscular strength and power, plus the probability of any given individual possessing the “preferable” profile. This was achieved using an original method of literature searching and statistical calculations, involving no primary data collection, as by Williams and Folland (2008: *Journal of Physiology*, **586**, 113-121) that utilised a genetic algorithm (Total Genotype Score). In the first step, 18 genetic polymorphisms were identified within the literature to be associated with muscular strength and power phenotypes. An inclusion (one positive significant association) and exclusion (disease) criteria was implemented into the literature search for studies. Using typical genotype frequencies, the probability of any given individual possessing the “favourable” polygenic profile was calculated as 0.0001% for the world population. Future identification of polymorphisms for muscular strength phenotypes will most likely reduce the probability even further. To examine the genetic potential for muscular strength within a human population, a “total genotype score” was generated for each individual within a hypothetical population of 1 000 000. The population expressed similarity in polygenic profile for which, at most, each individual was no different from the typical profile in more than 8 of the 18 polymorphisms. Therefore, skeletal muscle strength potential within humans appears to be limited by polygenic profile similarity. However, these findings are not derived from primary data taken in a laboratory setting and must be interpreted tentatively. The current study provides the basis for future research in specific samples (e.g. elite individuals), talent identification for power sports and individualised exercise prescription. Future research should aim to replicate more genotype-phenotype associations for muscular strength, because to date only 5 common genetic polymorphisms have had an association with strength or power replicated independently.

## **Pain and injury in youth sport: A sociological study**

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The aim of this study is to explore the perceptions and experiences of pain and injury among 13-14 year olds in physical education (PE) and club sport, an area that is largely under researched. A convenient and purposive sample of participants from one school in north-west England were used in the study that incorporated a mixed-method research design, consisting of self-completion questionnaires and focus groups. 204 questionnaires were returned complete and a sub-sample of 22 participated in 4 single-sex follow-up focus groups (2 male, 2 female). The questionnaires examined the prevalence of pain and injury within PE and club sport. Whilst perceptions and experiences of playing with pain and injury were explored in the focus groups. Questionnaire responses were manually entered into and analysed in Microsoft Excel and the focus groups were transcribed verbatim and analysed thematically. The questionnaire data indicated 52.4% of pupils experienced pain and injury during PE in the last 12 months, 68.6% played sport for a club outside of school and of these 47.1% of pupils experienced pain and injury during competitive matches for their club in the last 12 months, 44.3% experienced pain or injury whilst training for their club. The focus groups indicated that young people experienced various kinds of pains and injuries and managed these differently in both settings. They described these experiences in terms of the various constraints to which they were subject from coaches, teachers, parents and team mates. The paper concludes by suggesting that the attitudes and behaviours described by pupils were broadly similar to those of elite athletes and point to how 'playing hurt' is just one characteristic of the culture of youth sport. In this regard the young people in this study tended to normalize and rationalize 'playing hurt' as part of the of the sport ethic where they were expected and willing to give up their bodies for sport by playing injured.

## Leg muscle activation in different cycling postures

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Assumptions have been made regarding cycling posture and the optimal muscle activation within these. Studies that have looked at muscle activation have been limited mainly to standing postures and the effect of these on incline planes (Li & Caldwell, 1998: *Journal of Applied Physiology*, **85**, 927-938; Duc et al., 2008: *Journal of Electromyography and Kinesiology*, **18**, 116-127). Further research has investigated the biomechanical changes associated with postural change; such as shifting mass to increase leverage on the cranks (Hansen & Waldeland, 2008: *Journal of Sports Sciences*, **26**(9), 977-984). The purpose of this study was to investigate the impact of differing cycling postures on muscular activity; within the muscles of the lower limb. Additionally this study compared these differences in muscular activity between a group of cyclists and non-cyclists. EMG electrodes were placed; following skin preparation; on the muscle belly of 7 muscles identified from previous research in this area. The muscles studied were gluteus maximus, vastus lateralis, rectus femoris, bicep femoris, tibialis anterior, gastrocnemius, and soleus. The study was carried out using a fixed cycle ergometer; using two exercise protocols for each posture. The first was to assess maximum voluntary contraction values for each participant; with the second consisting of a maintenance of a fixed wattage. These procedures were passed by the ethics committee of Edinburgh Napier University. A significant difference ( $P < 0.05$ ) was found between postures for non-cyclists within the gastrocnemius. Between the groups of participants; significant differences ( $P < 0.05$ ) were shown for the seated posture within the gastrocnemius and soleus. Discussion: The results from this study contradict previous research with significant differences occurring in the lower leg muscles compared with the upper leg muscles in past research. The results suggest different cycling postures did not elicit a significant difference in muscular activity. The implication of this study identifies a need for further research in this area.

## **The effect of black elderberry extract (Sambucol) on immune responses to a high-intensity intermittent exercise**

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The alterations in the immune system following prolonged and intensive exercise results in an 'open window' where athletes may be at an increased risk of upper respiratory tract infection (URTI) for between three and 72 hours. Although the magnitude of such alterations following intermittent exercise are not as large compared to endurance events, neutrophilia, lymphocytopenia and fall in neutrophil function have been observed if the intermittent bout is of high enough intensity to increase catecholamines, cortisol and IL-6 concentrations (Bishop et al., 2002: *International Journal of Sport Nutrition and Exercise Metabolism*, 12, 145–156). Nutrition plays a crucial role in the relationship between heavy exercise and immune function where certain nutrients may have a direct effect by being involved in cell metabolism and replication or an indirect influence on other mediators of immune function such as stress hormones. Attention has now turned towards supplements that contain plant polyphenols due to their anti-oxidative and immuno-stimulant properties as potential nutritional countermeasures for exercise-induced immune depression. The black elderberry extract, Sambucol, which is abundant in polyphenolic compounds, has been shown to reduce the duration of URTI (Zakay-Rones et al., 2004: *Journal of International Medical Research*, 32, 132–140). The aim of this study was to determine the immune perturbations within blood or saliva that occur following a high-intensity intermittent exercise and identify if these could be influenced by acute supplementation of Sambucol. Following University Ethics approval, seven University football team players volunteered to participate in a double-blind randomised counterbalanced trial. Subjects ingested either Sambucol or placebo beverage immediately before participating in two main trials, seven days apart, that consisted of performing 5 × 15 minutes of intermittent running (maximal sprint, cruise, jog, walk) followed by continuous running to volitional exhaustion at alternating sub-maximal intensities (Loughborough Intermittent Shuttle Test). Repeated measures ANOVA revealed a significant main effect of time ( $P < 0.05$ ) with a post-exercise decrease in plasma glucose, saliva lysozyme:osmolality or an increase in salivary lysozyme secretion and circulating neutrophil count. A trend toward to an increase in neutrophil:lymphocyte from pre to post exercise was also found but this did not reach statistical significance. Analysis of neutrophil degranulation and salivary IgA are currently in progress. As of yet, no significant time × trial interactions have been revealed for any of the immunological measures. The present study's findings suggest that similar to other polyphenol-rich supplements, the beneficial effect of Sambucol on URTI may be due to direct anti-viral and anti-bacterial mechanisms rather than measurable changes in immune function.

## **What are the differences in the cognitive phase of a pre-shot routine in golfers of different ability levels?**

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There is considerable research that has investigated pre-performance routines (PPR) in sport, defined as a systematic sequence of motor, emotional, and cognitive behaviours that is performed immediately before the execution of self-paced tasks (Lidor and Mayan, 2005: *The Sport Psychologist*, 19, 343-363). However, few studies have investigated the cognitive phase of this routine in depth. Therefore, the aim of this study was to examine differences in the cognitive phase of PPRs in golfers of different ability levels. Four golfers were selected, two classified as experts (handicaps of scratch and 4) and two as intermediates (handicaps 18 and 24). Prior to the data collection, a habituation study was completed to develop the golfers' skills in verbalising (think aloud protocol) their thoughts. Each golfer played 9-holes with the researcher asking them to 'think aloud' during the period between placing their bag down by the tee and addressing the ball. Each golfer then continued their round (another 9 holes) without the researcher's prompts. All the verbalisations were recorded to dictaphone to inform the next phase. The four golfers independently played two separate rounds of golf (36 holes) with the researcher recording the think aloud verbalisations prior to every tee shot. The researcher then asked after the shot had been taken if they wished to add any additional information that they thought about when they stood over the ball. The investigation was carried out during practice rounds and was completed individually so the participants could recall the information without any distractions. Thematic analysis will be completed upon the verbalisations to categorize the range and variety of factors that the golfers identified before teeing off. The results will be discussed in light of decision-making theories, revealing the extent to which golfers use a classical (deliberative, weighing up of options; Cannon-Bowers and Salas, 2000: *Making decisions under stress*. Washington, DC: American Psychological Association) or a naturalistic (taking the first option; Johnson and Raab, 2003: *Organizational Behaviour and Human Decision Processes*, 91, 215-229) approach. It is anticipated that the study will provide information on allocating attention appropriately during the cognitive phase of the pre-shot routine in golf.

## **The roles of club doctors, managers and physiotherapists in the management of pain and injury in semi-professional football**

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In the terms of the risk of injury, it is well established that professional football is a high risk occupation and there is now a large body of research that has examined how pain and injury is managed in the game, for example Roderick *et al.*(2000: *International Review for the Sociology of Sport*, 2, 165-180). Much less is known, however, about the management of pain and injury in semi-professional football. The objectives of this study therefore are to examine the roles and responsibilities of club doctors, managers and match day physiotherapists in the management of pain and injury, at semi-professional level in Wales. The study involved semi-structured interviews with three groups of people within the 'sport nets' that constitute football and all of which occupied different roles within their clubs. The study involved three managers, three doctors and three match day physiotherapists. All interviews were recorded digitally, transcribed verbatim and the key themes then identified. The interviews focused on the relationships between the various groups and how relationships, responsibilities and standards of care at the club constrained all of the groups in their management of pain and injury. The key themes were identified by the reviewing of interview transcripts to identify common answers that could create an area of discussion. These themes were medical qualifications of staff, methods of appointment, standards of medical care and pressures. One key finding was that in all three clubs poor employment practice was reflected in the methods of appointment and qualifications that were possessed by physiotherapists. The findings also indicated that high standards of medical care and concern for players welfare were not institutionalized as important aspects of the operations of clubs and did not rank very highly among the priorities of those within the sportsnets. The findings also indicate that club doctors and physiotherapists qualifications need reviewing as there was a lack of sufficient qualifications (in particular match day physiotherapists) in semi-professional football as they might be expected in the NHS. Indeed, none of the match day physiotherapists who were interviewed had any sports specific or sports physiotherapy qualifications that would enable them to practice in the NHS. In conclusion the study indicates that there is an almost unrelenting pressure on players to play whilst in pain or when injured by themselves, fellow players or managers. They are also typically constrained to do so by poor standards of medical care that are more or less central aspects of culture of risk that exists in football.

## Relationship between muscular performance and markers of well being in elite rugby union players

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Testing and monitoring of various athlete parameters in any given sport on a regular basis can help to track athletes' changes in performance over time and modify training programmes accordingly. However, such regular testing should not be limited to physiological characteristics alone, but also encompass perceived psychological status and well-being. As was proposed by Foster (1998: *Medicine and Science in Sports and Exercise*, **30**, 1164-1168) monitoring of subjective well being may serve as a potential technique to prevent deterioration in the practice of physical tasks. The interdisciplinary relationship between psychological and physiological measures in professional team sport is not fully investigated. If physiology was linked to the mental component, any change in mental state could influence the physiological performance and vice versa. St Clair Gibson et al. (2003: *Sports Medicine*, **33**, 167-176) suggested that feelings of fatigue may be the mental representations of the physiological changes which characterise emotions. Therefore, the purpose of this study is to examine relationship between psychological self-assessment of well-being status and physiological parameters related to muscular performance in a professional rugby union team. Institutional ethical approval was gained prior to commencement of the study. 16 male professional rugby union players ( $26.4 \pm 5.6$  years;  $102.7 \pm 13$  kg;  $186.5 \pm 9.3$  cm) acted as participants. On a weekly basis over 5 months of the competitive season each player completed a 6-item perceived well-being questionnaire related to various manifestations of fatigue, and 3 single jump squats. A linear position transducer was used to record a vertical displacement, with further calculations of velocity, power, force, and force impulse for each jump. The linear position transducer was calibrated to a known distance (1 m) before testing. Time series analysis indicates no obvious relationship between measures of perceived well being and muscular performance. Although individual data analysis does show the existence of a relationship in some cases, it is possible that important variations may be missed due to player unavailability for testing as a result of injury or competitive requirements. The volume of missing data during this study highlights the problems inherent in performing long term analysis of athletes in a competitive team sport environment. The lack of obvious relationship between perceived well being and muscular performance could indicate i) there is no relationship ii) the questionnaires used were unable to identify important changes in well being iii) participants did not answer questions honestly.

## Exercise as a protective factor against problematic internet use

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Problematic internet use “creates psychological, social, school and/or work difficulties in a person’s life” (Beard & Wolf; 2001: Modification in the proposed diagnostic criteria for Internet addiction; *Cyberpsychology and Behavior*, 4, 377-383). Despite the several advantages the internet provides, research has shown many drawbacks if internet use becomes excessive; possibly leading to harmful dependence (Niemz; K.; Griffiths; M. D.; & Banyard; P; 2005: Prevalence of pathological internet use among university students and correlations with self-esteem: GHQ and disinhibition, *Cyber Psychology and Behavior*, 8; 562-570); resulting in depression (Morrison & Gore; 2010: The relationship between excessive internet use and depression: A questionnaire-based study of 1319 young people and adults; *Psychopathology*; 43; 2; 121-126). Regular exercise is often recommended on self-help websites for internet addiction and depression linked to excessive internet-use; however research relating to the relationship between normal exercise acting as a preventative measure for the development of internet addiction is scarce and non-conclusive. This study investigates the role participating in organised sport plays in protecting from developing internet dependency among students in tertiary education. To test this hypothesis, we compared the self-reported severity of internet dependency between exercisers and non-exercisers and investigated the likelihood of developing internet dependency in the two groups among 255 students from a UK HE institution, aged 18 years and above. After receiving ethical approval, the survey was available to participants either online through the student home page or as paper and pencil questionnaires. Almost half (n = 113) reported participation in organised sport compared to 142 participants who do not. Among the 47 items tapping into problematic internet use, factor analysis with Varimax rotation identified all but one factor had good reliability: ‘Unhealthy use’ ( $\alpha = 0.861$ ), ‘Controlled use’ ( $\alpha = 0.722$ ), ‘Avoidance of other duties’ ( $\alpha = .0.799$ ) and ‘Lack of interest’ ( $\alpha = 0.614$ ). Among the four factors, ‘Avoidance’ showed the most meaningful difference between the two groups. Using k-means cluster analysis on the ‘Avoidance’ score, participants were categorised into ‘normal’ and ‘at risk’ (score > 26) groups with mean scores  $18.64 \pm 4.7$  and  $32.8 \pm 4.8$ , respectively. Directional Fisher’s exact test confirmed that ‘Avoidance’ showed significant relationship with organised sport ( $P = 0.039$ ). The result demonstrates those who participate in organised sport are 1.6 times less likely to use the internet to avoid performing other duties.

## **A comparison of a supervised exercise programme and angioplasty on the gait and balance of peripheral arterial disease patients with intermittent claudication.**

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Peripheral arterial disease (PAD) refers to chronic arterial disease of the legs of atherosclerotic origin. Intermittent claudication (IC) is the feeling of pain in the extremities brought on by muscular activity and has long been considered the most classic manifestation of PAD (McDermott et al., 2002: *Annals of Internal Medicine*, 136, 873-883). With increasing pain and a decrease in muscular function and activity, noticeable adaptations in a patient's gait and balance would be apparent. Gait adaptations in a PAD-IC patient have been noted during pain free walking and have been exaggerated once the patient starts to feel the symptoms (Scott-Pandorf et al., 2007: *Journal of Vascular Surgery*, 46, 491-499). The primary objective of the study was to compare the effect of a 3 month supervised exercise programme with angioplasty on the gait parameters and postural control of PAD-IC patients. Participants diagnosed with PAD-IC and aged >65 years were recruited from the Hull Royal Infirmary Vascular Unit. Primary outcome measures were: ABPI, Quality of Life Questionnaire (QoL), gait parameters, 6-minute walk test and the 'Timed up and Go' (TUG) test. Postural Control was tested using the Sensory Organisation Test (SOT) and Motor Control Test (MCT) within a NeuroCom Equitest machine. The 6-minute walk test was incorporated into the gait analysis and was used to determine the distance walked and time taken until the onset of the participants' symptoms (ICD) and the point at which they need to stop: absolute claudication distance (ACD). To date, 15 participants were recruited (10 Male, 5 Female) with an average age of 68.9 years. The average ICD was 142m (range 50-330m) with average time of 2.14mins (range 0.58-5.33mins). The average ACD was 244m (range 100-550m) with average time of 3.87mins (range 1.46-7.33mins). It was hypothesised that the various physiological mechanisms associated with exercise and its improvement on vascular and muscular function would illicit improvements in the gait and balance of the PAD-IC patients with subsequent effects on their functional ability. This could be reflected by improvements in the more functional outcome measures, i.e. ICD/ACD and TUG. It could also be hypothesised that angioplasty may be more successful in the clinical outcome measures, i.e. ABPI and QoL.

## The physiological response to a pre-season training programme in university rowers

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Generic group training programmes are a commonly employed strategy of many rowing coaches. These programmes fail to account for the individuality of physiological responses and therefore the effectiveness of this approach is unclear. A rowing team must train together in the boats that they will be competing in to develop the necessary skills and understanding to work effectively. This is likely to result in unequal training stimuli in different individuals who must all work at the same absolute intensity. This study evaluated physiological responses to a standardised 3 month training programme in lightweight oarsmen ( $N = 18$ ). Oarsmen completed  $100 \pm 18$  km of rowing (~70% of which was on-water) and 2-3 circuit and strength training sessions weekly during this period. On two occasions (October & January), participants performed testing on a rowing ergometer to determine 2 km time trial (TT) performance, lactate threshold, mechanical efficiency, rowing economy, peak one-minute power output (PPO) and maximum oxygen uptake ( $\text{VO}_2\text{max}$ ). Data were analysed using a paired samples t-test. Statistical significance was set at  $P \leq 0.05$ . After 3 months, 2 km TT power was unchanged ( $333 \pm 25$  W on both occasions), despite increases in PPO relative to body mass ( $4.9 \pm 0.3$  W  $\cdot$  kg<sup>-1</sup> to  $5.2 \pm 0.4$  W  $\cdot$  kg<sup>-1</sup>,  $P < 0.01$ ) and relative  $\text{VO}_2\text{max}$  ( $62.3 \pm 4.1$  ml  $\cdot$  kg<sup>-1</sup>  $\cdot$  min<sup>-1</sup> to  $64.8 \pm 4.1$  ml  $\cdot$  kg<sup>-1</sup>  $\cdot$  min<sup>-1</sup>,  $P < 0.01$ ). Oarsmen significantly decreased mean body mass ( $73.9 \pm 2.6$  kg to  $72.8 \pm 2.5$  kg,  $P < 0.01$ ) and body fat ( $9.5 \pm 3.7\%$  to  $8.5 \pm 4.5\%$ ,  $P < 0.05$ ). There was a trend toward increased absolute  $\text{VO}_2\text{max}$  ( $4.6 \pm 0.3$  litres  $\cdot$  min<sup>-1</sup> to  $4.7 \pm 0.4$  litres  $\cdot$  min<sup>-1</sup>,  $P = 0.07$ ) and PPO ( $365 \pm 29$  W to  $375 \pm 37$  W,  $P = 0.08$ ), despite a range in individual responses (percentage change from -6% to +18% and -7% to +14% respectively). There were no significant changes in mechanical efficiency, rowing economy and power output at the lactate threshold. These results suggest a need to explore the potential of individualised exercise prescription to further enhance the physiological response. Rowing training emphasises low intensity technique training. Future research should also incorporate technique assessment to more fully reflect current training approaches.

## **Coach and player perspectives from a football professional centre of excellence on qualities needed to make the next step into the professional game**

Knight, C., & Mascarenhas, D. R. D.  
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Most of the literature on talent development in sport psychology consists of high achieving elite athletes reflecting back on their chosen athletic careers. By providing an understanding of the psychology of talent and ability of young players, coaches and sport psychologists will be in a better position to recognise and nurture talented individuals. Therefore, the aims of this investigation were twofold. Firstly, to ascertain the factors that managers and coaches deem to be important. Secondly, to identify whether professional centre of excellence coaches share the same perspectives and how well these are relayed to the players. One Centre of Excellence (COE) manager (age 32) and two COE coaches (U13 coach age 33, U15 coach age 41, both teams competing in the Football League development programme; all coaches UEFA A-license holders) were inductively interviewed to establish their current practice and philosophies on talent development. Analysing this data to identify the factors that may affect the players, then formed the basis for two focus- group interviews with 3 players from each of the coaches' respective squads (U13 and U15) to identify the clarity of the messages from the coaches and also to see what the players' deem to be important in their development. To assist the trustworthiness of the data, all the interviews were audio-recorded and transcribed verbatim. Thematic content analysis will be conducted independently on the two sets of data (coach interviews and player focus-groups) to identify emerging themes. The transcriptions and the emergent themes will be sent to the participants for member checking. It is anticipated that theoretically this paper will provide a broader understanding of talent development systems and structures in professional football as well as identifying the unique characteristics required to progress and establish oneself at the professional level. From an applied perspective it is expected that the results will identify how well the coaches highlight the attributes and characteristics required for players to develop.

## The effects of cold and wet-cold exposure on intermittent sprint performance

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Cold conditions have been shown to decrease performance by reducing muscle temperature resulting in reduced force, power and velocity (Guerts *et al.*, 2004: *European Journal of Applied Physiology*, **91**, 41-45). In wet-cold conditions, symptoms are exacerbated by shivering fatigue, which contributes to additional strength losses (Thompson and Hayward, 1996: *Journal of Applied Physiology*, **81**, 1128- 1137). The winter season of sports characterised by intermittent sprint activity, such as football and rugby, means that players are often exposed to cold and wet-cold playing conditions. It is therefore the purpose of the present study to investigate the effects of cold and wet-cold conditions on intermittent sprinting performance in games players. Four healthy subjects (mean  $\pm$  SD of age  $20.75 \pm 0.96$  years, height  $170.25 \pm 2.9$  cm and weight  $71.3 \pm 7.2$  kg) volunteered to participate in the study which received University ethical approval. On two separate occasions subjects completed 20 consecutive 2 minute 'blocks' of activity (each 'block' consisting of 10 s passive recovery, 5 s maximal sprinting and 105 s active recovery performed at 35%  $\text{VO}_2\text{max}$ ) on a friction-braked ergometer, in either cold ( $4^\circ\text{C}$ ) or wet-cold ( $4^\circ\text{C} + 10$  min shower prior to exercise) conditions, in a randomised, cross-over design. Power output (PO) was measured during every maximal sprint. Heart rate (HR), ratings of perceived exertion (RPE), thermal sensation, maximal handgrip strength, shivering assessment, skin ( $T_{\text{skin}}$ ) and core ( $T_{\text{rec}}$ ) temperature were recorded during 30 – 60 s of active recovery every other block of activity. Initial descriptive data analysis showed no significant difference ( $p= 0.41$ ) in mean power output between the wet-cold condition ( $776.78 \pm 257.46$  W) and cold condition ( $766.0 \pm 338.72$  W). Mean  $T_{\text{rec}}$  was similar in both conditions (wet-cold  $37.95 \pm 0.3^\circ\text{C}$ , cold  $37.97 \pm 0.3^\circ\text{C}$ ) and therefore showed no significant difference ( $p=0.36$ ) as was mean HR (wet-cold  $154.1 \pm 6.6$  BPM and cold  $160.3 \pm 13.87$  BPM).  $T_{\text{skin}}$  was lower in the wet-cold ( $19.75^\circ\text{C}$ ) than in cold ( $24.98^\circ\text{C}$ ). Although skin temperature was lower in the wet-cold condition than in cold alone,  $T_{\text{rec}}$  seems to be unaffected. Further data will allow us to substantiate these findings.

## A comparison of the physiological responses to exercise: % $\dot{V}O_{2max}$ versus % 'delta'

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Traditionally, exercise intensity has been described, prescribed and normalised as a fraction (%) of the maximal oxygen uptake ( $\dot{V}O_{2max}$ ). However, this method takes no account of other variables such as the gas exchange threshold (GET) and critical power (CP) which are known to influence the muscle metabolic and pulmonary gas exchange responses to sub-maximal exercise. Therefore, assigning exercise intensity as %  $\dot{V}O_{2max}$  could result in some participants exercising above, and some below, the GET or CP leading to greater variability in the physiological responses. The purpose of this study was to assess the degree of variability in the physiological responses to exercise ascribed using the %  $\dot{V}O_{2max}$  and % 'delta' ( $\Delta$ ) methods. The latter method involves the normalisation of exercise intensity on the basis of both the GET and the  $\dot{V}O_{2max}$ . Nine males volunteered to participate in this ethically approved study and initially completed a ramp incremental test to establish the GET and  $\dot{V}O_{2max}$ . Thereafter, participants completed six, randomised constant-work-rate cycling bouts at exercise intensities equivalent to: 50%, 70% and 90% of  $\dot{V}O_{2max}$  (i.e. calculated using the %  $\dot{V}O_{2max}$  concept); and 80% of the  $\dot{V}O_2$  at the GET, 40% $\Delta$  (40% of the difference between the GET and  $\dot{V}O_{2max}$ ) and 80% $\Delta$  (i.e. calculated using the % $\Delta$  concept). In both approaches, the intensity of the bouts was selected to broadly correspond to moderate, heavy and severe intensity exercise and exercise was continued for 20 min or to exhaustion if this occurred sooner. The mean  $\pm$  SD end-exercise  $\dot{V}O_2$  (as a percentage of the maximum) for the bouts prescribed using the %  $\dot{V}O_{2max}$  and % $\Delta$  concepts were, respectively, 59  $\pm$  11 vs. 36  $\pm$  6% (moderate), 97  $\pm$  14 vs. 72  $\pm$  13% (heavy) and 104  $\pm$  22 vs. 107  $\pm$  13% (severe). Four subjects reached  $\dot{V}O_{2max}$  and became exhausted before 20 min had elapsed (686  $\pm$  374 s) at the '70%  $\dot{V}O_{2max}$ ' work rate. The inter-subject variability in time-to-exhaustion during exercise at 80% $\Delta$  (487  $\pm$  108s; cv = 22%) was less than that at 90%  $\dot{V}O_{2max}$  (301  $\pm$  137s; cv = 46%). Blood lactate accumulation and ratings of perceived exertion were also more variable when exercise was prescribed using %  $\dot{V}O_{2max}$ . In conclusion, the physiological responses to constant-work-rate exercise were more consistent between individuals when the % $\Delta$  concept was utilised to normalise exercise intensity. These data have important implications for the prescription of exercise intensity in exercise physiology studies.

## Effects of correct & positive performance feedback in 4-km time trial cycling

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Pacing strategies in time trial (TT) events are integral to success. Excessive energy expenditure can lead to premature fatigue, whereas a lack of effort may lead to an insufficient power output (PO) and ultimately an undesired completion time (Hettinga *et al*, 2006: *Medicine & Science in Sports & Exercise*, **38**, 1484-91). Motivation is believed to be important in maintaining maximal effort and thus a potentially important facet in successful pacing. Recent models of central, anticipatory regulation suggest that a pacing schema is pre-set prior to exercise, based on knowledge of end-point (Tucker, 2009: *British Journal of Sports Medicine*, **43**, 392-400). During exercise, the initial schema is compared against the current exercise demands, so that PO is continuously refined to produce the optimal pacing strategy. Accurate performance feedback, based on a comparative prior exercise bout, can have a positive effect on performance. However, it has not been shown whether such a performance effect is due to improved motivation or an improved ability to compare past and present pacing schemas. Linked with Bandura's expectancy-value theory, it is thought that unexpected outcomes can serve as motivators or demotivators. Unexpected outcomes may alter an athlete's motivation and therefore, strategies to aid accuracy of outcome prediction may have a positive performance effect. The objective of this research was to further investigate the influence of feedback on motivation for time trial (TT) performance. While positive feedback is an established motivator, few studies have investigated comparative feedback. Therefore, this study sought to elucidate whether performance is improved through the provision of accurate or positive performance feedback. Seven well trained cyclists (10-15 hours training per week) completed three self-paced 4-km time trials (TT) over a 2 day period. Following familiarisation, participants completed a Baseline (BL) TT and two further TT where feedback based on BL performance was given. Feedback was either always positive (POS [always ahead of BL time]) or correct (COR [always accurate in reference to BL]). Data collection and analysis is ongoing and it is hypothesised that participants will produce faster TT times in the POS condition, whereas COR feedback will elicit an insignificant change in performance.

## **A laboratory model to test muscles in exercise**

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**Introduction;** Previous *in vivo* studies have indicated a significant relationship between muscle stretching and muscle performance. Skeletal muscle is an adaptive tissue continuously changing in response to the external environment. Results of exercise related *in vivo* studies may be affected by the different methodologies used. To further enhance understanding of the human body in respect to exercise, greater understanding with regards to the cellular and molecular adaptations must be determined. Therefore, the purpose of this present study was to investigate the use of novel model to assess muscle adaptation to stretch. **Methods;** Rat P1 muscle cells obtained from a primary source, were seeded into a collagen gel to form a three-dimensional (3D) structure for culture. The construct was then subjected to isometric mechanical strain. Gene expression of Myogenin and IGF-1 will be assessed using Real-Time PCR in order to quantify gene up regulation. Data will be analysed for statistical differences using an ANOVA. **Results;** It is predicted that Myogenin and IGF-1 will be upregulated by the duration and seeding density of the 3-D muscle constructs subjected to isometric strain. **Conclusion;** The model used for this experiment provides an *in vitro* method for further developing understanding of the mechanisms of *in vivo* muscle adaptation to exercise. Such a model could also be used to improve knowledge relating to exercise as a clinical intervention for many pathological conditions.

## Issues of identity in the trampoline gymnastics subculture

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This study explores the issues of identity in the trampoline gymnastics subculture. The concepts of Frank's (1995, *The Wounded Storyteller*, Chicago: Chicago University Press) 'mirroring body' and Goffman's (1971, *The Presentation of Self in Everyday Life*, London: Allen Lane The Penguin Press) 'societal interaction' have been employed to demonstrate *how* trampoline gymnasts construct their sub-cultural identity. Issues of choice and control of identity construction also feature highly in this study. A qualitative, emergent research design was employed. Female trampoline gymnasts (N = 6), aged 8-17 years old, and their parents (N=4) were interviewed. All interviews were recorded, transcribed and analysed thematically. The data was presented in the form of creative non-fictional narratives and adapted realist tales, in order to create an empathetic reality of issues of identity in the trampoline gymnastics subculture through the voice of the participants. This study revealed three main findings. Firstly, trampoline gymnasts construct a homogenous, unrealistic, ideal gymnastic identity that is associated with a singular notion of heterosexual, femininity. This identity construction begins at a young age (as young as eight years old). Secondly, this identity was problematic as the young gymnasts became sexualised, narcissistic and overtly conscious of their body. This created an atmosphere in which ridicule, scrutiny and stigma were common and led to anxiety and low self-esteem for many girls within the subculture. Finally, the gymnast's control and choice to construct this identity is, at best, limited by societal institutions such as, the family, media and the national governing body, British Gymnastics.

## Searching for competence: Examining reputation biases

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Research has found formation of initial impressions, gained from multiple sources including reputation or physical appearance, to heavily influence athletes' perceived competence of coaches (e.g. Manley *et al.*, 2008: *The Sport Psychologist*, **22**, 73-89; Thelwell *et al.*, 2008: *International Journal of Sport Psychology*, in press). In response, the current study attempted to establish whether individuals seek different visual information depending upon the reputation of the coach. 25 participants (age  $24.38 \pm 6.93$  years) from various sports volunteered to take part. Ethical approval and informed consent was obtained prior to testing. Participants were placed in one of three groups and instructed to watch two videos of coaches performing drills. The first video featuring the control coach was shown to all participants. However, text preceding the second video of the target coach was altered to portray three different reputations (professional, training and no reputation). Following this, participants were asked to complete a Coach Competency Scale (CCS) assessing motivation, character building, technical development and game strategy. For the duration of both videos, an Applied Sciences Laboratories (ASL) 501 eye-tracker was fitted to participants' heads to enable their visual search patterns to be determined. Data collected included the number of fixations, average duration of fixations and number of areas fixated. For the CCS data, two Multivariate Analyses of Variance (MANOVA) were employed and whilst no significant differences were found for the control coach ( $p > 0.05$ ), for the target coach the professional coach was perceived as more competent in their ability to motivate individuals than the coach given no reputation ( $p = 0.006$ ). Likewise, the professional coach was marked higher for the same subscale in comparison to the training coach ( $p = 0.086$ ). For the eye tracking data, a further two MANOVA's were conducted. For the control coach no differences were reported ( $p > 0.05$ ) and whilst the MANOVA was not significant for the target coach, the number of fixations for the professional coach decreased whereas for the training coach this increased. Although no significant differences were found from the eye tracking data, results confirm findings from previous studies where reputation has been found to influence the way individuals perceive coaches. More importantly the results suggest that an association may exist between the way individuals perceive a target and their resultant visual search employed. However, further research must be undertaken with a larger participant size to establish accurate conclusions. This may help coaches gain a better understanding of the types of behaviours they could exhibit during interactions with athletes.

## **Staying alive! A physiologists survival guide to working in a premier league soccer club**

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Student internships offer a unique opportunity for students to gain experience in their particular field, determine if they have an interest in a particular career and create a network of contacts for future opportunities. Internships provide employers with a short term staffing option with the quality assurance of a Higher Education department to support activity. One of the potential benefits of this is the prospect of interns returning to the company after completing their education and subsequently requiring little or no training to commence work. Few opportunities are available within the world of professional soccer, with most opportunities being abroad, such as in American Major League Soccer (MLS), or working with young academy players as opposed to senior elite professionals. For the 2009-2010 season, Everton FC collaborated with Liverpool John Moores University to create season-long internships for two postgraduate MSc. Sports Physiology students with the first team squad. The internship involved delivery as applied practitioners using evidence based practice to work closely with the fitness coaches at the club, shadowing their work and carrying out various tasks with the players. Most sports science graduates will go down either an 'applied' or 'academic' pathway; very few are able to combine both in order to relate academic research into the applied sporting world. This internship offered the perfect opportunity to determine whether time spent working academically could be applied into a professional climate. The position also introduced students into the unique world of a professional soccer club, where the culture is considered to be very different from that of other professional sports, traditionally entrenched with a masculine and macho background. By being placed in this challenging social environment, students were forced into a position of survival, in which they either developed their craft knowledge in order to be socially and professionally accepted or faced the consequence of being yet another highly qualified academic who cannot transfer their professional knowledge into the applied world. The potential value of an internship is the opportunity to develop academically whilst also building a vocational skill set that develops employability in preparation for future work upon graduation. This skill set involves development of personal qualities, such as self-confidence, determination and sociability, whilst also developing professional qualities, such as problem solving and assertiveness. Potentially, professional soccer clubs should consider the value of internships which allow students to learn and engage in an applied setting using evidence based practice.

## Effect of a physical and mental stressor on an accuracy performance test, state anxiety and $\alpha$ -amylase activity in healthy males

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Increased arousal levels may enhance athletic performance; however over-arousal could be detrimental to performance (Perkins et al. 2001: *Journal of Applied Sport Psychiatry* 13:3-239). Physical and mental stressors can independently increase sympathetic nervous system (SNS) activity (Chatterton et al., 1997: *The Journal of clinical endocrinology and metabolism*. 82:2503-9), yet how these relate to state anxiety and performance capacity is currently unknown. This study examined the effect of physical stress, with and without additional mental stressors on dart throwing accuracy, state anxiety and  $\alpha$ -amylase activity (sAA), a surrogate marker of SNS activity. Using a randomised cross-over design, 7 healthy males, mean age: 20.8 s=1.4 years, body mass: 73.6 s=7.5 kg, maximal aerobic capacity ( $VO_2$ max): 47.77 s=6.72 ml kg<sup>-1</sup> min<sup>-1</sup> completed 3 protocols 1) Control: 20min quiet rest. 2) Exercise: 20min cycle at 65%  $VO_2$  max. 3) Combination: 20min cycle at 65%  $VO_2$ max with mental tasks (mental arithmetic and the 'Stroop' colour word test) administered during minutes 6-10 and 16-20. Immediately after each protocol, participants completed a dart throwing accuracy test, 10 darts were thrown, with mean score recorded. Saliva samples, for sAA analysis, and a state anxiety inventory (SAI; Devito and Kubis 1983: *Educational and Psychological Measurement* 43:729-734) were collected at rest, 10 and 20min during the protocols. Heart rate was measured every 5min. Data were analysed using a repeated measures ANOVA and post-hoc t-tests with Holm-Bonferroni adjustments applied where appropriate. Dart throwing performance increased by 22% following the Exercise protocol compared with Control ( $P<0.01$ ), but this increase was not observed with the addition of mental stressors. Heart rate increased in Exercise and Combination protocols and was significantly greater than Control at 20min ( $P<0.0001$ ; 62 s= 6 vs 156 s=15 vs 165 s=14 b.min<sup>-1</sup> for Control, Exercise and Combination, respectively). SAI scores increased significantly in Exercise and Combined protocols and values were significantly higher in Combined compared with Exercise ( $P<0.05$ ) and Control ( $P<0.0001$ ) at 20min. SAA levels increased during the protocols ( $P<0.05$ ) but differences at 20min were not quite significant ( $P=0.064$ ; 54.78 s=13.45 vs 117.64 s=31.02 vs 128.82 s=28.18 U min<sup>-1</sup> for Control, Exercise and Combination, respectively). These results show that accuracy performance is increased following physical stress, but may be inhibited by the addition of mental stressors. These effects may be attributed to over-arousal as indicated by the increased SAI scores. SAA tends to increase in response to physical stress but was not significantly affected by additional mental stress in this study.

## **The influence of bicycle saddle design on genito-urinary system injuries in cyclists**

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Cycling is the second fastest growing sport in the country and an increasingly popular way to travel to work due to the current financial climate. The increasing number of people cycling is likely to result in a proportional increase in the incidence of cycling related injuries. This review addresses how bicycle saddle design influences genitourinary system injuries caused by overuse of a bicycle in men and women. Overuse injuries in cyclists are as a result of either friction between the perineum and the saddle or due to excess pressure on the perineum. I firstly discuss the anatomy in the area around the perineum in both sexes that is potentially affected by this type of injury and then present the most common and serious overuse injuries related to the genitourinary system, including genital numbness, erectile dysfunction in men, vulval hypertrophy in women and genital numbness in both sexes. I performed a review of the relevant literature using Google, Pubmed and Medline search engines. Search terms used included 'genito-urinary injuries', 'cycling', 'bicycle saddle design', 'overuse injuries', 'genital numbness' and 'erectile dysfunction' I then explored the references from the articles I found until I exhausted all the papers suitable for the review. Overall, it seems the risks associated with cycling saddle injuries are far outweighed by the health benefits and the enjoyment that can be gained from cycling. The ideal solution would be the design of a saddle that firstly feels comfortable and causes no injury, but also looks 'acceptable'. Ultimately, the only way to assess how well designed a new saddle is at eliminating, or at least minimising these symptoms, is to perform a large, long-term prospective study.

## **Age, sex, and finish time as determinants of pacing in the marathon**

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Previous researchers have suggested that faster marathoners tend to run at a more consistent pace compared with slower runners. None has examined the influence of sex and age on pacing. Therefore, the purpose of this study was to determine the simultaneous influences of age, sex, and run time on marathon pacing. Pacing was defined as the mean velocity of the last 9.7 km divided by that of the first 32.5 km (closer to 1.0 indicates better pacing). Subjects were 186 men and 133 women marathoners from the 2005, 2006, and 2007 races of a midwestern U.S. marathon. The course was a 1.6 km (1 mile) loop with pace markers throughout, thus facilitating pacing strategy. Each 1.6-km split time was measured electronically by way of shoe chip. The ambient temperature (never above 5\_C) ensured that hyperthermia, a condition known to substantially slow marathon times and affect pacing, was not likely a factor. Multiple regression analysis indicated that age, sex, and run time ( $p < 0.01$  for each) were simultaneously independent determinants of pacing. The lack of any 2- or 3-way interactions ( $p > 0.05$  for each) suggests that the effects of 1 independent variable is not dependent upon the levels of others. We conclude that older, women, and faster are better pacers than younger, men, and slower marathoners, respectively. Coaches can use these findings to overcome such tendencies and AU2 increase the odds of more optimal pacing.

## The effects of maximal quadriceps resistance training on running economy

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Running economy is well documented as an important determinant of running performance especially in elite distance runners (Saunders et al, 2004: *Journal of Sports Medicine*, 34, 465-485). When elite distance runners report similar  $\text{VO}_2\text{max}$  values ( $75\text{-}80 \text{ ml.kg}^{-1}.\text{min}^{-1}$ ) it is hypothesised a more accurate performance indicator is running economy (Daniels, 1985: *Medicine and Science in Sports and Exercise*, 17, 331-338). Resistance training is associated with improvements in economy, in particular traditional strength and plyometric training, that focuses largely on the lower extremities, are associated with improved running economy among non-elite and elite athletes (Foster and Lucia., 2007: *Sports Medicine*, 37, 316-319). The lower extremities are the primary muscles utilised in running, 84% of the concentric and eccentric muscle activity happens in the sagittal plane using the quadriceps, hamstrings and iliopsoas (McClay and Manal, 2003: *The Journal of Strength and Conditioning Research*, 237-242). It may be hypothesised that training these muscle groups may lead to strength increases (among other neuromuscular adaptations, such as improved utilisation of oxygen) ultimately improving running economy. The purpose of this study was to identify whether six weeks maximal resistance training that isolates the quadriceps in healthy men, whom do not currently participate in a running or resistance training, would improve their economy at velocities equating to 50% and 75% of their  $\text{VO}_2\text{max}$ . After obtaining ethical approval from the Centre for Health, Exercise and Sports Science ethics committee, twenty men (mean  $\pm$  SD age, mass, stature) provided informed consent prior to completing a  $\text{VO}_2\text{max}$ . On a separate day, the participants completed two 6 minute submaximal runs at velocities equating to 50% and 75% of their  $\text{VO}_2\text{max}$ , separated by 5 minutes passive recovery, the  $\text{VO}_2$  being averaged between the 5th and 6th minute. Both submaximal runs were retested 48 hours later for test-retest reliability: time, footwear, clothing, prior activity and temperature remained consistent throughout. Isometric strength throughout the range of motion was tested on the MedX knee extensor machine (Ocala, Florida). Participants were randomly allocated to either an experimental (EXP) ( $n = 10$ ) or control group ( $n = 10$ ) (CONT). The experimental group trained once a week at 65% of their maximal isometric torque to failure performing isotonic contractions. After 6 weeks training, both groups (EXP and CONT) had their isometric strength and economy at these two velocities retested to establish if any relationship between quadriceps resistance training and running economy existed.

## **Training anticipation skill in tennis using spatial and temporal occlusion.**

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Previously researchers have shown that skilled tennis players are able to anticipate an opponent's intended shot direction by extracting information from a relatively larger number of different body regions than novices do (Huys et al, 2009: *Journal of Motor Behaviour*, **41**, 158-170). In the case of novices, they tend to perform this task by attending to fewer body regions and have a greater dependence on the arm and racket for information about shot direction than their expert counterparts (Williams et al, 2009: *Human Movement Science*, **28**, 362-370). However, how best to train expert-like anticipation behaviour has not been thoroughly researched. The aim of this study therefore was to promote expert-like anticipation behaviour in less-skilled players. Two groups of novices will be trained to anticipate the intended shot direction of tennis forehand strokes over a four-week training programme. The End Effector group will only view forehand strokes in which information for shot direction will be preserved in the arm and racket only. The Rest of the Body group will only view forehand strokes in which information for shot direction has been preserved in all body regions apart from the arm and racket. Anticipation response accuracy and time will be measure during pre and post-tests and over acquisition. It is expected that the rest of the body group will be able to anticipate shot directions using a wider range of body regions whereas the End Effector group will rely of information extracted from the arm and racket only. By training the novice players to force and look for specific visual cues, their decision making process will be sped up and their advanced cue utilization improved; this can be expressed in terms of response accuracy and time. Not only will the accuracy of anticipated shot direction be improved, but the time it takes to make the correct decision will be decreased. This will be of particular value to coaches when their players need to focus on a specific shot as they will be able to plan the next shots in advance and gain the advantage over their opponent. It will also help them to establish learned connections between preparatory cues and response outcomes. In conclusion, the results from this study will help shed light upon how to train novices to enhance their anticipation skills, and where on the opponent a player can gain the most information in terms of the most effective visual cue for predicting shot direction. By training novices in this area, elite behaviour will be learned and shots will be selected quicker, therefore allowing players to gain a mental advantage over their opponent.

## **The accuracy of the Nintendo Wii balance board™ as a measuring tool for centre of pressure**

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Data on movements of the centre of pressure (CoP) during tasks is important to the sport sciences. The Nintendo Wii Balance Board (WBB) is a peripheral gaming device that has the ability to detect changes in standing posture (Nintendo, 2009: *Nintendo Co Ltd. Kyoto, Japan*; Shih *et al.*, 2010: *Research in Developmental Disabilities*, **31**, 281-286). The aim of this study is to validate the accuracy of CoP of the WBB during static and dynamic protocols. Calibration involved pushing down on the centre of the WBB and using the output from the four transducers to develop regression equations in Microsoft Excel. The accuracy of the CoP measurements was then assessed using three protocols; a point of force application model; a single block design (to represent standing) and a quiet standing balance. For the static tests, movements of the CoP were compared with known values. For the quiet standing test, movements of the CoP were compared with concurrent data acquired from a Kistler force plate (Kistler 9281CA, Kistler, Switzerland). For static trials, WBB CoP error was  $-0.03 \pm 1.56\text{mm}$  across the plate, and  $0.55 \pm 3.25\text{mm}$  along the plate. The larger errors occurred at the edges of the plate. For the dynamic trials WBB CoP error was  $0.070\text{mm}$  across the plate and  $0.216\text{mm}$  along the plate. A strong relationship between movements on the WBB and the force plate were found ( $R^2 = 0.9949$ ,  $R^2 = 0.975$ ). Tests for validity, including limits of agreement will be undertaken and it is expected that the findings will indicate that the WBB is just as valid as lab-based force plate for measuring movements of the CoP but with considerable advantages in terms of portability and cost.

## The practical application of a bioenergetic model to pacing strategy in competitive cycling

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Pacing strategies can be determined using the hyperbolic P-t (power-duration) relationship however the consistency of the constant curvature of this relationship,  $W'$ , at variable power outputs, is not unequivocal. Through modelling, Fukuba and Whipp (1999: *Journal of Applied Physiology*, **87**, 853-861) suggest that optimal performance, irrespective of pacing strategy, is achievable if power output is maintained above critical power (CP) and  $W'$  is fully exhausted at race end. The practical application of this model to a ten minute protocol employing a final sprint has not been tested. The purpose of this study was to compare  $W'$ , predicted from the pre-determined p-t relationship, to the total work achieved above critical power (CP) during different pacing strategies. Following ethical approval nine male subjects, age  $29 \pm 9$  completed 3 high intensity square-wave bouts for estimation of CP ( $254 \pm 30$  W) and  $W'$  ( $17.9 \pm 7.7$  kJ). The subjects then performed, in random order, 3 exercise trials separated by at least 24 hours. Each trial consisted of 9 minutes cycling at a constant power output, followed by a final minute sprint. The exercise intensity during the initial 9 minutes was calculated to facilitate a subtle increment (1080 J) in the remaining anaerobic reserve to be expended over the final minute in each trial: Trial 1 (T1) 282 W, Trial 2 (T2) 280 W, Trial 3 (T3) 278 W. The power output during the sprint was self-determined and strong verbal encouragement was given to encourage total exhaustion of  $W'$ . A significant difference was found between  $W'$  ( $17.9 \pm 7.7$  kJ) and the total anaerobic work achieved in T1 ( $22.4 \pm 9.4$  kJ,  $P = 0.02$ ), T2 ( $22.1 \pm 9.7$ kJ,  $P = 0.012$ ) and T3 ( $21.1 \pm 9.1$ kJ,  $P = 0.013$ ). Additionally the anaerobic work in T1 was significantly greater than that achieved in T3 ( $P = 0.012$ ). The anaerobic work achieved in the final minute was not significantly different across all three trials ( $P > 0.05$ ). Heart rate and  $VO_2$ , measured at minute intervals, were not significantly different. In conclusion,  $W'$ , calculated from the P-t relationship, underestimates the anaerobic work achievable in the pacing strategies studied. Additionally, when cycling trials are performed above CP and  $W'$  totally exhausted, performance can still be influenced by subtle differences in power output and enhanced when a greater power output is adopted at trial onset.

## **Changes in psychosocial health and physical activity levels of older adults attending a 6-week general and cardiac rehabilitation community walking programme**

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Walking is an accessible leisure activity that may yield psychological and social benefits in older adults, particularly in those who engage in little activity or have suffered significant health problems. Indeed, regular physical activity in clinical and healthy older populations may have physiological benefits. The aim of this study was to explore changes in psychosocial health and physical activity levels of older adults attending a 6-week general or cardiac rehabilitation community walking programme. Twenty three men and women aged 47 to 81 years attending two community walking programmes for general and cardiac rehabilitation in North West England participated in the study. Participants completed questionnaires pertaining to their quality of life, exercise self efficacy, social support for exercise, and perceived health at two time points (baseline and six weeks). Physical activity levels were measured at the two time points using pedometers for 7 consecutive days. Data were collected in October 2009 and January 2010. The research protocol received institutional ethical approval. Analyses of covariance (ANCOVA) with the baseline data as the covariate investigated differences in the change scores for all variables between the two programmes. Participants in the general group attained a significant difference in perceived social relationships (2.08;  $p = .01$ ) and perceived environment (1.81;  $p = .02$ ) compared to cardiac rehabilitation group; respectively. The general group also had greater self efficacy than the cardiac rehabilitation group (9.75;  $p = .09$ ). No significant changes were observed for weekly pedometer scores, perceived physical health, psychological health, and social support from friends or family in any group, though the cardiac rehabilitation group had higher perceived social support from friends. Lastly, groups revealed positive but non-significant changes in perceived health, however greater changes were observed in the general group. This study lends support to previous research that stated walking enhances psychosocial health in older adults. Findings from this study, however, also contrast previous research that stated that brisk walking may be the intensity required to produce corresponding changes in psychosocial health. Interestingly, greater benefits were observed in the general walking group compared to the cardiac rehabilitation group. Since the general walking group took place twice a week, the cardiac rehabilitation walking group may need a greater frequency of walks to benefit this group. However, a larger sample and longitudinal data are needed to further explore the relationship of walking and psychological health in older adults attending general or cardiac rehabilitation walking programmes.

## The effect of compression garments on exercise performance in the heat

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The capacity to exercise is reduced in hot environments due to reduced aerobic power, increased anaerobic metabolism, greater cardiovascular strain (Bergh and Ekblom, 1979: *Journal of Applied Physiology*, **46**, 885-889) and reduced central activation of myofibrils (Nybo and Nielsen, 2001: *Journal of Applied Physiology*, **91**, 1055-1060). Heat loss mechanisms employed by the body increase physiological demands of exercise yet are inadequate to prevent a rise in core temperature ( $T_{\text{core}}$ ) thus attenuate exercise performance (Bergh and Ekblom, 1979). Therefore, methods to reduce  $T_{\text{core}}$  may aid performance. Compression garments (CG) are designed to lower  $T_{\text{core}}$  by aiding evaporative heat loss yet there is limited research to support this (Houghton et al., 2007: *Journal of Science and Medicine in Sport*, **12**, 303-309). This study therefore aimed to investigate thermoregulatory, physiological and performance effects of CG during exercise in heat (35°C, 32%RH). Eight unacclimatised trained males ( $20.7 \pm 0.7$  years;  $163.6 \pm 7.7$  cm;  $85.9 \pm 9.9$  kg) completed 45 min at 90% of lactate threshold as calculated by Hagberg and Coyle (1983: *Medicine and Science in Sports and Exercise*, **15**, 287-289) followed by a 5 km time trial (TT). Nude mass was measured on arrival to the lab and post TT. A rectal thermometer inserted 10 cm beyond the anal sphincter was used to measure  $T_{\text{core}}$ , skin temperature ( $T_{\text{skin}}$ ) was measured using the four site method of Ramanathan (1964: *Journal of Applied Physiology*, **19**, 531-533). During steady state exercise  $T_{\text{core}}$ ,  $T_{\text{skin}}$  and HR were recorded every 5 min and capillary blood samples were taken every 15 min. Power output (w), time (min), HR and temperature were recorded every 1 km of the TT. Plasma volume was calculated from changes in haematocrit and haemoglobin (Dill and Costill, 1974: *Journal of Applied Physiology*, **37**, 247-248) while heat storage and rates of evaporation were calculated as shown in Tucker et al., (2006: *Journal of Applied Physiology*, **23**, 905-915). Repeated measures ANOVA and paired t-tests were used to compare dependant variables with an alpha level of  $p < 0.05$ . There was no significant difference in  $T_{\text{core}}$ , ( $p = 0.86$ ), plasma volume ( $p = 0.93$ ), rate of evaporation ( $p = 0.94$ ), HR ( $p = 0.41$ ), blood lactate ( $p = 0.24$ ) or heat storage ( $p = 0.09$ ), between conditions. However, when wearing CG 5 km time was reduced by 11% (CG =  $8.5 \pm 0.6$  s, no CG =  $9.2 \pm 0.9$  s,  $p < 0.01$ ) and mean power output was increased by 14.5% (CG =  $248.6 \pm 41.4$  w, no CG =  $217.1 \pm 16.6$  w,  $p < 0.01$ ). The results of this study suggest that while CG have limited thermoregulatory benefits during exercise in the heat, they have a positive effect on 5 km TT performance.

## The effectiveness of an MG-A imagery intervention on changing debilitating interpretations of pre-competitive anxiety in university track athletes

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The direction of athletes' pre-competitive anxiety refers to their interpretation of the intensity of their anxiety as either facilitative or debilitating. Jones' model (1995: *British Journal of Psychology*, **86**, 449-478) conceptualised control as the cognitive appraisal of the degree of certainty a performer has over their environment and self, predicting that successful performances are linked with facilitative anxiety interpretations. To help ameliorate debilitating anxiety interpretations, imagery techniques have been successful in assisting athletes to restructure their cognitions and learn to reinterpret anxiety symptoms as facilitative (Jones *et al.*, 2004: *Anxiety, Stress and Coping*, **17**, 187-199). Therefore, the purpose of the present study was to examine the effectiveness of an MG-A imagery intervention in changing debilitating interpretations of pre-competitive anxiety in university track athletes. Following institutional ethical approval, ten university track athletes (mean age =19.7,  $s=1.3$  years) reporting debilitating anxiety interpretations were split into experimental and control groups. The groups were dependent on athletes' imagery ability, assessed using the *Revised Movement Imagery Questionnaire* (Hall and Martin, 1997: *Journal of Mental Imagery*, **21**, 143-154). Following this, groups completed the Competitive State Anxiety Inventory –2D (Jones and Swain, 1992: *Journal of Personality and Individual Differences*, **17**, 653-663) pre and post the intervention to monitor the direction and intensity of their pre-competitive anxiety symptoms. Individualised MG-A imagery scripts were developed and employed throughout the six week intervention. The *Sport Imagery Questionnaire* (Hall *et al.*, 1998: *International Journal of Sport Psychology*, **29**, 73-89) was used as a manipulation check to ensure MG-A imagery was being utilised. A series of 2-way repeated measures Analyses of Variance (ANOVA) revealed significant interactions for both cognitive ( $F_{(1, 8)}= 6.180, P<0.05$ ) and somatic ( $F_{(1, 8)}= 13.133, P<0.05$ ) anxiety interpretation scores and for somatic anxiety intensity scores for the experimental group ( $F_{(1, 8)}= 14.24, P<0.05$ ). Follow up independent t-tests revealed a significant difference ( $P<0.05$ ) for post somatic anxiety scores. Paired t-tests revealed a significant difference for pre-post somatic anxiety interpretations and pre-post cognitive anxiety intensity scores ( $P<0.05$ ). The results suggest that an MG-A imagery intervention is influential in helping performers manage the somatic dimension of their pre-competitive anxiety. These findings are not surprising since MG-A imagery aims to target the physiological elements of anxiety. From an applied perspective, findings reinforce Martin *et al.*'s (1999: *The Sport Psychologist*, **13**, 245-268) recommendation for athletes to use MG-A imagery as an arousal regulation strategy, targeting somatic anxiety.

## **Embodied identity negotiation between amateur boxers and university footballers**

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This study explored how two male university footballers and two male amateur boxers experienced and used their bodies to shape and maintain identities within and outside of specific sporting contexts. In-depth interviews and informal participant observation were used to collect data. Further, as a male university student who inhabits and attempts to maintain identities within both of these sporting sub-cultures, I included self-narratives to shed further light on some of my own identity dilemmas as part of this negotiation. Drawing upon the work of Goffman (1969: *The Presentation of Self in Everyday Life*, Harmondsworth: Penguin), Donnelly and Young (1988: *Sociology of Sport Journal*, vol. 5, 2, 223-240) and Frank (1991: in *The Body*, edited by M. Featherstone, M. Hepworth and B. Turner, London: Sage) as part of an interpretive framework, findings highlight how identities and specific body types suggested by Frank (1991) ebb and flow with social interactions. Based upon these body-self relationships, University footballers took more risks with their bodies in society in order to preserve and maintain a footballer identity; a luxury that amateur boxers were not afforded as related to connections between body usage and social class. For example, as a working class male returning to education from manual labour, my own experiences illuminated some of these differences, which include the difficulties in managing identity dilemmas based upon social class as embodied. The findings indicate that transitioning from one identity to the other may be both problematic and contradictory.

## VO<sub>2</sub> plateaux elicited at a 'submaximal' VO<sub>2max</sub> in supramaximal VO<sub>2max</sub> verification tests

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Since the concept's inception, testing of maximal oxygen uptake (VO<sub>2max</sub>) has become the most commonly used physiological assessment in exercise physiology research. The importance of elucidating true VO<sub>2max</sub> therefore has widespread implications, though doubts remain as to whether traditional VO<sub>2max</sub> criteria are valid (Noakes, 1997: *Medicine Science Sports and Exercise*, 29, 571-590). The main purpose of the present study was to investigate the incidence of a VO<sub>2</sub> plateau during a ramped treadmill VO<sub>2max</sub> test and three subsequent verification tests, in ten male and eight female competitive runners and triathletes (aged between 18 and 49 yr). With institutional ethical approval, fully informed volunteers ran to the limit of their exercise tolerance on a 1% inclined motorised treadmill, which increased in speed at a rate of 0.2 km·hr<sup>-1</sup> every 12 s. Ten minutes after ramp test termination, a four stage incremental verification test was completed to the limit of tolerance at 105% of maximal treadmill velocity (vVO<sub>2max</sub>). Three and six hours after the first verification test, two further verification tests were performed at 110% and 115% vVO<sub>2max</sub>, respectively. Oxygen uptake and heart rate were recorded throughout the ramp and verification tests. Median (interquartile range) VO<sub>2max</sub>: males 58.3 (14.6) mL·kg<sup>-1</sup>·min<sup>-1</sup>, females 48.1 (3.1) mL·kg<sup>-1</sup>·min<sup>-1</sup>; verification test one: males 53.8 (20.3) mL·kg<sup>-1</sup>·min<sup>-1</sup>, females 46.9 (4.6) mL·kg<sup>-1</sup>·min<sup>-1</sup>; verification test two: males 55.4 (16.6) mL·kg<sup>-1</sup>·min<sup>-1</sup>, females 44.8 (8.8) mL·kg<sup>-1</sup>·min<sup>-1</sup>; verification test three: males 52.5 (12.1) mL·kg<sup>-1</sup>·min<sup>-1</sup>, females 44.5 (10) mL·kg<sup>-1</sup>·min<sup>-1</sup>. Using eleven breath rolling averaged VO<sub>2</sub>, a repeated measures one-way ANOVA found significant differences between mean VO<sub>2max</sub> and each mean verification VO<sub>2</sub> peak, (F = 12.9, p < 0.001). Pairwise comparisons found significant differences between ramp and verification tests one (p < 0.05), and two and three (p < 0.001). In the absence of traditionally used criteria, VO<sub>2max</sub> verification has been repeatedly demonstrated using verification tests following ramp and incremental exercise tests continued to the limit of exercise tolerance (Midgley and Carroll, 2009: *Scandinavian Journal of Medicine Science and Sports*, 19, 313-322). In the present study, however, some physiological factor appears to have limited the ability of trained endurance athletes to repeatedly elicit VO<sub>2max</sub> during supramaximal verification phases, even though in many cases VO<sub>2</sub> plateaux were apparent at exercise termination. Further research is clearly necessary to establish VO<sub>2max</sub> criteria based on validity not tradition.

## **Can cycling performance in a morning laboratory-based cycle time-trial be improved by the timing and level of light exposure the day before?**

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Circadian rhythms in humans can be altered by the acute timing of bright light exposure the day before (Minors et al., 1991: *Neurosci Lett*, **133**, 36–40). Morning exposure to bright light may advance the rhythm of exercise performance hence confer an advantage on morning time-trial performance the next day. Whereas noon light exposure should have no effect and evening exposure should delay the rhythm hence disadvantaging performance. Therefore, we investigated if morning time-trial performance is affected by the time at which light exposure is given (either bright 10,000 lux or room intensity 250 lux) the previous day. Six male recreational cyclists (mean  $\pm$  sd: age  $21 \pm 1$  years; body mass  $78.4 \pm 10.4$  kg; height  $179.1 \pm 5.7$  cm) completed this study. The local Ethics Committee of the University approved the study. The subjects completed three familiarisation trials to the best of their ability at a self-selected pace. The subjects then undertook four separate conditions exposed to i) bright light (10,000 lux) in the morning (08:00-09:00 h), ii) bright light in the afternoon (12:00-13:00 h), iii) domestic room light (250 lux) in the morning (08:00-09:00 h), and iv) bright light (10,000 lux) in the evening (03:00-04:00 h). The day after each condition the subjects completed a 16.1 km cycle time-trial. Heart rate, rating of perceived exertion (RPE), power output, thermal comfort (TC) and time were recorded at rest and every 1.61 km during the trial. Finishing time was also recorded. Data were analysed using an analysis of variance model (condition [4 levels]) for performance times. A two-way analysis of variance model (condition [4] x time-trial distance [10]) was used for RPE, HR, TC, power output and split times. A final abstract had not been submitted at time of printing

## **The effect of short-term heat acclimation on 5 km running performance in a temperate environment**

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Moderate ambient temperatures ( $\sim 21^{\circ}\text{C}$ ) are known to present sufficient heat stress that result in elevated core temperatures and a reduced endurance capacity (Galloway and Maughan, 1997: *Medicine and Science in Sports and Exercise*, **29**, 1240-1249). Even over short durations of high-intensity running (i.e. 20-30 min) there is evidence of substantial heat strain while exercising in temperate conditions (Adams et al., 1975: *Journal of Applied Physiology*, **38**, 1030-1037; Lee and Haymes, 1995: *Journal of Applied Physiology*, **79**, 1971-1976). Runners that train in temperate conditions demonstrate partial heat acclimation (HA), (Piwonka and Robinson, 1965: *Journal of Applied Physiology*, **22**, 9-12), which suggests that further acclimation may still confer some advantage to endurance performance. Short-term HA (i.e. 4 days) alleviates heat stress by reducing the rate of rise in core temperature and improving thermal comfort, thus enhancing exercise tolerance (Sunderland et al., 2008: *British Journal of Sports Medicine*, **42**, 327-333). The purpose of this study was to identify whether short-term (4-days) HA would alleviate heat strain and improve 5 km running performance in a temperate environment. With university ethics approval, twelve unacclimated, recreational runners were recruited to this study. Participants were assigned to either a HA ( $33^{\circ}\text{C}$ , 50% relative humidity) or control ( $19^{\circ}\text{C}$ , 35% relative humidity) group, both which involved four, 35 minute cycle sessions on consecutive days at 60%  $\text{VO}_2$  max. Prior and subsequent to the 4-day intervention, participants performed a self-paced 5 km time trial on a motorised treadmill. Rectal temperatures ( $T_r$ ) and 1 km split times were recorded throughout the 5 km time trials. Paired sample t tests between pre and post HA data ( $n = 6$ ) showed a significant reduction in  $T_r$  ( $1.5^{\circ}\text{C}$  pre vs.  $1.2^{\circ}\text{C}$  post;  $P = 0.043$ ) and a significant reduction in split times during the 5 km run ( $p < 0.05$ ) following HA. No significant differences in  $T_r$  or split times were observed in the control group ( $n = 6$ ). These findings support Sunderland and colleagues, (2008: *British Journal of Sports Medicine*, **42**, 327-333) who reported improvements in exercise tolerance from short-duration HA. Data suggests that four sessions of HA may incur physiological changes that alleviate heat strain and enhance 5-km running performance in a temperate environment.

## **Developing decision making skill in youth footballers**

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The study aimed to enhance the development of decision making capabilities of semi professional footballers, with the specific focus of developing attacking patterns of play. Eighteen male club youth footballers, aged 16-18 participated in this investigation. Six league football matches were videoed during the 2009-2010 season. Performance indicators were identified by expert coaches and 10 attacking turnover situations in the midfield were identified from each match and recorded (Focus X2). These clips were reviewed by a panel of three expert coaches working in the club to establish correct decisions of attacking play. The first contact session with the players established a team playing philosophy in relation to attacking patterns. Over the period of six weeks 10 clips from each of the previous weekend league games were reviewed by the players in a team environment. A period of two days elapsed between the league game and the review session enabling footage to be analysed and for clips to be selected and verified. Players independently completed a decision book at each video session requiring them to state the correct course of action for all clips, based on their playing philosophy. Clips 1 – 4 and 6 – 9 required a group discussion on what the correct outcome was. Players identify for clips 5 and 10 respectively the correct decision and action to be made by the team and individuals to successfully create attacking patterns of play; this was outlined in a written format. Following the completion of the respective 'clip sheet', the discussion of the clip was facilitated at a group level under the guidance of the coach. Both qualitative and quantitative analysis was conducted on the data. Repeated measures ANOVA with post hoc test was used to assess the number of correct decisions from the players between the weeks. Content analysis was used to assess the depth of the players' responses. Results are discussed in relation to the development of a team decision making model to enhance the development of a football team's attacking play. Preliminary data indicates that the process of analysing video clips that reflect real situations has resulted in a greater number of correct decisions being made by the players and a more complete understanding of the team philosophy. Further analysis of whether this has been transferred to the actions of the players has yet to be made.

## Six weeks of whole body vibration improves insulin action in sedentary young adults

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Regular exercise is known to improve risk factors for chronic metabolic disease but the current physical activity guidelines frequently fail to stimulate adherence in the general population, with time and feelings of discomfort often stated as major barriers to exercise compliance. Whole body vibration (WBV) is a time and intensity efficient training strategy which has been shown to improve glycaemic control in a type 2 diabetic population (Baum et al, 2007: *International Journal of Medical Sciences*, 4, 159-163). However, the effects in normoglycaemic individuals have not been investigated. This study aimed to determine the effect of six weeks whole body vibration training on insulin action in sedentary young adults. Following ethical approval, five healthy young sedentary subjects (2 male and 3 female: mean  $\pm$  SD, age:  $19 \pm 1.6$  y, BMI:  $24 \pm 2$  kg.m<sup>-2</sup>, VO<sub>2</sub>peak:  $37.9 \pm 9.7$  ml.kg<sup>-1</sup>.min<sup>-1</sup>) completed 3 sessions of WBV each week for 6 weeks with the intensity of vibrations increasing each week. The plasma glucose, insulin and non-esterified fatty acid (NEFA) response to a 75g glucose load (oral glucose tolerance test, OGTT) were determined in the week prior to training and 48 hours after the final training bout. Female subjects were assumed to be at the same stage of the menstrual cycle pre and post due to time between measurements. Pre- and post responses to the OGTT were analysed using a two way ANOVA with post hoc Sheffe testing. Differences in pre- and post training area under the plasma glucose, insulin and NEFA curves and peripheral insulin sensitivity, as measured by the Cederholm index, were examined using 2 tailed paired sample t-tests. Following 6 weeks of WBV the area under the plasma glucose (-9%,  $P = 0.06$ ), plasma insulin (-25%,  $P = 0.35$ ) and plasma NEFA (-29%,  $P = 0.055$ ) curves decreased during the OGTT. Fasting plasma glucose and insulin concentrations were unchanged but there was a significant reduction in fasting plasma NEFA concentration (-36%,  $P < 0.05$ ). Furthermore, there was a non significant rise in peripheral insulin sensitivity (27%; Cederholm Index) post training. These results suggest that this novel time and intensity efficient exercise strategy has the potential to improve metabolic risk factors in a young sedentary population and warrants further investigation in a larger cohort and in populations unsuited to traditional exercise such as frail elderly.

## Use of TRIMP<sub>MOD</sub> to quantify the in season training load of semi-professional soccer referees

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The aims of the study are to examine the relationship between TRIMP<sub>MOD</sub> (Stagno et al., 2007: *Journal of Sports Sciences*, **25**, 629-634) and changes in the fitness levels of semi-professional soccer referees over a six-week period during the competitive season. Eight male soccer referees; officiating in the JJB Sports™ Premier League; took part in the study (mean ± s: age 37 ± 6 years; body mass 78.7 ± 6.7 kg; and stature 174.4 ± 5.3 cm). Each participant performed a sub-maximal treadmill exercise test to allow for the calculation of TRIMP<sub>MOD</sub>. The test was adapted from Heck et al. (1985: *International Journal of Sports Medicine*, **6**, 117-130) and consisted of 4 x 4-min exercise bouts at running speeds of 10, 12, 14 and 16 km · h<sup>-1</sup> at a fixed gradient of 2 %. In the 1-min interval between bouts, a capillary blood sample was taken from the fingertip and analysed for lactate (Analox Microstat GM7, Analox Instruments Ltd, London, UK). Heart rate was recorded using short-wave telemetry (Polar Accurex Plus, Polar Electro, Kempele, Finland) throughout the trial. Following the test, blood lactate concentrations were plotted against speed and heart rate. The speed at 4 mmol · l<sup>-1</sup> (V<sub>OBLA</sub>), heart rate at 1.5 mmol · l<sup>-1</sup> (HR<sub>LAC</sub>) and 4 mmol · l<sup>-1</sup> (HR<sub>OBLA</sub>) were identified via linear interpolation (Usaj & Strac, 1996: *International Journal of Sports Medicine*, **17**, 34-40). The protocol identified by Stagno et al. (2007) for the production of TRIMP<sub>MOD</sub> was replicated. A sub-maximal field test was performed at the start of the competitive season and 6 weeks later. Heart rate was recorded during all training sessions and match-play; from which TRIMP<sub>MOD</sub> was calculated. Mean weekly TRIMP<sub>MOD</sub> (391.93 ± 162.35) was not correlated with change in 6-minute sub-maximal Yo-Yo Intermittent Recovery Test from the start (92.8 ± 5.7 % of HR<sub>max</sub>) of to 6 weeks (93 ± 10.9% of HR<sub>max</sub>) into the competitive season (P>0.05). The results do not support existing research (Stagno et al., 2007), which suggests that TRIMP<sub>MOD</sub> is means of quantifying training load in intermittent sports.

## **Assessing the cardiovascular and behavioural impact on an autistic individual's ability to learn: A case study.**

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Autism is a severe learning disability that manifests into many forms of behaviour. The relationship between behaviour and learning is widely researched, with stereotyped behaviour shown to have a negative effect on an individual's ability to learn (O'Brien and Pearson, 2004: *Autism*, **8**, 125-140). Furthermore autistic individuals are thought to suffer from sensory processing dysfunction, resulting in either hypo- or hyper- aroused states. The syndromes unconventional arousal response is linked to several stereotypical behaviours (rocking/flapping/echolia/obsession of objects). In addition the cognitive states of arousal also exhibit somatic symptoms which are relatively non-invasive to assess. Previous research (Goodwin et al, 2006: *Focus on Autism and Other Developmental Disabilities*, **21**, 100-123) has assessed heart rate (HR) (POLAR: Polar Team2 Pro: Kempele, Finland) to observe arousal states. However to the author's knowledge no previous studies combine the observation of learning, behaviour and cardiovascular arousal and consequently do not adequately evaluate the interacting relationships. The purpose of this study is to further explain the behavioural, arousal and learning enigma of autism by assessing all three variables in relation to each other. A male autistic adolescent, age 17, was selected from a specialist autistic school in Hampshire. The study received ethical clearance from the Heath Exercise and Sport Science ethics committee in accordance with the mental capacity act (2005) in addition informed consent from the parent was received prior to the experiment. The adolescent was also informed of the study using a combination of a social story and the picture exchange communication system (Bondy and Frost, 1994: *Focus on Autism and Other Developmental Disabilities*, **9**, 1-19). Prior to data collection a 2 week period was introduced to acclimatise the participant to the HR monitor and camera. The protocol consisted of three P level curriculum activities for the adolescent to undertake (i.e. a literacy and motor skill task which required the participant to copy shapes), the tasks were completed 3 times per week. The adolescent sat with a familiar staff member to complete the task. After each week less support was given to the adolescent to complete the task. Behaviour and HR were monitored throughout the task. Finally, learning ability was assessed 3 weeks subsequent to the task initiating. HR data was exported to Microsoft Office Excel (Microsoft UK: Berkshire, UK), behavioural data was input analogous to the HR data after being viewed and described into forms of stereotyped behaviour (i.e. jumping, rocking and obsession of an object). The learning effect was categorized into time until task completion and prompts received.

## Energy balance in low and high physically active children

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Regular physical activity is important in the regulation of energy balance and body composition. However, there is some evidence that the coupling between energy expenditure and energy intake is less at low compared to high levels of physical activity. Therefore, the purpose of this study was to investigate the relationship between energy balance and BMI in a group of high and low active children. The study was approved by the University Ethics Committee. Fourteen boys age  $13.4 \pm 1.0$  years (mean  $\pm$  s) and 12 girls  $13.5 \pm 0.9$  years and body mass  $53.5 \pm 10.4$  kg and  $51.8 \pm 10.1$  kg respectively were categorized as either high (n = 8 (B), 6 (G)) or low active (n = 6 (B), 6 (G)). All participants took part in training sessions on portion size estimation. Participants then maintained a four day record of food intake and simultaneously wore an ActiGraph GT1M accelerometer. Accelerometer data was converted into energy expenditure units according to Puyau's prediction equation (2004: *Medicine and Science in Sports and Exercise*, 36, 1625 -1631). Four day mean energy intake and expenditure showed that high active girls were in negative energy balance ( $-222 \pm 396$  kcal·d<sup>-1</sup>) while low active girls were in positive energy balance ( $+365 \pm 429$  kcal·d<sup>-1</sup>). Both high active and low active boys were found to be in negative energy balance ( $-697 \pm 282$  kcal·d<sup>-1</sup> and  $-258 \pm 891$  kcal·d<sup>-1</sup>) respectively. No significant relationships were found between energy intake and body mass index in both boys and girls ( $r = -0.01$ ,  $P = 0.98$ ,  $r = -0.10$ ,  $P = 0.75$ ) respectively. No significant correlation between BMI and physical activity ( $r = -0.01$ ,  $P = 0.75$ ) was revealed in girls, whereas a strong negative association with skinfolds was found ( $r = -0.82$ ,  $P < 0.01$ ). In boys, there was significant but moderate inverse association between BMI and physical activity ( $r = -0.46$ ,  $P = 0.04$ ). Previous studies in children have failed to collect energy intake and physical activity data on the same days unlike our study. The energy intake-expenditure coupling appears less for low active children but better for higher activity patterns, hence high active children were in greater negative energy balance. Consequently, increasing regular physical activity may help reduce fat gain which would have ramifications for healthier long term weight balance.

## **The influence of activity type and gender on physical activity levels during Physical Education (PE) lessons**

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In the context of rising childhood obesity levels, this study investigated the potential role of PE in providing time for health-promoting physical activity. PE lessons delivered within school-time are the only opportunity that some children get to partake in physical activity. The National Institute for Health and Clinical Excellence (NICE, 2009: *Promoting physical activity, active play and sport for pre-school and school-age children and young people in family, pre-school, school and community settings*. London: NHS, NICE) suggests that young people should aim to participate in various activities at a moderate to vigorous intensity for a minimum of 60 minutes a day. It has also been proposed that for pupils to be classed as active during PE they must be involved in moderate to vigorous physical activity (MVPA) for at least 50% of the lesson, but evidence suggests that typically such targets are not met. In this study the potential for PE lessons to be a significant contributor to children's physical activity levels was investigated in boys and girls, with a particular focus on whether the type of activity had an influence on MVPA. After gaining ethical approval, thirty-two children (17 girls, 15 boys) aged 11-12 years from two Bedfordshire Middle Schools were recruited for the study. Children wore RT3 Stayhealthy® accelerometers and Suunto heart rate monitors during two 6 week teaching blocks of PE lessons (netball followed by football for girls and rugby followed by football for boys). For each child the amount of time spent engaging in MVPA in the lesson was recorded as a percentage of total lesson time. T-tests were employed to determine whether there were differences in MVPA time according to activity type (paired), and between genders (unpaired). In girls, average time spent in MVPA was significantly higher during football versus netball ( $50.93 \pm 5.76$  versus  $46.22 \pm 4.39\%$ ,  $P < 0.05$ ), and in boys % MVPA was significantly higher during football versus rugby ( $59.31 \pm 6.95$  versus  $40.72 \pm 7.26\%$ ,  $P < 0.05$ ). A non-significant trend for greater % MVPA time in boys versus girls was also noted ( $P > 0.05$ ). In conclusion, the results suggest that the type of activity had a significant effect on MVPA during PE lessons as boys and girls spent longer in MVPA during football than their alternative activity ( $P < 0.05$ ). Such findings may relate to differences in pedagogical teaching strategies, level of skill development, motivation and enjoyment and warrants further research.

## **The effect of high intensity training in aerobic and anaerobic performance in adolescent females**

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Burgomaster et al (2005, *Journal of Physiology*, **98**, 1985-1990) demonstrated that six high intensity interval training (HIT) sessions over 2 weeks can increase aerobic performance in adult males. However, limited information exists on the aerobic and anaerobic response to this type of training in adolescents, especially females'. Therefore, the aim of this study was to investigate the effects of HIT on the aerobic and anaerobic performance of adolescent females. It was hypothesised that 3 weeks HIT would elicit improvements in time to exhaustion (TTE), heart rate (HR), peak and mean power (PP, MP) and fatigue index rate (FI). Ten adolescent females (aged  $16.2 \pm 0.5$  years) performed an incremental stage cycle test to exhaustion prior to, and following a 3 week HIT programme. Six participants completed a control condition before completing the HIT protocol. The HIT programme included 3 sessions  $3 \text{ times} \cdot \text{week}^{-1}$ . Sessions in weeks 1 and 2 involved  $3 \times 20$  sec all out cycle sprints against a fixed resistance of  $0.06 \text{ kg} \cdot \text{kg}^{-1}$  with 3 min active unloaded recovery between sprints. In week 3, the participants completed 4 sprints/session. Using two-factor repeated measures ANOVAs it was demonstrated that training led to an increase in time to exhaustion during the incremental stage test by 24.9% ( $8.88 \pm 1.43$  vs  $11.09 \pm 2.14$ , min,  $p < 0.001$ ), and a decrease in HR (8.8%) at the end of stage one of the incremental tests ( $160 \pm 14$  vs  $146 \pm 13$ , bpm,  $p < 0.01$ ) with no significant changes in the control condition. PP did not significantly increase as a result of training; however there was a significant increase in MP and significant decrease in FI with the 3 week training programme. . It can be concluded that 3 weeks of HIT improves TTE, HR, MP, and FI. Although this intuitively indicates an improvement in both aerobic and anaerobic performance, the absence of an improvement in PP suggests a most likely training adaptation of aerobic metabolism, and potentially some adaptation of the lactic-anaerobic system.

## **Social physique anxiety and attention towards specific body areas: Will this vary according to body examined and level of anxiety?**

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In recent years it has become evident through meta-analysis and surveys that body image perceptions are worsening (Cash, 2004: *Body Image*, **1**, 1-5). Individuals, specifically women and girls, have developed higher rates of body image disturbance and dissatisfaction a trend that has increased in recent decades. Social Physique Anxiety (SPA) has been strongly associated with body dissatisfaction and body image distortion (Koca & Hulya, 2006: *Adolescence*, **41**, 185-197). However much of the research fails to examine those with extreme scores. SPA research has primarily focused on the cognitive and behavioural outcomes; few studies have examined the potential influence on visual attention. The purpose of the present study was to examine the eye fixation differences between participants with high and low SPA, as measured by scores on the Social Physique Anxiety Scale (SPAS, Hart *et al.*, 1989: *Journal of Sport & Exercise Psychology* **11**, 94-104). More specifically, when attending to body areas, namely the waist, hips, lower and upper arms and lower and upper legs. An independent group, quasi-experimental design was used and inclusion was restricted to females scoring in the upper and lower tertiles of the SPAS (low=12-28; high=44-60). Twenty Seven female university students completed the SPAS (mean age=20; SD±1), from this group, sixteen met the inclusion criteria and volunteered for participation in the experiment. The high SPA group and the low group each contained 8 participants. Following selection, participants were exposed to 5 images of females possessing different body shapes (namely, ectomorph, endomorph, mesomorph, athletic-ectomorph and athletic-mesomorph) while wearing eye tracking headwear in order to track the point of eye gaze and calculate the dependent variable of the number of fixations on each area. Descriptive statistics will be used to establish if the assumptions of parametric tests are met. To examine differences between high and low SPA females in terms of visual attention to specific body areas independent t-tests will be used. It is hypothesised that participants scoring highly on the SPAS will show increased attention to the chosen body areas. Furthermore, it is anticipated that there will be a difference in the eye fixations of individuals dependent upon the body shape examined. Evidence from this study will be discussed in terms of SPA and visual attention towards body areas of dissatisfaction.

## **An exploratory investigation of superstition, personal control, learned helplessness and coping**

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Superstition has been defined as “reactions which are repetitive, formal, sequential, distinct from technical performance and which the athletes believe to be powerful in controlling luck or other external factors” (Bleak & Frederick, 1998: *Journal of Sport Behavior*, **21**, 1-15. P.2). These rituals can come in the form of ice baths before a football game or listening to a certain song before a gymnastics event. Past research has differentiated between superstitious behaviors and pre-performance routines. Superstitious behavior is an act that has no obvious technical function in skill execution, and involves behaviours that athletes initiate to gain a feeling of control, when actual control is perceived as unlikely or unattainable (i.e., secondary control, primary control is when attempts are made to change outcomes instrumentally). The purpose of this study is to explore the possible relationships among personal control, learned helplessness, and coping with superstitious behaviors. The participants for the study will be university students from UK and Ghana; they will complete the Superstitious Ritual Questionnaire, Superstitious Belief Scale, Belief in Personal Control Scale, Brief COPE, Measurement Instrument for Primary and Secondary Control Strategies, and the Maladaptive Achievement Pattern Questionnaire. Analysis of variance procedures will be employed to analyze the results. It is hypothesised that analysis of variance will reveal significant interactions between superstitious behaviour and the individual difference measures (learned helplessness, control strategies, and coping skills). Findings will inform further research which aims to use the Theory of Challenge and Threat States in Athletes (Jones, Meijen, McCarthy & Sheffield, 2009: *International Review of Sport and Exercise Psychology*, **2**, 161-180) to determine the extent to which superstition serves as a secondary control strategy to be used as a buffer for life and career stressors when primary control fails.

## Effects of brisk walking on chocolate snacking, during a low and high stress task, and chocolate cravings.

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Stress detrimentally effects eating behaviour (i.e., food choice, appetite, and energy intake), partly to self-regulate negative mood states (Gibson, 2006: *Physiology & Behavior*, **89**, 53-61). Exercise can acutely reduce chocolate cravings (Taylor & Oliver, 2009: *Appetite*, **52**, 155-60) but no studies have considered the effects on cravings and snacking under conditions of low and high stress. This study aimed to examine if manipulated stress is associated with increased chocolate consumption, and if exercise moderates this effect. Forty subjects (16 males, 24 females), age  $28.3 \pm 10.1$  years, BMI  $23.9 \pm 4.0$  recorded a 3-day chocolate diary and refrained from eating for 3 hours before coming to the laboratory. They were randomly assigned one of four conditions, in a 2 x 2 factorial design involving exercise (i.e., a 2 min warm-up and 15 min brisk walk, at a rating of perceived exertion of 11 to 13) or rest (i.e., sitting quietly for 15 min without reading materials), and a high or low-stress condition. The stressor involved a Stroop colour-word interference task under low (3 sec inter-stimulus interval; LS) and high-stress (HS) conditions (1 sec), performed in three 180 sec blocks and 90 sec intervals between blocks. Throughout the session, on the table besides the computerised Stroop task, a pre-weighed bowl with unwrapped chocolates (i.e., maltesers and buttons) in it was placed and participants were informed that they may help themselves to as many as they wished. After the Stroop task chocolate cravings (FCQ-S) were assessed before and after opening a chocolate bar. Participants were asked to eat it and their satisfaction was assessed with a simple question. Mixed repeated measures ANOVA revealed that there was no interaction effect of exercise and stress on total chocolate consumption [ $F_{(1, 36)} = 1.70, p > .05$ ]. However, after removing participants who ate no chocolate from the analysis, there was a significant interaction [ $F_{(1, 27)} = 5.61, p < .05$ ]; only after rest there was a significant difference between HS and LS [ $t_{(12)} = -3.06, p < .01$ ]. Opening a chocolate bar increased chocolate cravings, especially under HS [ $F_{(1, 16)} = 20.56, p < .001$ ], but exercise did not moderate this effect. Thus exercise may reduce chocolate consumption in the situations that elicit boredom (i.e., low stress), but not during high stress as anticipated. Further research is needed to explore how exercise impacts on mood-induced eating behaviour, particularly high energy snacking.

## The 'coolness' of sport psychology

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Performance enhancement with elite athletes continues to dominate media attention exciting prospective students who perhaps perceive that applied sport psychology (ASP) would be 'cool' to study regardless of whether there are opportunities open to them for careers in this field. While there has been increasing research on practitioner development (Tod, 2007: *The Sport Psychologist*, 21, 94-108), there has little research focusing on postgraduate students and their early experiences of ASP practice. Understanding these student's perceptions of ASP practice and their motivation to embark on a practice career might add to knowledge on practitioner development, and provide useful information to guide university tutors and supervisors. Therefore the purpose of this research was to explore student's preconceptions of ASP who were initiating their first steps in pursuit of a career in ASP. Individual in-depth semi-structured interviews were conducted with 7 MSc students prior to the start of a module in ASP. An interview schedule was developed in order to explore their beliefs, motivations and experiences of practice. Thematic analysis provided main themes: perceptions about applied sport psychology practitioners, perceptions of the nature of ASP practice and the practitioner role, personal motivations to engage in an ASP practice career, and views on career opportunities. Initially, students were reliant upon the practitioner for practical guidance, direction and structure. Furthermore, despite the fact that the majority of participants had extremely limited applied experiences they placed high expectations that they would have the opportunity to work with elite athletes on completion of their MSc or shortly afterwards. There was also evidence that students were motivated to pursue a practice career to meet a range of 'self-gratifying' needs (e.g. glory seeking, fame, status, need to be needed) that Andersen (2005: *Touching taboos: Sex and the sport psychologist*. In *Sport psychology in practice*, pp. 171-191, Champaign, IL: Human Kinetics) highlights as dysfunctional. The findings of this research add to the existing knowledge of practitioner development, specifically providing information on why students may pursue a career in ASP. Additionally, they may assist post-graduate and practice-training providers prepare and provide for students who initiate an applied practice career. They indicate the importance of structured reflection which help students become more aware of, and work through their own motives and needs. Perhaps it is important for supervisors to intervene at Undergraduate level and highlight realistic career opportunities which might help prepare students and plan their professional careers, growth and development.

## The effects of sodium bicarbonate ingestion on exhaustive bench press performance

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The objective of the current investigation was to examine the ergogenic potential of sodium bicarbonate on multiple high resistance bouts, the final of which performed to exhaustion, on the bench press with varying recovery periods between sets. The following protocol was approved by the departmental ethics committee in which seven resistance trained male participants (characteristics [mean  $\pm$  SD] age:  $20.3 \pm 0.8$  years; height  $176.2 \pm 5.0$  cm; mass  $79.6 \pm 7.4$  kg) completed the study in accordance with satisfying inclusion criteria and completing a medical questionnaire prior to providing their informed consent. The study utilized a single blind, randomised, repeated measures design in which two levels of independent variable were manipulated: 1) ingestion of sodium bicarbonate ( $0.3 \text{ g}\cdot\text{kg}^{-1}$  body mass  $\text{NaHCO}_3$ ) or placebo ( $0.045 \text{ g}\cdot\text{kg}^{-1}$  body mass sodium chloride) and 2) recovery periods between sets which were 60, 120 and 180 seconds respectively; therefore subjects completed six trials in total. Initial data collection involved taking resting capillary blood samples in duplicate ( $\sim 95 \mu\text{l}$ ) for determination of whole blood pH, bicarbonate ( $\text{HCO}_3^-$ ), base excess and performing a one repetition maximum (1RM) assessment on the bench press. During subsequent visits to the laboratory, each separated by one week and at a similar time corresponding to their first visit, subjects completed three sets on the bench press at 70% of 1RM. During the first two sets volunteers were encouraged to complete eight to ten repetitions (reps) before the final set which was completed to exhaustion, in which recovery periods between sets varied according to the condition. In all cases reps were completed at a moderate velocity (approximately two seconds eccentric: two seconds concentric). Subjects ingested either  $\text{NaHCO}_3$  or placebo two hours prior to the execution of the multiple set trials in which blood samples were taken prior to and immediately after the completion of exercise. Results indicated via a repeated measures ANOVA revealed that although pre-exercise blood  $\text{HCO}_3^-$  was elevated in the  $\text{NaHCO}_3$  condition ( $\text{NaHCO}_3$ :  $29.96 \pm 1.5 \text{ mmol}\cdot\text{L}^{-1}$ ; placebo:  $25.83 \pm 0.97 \text{ mmol}\cdot\text{L}^{-1}$ ;  $P < 0.05$ ), no significant differences were evident between the number of reps performed during the final set of the  $\text{NaHCO}_3$  or placebo conditions ( $P > 0.05$ ). However, there was a significant effect for time, as for both conditions the number of reps subsequently increased as the rest periods increased ( $P < 0.05$ ).

**The influence of body mass index (BMI) and percentage (%) body fat on physical activity (PA) levels in physical education (PE).**

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There have been marked increases in the prevalence of childhood obesity in the last two decades, with around three in ten boys and girls aged 2 to 15 being classed as either overweight or obese in 2007. There is also evidence that PA is associated with a reduced incidence of obesity. It is suggested that children should be moderately active for at least 50% of a PE lesson in order to have a significant contribution to the recommended 60 minutes of PA per day, but evidence suggests that PE lessons typically fall short of this target (US Department for Health and Human Services, 2000) (NICE, 2009). The purpose of this study was to investigate whether BMI and % body fat has an influence on PA levels in PE. Subsequent to ethical approval a sample of 32 volunteers (15 boys and 17 girls) aged 11-12 years old were recruited from two local Bedfordshire Middle Schools. Bioelectrical Impedance Analysis (Tanita BC-418®) was used to measure percentage body fat and body mass. Height and weight measurements were used to calculate Body Mass Index (BMI). The children wore tri-axial accelerometers (Stayhealthy RT3 ®) during all PE lessons over 2 x 6 week blocks (which included netball and football for girls and football and rugby for boys) and the percentage of time spent in moderate to vigorous PA (MVPA) was recorded. A Pearson's Correlation was used for statistical analysis of the data. There was a significant positive correlation between BMI and % body fat in both girls and boys ( $r=0.852$ )( $N=32$ ,  $P<0.05$ ). In terms of physical activity data there were significant gender differences. In boys ( $N=15$ ) there was a negative correlation between BMI and MVPA ( $r=-0.266$ )( $P<0.05$ ) and % body fat and MVPA ( $r=-0.358$ )( $P<0.05$ ), but in girls ( $N=17$ ) the correlation between BMI and MVPA was positive ( $r=0.455$ )( $P<0.05$ ). However, there was no significant association between % body fat and MVPA in girls (.375). The gender differences in MVPA relationships with body fat % and BMI may relate to the difference in activity type undertaken by girls and boys. More research is required to determine whether a higher BMI or % body fat in boys predisposes them to engage in less MVPA and whether the reverse is true in girls, and whether activity type (and other PE lesson-related factors) has a more significant influence on MVPA.

## **Exploring the retirement from sport decision-making process: A qualitative investigation**

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The purpose of this study was to explore the retirement from sport decision-making process. The transtheoretical model of behaviour change, which has helped better understand the decision-making process in other areas, was used as a guiding framework in this study. A total of 12 participants took part in one of three focus groups (four current players; five retired players; three coaches) which focused on athletic identity, coping strategies and the coach-athlete relationship. All participants (seven males & five females; mean age  $31.25 \pm 3.49$  years) were either current or former Korean elite level tennis players. Data were thematically content analysed, and the transtheoretical model was used to interpret the findings. Results showed three themes: (a) readiness for sport career end (e.g., perceived gains and losses associated with decision to retire), (b) psychological and emotional responses during the decision-making process (e.g., self-re-evaluation), and (c) coping strategies (e.g., social support). Results indicated that athletes' sport career end decision-making is a dynamic process, which is accompanied by various emotional responses requiring different coping strategies. In addition the findings indicated that the transtheoretical model was helpful in explaining athletes' retirement from sport decision-making. For example, results revealed the influence of athletes' readiness for facing post-sport life on their actual retirement decision.

## Effect of initial metabolic rate on the parameters of the 3-min all-out cycling test in men

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A single 3-min all-out cycling test can be used to estimate the power asymptote (critical power; CP) and the curvature constant ( $W'$ ) of the hyperbolic power-duration relationship for severe-intensity exercise. The CP represents the highest work rate that does not require the expenditure of the finite work capacity denoted by the  $W'$ ; the latter is expended at a predictable rate  $>CP$ . It was hypothesized that when exercise performed immediately preceding the 3-min all-out test was performed  $<CP$  (moderate and heavy exercise), the CP and  $W'$  parameters would be unaffected, whereas preceding exercise of different durations  $>CP$  (severe exercise) would systematically reduce the  $W'$  without affecting the CP. Seven physically active male subjects completed 3-min all-out cycling tests in randomized order on 5 occasions: with the test immediately preceded by unloaded cycling (control; C); 6-min moderate (M); 6-min heavy (H); 2-min severe (S2); or 4-min severe (S4) intensity exercise. The CP was estimated from the mean power output over the final 30 s of the test and the  $W'$  was estimated as the power-time integral above end-test power. Mean  $\dot{V}O_2$  over the final 90 s of the test enabled comparison of  $\dot{V}O_2$  between trials. Data were analyzed using one-way ANOVA. There were no significant differences in the estimated CP between C ( $265 \pm 69$  W), M ( $275 \pm 52$  W), S2 ( $274 \pm 55$  W), or S4 ( $273 \pm 65$  W). However, the estimated CP following H ( $286 \pm 66$  W) was significantly elevated compared to C ( $P < 0.05$ ). The  $W'$  was significantly lower ( $P < 0.05$ ) in S2 ( $11.5 \pm 2.5$  kJ) and S4 ( $8.9 \pm 2.2$  kJ) than in C ( $17.3 \pm 3.1$  kJ), M ( $17.2 \pm 2.4$  kJ) and H ( $15.6 \pm 2.3$  kJ).  $\dot{V}O_2$  during the 3-min test was significantly higher following H ( $4.06 \pm 0.77$  l.min<sup>-1</sup>), S2 ( $3.98 \pm 0.72$  l.min<sup>-1</sup>) and S4 ( $4.06 \pm 0.76$  l.min<sup>-1</sup>) compared to C ( $3.75 \pm 0.78$  l.min<sup>-1</sup>,  $P < 0.04$ ). Consistent with our hypothesis, the  $W'$  was significantly reduced by prior severe-intensity exercise with greater effect for S4 compared to S2. However, while the CP was not different between the C, M, S2 and S4 conditions, it was significantly increased by preceding H exercise. These results are generally consistent with the predictions of the CP concept. The effects of prior H exercise on the parameters of the power-duration relationship warrant further investigation.

## Non-invasive monitoring of exhaled volatile organic compounds using SIFT-MS – the potential for health and exercise physiology

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Breath analysis in exercise physiology is focused primarily around spirometry and the rates of gaseous exchange, particularly oxygen and carbon dioxide. Breath contains a large number of volatile organic compounds (VOCs) and some of these are produced endogenously as by-products of metabolism or infection. Many VOCs are associated with disease/inflammation, including; acetone with diabetes, isoprene with cancer and cholesterologenes, and isoprene/ethane with oxidative stress. With selected ion flow tube mass spectrometry (SIFT-MS) selected VOCs can be detected in trace concentrations (1 ppb) (Smith and Španěl, 2005: In *Breath Analysis for Clinical Diagnosis and Therapeutic Monitoring*, edited by A. Amann and D. Smith, Singapore: World Scientific Publishing Co. Pte. Ltd) but little is known regarding VOC concentrations and exercise. The purpose of this study was to monitor the changes in VOC concentration during the Australian Lung Foundation 6 minute walk test and examine their relationship to blood glucose concentration. With University ethical approval 8 healthy volunteers (mean  $\pm$  sd; age, height, mass, FVC, FEV<sub>1.0</sub>, FEV<sub>1.0</sub>%FVC, resting blood glucose concentration; data is currently being collected), will complete the walk test that was designed for COPD patients. Subjects will complete this normally and with induced respiratory restriction, achieved by wearing a nose clip and oral breathing through a tube (~ 10 mm diameter) to simulate broncho-constriction and induce a greater respiratory challenge. Subjects will exhale 4 breaths into a VOC collection bag and have a fingertip blood sample taken for glucose concentration at rest and upon completion of the test. VOC bags will be analysed with the SIFT-MS for trace concentrations. Descriptive data will be presented and Pearson's product-moment correlation coefficient will be calculated for relationships between blood glucose and VOC. Pilot data from one subject during 5 min cycling at 120 W shows that there is an increase in acetone of 208 ppb, and a more moderate and temporary increase in isoprene of 38 ppb during exercise from resting values, whilst both decrease during recovery. This is consistent with previous findings (Senthilmohan et al., 2000: *Redox Report*, 5, 151-153; Turner et al. 2006: *Physiological Measurement*, 27, 13-22) and data from other compounds such as pentane and acetaldehyde will be presented. The study of VOCs exhaled in breath may provide an insight into many aspects of exercise physiology, including oxidative stress during exercise therapy and exercise induced muscle damage. SIFT-MS technology may be useful in improving the accuracy and understanding of VOCs during exercise to improve therapeutic and athletic interventions.

## Teaching group dynamics in sport & exercise through experiential learning

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The sport and exercise sciences are a dynamic and engaging blend of subjects to be taught, encouraging the use of innovative teaching methods that do this justice. However, many students tend to adopt a *surface* – as opposed to a *deep* - approach to learning (Martin & Säljö, 1976: *British Journal of Educational Psychology*, **46**, 4-11), as reflected in a tendency to be ‘assessment-driven.’ Consequently, student learning can suffer as a result of maladaptive behaviours including, for example, reduced attendance and minimal engagement (Singh *et al.*, 2002: *The Journal of Educational Research*, **95**, 323-332); behaviours that may reflect low levels of self-determined motivation. Therefore, it is imperative for educators to implement module designs that reconcile institutional goals for academic learning and achievement, and fulfil the motivational needs of students’ in terms of autonomy, competence and relatedness. The purpose of this presentation is to document an example of how we have incorporated multiple pedagogical strategies into a new course entitled “Group dynamics in sport and exercise,” in an attempt to address these issues. Students on the module are 92 sport and exercise science and human biology and equine science, level 1 undergraduate students with varying sport and exercise backgrounds. In the introductory lecture, students self-selected equal-sized groups of 6 peers with whom they would work throughout the module to achieve desired outcomes, including a final poster-based assessment (15 groups in total). The nature of the module content ‘group dynamics’ provides an ideal forum to promote group-based *experiential* or *active learning* (Meyers & Jones, 1993: *Promoting Active Learning, Strategies for College Classroom*. San Francisco: Jossey-Bass Publishers). In this way, students actually experience group dynamic principles, rather than simply be passive recipients to the lecturer’s accounts of group dynamic theory and research. Each of the four key module topics is delivered via a two-hour lecture and two-hour workshop. During this contact-time, learning is consolidated using various activities and tasks, all of which involve collaboration with one’s teammates. Further, a competitive element has been introduced in the form of a league table that is updated weekly based on each group’s task performance in the workshops. Preliminary observations from the first six weeks of the module include a very favourable attendance rate, and evident engagement with the set reading and competitive challenges.

## A comparison of balance between Scottish country dancers and physically active control females over the age of 50 years

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Ageing is associated with a decrease in balance and this can affect the chances of an older person falling (Campbell et al., 1981: *Age and Ageing*, **10**, 264-270). Injuries due to falling, i.e. hip fractures, are a growing concern, as this indirectly leads to older people not participating in physical activity which in turn increasing the rate of disability among the older population (O'Loughlin et al., 1993: *American Journal of Epidemiology*, **137**, 342-354). Older people are reluctant to participate in higher intensity activities, for fear of injury and ageism, opting instead for lower intensity exercise (Wilcox et al., 2002: In *Gender, physical activity and ageing* edited by R.J. Shephard (Boca Raton, FL: CRC Press). The BBC (BBC News March 2009) reported that more people are taking up dance as a form of physical activity, with social dancing being a favourable choice of physical activity among older adults in the West of Scotland. The purpose of this study is to see if Scottish Country Dancing affects balance of older people over the age of 50 years. Thirty-two Scottish Country dancers (aged, mean  $\pm$  SD, 69.91  $\pm$  7.61 yrs) and thirty-nine non-Scottish Country Dancers (aged 73.15  $\pm$  6.78 yrs) took part in a postural assessment which required the subjects to perform the Romberg test and Tandem test under opened and closed eyes conditions. Subjects were required to hold the position for 30 seconds while standing on a piezo-electric platform linked to customised software in a PC, which recorded sway area and sway length. Data (shown as mean  $\pm$  SD) were analysed using an independent T-test.

	Control	Dancers	Control	Dancers
95% Ellipse Area Romberg Eyes Open	0.9417	1.0262	0.50639	0.56596
Sway Length Romberg Eyes Open *	153.4207	123.0753	42.57114	23.10053

Table: Mean and Standard deviation of 95% Ellipse Area (cm<sup>2</sup>) and Sway Length (cm) Dancers and Control. \* denotes significantly difference between dancers and control (p<0.05).

Results of the 95% ellipse area showed no significant difference between the groups. Sway length, however, was greater in the control group compared to dancers (p < 0.05). All conditions except Tandem eyes closed showed similar results; for simplicity Romberg eyes open is only shown. In conclusion, despite having a similar sway area, as shown by the 95% Ellipse Area, the control group had a longer sway length than the dancers, suggesting that the control group had to move more to maintain this similar sway area.

## **Nintendo Wii® as a tool to promote physical activity in older adults**

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Aging is associated with a decline in cognitive function and this can affect the quality of life of an older adult (Muangpaisan et al., Quality of life of the community-based patients with mild cognitive impairment. *Geriatrics & Gerontology International*, 2008. 8(2): p. 80-85.). Research suggests this deterioration in cognitive function can be slowed down with physical activity (Allmer, H., Physical activity and cognitive functioning in ageing. *Journal of Public Health*, 2005. 13(4): p. 185-188.). Research has shown that older adults who exercise perform better in cognitive tests compared to older adults who do not (Churchill et al., Exercise, experience and the ageing brain. *Neurology of Ageing*, 2002. 23(5): p. 941-955). As adults grow older, they tend to do less physical activity or their intensity of physical activity is lower compared to younger adults. Video games which encourage physical activity during play have recently been introduced to the market. These devices may help to encourage physical activity in older adults who prefer to exercise in their own home. Some research suggests they may also improve cognitive function (Drew et al., Video games: Utilisation of a novel study to improve perceptual motor skills and cognitive functioning in the non-institutionalised elderly. *Cognitive Rehabilitation*, 1986. 4: p. 26-34). The aim of this study was to investigate the use of the Nintendo Wii as a tool to promote physical activity and potentially improve cognitive function in older adults. Twenty healthy adults (aged  $61.75 \pm 6.61$  yrs, BMI of  $26.46 \pm 4.65 \text{ kg/m}^2$  ( $\pm$ SD)) took part in a standardised session on the Nintendo Wii® using 9 activities from the Wii Sport and Wii Fit programmes. Heart rate and perceived exertion were recorded. Pre and post Wii-session measurements of mood (Positive and Negative Affect Schedule (PANAS)) and cognitive function (Test of Non-Verbal Intelligence (TONI-IQ) and trail B test) were taken. Results from the study show that, in 3 activities heart rate, expressed as %heart rate maximum, reached a moderate intensity and in 1 activity corresponded to a vigorous intensity. Post-session PANAS positive scores were greater than pre-session scores ( $p=0.001$ ) and post-session PANAS negative scores were less than pre-session scores ( $p<0.000$ ). The Wii could be used as a physical activity tool in older adults and may result in health benefits, however further research is required to fully explore the use of these devices as physical activity promotion tools, particularly over a longer term.

## **The effects of complex training and post activation potentiation response in sub-elite university rowers**

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Complex training involves pairing a strength training exercise with a plyometric exercise of biomechanical similarity (Young et al. 1998: *Journal of strength and conditioning research*, **12**, 82-88). The proposition of accumulated enhanced contractions via post activation potentiation has led many to assume greater chronic benefits utilizing this technique (Duthie et al. 2002: *Journal of strength and conditioning research*, **16**, 530-538). However the effects of complex training remain equivocal. With this in mind the aims of the present study were to evaluate complex training as a means of improving counter movement jump height and to monitor the presence of post activation potentiation throughout 2 training mesocycles. Ten university rowers (age  $19.4 \pm 1.6$  y, body fat  $21.9 \pm 8.4\%$ , lean mass  $60.1 \pm 11.2$  kg) participated in the study. A randomized crossover design was utilized in which 5 participants performed 4 weeks (8 sessions) of complex training in place of 1 set of lower body strength training whilst 5 participants continued normal training before reversing roles. All participants were tested for countermovement jump height before and after each 4-week intervention. Post activation potentiation was monitored during all complex training. Repeated measures analyses of variance examined differences in jump height pre and post intervention and for differences in Post activation potentiation response between sessions during complex training. Statistical significance was set at  $P \leq 0.05$ . No significant difference was found between the effects of complex training and normal strength training. Post hoc analysis revealed a difference ( $P < 0.01$ ) in post activation potentiation between several sessions during complex training. Post activation potentiation effect increased session to session; peaking during the 4th and 5th exposures before decreasing back to initial levels by the final 2 sessions. Results indicate that post activation potentiation response to complex training will alter based on training effect. To ensure the effectiveness of this form of training factors influencing post activation potentiation response should be altered to counterbalance possible changes due to training effect. Eight sessions of complex training without ensured post activation potentiation response was not found to significantly improve countermovement jump height.

## **The relationship between leadership behaviour, coach-athlete relationship, and athlete's motivation in spring- and high-board diving**

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The coach-athlete relationship, leadership behaviours of the coach and athlete motivation all influence each other and can determine success and satisfaction (Trninic et al., 2009: *Acta Kinesiologica*, **3**, 18-25). Where there is congruence between the preferred and actual leadership of the coach, the relationship is reported to be stronger (Hoigaard et al., 2008: *International Journal of Sport Science and Coaching*, **3**, 241-250). When the coach-athlete relationship is strong the motivation of the athlete can be elevated. In the last decade there have been significant advances in the knowledge and understanding of these elements in isolation; however, the author is unaware of any study which has considered all three elements together. Despite the heightened profile and recent success of Team GB in high-board diving, there continues to be limited research into coach and athlete psychology within diving. The purpose of this study aims to explore the inter-relationships between the diver's perception of their coach-athlete relationship, the coach's leadership behaviour, and athlete's motivation. A sample of divers (N=15) and coaches (N=5) from four high performance diving academies participated in this study. Participants represented three different performance stages: Olympic (N=5), Elite (N=5), and Masters (N=5). The elite athletes compete at national age groups and represent their club internationally. The Master divers (>25 years old) compete at UK and European Events and the Olympic participants have competed at least once at the Olympics or commonwealths within the last eight years. Each athlete completed the Coach-Athlete Relationship Questionnaire (CART-Q) from Jowett *et al.* (2004: *Scandinavian Journal of Medicine & Science in Sports*, **14**, 245-257), the Sport Motivation Scale (SMS) from Pelletier *et al.* (1995: *Journal of sport and exercise psychology*, **17**, 35-53), and the athlete's perceived and preferred versions of the Revised Leadership Scale for Sport (RLSS), from Zhang *et al.* (1997: *Journal of sport behaviour*, **20**, 105-121). Semi-structured focus group interviews were conducted separately with athletes and coaches. Quantitative questionnaire data was analysed through a Pearson's Bivariate correlation test followed by a One-Way ANOVA and Tukey Post Hoc. Qualitative data was transcribed verbatim and analysed using inductive and deductive content analysis. Results reveal correlations between all three key areas. Individual group correlations show elite athletes to be more susceptible to coaching behaviours than others. Anova results reveal significant differences ( $p < 0.05$ ) between the groups for numerous variables, primarily upon perceptions and preferences for leadership behaviours. Overall, the data suggests that diving coaches should differentiate their coaching and leadership behaviours for different performance groups.

## The effect of two respiratory warm-ups on 3000 m time trial performance in trained runners

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Pulmonary limitations to exercise, such as inspiratory muscle fatigue and perceived exertion, have been attenuated through inspiratory warm-up (IWU). IWU has increased maximal inspiratory pressure (MIP) and improved running performance but no study has assessed time trial time (TT) after IWU or any sporting performance after combined inspiratory/expiratory warm-up (RWU). The present study hypothesised that RWU would increase maximal expiratory pressure (MEP), both RWU and IWU would increase MIP, and MIP change ( $\Delta$ MIP) would negatively correlate with running TT change ( $\Delta$ TT). 15 healthy, trained endurance athletes (age  $31.9 \pm 5.9$  years, height  $1.73 \pm 0.07$  m and mass  $72.3 \pm 11.0$  kg) completed three 3000 m time trial conditions in randomised order, 7-10 days apart. Each time trial condition included a different warm-up, either control rest, IWU ( $2 \times 30$  inspirations at 50% MIP with 1 minute rest between sets) or RWU ( $2 \times 30$  alternate inspirations at 50% MIP and expirations at 50% MEP with 1 minute rest between sets). A one-way repeated measures ANOVA revealed that  $\Delta$ TT was not significant after either IWU ( $\Delta$ TT =  $-0.39 \pm 1.01\%$ ,  $P = 0.143$ ) or RWU ( $P = 0.799$ ), compared to control rest. MIP increased after IWU compared to control rest ( $\Delta$ MIP =  $+5.7 \pm 9.6\%$ ,  $P = 0.041$ ) and compared to RWU ( $\Delta$ MIP =  $+3.8 \pm 6.3\%$ ,  $P = 0.046$ ) but respiratory pressures were otherwise unchanged. Pearson correlation coefficients revealed that  $\Delta$ TT correlated with  $\Delta$ MEP ( $r = -0.54$ ,  $P = 0.039$ ) after IWU. The correlation between  $\Delta$ MEP and  $\Delta$ TT concurs with a previous suggestion that  $\Delta$ MEP might reflect expiratory muscle fatigue in 3000 m running (Verges *et al.* 2007: *European Journal of Applied Physiology*, **101**, 225-232). It could be concluded that IWU was a more effective warm-up than RWU for MIP but neither changed MEP or 3000 m TT.

## **Does motivational climate and gender influence situational self-handicapping strategies? An examination of veteran swimmers**

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Self-handicapping is a term used to describe the process of proactively avoiding threats to one's self-esteem via any action or choice of performance setting that enhances the opportunity to externalise failure (excuse) and internalise success (Berglas & Jones, 1978: *Journal of Personality and Social Psychology*, **36**, 405-417). Men tend to employ more self-handicapping strategies than women in circumstances relating to their own behaviour (Hirt *et al.*, 2000: *Personality & Social Psychology Bulletin*, **26**, 1131-1141), however the evidence within sport is sparse. Previous research has centred on assessing the situational environment in which the individual operates and how this may influence the extent to which he or she chooses to self-handicap. The research has almost exclusively used youth and child populations calling into question the applicability of findings to adult competitive athletes. The purpose of the present study therefore, was to examine the relationship between club motivational climate and the self-presentation strategy of self-handicapping in competitive veteran swimmers. Using a cross-sectional design, 40 swimmers (males = 20; females = 20; M age = 34.28 years  $\pm$  13.07 years), completed the Perceived Motivational Climate in Sport Questionnaire-2 (PMCSQ-2; Newton *et al.*, 2000: *Journal of Sports Sciences*, **18**, 275-290) and a constructed situational self-handicapping questionnaire (consisting of items from Carron *et al.*, 1994: *Journal of Sport and Exercise Psychology*, **16**, 246-257). It was hypothesised that there would be a difference in the situational self-handicapping strategies employed by swimmers dependent on their perception of the club motivational climate and gender. A 2x2 between groups ANOVA will be used to examine interaction between perceived motivation climate (performance; mastery) and gender (male; female) in terms of situational self-handicapping scores with post hoc simple effects analysis used to pinpoint significant differences. Previous literature would suggest that swimmers (in particular males) who perceive a mastery climate would employ more self-handicapping strategies than swimmers (in particular females) who perceive a performance climate.

## **Transformational leadership and exercise attendance: The mediating role of basic needs**

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Transformational leadership has been shown to positively influenced sport participation (Rowland 2006:*Journal of Applied Sport Psychology*,18,312-325). However, little is known about potential mechanisms by which transformational leadership impacts participation. Self Determination Theory (Deci & Ryan 1985: *Intrinsic motivation and self-determination in human behaviour*. New York: Plenum publishing co), specifically the basic needs theory comprising of competence, autonomy and relatedness may provide a possible explanation for the impact that transformational leadership has on participation. That is, it might be through the satisfaction of the basic needs that transformational leadership has it's affect. The satisfaction of the basic needs have been shown to impact leisure time physical activity, with competence being the strongest predictor (Cox, Smith, & Williams 2008: *Journal of adolescent health*, 43,506-513). Competence has also been shown to significantly predict exercise attendance (Vlachopoulos & Neikou 2007: *Journal of Sports medicine & Physical fitness*, 47,475-482).The purpose of this study is to investigate whether the relationship between transformational leadership and exercise participation is mediated by the satisfaction of the basic needs. Ethical approval was obtained from Bangor University and permission obtained from British Military Fitness (BMF) head office. Participants N=155 BMF Clients 54 Male & 101 Female with a Mean age of 32 years  $\pm$ 10. Participants completed questionnaires, Comprising of informed consent, participant details, attendance data, DTLI-S (Callow *et al.*, 2009: *Journal of Applied Sports Psychology*,21,395-412) and Basic Needs scale (Gillet *et al*, 2008: Canadian Journal of behavioural sciences,40,230-237).Statistical significance  $P \leq 0.05$ ,Correlations revealed Intellectual stimulation (I.S), High performance expectations (H.P.E) and Appropriate role models (A.R,M) significantly correlated with attendance,( $r = .169$ ,  $r = .225$ ,  $r = .171$ ) respectively. Relatedness and competence significantly correlated with attendance, ( $r = .319$ ,  $r = .285$ ) respectively. Contradictory to current theory autonomy was not significant. Meditational regression utilising Barron & Kenney (1986: *Journal of personality and social psychology*, 51, 1173-1182) method revealed relatedness fully mediated the relationship between H.P.E and attendance and that relatedness fully mediated the relationship between ARM and attendance. These results partially support the theoretical framework as competence and relatedness significantly correlated to attendance, however partially inconsistent with theory due to autonomy being non significant.

## Comparison of diet in UK based triathletes with the Eatwell Plate healthy eating guidelines.

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Athletes put considerable resources, both time and money, into improving their performance. This tends to be focused on equipment and training techniques. Whilst many athletes develop specific nutrition strategies to follow during competition, more general aspects of diet are often overlooked. Despite the unanimous opinion of sporting bodies and authorities that 'Physical activity, athletic performance and recovery from exercise are enhanced by optimal nutrition' (American Dietetic Association, Dieticians of Canada & American College of Sports Medicine, 2000: *Journal of the American Dietetic Association*, 100 1543-1556) diet does not get the attention it deserves. They advise as energy requirements increase athletes should 'aim to keep the proportions of energy provided by different food groups consistent' (ADA, DC & ACSM, 2000). After receiving ethical approval, this study compared the diet of UK based amateur triathletes with the UK Government healthy eating advice as presented in the EatWell Plate (Food Standards Agency, 2008, [www.eatwell.gov.uk](http://www.eatwell.gov.uk)). A food frequency questionnaire, consisting of 207 food items and requesting recall over 3 months, with supplementary questions on the Eatwell Plate, was distributed by email and through social networking websites. Responses with incomplete classification or food frequency data were discarded. Those missing some of the supplementary questions but otherwise complete were included. One hundred and sixty three questionnaires were analysed. This was made up of 102 males and 61 females, aged 20 to 52. Each group was equally divided between short (up to half Ironman) and long (over half Ironman) Distance athletes. The data was analysed in SPSS. As expected a Pearson correlation showed a positive correlation ( $p < 0.001$ ) between training hours completed and number of food portions consumed. Overall 94 of 159 respondents (59%) recognised the Eatwell plate, with females (78% of 59 female respondents) more likely to recognise it than males (48% of 102 male responses). The key findings of the study were that none of the triathlete group's diets matched that of the Eatwell plate recommendations. The triathletes reported a surprisingly high consumption of fruit and vegetables, exceeding the minimum intake for a healthy diet on these criteria. Despite the stereotype reputations of triathletes to eat high amounts of pasta, rice and potatoes, none of the groups met the target 33% of the diet coming from carbohydrates. It was also observed that a large proportion of their diet was coming from protein, 23%, and they consumed well over the target figure of 12% for this food group.

## Feedback behaviour of professional academy soccer coaches

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Research identifies that feedback is an important component of skill acquisition and performance in sport. According to McMorris and Hale (2006: *Coaching Science, Theory into Practice*, Chichester, Wiley and Sons) feedback includes all information produced from actions and responses and can come from internal or external augmented sources. Poor feedback can be detrimental to player experience and development. The success of coach feedback in soccer is subject to many different factors. A number of studies have identified individual components that positively affect feedback in controlled environments. These include the proximity of the coach, target audience, frequency, timing, duration, content, appropriateness of the feedback, coaching style, session goals and objectives, motivational climate, and the coach's emotional intelligence. To date the author is unaware of a study which examines all of the combined components of feedback in an open soccer coaching environment. This study will produce a framework of affective feedback behaviour for soccer coaches which can be used by less experienced coaches to improve their coaching skills. This paper addresses this by attaining the feedback behaviour of professional soccer coaches and produces a framework of good practice for achieving training goals and successfully improving player development. The participants were professional U8 – U16 coaches (n=8) from a premier soccer academy, all of which have achieved a minimum certification of a UEFA B football coaching licence. Feedback behaviour was recorded using notational analysis of training session video footage. Data was collected via a pen and paper frequency instrument which combined two previously used assessment tools; the Coaches Analysis Instrument (CAI) (More *et al.*, 1996: *Journal of Sport Behaviour*, 19, 1-14) and the Coaching Behavioural Assessment System (CBAS) (Howe & Allen, 1998; *Journal of Sport and Exercise Psychology*, 20, 280-299). The notational analysis was supported by individual interviews with the participating coaches and two focus groups with randomly sampled players from each age group. Interviews and focus groups questions were based upon the categories included in the CAI and CBAS. Coach interviews indicate a variety of coaching philosophies; however observation demonstrated incongruence between their philosophy and their coaching behaviour. Coaches are shown to provide group feedback in close proximity, often providing technical information rather than motivational, with the frequency of feedback reducing with age. Younger players are provided more feedback during drill execution contrasting older players who are provided more terminal feedback. Focus group data identifies that children aged 10 – 16 respond well to high pressure from coaches, preferring technical feedback provided one to one in a close proximity, within short durations.

## **Health behaviours and beliefs of university students in the first and third year of education**

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Numerous studies have focused on particular unhealthy behaviours during the first year of university, often resulting in weight-change (Anderson; Shapiro & Lundgren, 2003: *Eating Behavior*, 4, 363-367). These have included detrimental nutritional and exercise behaviours (Wengreen & Moncur, 2009: *Nutrition Journal*, 8, 1-7) and increased levels of stress, with a focus on the resulting impact of such lifestyle behaviours (Liu et al., 2007: *Physiology & Behavior*, 92, 748-754). However, only a few studies considered changes in health behaviour beyond the first year of university (Racette et al., 2008: *Journal of Nutrition Education and Behavior*, 40, 39-42; Lloyd-Richardson et al., 2009: *Preventive Medicine*, 48, 256-261). The purpose of this study is to investigate whether the trend of unhealthy behaviours remained the same or altered across the university life-span. The primary aim of this study is to determine whether there is a difference in the exercise and nutritional behaviour and health beliefs of students in the first to last year of university. The secondary aim is to examine the effects of stress on exercise and nutritional behaviours. Participants are undergraduate students at Kingston University studying Sport and Exercise Sciences. A questionnaire on physical activity levels, physical activity barriers, nutritional behaviours, health-beliefs and stress-levels will be distributed to 38 final year students and approximately 80 first year students. The statistical analysis for the primary aim will be an analysis of variance (ANOVA).

## **The influence of 16 weeks rowing training on a submaximal rowing ergometer assessment and 2000m rowing performance: A case study of a competitive male lightweight rower**

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Rowing is characterised as a strength endurance sport, comprising two distinct seasons: distance (September-March) and sprint (April-July). The distance season includes events between 5 kilometres (km) and 7km which is in contrast to the sprint season, where races are contested over 2km. This represents a challenge to rowing coaches and sport scientists in the preparation for overlapping seasons. In this case study, physiological support was provided to a competitive male lightweight rower transitioning from distance to sprint seasons over a 16 week period. The aim of the intervention was to improve 2km rowing ergometer performance and ultimately race performance. Performance during a 2km rowing ergometer time trial was established at the start of the support period and used to calculate intensities for a seven stage progressive rowing ergometer assessment (PREA)(Gore, 2000: *Physiological Tests for Elite Athletes*. Champaign, IL: Human Kinetics). Heart rate (HR) was monitored throughout and blood lactate (Bla) measured at the end of each four minute stage for calculation of the lactate (LT) and anaerobic threshold (AT). Both LT and AT have been shown to be sensitive markers of endurance performance (Weltman, 1995: *The Blood Lactate Response to Exercise. Current Issues in Exercise Science Monograph No.4*. Champaign, IL: Human Kinetics). Accompanying HR data was collected for all training sessions throughout the intervention period. Time trial performance (2km) was re-assessed at the end of week 16. LT and AT did not improve between weeks 1-8. Percentage total training time spent at low, moderate, high and maximum intensity, as defined by threshold data, were 98.7%, 1.29%, 0.4% and 0.14% respectively during weeks 1-8, and 60%, 30%, 10% and 0% during weeks 9-16. Personal best (PB) over 2km did not improve from weeks 1-8. A 4.66% improvement in 2km time trial performance occurred between weeks 9-16 (6 minutes 48 seconds to 6 minutes 29 seconds). These results support the rationale for inclusion of a sufficient anaerobic stimulus in the training of rowers to improve 2km rowing performance (Hagerman, 1984: *Sports Medicine*, **1**, 303-326; Mickelson and Hagerman, 1982: *Medicine and Science in Sports and Exercise*, **14**, 440-444). Data also supports the importance of regular assessment and monitoring of physiological responses to training.

## Is there a superior polygenic profile for elite power performance? Insights from the sport of Olympic diving

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Elite athletic ability represents a unique mixture of physiological characteristics that are dependent upon a combination of biological and biomechanical aspects (Payne and Montgomery, 2003: *Biomedical Society*, 31, 1286-1289). However, it is also the variation between individuals' that partly accounts for these physiological differences (Payne and Montgomery, 2003). Two genetic polymorphisms consistently linked with elite athletic ability are; 1) the single nucleotide polymorphism that occurs in the ACTN3 gene, where the presence of the amino acid arginine (R) is associated with elite power based performance (Yang *et al.*, 2003: *American Journal of Human Genetics*, 73, 627-631), and 2) the insertion/deletion polymorphism that occurs in the ACE gene (deletion [D] or insertion [I] allele) (Montgomery *et al.*, 1998: *Scientific Correspondence*, 393, 221-222). The purpose of the present investigation was to compare the total gene score (TGS) obtained from two power associated polymorphisms of elite (ED; n = 12; age  $29 \pm 12$  y; height  $1.65 \pm 0.07$  m; body mass  $63.00 \pm 6.54$  kg) and regional class divers (RD; n = 12; age  $24 \pm 1$  y; height  $1.60 \pm 0.07$  m; body mass  $67.40 \pm 2.83$  kg) and a recreationally active control group (C; n = 50; age  $23 \pm 3$  y; height  $1.79 \pm 0.07$  m; body mass  $74.73 \pm 11.39$  kg). Written informed consent was obtained from all participants. The investigation protocol was approved by the Nottingham Trent University Ethics Committee. DNA samples were collected from either buccal cells or leukocytes which were extracted from saliva samples and whole blood. All genotypes were determined using the polymerase chain reaction method using a thermal cycler and where necessary (ACTN3) with restriction enzyme digest. Results showed a higher frequency of the RR (27% higher than RD and 35 % higher than C) and DD (23% higher than RD and 15 % higher than C) genotypes in ED compared to the RD and C. However, TGS were similar between ED (58%) RD (57%) and C (44%). The findings of individual genotype analyses provide further support for the notion that elite athletic ability is partly accounted for by genetic superiority. However, this suggestion is only tentatively supported here as TGS between ED and C were 14% different but with little difference between ED and RD.

## **The effects of augmented eccentric loading on force and power production during the countermovement jump**

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The practice of incorporating augmented eccentric loading (AEL) into resistance exercise is still relatively new, although limited, there is evidence supporting the contention that AEL may lead to both superior acute (Doan et al, 2002: *Journal of Strength and Conditioning Research*, **16**, 9-13) and chronic (Brandenburg and Docherty, 2002: *Journal of Strength and Conditioning Research*, **16**, 25-32) adaptations over more traditional methods. Evidence also suggests that AEL is no more effective than traditional training methods for increasing strength and power across populations (Moore et al, 2007: *Journal of Strength and Conditioning Research*, **21**, 372-377). Although no conclusive statement can be made with regards to eccentric-concentric optimal load selection and concentric performance enhancement, superior gains in strength, power and hypertrophy may be achieved when eccentric loads are in excess of the concentric 1-RM (i.e., strength ~105-120%; power ~70-80%; hypertrophy ~ 90%), and when the optimal eccentric load is approximately 20% greater than the concentric load (Watkins, in press: *Professional Strength and Conditioning*). Therefore, the aim of this study was to examine the acute effects of AEL during the box squat exercise (BSE), using a loading strategy for enhancing power production, on subsequent countermovement jump (CMJ) performance. Following ethical approval and informed consent, seven resistance trained sport and exercise science students (age;  $23.8 \pm 9.1$ , height (cm)  $173.8 \pm 14.1$ , weight (kg)  $75.3 \pm 40.6$ ) volunteered for this study. Participants performed maximal effort repetitions of the BSE followed by the CMJ during 3 testing sessions using the following loading conditions: Condition 1, Baseline measures; Condition 2, 50/50% BSE eccentric/concentric; Condition 3, 70/50% BSE eccentric/concentric. Sessions were conducted 72 hours apart to account for fatigue effects and a portable force plate (Fittech, Australia) calculated force and power parameters at a sampling rate of 500Hz. A one-way repeated measures ANOVA revealed no significant differences ( $p > 0.05$ ) between peak concentric force (PF), peak concentric power (PP) and peak rate of force development (PRFD) across all loading conditions. Although the highest peak power was observed during the 70/50% loading condition. The authors suggest that individuals selecting augmented eccentric load thresholds for optimal concentric power production in the BSE maybe most effective when loads are selected individually. More research using multiple concentric loads across populations is required to confirm if such thresholds exist.

## Between-session reliability of measuring whole-body reaching kinematics

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Between sessions reliability or reproducibility can be difficult to achieve, with measurement error and variability coming from: (1) the examiner, (2) measurement system, (3) the participant, (4) the experimental protocol, and (5) processing techniques (Hopkins, 2000: *Sports medicine*, **30**, 1-15). With kinematic measures, differences in marker placement between sessions can cause a shift or offset in the data which can result in poor reliability. The objective of this study is to assess the between sessions reliability of the experimental protocol to obtain whole-body reaching kinematic data. With ethical approval from the Faculty's Research Ethics Committee obtained, ten participants were recruited ( $25.7 \pm 1.3$  years,  $1.78 \pm 0.12$ m,  $77.19 \pm 6.46$ kg). Sixty-one passive reflective markers were attached to the specific landmarks on the body using recommendations from the International Society of Biomechanics (Wu *et al.*, 2002: *Journal of Biomechanics*, **38**, 981-992; Wu *et al.*, 2005: *Journal of Biomechanics*, **35**, 543-548), Konz *et al.* (2006: *Spine*, **31** (24), E898-906) spinal model and Rab *et al.* (2002: *Gait and Posture*, **15**, 113-119) shoulder model. Participants completed the manual fitting task at 60, 80 and 100% of their pre-determined functional reaching distance. Kinematic data collected at 100Hz using a 12 camera motion analysis system (Motion Analysis Corporation, Santa Rosa, CA, USA) were filtered with a low-pass Butterworth filter with a cut-off frequency of 2Hz. All trials were normalised to the static trial. The Cardan rotation sequence x,y,z (flexion/extension, abduction/adduction, and axial rotation) was applied to generate joint angles relative to the proximal segment. The mean and standard deviation of joint angles were calculated at the point of fit, defined as the point when the block had passed completely through the opening. The intraclass correlation coefficient and limits of agreement were calculated. Between the two measurement occasions consistent mean and standard deviation values were reported. The reported intraclass correlation coefficient values were interpreted as good ( $R = 0.4 < 0.75$ ) to excellent ( $R > 0.75$ ) (Fleiss, 1986: *The design and analysis of clinical experiments*. New York: Wiley). The limits of agreement varied across the three reaching distances and ranged between  $2.0^\circ$  -  $13.5^\circ$  comparable to the  $5-10^\circ$  reported from a systematic review on reliability in gait analysis by McGinley *et al.* (2009: *Gait and Posture*, **29**, 360-369). The acceptable intraclass correlation coefficient and limits of agreement values indicate good reliability of the experimental protocol.

## Effect of targeted foam roller release of hip flexors on 20 m sprint performance

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Previous research into the effects of pre-exercise active dynamic stretching has shown a positive impact by significantly reducing 20 m sprint performance time (Fletcher & Jones, 2004, *Journal of Strength and Conditioning Research*, , **18(4)**, 885-888; Little & Williams, 2006 *Journal of Strength and Conditioning Research*, **20(1)**, 203-207 ). The addition of a foam roller to perform direct self myofascial release has been shown to increase joint range of motion (ROM) by mobilising soft tissue which encourages proper movement patterns (1998: *Massage for therapists*, edited by M. Hollis. Oxford. Blackwell Science), however previous research has been inconclusive as to whether this provides a positive or negative impact on sprint performance. Therefore, the aim of this study is to examine the effect of targeted foam roller release of the hip flexor on 20 m sprint performance in male semi-professional rugby players. Thirty male National 3 level rugby union players volunteered to participate in the study. All subjects performed one baseline test to determine hip ROM followed by two testing trials. The baseline test measured hip ROM using a goniometer (True Angle Goniometer, Gaiam-Pro, Warwickshire) and also baseline for 20m sprint performance. During Test 2 and 3, participants were divided into three trial groups (n = 10). All subjects performed a 10 min cycling warm up followed by one of the following pre-exercise stretching protocols: no stretch trial (NS), dynamic stretch trial (DS) consisting of 10 min of structured dynamic stretching, or a combined self myofascial release and dynamic stretch trial (MR). Hip flexor ROM was measured before and after the 10 min cycle warm up. The dynamic stretch routine was identical for both the DS and MR trial, the foam roller self myofascial release was performed on the hip flexors for ~ 30 seconds. The results showed no differences at pre-test in right hip flexor flexibility between groups ( $P = 0.103$ ); however, the left hip flexor was less flexible in the NS group compared to DS and MR groups ( $P = 0.025$ ). Post hoc analysis, corrected using the Bonferroni adjustment, revealed an increase in hip flexor flexibility from pre-warm up to post-warm up for all three groups (NS left leg 5.4% change; NS right leg 3.22% DS left leg 3.35% change; DS right leg 3.2%; MR left leg 3.16% change; MR right leg 4.55%:  $P < 0.016$ ). There were no differences in 20 m sprint time performance compared to baseline between the NS ( $2.77 \pm 1.81$ ), DS ( $3.94 \pm 0.20$ ) and MR ( $3.91 \pm 0.18$ ) groups ( $P = 0.093$ ). The findings suggest an increase in hip flexibility after all stretch protocols, with MR showing the greatest improvement in hip flexion and 20 m sprint performance. These findings suggest that both DS and MR improve hip flexion greater than NS, but the impact on 20 m sprint time performance seems equivocal.

## **The use of questionnaires in determining physical activity behaviours in relation to musculoskeletal health**

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The objectives of this research were to develop a questionnaire based methodology for measuring life-time physical activity behaviours to assist the advancement of epidemiological research into understanding how these behaviours can impact musculoskeletal health in later life. In accordance with institutional ethical approval, written informed consent was received from 51 participants (age=  $53 \pm 9.8$  yrs) who completed the Bone Loading History Questionnaire (Dolan et al., 2006: *Medicine & Science in Sports & Exercise*, **38**, 1121-1131; BLHQ); that had been selected as an appropriate questionnaire for this study. Only leisure-time activity was recorded in the questionnaire; which was divided into age range categories: 5-11; 12-18; 19-30; 31-49; 50-64; and 65-74 years. Activity and load exposure was scored separately for each activity listed; based on energy expenditure and load scoring methods respectively; and the total activity score and load exposure per year within each age range was calculated. Multiple and stepwise regression analyses were performed to determine the relationship between physical activity and load exposure in early life with later life. 5-11 years was the most active age range for both load exposure and activity scores; a significant drop in load and activity occurred at 12-18 years; and 19-30 years; after which activity and load exposure plateaued. Physical activity and load exposure at 19-30 years was the only significant predictor of physical activity and load exposure respectively at 31-49 years (adjusted  $R^2 = 0.413$ ; and  $0.465$  respectively;  $p < 0.001$ ). At 50-64 years the most significant predictor for activity and load exposure was load exposure at 19-30 years (adjusted  $R^2 = 0.409$  and  $0.429$  respectively;  $p < 0.001$ ). These results indicate that the decline in activity levels during adolescent years and early adult life may be important determinants of the risks to musculoskeletal health in later life. The method for scoring load exposure and activity separately will help further the understanding of how differences in activity type may influence musculoskeletal health.

## Response of plasma BDNF to exercise, in young men

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Brain derived neurotrophic factor (BDNF) is a member of a family of proteins, the neurotrophins, that have been shown to promote neuronal growth and survival. A study involving rodents has shown one of the important functions of BDNF is facilitating the relearning of challenging motor tasks after stroke (Ploughman *et al.*, 2007: *European Journal of Neuroscience*, **25**, 3453-3460). Animal studies have also shown increased hippocampal mRNA activity in response to exercise (Cotman and Engesser-Cesar, 2002: *Exercise Sports Sciences Reviews*, **30**, 75-79) and that BDNF crosses the blood-brain barrier (Pan, *et al.* 1998, *Neuropharmacology*, 37:1553-61). The inference therefore is that BDNF measured in peripheral blood is representative of BDNF circulating in the encephalon. Studies have determined that BDNF concentration increases with exhaustive exercise (Ferris *et al.*, 2007: *Medicine and Science in Sports and Exercise*, **39**, 728-734). Less clearly understood is the time-course of plasma BDNF recovery after exercise. Therefore, the purpose of the present study was to investigate plasma BDNF concentrations after exhaustive exercise. Venous blood samples were obtained from fourteen men (mean age,  $27.5 \pm 5.5$  years), at rest (pre-exercise) and after a maximal cycle ergometer test (time points: 0, 30, 60 and 90 minutes). BDNF concentrations were determined using an enzyme-linked immunosorbent assay (ELISA). Data was analysed using Friedman's ANOVA, followed by post-hoc Wilcoxon signed rank tests. There was a significant increase from pre- to post-maximal exercise BDNF concentrations ( $p = 0.001$ ). Post-hoc analysis showed time points 0, 30 and 60 minutes post-exercise were significantly higher compared with pre-exercise levels ( $p \leq 0.007$ ). Peak plasma BDNF concentration occurred immediately post-exercise and had returned to pre-exercise levels by 90 minutes. Previous studies have shown elevated BDNF concentrations are important in cognition, the present study demonstrates that exhaustive exercise increases plasma BDNF for up to 60 minutes post-exercise.

## The effects of caffeine on repeated 1000 m rowing performance

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Caffeine is commonly ingested by athletes because of its reported ergonomic effects on endurance performance (Chester, N., & Wojek, N., 2008: *International Journal of Sports Medicine*, **29**, 524-528.). A common explanation of this ergonomic effect has been attributed to increased fat oxidation during exercise, therefore sparing muscle glycogen (Costil et al., 1978: *Medicine and Science in Sports*, **10**, 155-158). However, little research has been conducted into the effects of caffeine on short-term high-intensity exercise or short-term endurance performance, in which performance is unlikely to be limited by glycogen depletion. The purpose of this study was to investigate the effects of caffeine ingestion on short-term repeated 1000-m rowing performance. In a randomised double-blind controlled experiment, seven senior university rowers (4 males: mean  $\pm$  SD age  $22.5 \pm 3.0$  yrs, height  $1.80 \pm 0.08$  m, body mass  $76.0 \pm 10.6$  kg and 3 females: age  $23.0 \pm 3.6$  yrs, height  $1.76 \pm 0.02$  m, body mass  $73.5 \pm 5.6$  kg) completed two 1000 m time trials, separated by a 20 min recovery, on a rowing ergometer (Concept 2, Model C, Morrisville, Vermont, USA) on three occasions, each separated by 7 days. During each trial, participants ingested either caffeine ( $6 \text{ mg.kg}^{-1}$ ) one hour pre-exercise and a carbohydrate solution ( $5 \text{ ml.kg}^{-1}$ ) during the 20 min recovery (CAF), a placebo tablet one hour pre-exercise and a carbohydrate solution ( $5 \text{ ml.kg}^{-1}$ ) during recovery (CHO), or a placebo tablet one hour pre-exercise and a placebo solution ( $5 \text{ ml.kg}^{-1}$ ) during recovery (PLA). Rating of perceived exertion (RPE) was recorded during each time trial; with blood lactate (LAC) and glucose (GLU) measured from ear-prick capillary samples taken pre and post each time trial. A two-way ANOVA identified significant decrements in performance, with T2 was significantly slower compared with T1 ( $F = 18.496$ ,  $P < 0.05$ ), but no significant differences between the three conditions. However, there was a tendency for times to be faster in both trials in CAF (by 1.03 s and 2.50 s in T1 and T2, respectively). Lactate concentrations increased in CAF trial with significant increases pre to post time trials ( $F = 198.247$ ,  $P < 0.05$ ), however, there was no significant difference between experimental conditions. These data demonstrates no significant ergogenic effect of caffeine on performance; however, there was a tendency for times to be faster in both trials in CAF.

## The use of facemask or mouthpiece-nose clip fixtures for the assessment of $\dot{V}O_{2\max}$ : An examination of limits of agreement

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The attainment of  $\dot{V}O_{2\max}$  as an assessment of aerobic power has long been accepted as a valid measurement due to the central and peripheral cardio vascular components (Roels et al., 2005: *British Journal of Sports Medicine*, **39**, 965-968). Through numerous methods utilising indirect calorimetry, it is possible to identify some key physiological parameters. These include exercise economy, lactate and ventilatory threshold, oxygen uptake kinetics and mitochondrial capacity (di Prampero, 2003: *European Journal of Applied Physiology*, **90**, 420-429; Whipp et al., 1982: *Journal of Applied Physiology*, **52**, 1506-1513). Although the equipment used in the assessment of  $\dot{V}O_{2\max}$  varies greatly, there has been little investigation in regards to the influence this has upon the values attained; with most focusing on sub maximal workloads or rest, when comparing collection assemblies (Evans et al., 1995: *Journal of Sports Medicine and Physical Fitness*, **35**, 93-98; Hirsch et al., 1969: *Journal of Applied Physiology*, **53**, 1281-1290; Saey et al., 2006: *Medicine and Science in Sports and Exercise*, **38**, 223-230). The current study aimed to validate the use of facemask and mouthpiece-nose clip fixtures to collect expired air for the subsequent assessment of  $\dot{V}O_{2\max}$ . Ten volunteers participated in a repeated measures design. On two occasions participants performed a cycle  $\dot{V}O_{2\max}$  test with the use of a mouthpiece-nose clip and facemask in a randomised order, respectively. Participants cycled at a self-selected speed on an electronically braked cycle ergometer, with a cadence increase of  $0.5 \text{ W}\cdot\text{s}^{-1}$ .  $\dot{V}O_2$  was assessed by a breath-by-breath portable gas analyser (Metamax 3B) with the attainment of  $\dot{V}O_{2\max}$  verified against BASES lab guidelines. A Bland-Altman limits of agreement plot was carried out on all data, which was presented as means and standard deviations, with a follow up dependent paired samples *t*-test. The resulting data will provide a further insight into the limits of agreement of these two common protocol variations in the attainment of  $\dot{V}O_{2\max}$ . Hence researchers will be able to make more informed interpretations of  $\dot{V}O_{2\max}$  data and the influence of equipment selection.

## **Determination of gait events using an externally mounted accelerometer**

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Biomechanical analysis of human locomotion requires the determination of specific foot contact events. The gold standard for the identification of these events is based around force platform data, whereby a simple threshold can be defined in order to provide heel-strike and toe-off. However force platforms are traditionally located only in specific sport/gait laboratories and restrict the number of consecutive gait cycles that can be analyzed based on the number of available platforms. An algorithm was developed for the determination of heel-strike and toe-off based around the signal derived from a shank mounted accelerometer (Biometrics ACL 300) in the axial direction. The aim of this study was to determine whether specific gait events could be consistently identified using an algorithm based around an externally mounted accelerometer attached to the distal tibia. Sixteen participants consisting of eleven males and five females (Age  $29.38 \pm 5.68$  years; Height  $1.73 \pm 4.87$  m; Weight  $67.83 \pm 10.65$  kg), completed a minimum of 10 trials whilst running overground at  $4.0\text{ms}^{-1} \pm 5\%$ . Accelerations in the axial direction of the tibia were sampled at 1000 Hz. Synchronously the vertical vector of the ground reaction force was calculated as participants ran over a force platform (Kistler 9281CA). A threshold of 20 N for the vertical ground reaction force component was chosen to determine the time onset of both heel-strike (on ascent) and toe-off (on descent). Events determined using the accelerometer were compared to the corresponding event determined by the GRF. The difference in the time of occurrence was then recorded and descriptive statistics (means and standard deviations) were obtained using SPSS 17.0. The results revealed mean  $\pm$  standard deviation errors of  $1.7 \pm 8.3$  ms for heel strike and  $-5.7 \pm 12.0$  ms for toe-off respectively. The error values compare favourably to other methods of predicting gait events using kinematic data or pressure sensors. The repeatability of this method is evidenced by the high number of trials (160) that were completed during this study by 16 different participants. The results of this study suggest that gait events can be reliably and accurately detected using a shank mounted accelerometer provided that due care is taken when mounting the device.

## Gender differences in motives, barriers and experiences in exercise among adolescents

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Several theories seek to explain exercise behaviour. However, no one single theory has been accepted as the most important in understanding physical activity. There is also little research looking at exercise behaviours in youth, especially qualitative research that isn't limited to the study of isolated variables. Therefore, the purpose of this study was to investigate the exercise perceptions of adolescents, specifically focussing on the gender differences. A year 10 cohort was selected to take part in the study. The Godin Leisure Time Exercise Questionnaire (Godin and Shephard, 1997: *Medicine and Science in Sports and Exercise*, S36-S38) was used to filter the students for interview. The 20 students who reported taking part in the least number of hours of leisure time physical activity per week were interviewed. Four focus groups took place, each made up of 4-6 students. All data was recorded on a Dictaphone and burnt to disc before being transcribed. The transcriptions were read and reread to facilitate familiarisation before a content analysis was undertaken. Ethical approval was granted by the University of Brighton. The results showed that both boys and girls reported enjoyment to be an important motive for exercise, supporting the findings of Sallis et al (2000: *Medicine and Science in Sports and Exercise*, **32**, 963-975) who found enjoyment to have a strong positive relationship with exercise. Overall, girls perceived more barriers than boys, and were more influenced by past experiences, especially PE lessons. The main theme amongst the girls was the context of the exercise, including a lack of choice and concerns over body image/social image. Boys often reported lack of social support as a barrier, specifically from friends, as well as motivational barriers such as "Too lazy really" (Chris, Interview 3). Overall, the findings support the Self-determination theory (Deci and Ryan, 2000: *Psychological Inquiry*, **11**, 227-268) whereby motivation is related to the social context and where perceptions of autonomy, competence and social belonging are crucial for higher levels of intrinsic motivation and sustained physical activity involvement. In order to increase physical activity in teenagers, a change in PE lessons would be beneficial. More choice and variety would lower boredom and increase enjoyment (Biddle and Mutri, 2002: *Psychology of Physical Activity: Determinants, Well-being and Interventions*. London: Routledge). Alternative activities such as yoga may be beneficial for girls. Overall, the results suggest that girls perceive more barriers to exercise than boys. Future research should focus on strategies to overcome this, mainly focussing on what appears to be the root of the problem: school PE.

## **An investigation into the effects of low level sound frequencies on muscle fatigue of the biceps brachii**

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Previous research experimenting with sound frequency testing discovered that an individual experienced unusual fatigue while accidentally being exposed to a sound frequency (~ 285 Hz) over 20 feet away (Swingle, 1996: *Journal of Neurotherapy*, **2**, 15-22). If a sound frequency can alter the vibration level of atoms (Feynman et al., 1963: *The Feynman Lectures on Physics*, Vol I. Addison Wesley: Reading), it may also be possible to expose larger muscle mass to the same effect which may influence physiological processes such as muscle fatigue (Ament et al., 2009: *Sports Medicine*, **5**, 389-422). Although muscle fatigue has many mechanisms, the fundamental principle of fatigue hinders exercise tolerance. Therefore, the purpose of the study is to investigate whether low level sound frequencies have an effect on muscle fatigue. Eight healthy adults (age:  $29 \pm 6$  years; stature:  $171.7 \pm 9.3$  cm; body mass:  $76.8 \pm 18.6$  kg) of varying fitness levels volunteered to participate in the study. After completing a written informed consent, participants underwent two separate trials: control (C) and experimental (E) trial. During the C trial, participants performed bicep curls until task failure using strength bands at 50% of their one repetition maximum, while surface electromyography (sEMG) readings were taken of the contracting biceps brachii muscle. During the E trial, subjects performed the same exercise and measurements as the C trial but were exposed to a sound frequency of 50 Hz using sound frequency software (Tone Generator software, NHC Software ltd), amplifier (NAD C 320BEE), and subwoofer (Mordaunt Short MS308). During the E trial, all subjects showed a decrease in the number of repetitions performed ( $20 \pm 5$  reps vs  $27 \pm 6$  reps, respectively;  $P = 0.022$ ) and a decreased limit of tolerance ( $37.58 \pm 10.79$  sec vs  $52.39 \pm 18.10$  sec, respectively;  $P = 0.046$ ) compared to the C trial. There was a greater decrease in average maximal amplitude from the beginning to the end of the E trial ( $9 \pm 7$  %) compared to the C trial ( $19 \pm 9$  %;  $P = 0.046$ ). The results suggest that muscle fatigue of the biceps brachii is influenced by low level sound frequencies.

## Group cohesion as a predictor of state flow in dancers

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There is limited research exploring group cohesion and its association with athletes' experience of flow states. Flow is an optimal state that is often associated with high levels of performance and a positive experiential state. The majority of research to date has focused on understanding and examining flow in physical activity settings (e.g. Jackson *et al.*, 2001: *Journal of Applied Sport Psychology*, **13**, 154-178). The purpose of the present study was to examine whether group cohesion was a significant predictor of flow among dancers. Given the dearth of evidence regarding this prediction, the null hypothesis was tested. A purposive sample of 32 volunteer dancers aged 19-26 years was recruited from a dance troupe in west London. Participants represented a variety of ethnic backgrounds and represented both genders equally. Group cohesion was assessed using the Group Environment Questionnaire (GEQ; Carron *et al.*, 1985: *Journal of Sport Psychology*, **7**, 244-266) and flow using the Flow State Scale-2 (FSS-2; Jackson & Eklund, 2002: *Journal of Sport & Exercise Psychology*, **24**, 133-150). Informed consent was obtained prior to a dance rehearsal and the GEQ was administered. The FSS-2 was administered immediately after the rehearsal. Data were screened for univariate outliers using  $z$  scores  $> \pm 3.29$  within each cell of analysis and multivariate outliers using the Mahalanobis Distance test with  $p < .001$ . Skewness and kurtosis were also checked within each cell of the analysis. The data were analysed using nine standard linear regressions with GEQ subscales as the predictor variables and FSS-2 subscales as the dependent variables. The results have yet to be analysed and will be included in the resubmission of the abstract following blind review. My supervisor Dr Costas Karageorghis will provide written confirmation that the results will be ready in time to meet the resubmission deadline.

## **On the orthogonality of dimensions of group cohesion, social support, and subjective norms in an exercise context.**

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As the effects of group processes on exercise adherence become more apparent there has been burgeoning interest in how our social interactions influence exercise behaviour (Fraser & Spink, 2001: *Journal of Behavioral Medicine*, 25, 233-249). Social support, subjective norms and group cohesion are the three social constructs that have been given most consideration (Courneya & McAuley, 1995: *Journal of Behavioral Medicine*, 18, 499 - 515). Research has shown that when operationalised correctly, these constructs show discriminant validity (Courneya & McAuley, 1995: *Journal of Behavioral Medicine*, 18, 499-515). There are relatively few studies examining exercise behaviour in the elderly (Mailloux, Finno, & Rainville, 2006: *American Journal of Physical Medicine and Rehabilitation*, 85, 120-126) and to date no study has looked at the orthogonality of all three social constructs in an exercise context. Accordingly, this study did just that using an intact group of senior exercisers. The constructs were assessed using the Social Provisions Scale moderated for exercise (Russell & Cutrona, 1987: *Advances in Personal Relationships*, 1, 37-67), the Group Environment Questionnaire - Exercise (GEQ: Spink & Carron, 1994: *Small Group Research*, 25, 26-42) and Subjective Norm items were developed using appropriate guidelines (Ajzen, 2006: Accessed from: <http://www.people.umass.edu/aizen/pdf/tpb.measurement.pdf>). Data were checked for outliers and then normality using standard skewness and kurtosis ( $z > \pm 1.96$ ). Subsequently, orthogonality was assessed using Pearson's  $r$  or Spearman's  $Rho$  for variables that violated the parametric assumptions. ATG-Social was correlated with the social support variables of attachment ( $r = .388, P < .05$ ) and nurturance ( $r = .449, P < .01$ ) as well as subjective norms ( $r = .548, P < .01$ ). ATG-Task was significantly correlated with guidance ( $r = -.489, P < .01$ ). Social support factors (attachment, nurturance and guidance) were correlated with subjective norms ( $r = .563, P < .01$ ;  $r = .504, P < .01$ ;  $r = .433, P < .01$ ). The social support factor of attachment was correlated with nurturance and guidance ( $r = .652, P < .01$ ;  $r = .751, P < .01$ ) and nurturance was correlated with guidance ( $r = .688, P < .01$ ). Social support factors of social integration and reassurance were correlated ( $r_s = .527, P < .01$ ) as were reliable alliance and reassurance ( $r_s = .395, P < .05$ ). In sum, none of these factors demonstrated clear orthogonality in an exercise context; the correlations reported herein are of a moderate order.

## **Effect of training with and without pelvic restraints on development of lumbar extensions strength and lumbar muscle activity**

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Back pain is one of the most costly conditions in the UK (Maniadakis & Gray, 2000: *Pain*, 84, 95-103). Effective testing and training of the lower back requires total pelvic stabilisation (Pollock *et al.*, 1989: *The American Journal of Sports Medicine*, 17, 624-629). The MedX lumbar extension machine (MedX, Ocala, Florida) is capable of such isolation. Improvements in lumbar muscle strength, endurance and range of motion from isolated lumbar extension training are associated with reductions in back pain (Carpenter & Nelson, 1999: *Medicine & Science in Sport & Exercise*, 31, 18-24). Many commercial gyms have back extension resistance machines, most of these contain no restraint system for pelvic stabilisation. Within the literature, the effect of pelvic stabilisation on development of lumbar extension strength is equivocal (Graves *et al.*, 1994: *Arch Phys Med Rehabil*, 75, 210-215, Mayer *et al.*, 2002: *Journal of Back Musculoskeletal Rehabilitation*, 16, 25-31). Electromyographic (EMG) activity of the lumbar musculature has also been examined with and without pelvic stabilisation, favouring stabilisation to increase the specificity of the exercise (San Juan *et al.*, 2005: *Journal of Strength & Conditioning Research*, 19, 77 – 81). To date however no study has examined both strength and EMG activity within the same sample. The present study aims to examine both lumbar extensor strength and muscle activation with and without pelvic stabilisation. Ethical approval was obtained from the Health Exercise and Sport Science Ethics Committee at Southampton Solent University. Nineteen participants (male, n = 15, female, n = 4) (Mean  $\pm$  SD, age, 23  $\pm$  9 years, height, 174.8  $\pm$  10.7 cm, body mass, 76  $\pm$  13.5 kg) were randomly assigned to either MedX lumbar extension machine, a commercially available back extension machine (Pulse, Congleton, Cheshire), or control group. Maximum isometric testing on the MedX and a 1RM test on the Pulse was undertaken pre and post 12 week training undertaking 1 session/week (Smith *et al.*, 2008: *Journal of Orthopaedics*, 5, Online). EMG was used to assess lumbar muscle activity during an additional training session. Between groups comparisons for strength changes were analysed using one-way repeated- measures ANOVA. Post hoc Tukey was used to identify where any significant differences existed. Between group comparison of EMG activity was analysed using an independent samples t-test. Incomplete results (n=14) indicate both MedX and Pulse groups improved isolated lumbar extension strength following the intervention (mean increase of 19.6% and 14.1% respectively) with no significant difference between training groups ( $p > 0.05$ ). No significant difference between groups was observed for normalised EMG data ( $p > 0.05$ ). The preliminary results of this study indicate that pelvic stabilisation may not be necessary for development of lumbar extension strength and that the lumbar extensors are adequately recruited to optimise strength gains during unrestrained training.

## Performance and metabolic responses to a high theobromine dose during prolonged running exercise

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Theobromine, like caffeine, belongs to a group of drugs called methylxanthines. One of the reported biologic effects of methylxanthines is increased lipolysis, and theobromine has been shown to stimulate lipolysis in isolated fat cells of rats (Beavo et al., 1970: *Molecular Pharmacology*, 6, 597-603). However, as yet, no one has investigated the effects of theobromine on exercise performance in humans. The possible lipolytic effect of theobromine may be significant because one of the limiting factors in endurance exercise is depleted muscle glycogen (Karlsson & Saltin, 1971: *Journal of Applied Physiology*, 31, 203-206). Therefore, the purpose of this study was to investigate whether a high theobromine dose, ingested in the form of a chocolate drink (100% cacao) has an ergogenic effect on endurance performance. A group of nine healthy male and female subjects (mean  $\pm$  SD) age  $19.8 \pm 1.7$  years, height  $170.4 \pm 11.2$  cm, mass  $70.0 \pm 10.3$  kg,  $\text{VO}_2\text{max}$   $48.1 \pm 6.5$  ml.kg.min<sup>-1</sup> volunteered to take part in this study, which received University ethics approval. On two separate occasions, subjects completed a 30 minute steady state run at 75%  $\text{VO}_2\text{max}$ , followed by a 1 km self-paced time trial, after either ingestion of a placebo drink (white chocolate and water) or a cacao chocolate drink (10 mg/kg body mass theobromine and water) in a single blind, randomized cross over design. The experimental drink was consumed one hour prior to exercise and measurements of heart rate (HR), rating of perceived exertion (RPE), oxygen uptake ( $\text{VO}_2$ ), minute ventilation (VE) and respiratory exchange ratio (RER) were recorded every 5 minutes during the steady state run, and HR and RPE were recorded every minute during the 1km time trial. Data from the steady state run were analysed using a repeated measures ANOVA and post hoc pairwise comparisons. Data from the 1 km time trial was analysed using paired samples t-tests. Statistical significance was set at  $P < 0.05$ . One km performance significantly improved by 16% following theobromine ingestion ( $P < 0.05$ ). RER was significantly lower during the steady state run following theobromine ingestion ( $P < 0.05$ ). RPE values were lower throughout the theobromine trial, however these results did not reach significance.  $\text{VO}_2$ , VE and HR during exercise were not different between the two trials. These data suggest that ingestion of 10mg/kg body mass theobromine ingested in the form of a cacao chocolate drink enhances endurance performance possibly due to a greater reliance on fat metabolism, as indicated by a lower respiratory exchange ratio.

## **The labour migration of African professional footballers to the English premier league since 1992: A sociological study**

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Although there has been an expanding body of research conducted on labour migration in sport, and the migration of groups such as African footballers to Europe, little research has so far been conducted on the migration of professional African footballers to England. The purpose of this study was to examine the migration of professional African footballers to England, since the formation of the FA Premier League in 1992, an area that is currently under researched. The data sources used for this study were the official Rothmans and Sky Sports football yearbooks. For each season of the Premier League from 1992/1993 until 2008/2009, the number of African players (classed as African by their place of birth) signed by every Premier League club were recorded, as were the nation of birth for each player, the total squad numbers for each Premier League team per season, and the proportion of African players signed per club and the division as a whole. The findings indicate that the number of African migrant players employed within the Premiership has risen since the league was established. In 1992/1993 African migrant players made up 1.1% of the Leagues player population, by 2008/2009 that number had risen to 8.0%. The data revealed that 33 African nations have supplied footballers to the Premier League, though different nations have made a differential contribution to the trend in African labour migration to England. The biggest supplier of African talent between 1992 and 2009 was Nigeria (30 players). Other countries across central Africa including Sudan and Ethiopia supplied no players. The processes associated with this growing influx of African footballers is explained from the perspective of figurational sociology. It is suggested that complex networks of relationships have contoured the migration of professional African players into the top flight of English football and that their migration can be viewed as resulting from the outcomes of multi-dimensional social processes that are structured by, economic, political, historical and geographical developments. In addition, the study indicates that colonialization, increased globalization, commodification of sports and commercialisation are key elements of these processes. In conclusion the study demonstrates that Africa has become an increasingly utilised source of migrant player labour, and the recruitment of African footballers has increased significantly, though these players have been provided by a small number of nations predominantly on the continent's western coast.

## **The effect of acute hypoxia on heat shock protein 72 expression and oxidative stress *in vivo*: Implications for cross tolerance and performance**

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The inducible human stress protein HSP72 performs vital roles within the body at rest and during periods of stress. Recently a previously disclosed quadratic trend in basal HSP72 expression was shown to be reliable and repeatable. The notion of a physiological stressor such as hypoxia disrupting this basal quadratic trend is an interesting one. Monocyte expressed HSP72 and a measure of oxidative stress (TBARS) was determined every 3 h; over a 12 h period in twelve healthy male subjects on two separate days; with trial day one ascertaining control values. Monocyte expressed HSP72 was assessed via Flow Cytometry from venous blood samples using an established biochemical assay. These blood samples were centrifuged with EDTA rich plasma removed and stored at -80 °C for TBARS analysis at a later date. A hypoxic intervention consisting of 75 mins at a simulated altitude of 2980 m, commencing and ceasing at 0930 and 1045 respectively was incorporated on trial day two. The hypoxic condition induced significantly elevated HSP72 values at 1100 ( $p = 0.002$ ); 1400 ( $p < 0.001$ ); 1700 ( $p = 0.034$ ) and 2000 ( $p = 0.041$ ) compared to control. Significant increases in plasma TBARS were seen in the Hypoxic condition compared to control at 1100 ( $p = 0.006$ ) and 1400 ( $p = 0.032$ ). The results demonstrate a 75 min bout of normobaric hypoxia is sufficient to induce significant increases in HSP72 expression, which disrupts the basal quadratic trend shown by others and here in the control condition. This increase may be linked to the observed changes in oxidative stress. These results may provide a tool for manipulating basal monocyte HSP72 expression within human heat acclimation exercise protocols/strategies or for whole body preconditioning in non-cardiac surgery.

## Secret clock manipulation during a set distance and the perception of effort

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During athletic events; well-trained athletes employ pacing strategies in order to optimise performance (Abbis and Laursen; 2008: *Sports Medicine*, **38**, 239-252). A key factor in optimising pacing strategy is knowledge of endpoint (St Clair Gibson *et al.*; 2006: *Sports Medicine*, 36, 705-722). Perception of effort has also been identified as an important factor in regulating pacing (Tucker 2009: *British Journal of Sports Medicine*, **43**, 392-400.). Noakes (2004: *Journal of Applied Physiology*, **96**, 1571-1573) suggests a perceived exertion template is created prior to exercise to protect the athlete from causing potential bodily harm. Although, the precise mechanism through which ratings of perceived exertion (RPE) regulate pacing strategy is unknown, deception studies involving use of incorrect distance or duration feedback have investigated the nature of the relationship between RPE and pacing. A recent deceptive study involved clock manipulation (Morton, 2009: *Journal of Science and Medicine in Sport*, **12**; 332-337). However, this study used a time to task failure at a constant workload protocol, thereby not permitting regulation of power output. The purpose of this study was therefore to investigate the effect of incorrect time feedback on performance and RPE during a series of self paced 10-km cycle time-trials (TT). With institutional ethics approval seven well trained males (mean  $\pm$  s, age 33  $\pm$  13) completed a familiarisation trial and three 10-km TT in a single-blind random repeated measures design. Participants completed each trial using their own cycles attached to the Kingcycle ergometer rig. Following an individualised warm up participants were asked to verbalise their goal for each trial. The only instructions given to participants were to complete each as quickly as possible. Distance feedback was made available via visual display, along with a digital clock displaying elapsed time. However; on two occasions the clock calibration was altered to run either 10% fast or 10% slow. RPE was recorded at 0.5km intervals. Manipulated times were later converted to real times. The Friedman test was used to assess differences between clock conditions. Although, none of the differences reached statistical significance ( $P < 0.05$ ) mean real finishing time was fastest in the slow clock (896.2s) and slowest in the fast clock (913.4s) condition. Mean speed was almost identical for each 0.5km interval until the midway point, when speed in each of the conditions began to diverge with the highest speeds in the slow clock and the lowest speeds in the fast clock condition. The magnitude of the frequently observed 'endspurt' in the final 10% was also greatest in the slow clock and smallest in the fast clock conditions. Despite the different levels of performance achieved, RPE scores were similar throughout in all conditions. These results confirm the idea that an RPE template may be created prior to a maximal exercise bout, but that muscular work at each level of RPE may be influenced by psychological factors.

## The relationship between 2D:4D ratios, self-perception, and health- & skill-related tests in 7-11 year old children

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Sedentary behaviour in children is one of the main risk factors for the development of obesity (Anderson et al., 1998: *Journal of the American Medical Association*, **279**, 938 - 942). The ratio of the 2nd and 4th digit lengths (2D:4D) is negatively correlated with prenatal and adult testosterone (Manning and Taylor, 2001: *Evolution and Human Behavior*, **22**, 61-69). There is empirical evidence that links 2D:4D to high athletic performance (Manning and Taylor, 2001) but there is limited literature examining the relationship between 2D:4D and athletic performance in children. Therefore the aim of this study was to examine the relationship between 2D:4D and various health- and skill-related tests (Eurofit tests, Adam et al., 1988: EUROFIT: European Test of Physical Fitness. Rome: Council of Europe; Committee for the Development of Sport) in 8-11 year old children. One hundred and six year four (BMI  $18.0 \pm 3.2$  kg/m<sup>2</sup>); 76 year five (BMI  $17.8 \pm 2.9$  kg/m<sup>2</sup>); and 96 year 6 children (BMI  $18.2 \pm 3.2$  kg/m<sup>2</sup>) participated in the study. Participant's 2D:4D was assessed using the protocol used by Honekopp et al. (2006: *Hormones and Behavior*, **49**, 545-549). The subjects performed 8 Eurofit tests (Adam et al., 1988), standing broad jump (SBJ), 20 m endurance shuttle run (20-MST), speed bounce (SB), plate tapping (PT), 10 x 5 m agility run (10 x 5), sit and reach (SR), modified sit and reach (MSR) and handgrip strength (GS). Data were analysed using Pearson's correlation, Spearman's rank correlation was used where data was not normally distributed. Statistical significance was set at  $P \leq 0.05$ . The study revealed that there was no significant correlations between 2D:4D and SBJ ( $r = -0.085$ ;  $P = 0.135$ ), 20-MST ( $r = -0.048$ ;  $P = 0.400$ ), SB ( $r = 0.071$ ;  $P = 0.213$ ), PT ( $r = -0.097$ ;  $P = 0.089$ ), 10 x 5 ( $r = 0.090$ ;  $P = 0.113$ ); SR ( $r = 0.093$ ;  $P = 0.105$ ) and MSR ( $r = 0.116$ ;  $P = 0.042$ ), GS ( $r = -0.040$ ;  $P = 0.480$ ) and BMI ( $r = -0.018$ ;  $P = 0.749$ ). The data suggests there is no significant relationship between 2D:4D and skill and health related fitness in children. In addition to this; the relationship between physical self-perceptions; 2D:4D and health and skill-related Eurofit tests will be examined. However; data has not been collected for this at the present time.

## Is there a cumulative effect of intermittent exercise on circadian pineal function and blood pressure in humans?

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The secretory product of the Pineal Gland, melatonin, is important for control of human circadian rhythms. Salivary melatonin concentration peaks at night and is inversely related to the circadian variation of core body temperature (T<sub>core</sub>). Recently; melatonin has been discussed in the context of exercise physiology because physical activity can synchronise circadian rhythms (Atkinson *et al.*, 2003: *Sports Medicine*, **33**, 809-831) and because exogenous melatonin may help pre-cool athletes prior to exercise in the heat (Atkinson *et al.*, 2005: *Journal of Pineal Research*, **39**, 353-359). Nevertheless, research is still lacking on the responses of endogenous melatonin to exercise, especially that of an intermittent nature. Therefore, the purpose of this study was to compare the responses of endogenous melatonin, haemodynamic and thermoregulatory variables to intermittent exercise performed at two times of day. In keeping with recently-published evidence for the particular benefits of intermittent exercise (Jones *et al.*, 2009: *Chronobiology International*, **26**, 293-306), it was hypothesised that there is a cumulative response of melatonin over repeated blocks of intermittent exercise, and a generally greater response in the morning when resting melatonin concentration is still relatively high. Using a novel sleep- and posture-controlled protocol administered at 06:30 and 16:00 h, 6 men (aged 20-43 years) completed intermittent semi-supine cycling at 60% VO<sub>2</sub>max. There were 3 x 10-min exercise blocks; each interspaced with 10 min of passive recovery. Salivary melatonin levels were measured at baseline; and at the beginning of each rest period during the protocol. T<sub>core</sub> (intestinal temperature) skin temperature (T<sub>skin</sub>) and skin blood flow were also measured continuously during trials. Data were analysed using two-factor (protocol x time) repeated measures general linear models. Relationships between melatonin and body temperature responses were also examined with appropriate within-subjects correlations (Bland and Altman, 1995: *BMJ*, **310**, 446). Statistical significance was set at  $P \leq 0.05$ . Mean (SD) melatonin concentration was 25.4 (14.7) pg/ml higher in the morning compared with the afternoon ( $P=0.008$ ). Although melatonin was significantly influenced by posture changes ( $P=0.004$ ), there was no evidence of any effects of exercise ( $P>0.25$ ), despite exercise mediating a significant reduction in mean arterial pressure (MAP) of 7 (2.5) mm Hg, these reductions were cumulative at both times of day. These data indicate that melatonin levels are consistently higher during posture manipulations and exercise in the morning compared with the afternoon, but exercise itself does not mediate any additional effects on melatonin when prior sleep is carefully controlled.

## **The importance of mental toughness in cricket and soccer**

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The purpose of the present study was to investigate how important each of the 30 mental toughness attributes (Jones *et al.*, 2007: *The Sport Psychologist*, **21**,234-264) are within soccer and cricket. Four male premier league cricket players aged between 20 and 21 (M=20.75 SD=0.5) and four male semi-professional soccer players aged between 21 and 23 (M 21.75 SD=1.0) were interviewed on their rating out of 10 for each attribute. The data was analysed by firstly generating mean ratings for every attribute in each sport and placing them in order of importance. Secondly, interview data was deductively analysed for the top 10 attributes using cross case causal networks. The results showed that cricket players identified attributes under the sub-component handling pressure to be the most important as cricketers need to control anxiety in order to adapt and make the right decisions every ball. Soccer players identified attributes under the sub-components belief and regulating performance to be most vital. The players identified that in order to maintain their self-belief it is important to remain focused and learn from mistakes, whilst regulating performance entails capitalising on the opposition's mistakes to score. Consistent with previous research, both sports identified that mental toughness was most important in the competition environment. These findings enable practitioners, coaches and athletes alike to tailor interventions and environments to develop sport specific mental toughness that will match and buffer the stressors experienced within cricket and soccer (Fletcher *et al.*, 2006: In *Literature Reviews in Sport Psychology*, edited by S. Hanton and S. Mellalieu. New York : Nova Science Publishers). Future research should use super elite participants as they are likely to have a far greater insight into the makeup of mental toughness (Jones *et al.*, 2007), and also examine the 20 components not analysed in this study to find out why they were perceived less important. Additionally, a study that looks at individual skill or endurance based sports would be a logical progression, to identify if attributes vary depending on the nature of other sports.

## The effects of dehydration on tennis performance

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There seems to be discrepancies when addressing hydration and its effect on performance. Marathon runners compete successfully despite being dehydrated (6% body mass loss) and having high rectal temperature, weight loss, and sweat rate (Pugh et al. 1967: *Journal of Applied Physiology*, **23**, 347-352). However, it has been suggested that tennis players need to minimise fluid loss (Bergeron et al. 1995: *Clinical Sports Medicine*, **14**, 23-32). Hence this pilot study investigated the effects of dehydration on tennis performance. The study was approved by the University ethics committee. Participants were three male tennis players from a local tennis academy (age  $17 \pm 1$  years, height  $180 \pm 9$  cm, body mass  $77 \pm 11$  kg) who undertook a habituation session prior to experimental testing and then completed two main trials, seven days apart, using a randomised cross-over design. Each trial comprised a forced dehydration protocol – 60 min walking and jogging in an environmental chamber (air temperature  $\sim 30^\circ\text{C}$  and relative humidity  $\sim 40\%$ ) – followed by a 45 min rest period, when participants were either rehydrated (F) with plain water (volume equal to body mass loss) or were allowed no fluid (NF). Participants then completed the service element of the Loughborough Tennis Skill Test, which consisted of 10 serves into a marked rectangle (1.0 x 4.0 m) just below the service line on either side, and a 5 m shuttle run test, each separated by 5 min. Service accuracy, heart rate, distance covered during the shuttle runs and pre and post body mass were obtained. The forced dehydration caused a  $1.2 \pm 0.3$  kg body mass loss, equivalent to  $1.6 \pm 0.3\%$ , which was temporally related to a reduction in service performance on the right-hand side (F;  $5.0 \pm 0$  vs. NF;  $3 \pm 1$  but not the left-hand side (F;  $3 \pm 1$  vs. NF;  $5 \pm 0$ ). Dehydration resulted in greater cardiovascular strain during the serve test (F;  $126 \pm 25$  vs. NF;  $132 \pm 17$  beats $\cdot\text{min}^{-1}$ ) but not during the shuttle run (F;  $182 \pm 7$  vs. NF;  $182 \pm 8$  beats $\cdot\text{min}^{-1}$ ). Finally no performance decrement was found in the shuttle run (F;  $591 \pm 97$  vs. NF;  $614 \pm 96$  m). In conclusion, acute dehydration failed to consistently and negatively impact tennis performance, however more data collection is needed to allow quantitative analyses to be conducted and clearer conclusions to be drawn.

## **Assessing the long term benefits and efficacy of the high performance coach programme (HPCP also known as NLP Sport Practitioner) for personal and professional development**

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The mission of UK Sport is ‘to work in partnership to lead sport in the UK to World Class Success’. British sporting achievements have been on the increase over the last number of years, with the climax being at the Beijing 2008 Olympics and Paralympics. Excellence is something everyone wants to achieve in whatever they do whether in sport, business or life. Neuro Linguistic Programming (NLP) looks at modelling excellence. O’Connor & Seymour (1995: XII - *Introducing NLP*, 2<sup>nd</sup> ed, Torsons, London) states that ‘NLP is the art and science of personal excellence’. Professional development is essential to success and enhancing performance, which is the vital component in a highly skilled performance. Both NLP and professional development have a common link of enhancing performance. Therefore in light of this gap in research, the aim of this study was to assess the long term benefits and efficacy of the HPCP for professional and personal development. 18 participants took part in the study, 12 male and 6 female who had all attended the HPCP as part UK Sport Elite programme. Participants completed an online, specifically designed questionnaire, which was distributed through a third party so complete anonymity was kept. A content analysis was performed. The results showed that 100% of UK Sport respondents stated the programme had had a positive impact on their Personal and Professional Development. 100% reported professional benefits resulting in a direct impact on key performance variables for athletes. 100% reported personal benefits resulting in a direct impact on their professional role as a coach. 100% reported an improvement in their understanding of people. 75% reported an improvement in their communication abilities. 38% reported they now take more individual responsibility. 50% reported they became more positive. 61% report using skills learnt on the programme to resolve conflicting situations. 66% report an improvement in personal and professional confidence. 22 % report an improvement in the way they deliver feedback to athletes. The findings show that coaches and practitioners consider attending this programme as beneficial to both personal and professional development, and that based on the responses provided, benefits are seen in the following 7 areas: Understanding People and Behaviour; Improving Communication Skills; Taking Responsibility; Resolving Conflict Situations; Improving Confidence (self and others); Ability to Provide Feedback and Creating a Positive Mindset. Therefore the assumption was made that the HPCP enhanced performance both personal and professionally.

## **Group cohesion as a predictor of the needs underlying intrinsic motivation in an exercise context**

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People engage in physical activity for a variety of reasons. Intrinsic motivation refers to engaging in an activity for its own sake and the pleasure and satisfaction derived from participation (Deci, 1975: *Intrinsic motivation*. New York: Plenum). According to self-determination theory (SDT; Deci & Ryan, 2000: *Psychological Inquiry*, **11**, 227-268), intrinsic motivation will occur if an activity or experience can satisfy three innate psychological needs for competence, autonomy, and relatedness. A considerable amount of physical activity occurs within group settings yet little research has explored the potential influence of group dynamics, such as group cohesion, on these needs. Accordingly, the purpose of this study was to examine whether group cohesion was a positive predictor of the needs underlying intrinsic motivation in an exercise context. Thirty participants attending weekly cardiac rehabilitation exercise classes completed the Exercise-specific Group Environment Questionnaire (GEQ; Spink & Carron, 1994: *Small Group Research*, **25**, 26-42) at the beginning of a class to assess the level of cohesion within the group. This was followed by completion of the Activity Feelings State scale (AFS; Reeve & Sickenius, 1994: *Educational and Psychological Measurement*, **54**, 506-515) at the end of the class to assess participants' perceived competence, self-determination, relatedness, and tension. Data collection and analysis are ongoing at the time of print.

## Acute tyrosine supplementation increases exercise capacity in the heat

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Improvement in prolonged exercise tolerance in the heat has been linked to increased brain dopamine availability. In man, supplementing tyrosine, the nutritional precursor of dopamine, can improve cognitive and psychomotor measures while under conditions of extreme environmental stress, however it is unclear whether tyrosine can improve exercise tolerance in the heat. The purpose of the present study was therefore to explore whether acute supplementation of tyrosine would increase exercise capacity in a warm environment. Subjects were provided with written and verbal information before giving their informed consent, and prior ethical approval was granted by the University Research Ethics Committee. Eight healthy male volunteers [mean age  $32 \pm 11$  (SD) years; peak oxygen uptake ( $\dot{V}O_{2\text{peak}}$ )  $3.50 \pm 0.33 \text{ l}\cdot\text{min}^{-1}$ ] who were unacclimated to exercise in the heat, performed two trials separated by at least 7 d in a randomised, crossover design. Subjects consumed either 500 ml of a flavoured sugar-free drink (PLA), or the same drink with  $150 \text{ mg}\cdot\text{kg body mass}^{-1}$  tyrosine (TYR) in a double-blind manner 1 h before cycling to exhaustion at a constant exercise intensity of  $161 \pm 17 \text{ W}$ , equivalent to  $68 \pm 5\% \dot{V}O_{2\text{peak}}$ , in  $30^\circ\text{C}$  and 60% relative humidity. A repeated measures two-factor (time  $\times$  trial) ANOVA was used to compare trials. Where significant differences were found in ANOVA, post-hoc analysis was carried out using paired student's *t* tests with the Bonferroni correction to highlight pairwise differences. Statistical significance was accepted at  $p < 0.05$ . Subjects cycled for longer in TYR compared to PLA ( $80.3 \pm 19.7 \text{ min}$  vs.  $69.2 \pm 14.0 \text{ min}$ ;  $p = 0.003$ ). Administration of tyrosine in TYR caused a 4.7 fold increase in plasma concentrations ( $p < 0.01$ ) and a 2.9 fold increase in tyrosine:LNAA (large neutral amino acids) pre-exercise, while there was no change in PLA ( $p = 0.358$ ). Core temperature ( $T_{\text{core}}$ ), mean weighted skin temperature ( $T_{\text{skin}}$ ), ratings of perceived exertion (RPE) and thermal sensation (TS) were similar in TYR and PLA up to 50 min of exercise ( $p > 0.05$ ) and at exhaustion ( $p > 0.05$ ). These results show for the first time, that acute ingestion of  $150 \text{ mg}\cdot\text{kg body mass}^{-1}$  tyrosine pre-exercise increases exercise capacity in the heat. The availability of tyrosine seems to, at least in part, govern exercise tolerance in the heat.

## The effects of sodium bicarbonate hyperhydration on cycling performance in the heat

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As little as 2% dehydration can have significant effects upon performance as well as down regulate physiological capacities to cope with heat stress (Coyle, 2004: *Journal of Sport Science*, **22**, 39-55). During dehydrating exercise sweating can cause sodium losses (Twerenbold *et al.* 2003: *British Journal of Sports Medicine*, **37**, 300-303). Sodium can have a significant effect upon plasma volume levels during prolonged exercise (Sanders *et al.* 2001: *European Journal of Applied Physiology*, **84**, 419-425). Sodium citrate which is a similar acid-base regulator to sodium bicarbonate ( $\text{NaHCO}_3$ ) has been found induce hyperhydration (Nelson *et al.* 2008; *International Journal of Sports Physiology and Performance*, **3**, 505-515) however  $\text{NaHCO}_3$  is yet to be investigated as a potential hyperhydration aid prior to exercise in the heat. 8 Male university students of which 4 have been completed (Age  $20 \pm 0.5$  years, Height  $174.75 \pm 6.94$  cm and Weight  $67.07 \pm 8.95$  kg) performed 60 minutes steady state (SS) cycling in a hot environment (Temperature  $33.65^\circ\text{C}$ , Humidity 29%) at 90% of lactate threshold ( $111 \pm 16.29\text{W}$ ) under three conditions: consumption of 1L water with 18g  $\text{NaHCO}_3$ , 4.8g of sodium chloride ( $\text{NaCl}$ ) or a control of 800 ml water with 200ml of cordial 60 minutes prior to exercise. Following SS exercise subjects rested for 10 minutes then completed a 5km time trial (TT). Blood capillary samples were taken pre ingestion and exercise, post exercise and TT. Urine osmolality (UOsm) was measured pre and post ingestion and post TT. All trials were separated by a week. A two-way repeated measure ANOVA compared effect for time between trials. Preliminary results show that the percentage dehydration post TT was greatest following control trial (-1.87%) compared with  $\text{NaHCO}_3$  and  $\text{NaCl}$  trials (-1.74% and -1.27% respectively). Plasma volume changes post-ingestion were greatest following control (-8.35%) compared to  $\text{NaHCO}_3$  and  $\text{NaCl}$  (-4.84% and -2.92% respectively).  $\text{HCO}_3$  and Base-excess post ingestion were greater during  $\text{NaHCO}_3$  ( $P < 0.05$ ). No main effect for time or between trials in pH were observed ( $P > 0.05$ ). Sodium values did not change throughout nor did they differ between trials ( $P > 0.05$ ).  $\text{NaHCO}_3$  UOsm values were greater post exercise than all other trials ( $P < 0.05$ ). Performance times were not different between any trials with no trend in improved performance time as a result of  $\text{NaHCO}_3$  ingestion ( $P > 0.05$ ). The use of sodium bicarbonate does not increase hydration levels prior to exercise in the heat nor improve cycling performance in the heat.

## Sources of confidence identified by recreational athletes

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The purpose of the present study was to identify sources of confidence most salient to recreational athletes. This study utilised two male hockey teams (n=33) competing in a regional league. Before each game, over a six week period, participants were required to respond to the following stem; 'I feel confident about today's game because...'. Each identified source was also given an importance rating and following the game, each individual was then required to rate their personal performance on a scale of 0-10. The sources were then content analysed across the six weeks into more meaningful sub-themes, higher-order themes and then global dimensions. Overall, the following themes emerged within the data; team and individual form, pre-game physical condition, personal management and social support. These findings are consistent with that of previous research, which provide some support for the predictors of Self-Efficacy theory (Bandura, 1997: *Self-Efficacy: The Exercise of Control*. New York: Freeman) and Sport-Confidence theory (Vealey *et al.*, 1998: *Journal of Sport & Exercise Psychology*, 20, 54-80). However, unique sources to recreational athletes were also recognised such as; feeling rested, stress free, training quality, positive thoughts regarding the team, playing environment/conditions and nature of opposition. In terms of practical implications, this evidence suggests that those athletes who compete in a structured environment but lack the amount of sport science support received by elite level athletes derive their confidence from different sources not previously identified in the literature. Therefore, it would be advisable for the coach or captain of the team to consider these factors in order to increase confidence. The findings of this study also provide further evidence that organisational and athletic-specific factors influence sources of self-confidence and that a sport-specific framework is required when examining confidence in future research.

## **Systematic review of barriers and facilitators to physical activity in young people in England, 1st January 2000 to 31st December 2010**

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Physical inactivity is a worldwide public health priority that affects people of all ages and is accountable for an estimated 1.9 million deaths per annum (Dobson *et al.*, 2009 *The Cochrane Library Issue 4*; WHO, 2004 *Global Strategy on diet, physical activity and health*). It is known within the medical and sport fraternity that physical inactivity leads to increased risk of cardiovascular disease, cancers, reduced mobility, obesity and diminished bone health, which when combined, act to significantly reduce quality of life (QoL) and life expectancy (Lee *et al.*, 2009 *British Journal of Sports Medicine* 43 , 49-51.). Physical inactivity in England is high with 68% of boys and 76% of girls self-reporting activity levels below those recommended by the Chief Medical Officer (HSE, 2009 *Health Survey for England 2008 Physical activity and fitness. Volume 1*). Twice as many children are obese when they leave primary school than when they start (NCMP, 2009 *National Child Measurement Programme* (2009)). With this information in mind, the question posed is: What do young people describe as their barriers to physical activity? The current research aims to update previous research (Rees *et al.*'s 2001 EPPI Centre) , with research conducted or published between January 2000 and December 2009. Findings from this systematic review should be of interest to a wide range of policy makers and academics across children, health and exercise settings, with the aim of improving our understanding of factors helping and hindering young people to being physically active. Research articles, published and unpublished, reporting the barriers and facilitators of young people to being physically active will be reviewed in four phases. *First phase*: a key word search across databases, combined with a search of the 'grey literature' to identify relevant articles. *Second phase*: a researcher using set criteria will ensure only research specific to the review objectives will proceed to the next phase. Letters will also be sent to prominent authors requesting knowledge of further research. *Third phase*: the full text articles will be retrieved and reviewed by two researchers applying the Critical Appraisal Skills Programme Assessment Tool (CASPT; Public Health Resource Unit, 2006). *Fourth phase*: data extraction and coding, with the most methodologically robust research rated by CASPT score analysed first. Thematic analysis will occur in an iterative process with new articles continuing to be added to the dataset until thematic saturation is reached. Findings to be presented at conference.

## Comparing lower leg kinematics in sprint acceleration with and without the constraints of holding a field hockey stick

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The importance of rapid sprint acceleration in team based sport performance has been well established (Sayers, 2000: *Sports Coach*, 23, 26-27). Sports scientists have created a number of training techniques, such as interval sprint training (Reilly, 2001: *European Journal of Sport Science*, 1, 1-12), to improve the acceleration of sports performers over a short distance. Athletes have been hypothesised to adapt their sprinting technique according to the constraints of the task (Walsh et al., 2007: *Journal of Sports Sciences*, 25, 185-192). A variety of sports including rugby, field hockey, tennis, and lacrosse, require the athlete to accelerate with the constraint of carrying an implement, which has been found to have an adverse effect on the sprint performance of the athlete over a set distance (Walsh et al., 2007). Sprint training regimes traditionally do not facilitate the development of game-specific sprint-based skills. The aim of this study was to investigate the technique of sprint acceleration when performing sprint-based tasks with and without the constraints of carrying a field hockey stick. With institutional ethics approval 18 experienced university male field hockey players (mean  $\pm$  s), age  $20 \pm 1$  years, body mass  $73.3 \pm 7.1$  kg and stature  $1.78 \pm 0.05$  m completed 3 sprint accelerations holding a field hockey stick and 3 sprint accelerations without a field hockey stick. Technique-based measures (Hunter et al., 2005: *Journal of Applied Biomechanics*, 21, 31-43) were analysed through a kinematic analysis (CODA motion analysis system, Charnwood Dynamics, UK) of the lower extremities at touchdown and toe-off during the sprint running stride. Performance measures were analysed and included average velocity and step velocity between 5-10m and 18-22m. The results showed significant differences between sprint acceleration with and without the constraint of holding a field hockey stick ( $p < 0.05$ ) in the ankle angle and hip angular velocity at touchdown and hip and trunk angle at toe-off. Significant differences ( $p < 0.05$ ) between the two conditions were also found in the mean sprint velocities between 5-10 m and 18-22 m and the stride length between 5-10 m. The main implication of the studies findings are for coaches include the addition of the equipment in the sprint training regimes discussed. This may enable the athlete to make the necessary technical adjustments to maximise their sprint acceleration.

## **An investigation into the effect of social comparison information on exercise adherence during a 12 week circuit training program**

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Current research suggests that exercise initiatives have a somewhat limited success; 50% of individuals will terminate an exercise programme within six months of beginning (Weinberg and Gould, 2007: *Foundations of Sport and Exercise Psychology* (4<sup>th</sup> edition). Champaign, IL: Human Kinetics) and relapse rates to problematic behaviour are particularly high (Prochaska and Velicer, 1997: *American Journal of Health Promotion*, **12**, 38-48). Interventions to promote adherence are at best moderately successful (Biddle and Mutrie, 2007: *Psychology of Physical Activity*. New York: Routledge). This study aims to promote adherence using Social Comparison Theory (Festinger, 1954: *Human Relations*, **1**, 117-140) by giving feedback to participants in a physical activity intervention. The study will build upon the work of O'Donnell (under review) who reports significant adherence improvements from utilising social comparison information as feedback in a physical activity intervention. Social Comparison theory (SCT) allows both upward and downward social comparison enabling us to give participants information where they are shown to outperform or lag behind members of the group. O'Donnell found large increases in adherence rates from an intervention used in groups of obese men in resistance training given SCT feedback compared to groups given individual feedback. The present study aims to establish whether a similar effect can be found using a different mode of physical activity. This study utilises a 12 week program of circuit training classes. The intervention was delivered across three university campuses at the University of the West of Scotland. The participant pool was drawn from the general population of employees of the University (15 male and 59 female). Once informed consent and PARQ had been carried out, participants were randomly assigned to either a control group, who attended the classes and received a weekly email containing physical activity and weight loss advice, or an experimental group, who attended the classes and received the email advice plus information on how they scored on two measures from the circuit training class (crunches and shuttle runs). The experimental group were also informed of the group mean scores for these measures. Measures of Rate of Perceived Exertion and self efficacy are being taken at three intervals. Data collection is ongoing and not yet completed. However, early analysis of data (after 6 weeks of the programme) shows strong trends towards greater adherence in the experimental group. Further analyses of adherence and the impact on self efficacy, and circuit-related performance measures will be compared across the two groups.

## The effect of caffeine on time to fatigue for an isometric contraction of the quadriceps

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Caffeine is one of the most widely used drugs in the world and due to the similarity with several endogenous metabolites is able to affect many human body tissues including muscle. Although previous research has shown that it can have ergogenic effects for aerobic exercise, there are conflicting results in terms of strength endurance (Astorino *et al.*, 2008: *European Journal of Applied Physiology*, **102**, 127-132; Conway *et al.*, 2003: *Journal of Applied Physiology*, **94**, 1557-1562). Therefore the primary aim of this study was to explore the effect of caffeine on strength endurance of the quadriceps muscle at 60% of maximum voluntary contraction (MVC). It was hypothesised that caffeine, when compared to placebo, would significantly increase time to fatigue. Seven females ( $20 \pm 8$  years,  $61.7 \pm 6.6$  kg) and twenty-five males ( $20 \pm 2$  years,  $84.7 \pm 15.2$  kg) participated in the study with a randomised, double blind, crossover design. Prior to (T0) and 30 (T30) and 60 (T60) minutes after ingestion of a  $6 \text{ mg}\cdot\text{kg}^{-1}$  body mass dose of caffeine or placebo subjects performed a leg extension at 60% MVC which was held as an isometric contraction until failure. Electromyography (EMG) was used to further investigate potential mechanisms for the ergogenic effects of caffeine. Data was analysed with 2-way repeated measures ANOVA with LSD post hoc analyses on SPSS (Version 14.0, Chicago, IL), with significance set at  $P < 0.05$ . The average time to fatigue was significantly increased by 18% at T30 and 21% at T60 compared to T0 in the caffeine trial ( $P < 0.01$ ). Time to fatigue increased by 11% for caffeine compared to placebo at T30 ( $P < 0.01$ ) and 23% at T60 ( $P < 0.001$ ). Median frequency (MF) of the EMG signal at the start of the contraction was significantly higher than MF at the end of the contraction (demonstrating fatigue) for all time-points for the two trials separately ( $P < 0.001$ ), but neither MF nor root mean square (RMS) were significantly affected by caffeine. In addition, results were analysed for an order-effect with no significant difference found in performance when the first test was compared to the second test. In conclusion, the results support the hypothesis that caffeine improves strength endurance, but measurement of EMG could not be used to further elucidate the mechanisms of this effect. Additional research should be conducted into the potential mechanism of action of caffeine.

## Validation of a low cost flexible contact mat to assess vertical jump height and ground contact times

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A vertical jump is a component of many sporting actions; the volleyball smash, the basketball tip off, and a football header are examples. Vertical jump height is seen as an important measure of explosive leg strength in an athlete. Studies have compared alternative systems to assess the validity for calculating vertical jump height (eg. Leard *et al*, 2007: *Journal of Strength and Conditioning Research*, 21(4), 1296-1299, Aragon-Vargas, 2000: *Measurement in Physical Education and Exercise Science*, 4(4), 215-228). Leard *et al* (2007) compared a Just Jump system (Probotics, Huntsville) and the Vertec jump and reach system (Vertec, Hilliard, OH) against the 'gold standard' 3 camera motion analysis system and found the Just Jump system to be a valid measure of vertical jump height. This study aims to provide clarification on the criterion validity of alternative low cost methods to measure ground contact times and vertical jump height using the time of flight equation:  $\text{Jump height} = g \times (\text{Ft}/2)^2 \times 2^{-1}$ . Where  $g$  is the acceleration due to gravity,  $9.81\text{m.s}^{-2}$  and  $\text{Ft}$  = flight time. Ten sports students performed three squat vertical jumps on consecutive weeks. Four systems, force platform (Kistler model 9281CA, Hampshire, UK), jump mat (Newtest), jump chord (Takei), and a custom contact switch mat simultaneously measured flight time and data was compared to COM displacement from a synchronised 8 camera infra red system (Qualysis, Sweden). Pearson 'r' correlations and paired t-tests were conducted. All systems had a strong significant correlation with the 8 camera system. The strongest correlation was with the Takei jump chord ( $r = 0.85$ ,  $p < .01$ ,  $r^2 = 0.73$ ). The correlation between contact mat and 8 camera system was strong ( $r = 0.78$ ,  $p < .01$ ,  $r^2 = 0.64$ ) the mat also had a strong correlation with the force platform ( $r = 0.85$ ,  $p < .01$ ,  $r^2 = 0.72$ ). All methods demonstrated test retest reliability. The 8 camera system had the smallest test retest difference ( $x = 0.14\text{cm}$ ,  $p = 0.95$ ) whilst the custom contact mat difference was ( $x = 0.71\text{m}$ ,  $p = 0.79$ ). Limitations of the methodology; a tracking marker on a belt, not attached to the body, could explain the unexpected lower correlation ( $r = 0.74$ ,  $p < .01$ ,  $r^2 = 0.54$ ) between the force platform and the 8 camera system. To conclude, the low cost custom contact mat has been shown to be a valid system to reliably measure jump height.

## **‘Part of the game’: Experiences and perceptions of controlling techniques used in professional football academies and centre of excellence**

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In recent years, there has been growing concern regarding the welfare of young players who attend Academies and Centres of Excellence (CoE) at professional football clubs in England. One expression of this growing concern has seen the Football Association produce a number of policies and initiatives, such as the ‘Charter for Quality’ and ‘charter mark’, that aim to address issues surrounding the welfare of players. One aspect of this concern relates to the health of players, in particular, to the potentially detrimental impact of abusive behaviours on physical, social and psychological wellbeing (Fasting et al, 2002: *Journal of Sexual Aggression*, **8**, 37-48; Pitchford et al, 2004: *Soccer and Society*, **5**, 43-60). However, within this context, little research has been conducted that explores the extent of these behaviours within Academies and CoE, and, more importantly, how these behaviours impact on players’ experiences. Snowball sampling was used to obtain 5 professional and ex-professional footballers for the study. The players attended Academies and CoE from Premiership and Championship clubs in the 1980s, 1990s and 2000s. Semi-structured interviews were used to shed light on the perceptions and experiences footballers had of the controlling techniques used within their respective Academies and CoE. Using thematic analysis, the study established that abusive behaviours were often utilised by coaches when controlling players. These abusive behaviours were recognised by players and were, for the most part, accepted because they were seen as ‘part of the game’. In addition to this, the witnessing of professional players being treated in a similar way reinforced this acceptance. Whilst the data suggested that there were occasions when players were not comfortable with the controlling techniques used, this behaviour was not questioned in public because of the perceived powerful position of the coach and, in that respect, a fear of possible repercussions. The players’ willingness to accept abusive controlling techniques gives an insight into the culture of football and how these behaviours are often a core element of this culture. The paper concludes by suggesting that the network that each player is in contributes to their socialisation to accept the norms, values and behaviours of the culture of football. This leads to players accepting behaviours that are beneficial to their sporting performance, despite many of them being potentially detrimental to their personal welfare and health.

## **Classification systems in paralympic athletics: Perceptions of fairness**

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The classification of disabled athletes is fundamentally intended to establish equitable competition and minimise the influence of impairment on success. With the recent alignment between the Olympic Games and the Paralympic Games there has been a commercially induced pressure to ensure only viable events (with more than 6 athletes in the competition) remain on the programme. Therefore, the classification system must strike a careful balance between equitable competition and viable competition. In evaluating this balance, this study recognises the importance of the athletes' and coaches' perceptions of fairness. This study is an attempt to ascertain and highlight the attitudes of Paralympic athletes and coaches towards the current competitive classification system in Athletics. One to one interviews were carried out with Paralympic athletes and coaches (N=8) and results are contextualised in four themes: (I) Perceptions of advantage and disadvantage in competition, (II) Taxonomy and the functionality continuum, (III) Classification determines success, (IV) Viability at the Paralympics. It was found that all participants acknowledged experiences of unfairness within the current system. Responses also demonstrated that categorising athletes by impairment is problematic. Furthermore, data demonstrated that there is a perception that classification has a major influence on sporting achievement. However, responses also showed that viability is perceived as important to maintain. A revaluation of the classification system is recommended following further research.

## **The influence of training status and exercise mode on the oxygen uptake kinetics of prepubertal girls**

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Few studies have investigated the influence of training on the oxygen uptake kinetics of prepubertal children. Those that have generally report no influence. However, single transitions, pooling of data from both sexes and the prescription of work rates as a percentage of peak  $\dot{V}O_2$  require these results to be considered with caution. This study addressed these issues and furthermore the controversy surrounding the importance of exercise mode specificity. Eight trained (TC,  $11 \pm 0.7$  y, mean training =  $8 \pm 2.5$  hrs/week) and eight untrained girls (UTC,  $11 \pm 0.6$  y) girls completed repeated bouts of constant work rate cycling and upper body exercise at 40% of the difference between the gas exchange threshold and peak  $\dot{V}O_2$ . Gas exchange variables were measured breath-by-breath and averaged responses were subsequently modelled using a single exponential with a time delay and without a time delay respectively, until the onset of the slow component. The phase II  $\dot{V}O_2$  time constant was significantly shorter in the trained girls during upper body exercise (T:  $25 \pm 3$  vs. UT:  $37 \pm 6$  s;  $P < 0.01$ ) but no training status effect was evident in the cycle response (T:  $25 \pm 5$  vs. UT:  $25 \pm 7$  s). The  $\dot{V}O_2$  slow component amplitude was not affected by training status or exercise modality. The time constant of the HR response was significantly faster in trained girls during both cycle (T:  $31 \pm 11$  vs. UT:  $47 \pm 9$  s;  $P < 0.01$ ) and upper body (T:  $33 \pm 8$  vs. UT:  $43 \pm 4$  s;  $P < 0.01$ ) exercise. The time constants of the phase II  $\dot{V}O_2$  and HR response were not correlated regardless of training status or exercise modality. These data therefore highlight the importance of test specificity in revealing training status differences and demonstrate, for the first time, that  $\dot{V}O_2$  kinetics are faster in trained compared to untrained pre-pubertal girls. The faster  $\dot{V}O_2$  kinetics in the trained girls may be attributable to an enhanced oxidative capacity and/or to differences in muscle fibre-type distribution or recruitment subsequent to training. The uncorrelated  $\dot{V}O_2$  and HR time constants suggests an altered oxygen delivery does not contribute to the faster  $\dot{V}O_2$  kinetics in trained girls and highlights the inappropriateness of assuming HR time constant provides information regarding  $\dot{V}O_2$  time constant.

## **The effects of wearing the incorrect bra size on vertical breast displacement during treadmill running and drop jumps**

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Due to minimal internal support the female breast moves independently during exercise (Bowles et al., 2008: *British Journal of Sports Medicine*, **42**, 670-673). This can reduce physical activity participation as it causes discomfort in 70% of women (Bowles et al., 2008: *British Journal of Sports Medicine*, **42**, 670-673). Sports bras are effective in the reduction of vertical breast movement and breast discomfort (Mason et al., 1999: *Journal of Science and Medicine in Sport*, **2**, 134-144; Branson et al., 2005: *Journal of Textiles and Apparel, Technology and Management*, **4**, 1-14). However, wearing an ill-fitting bra can cause neck, shoulder or back pain, which could be a significant issue with an estimated 70% of women wearing the wrong size bra (Greenbaum et al., 2004: *British Journal of Plastic Surgery*, **56**, 230-236). Breast discomfort has been reported during running and jumping activities (Scurr, 2007: *The Sport and Exercise Scientist*, **13**, 4-5), which are prominent in sports such as basketball. The purpose of this study was to analyse vertical breast displacement in running and jumping. It was hypothesised that wearing the correct size bra would be most effective in limiting vertical breast displacement in female athletes. Following ethical approval, four female volunteers with D cup size breasts and band sizes of 32 or 34 inches were recruited. Retro-reflective markers were placed on participant's suprasternal notch, right nipple and ankle. Marker coordinates were tracked using eight calibrated Oqus cameras (Qualisys, Sweden). Each participant performed a 2 minute treadmill familiarisation (H/P/Cosmos, Germany), this was followed by an incremental treadmill test and six drop jumps. The treadmill test began at 5 km.h<sup>-1</sup> (walking) and increased by 1km.h<sup>-1</sup> after five gait cycles until 12 km.h<sup>-1</sup> was reached. Drop jumps were performed from a height of 0.4 m. Participants repeated the treadmill test and drop jumps in six breast support conditions (bare breast, correct bra size, one band size larger and smaller, one cup size larger and smaller). Markers were identified (QTM, Version 1.10.282, Qualisys, Sweden) and the results are currently being analysed. It is expected that there will be a significant increase in vertical breast displacement with the incorrect bra sizes compared to the correct bra size during treadmill running and drop jumping.

## **Consumption of a carbohydrate-protein beverage improves cycling time to exhaustion following exercise of varying intensity**

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It is common practise for endurance cyclists to consume carbohydrate-electrolyte beverages to improve performance. The mechanisms by which consumption of carbohydrate-electrolyte beverages improve performance include the maintenance of high blood glucose concentrations, high rates of carbohydrate oxidation and endogenous glycogen sparing. Evidence also suggests that carbohydrate can act via a central effect. Recently, studies have reported that the addition of protein to a carbohydrate-electrolyte beverage enhances the ergogenic benefit. This study examined the effects of a carbohydrate-protein or carbohydrate only beverage on cycling time to exhaustion following a 112 minute preload of varying intensity cycling exercise. In a double blind randomised, cross over design, six trained cyclists (mean  $\pm$  SD; age,  $28 \pm 7$  y; weight,  $72.5 \pm 6.2$  kg; height,  $1.79 \pm 0.05$  m; maximal oxygen uptake [ $\text{VO}_2 \text{max}$ ],  $58.8 \pm 5.1$  ml.kg.min<sup>-1</sup>) exercised on two separate occasions, separated by at least one week. The cycling exercise consisted of a 112 minute preload, during which the exercise intensity was alternated between 45% and 85%  $\text{VO}_2 \text{max}$ , followed by a ride to exhaustion at 90%  $\text{VO}_2 \text{max}$ . Every 20 minutes during the 112 minute preload, beverages containing 200 ml of fluid were provided. Beverages were composed of 9.69% carbohydrate solution or 7.75% carbohydrate and 1.94% protein solution, matched for total energy content. This study was approved by the Oxford Brookes University research ethics committee. A paired t-test was used to analyse differences in time to exhaustion between treatments and a two way (time x treatment) repeated measures analysis of variance (ANOVA) was used to examine differences in respiratory measures, blood glucose, blood lactate, rating of perceived exertion (RPE) and heart rate. Time to exhaustion in the carbohydrate treatment was  $7.05 \pm 1.76$  minutes. The addition of protein significantly increased time to exhaustion by 31% compared to carbohydrate alone (carbohydrate-protein  $9.27 \pm 3.27$  minutes,  $p < 0.05$ ). No significant differences were observed between treatments in respiratory measures, heart rate, RPE, blood glucose, blood lactate or self selected cadence. In conclusion, a carbohydrate-protein beverage enhanced endurance performance of variable intensity, compared to carbohydrate alone when beverages were matched for total energy. This benefit is evident despite delivering carbohydrate at  $\sim 60$  g/h. The mechanism for this improvement is yet to be fully elucidated.

## **Isometric vs. isotonic strength trainings effect on the anaerobic Wingate test: A predictor of alpine skiing ability**

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Previous Alpine skiing research includes; knee ligament injuries, knee structure injuries as well as EMG activity of the lower limb muscles (Palletta et al, 1994: *Journal of Sports Medicine*, **17**, 411-23). Isokinetic training of skiers has been researched, hypothesised to be the most effective method to improve Alpine skiing predictor results. However, no significant improvements were seen. The purpose of the present study was to investigate the optimum method of knee extensor training with the intension of maximising anaerobic power, tested using the Wingate Test from Inbar *et al* (1996: *The Wingate Anaerobic Test*. USA: Human Kinetics) used as a performance predictor in alpine ski racing. University ethical clearance was received. Thirty volunteers, who have participated in snow skiing in the past 12 months aged  $21 \pm 3$  years, consisting of male (N = 18) and female (N = 12) participants were randomly allocated to either a control group (Cont) (N = 10) a group working isometrically (IsoMet) (N = 10) and a group training isotonicly (IsoTon) (N = 10). A warm up was completed by all, resistance set at 1 kg for all, subjects pedalled at a self selected speed for duration of five minutes. Five second sprints were performed at the 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> minute, followed by a three minute recovery. During the Wingate tests, resistance was set at 7.5% TBW for both males and females. Subjects reached 60 RPM before resistance was applied. IsoMet group undertook a 4 week training programme on the MedX leg extension (Ocala, Florida) training once a week. Exerted force used to monitor and manipulate volume and intensity. Contractions lasted seven seconds, repeated throughout subject's range of motion (ROM), (Jones 1993: *Testing and Rehabilitation*, USA). IsoTon group undertook an identical four week training programme regarding intensity, volume and frequency, difference being they were trained isotonicly. Each repetition lasted seven seconds at a weight causing fatigue at seven repetitions. Results of the initial Wingate test were as follows; mean peak power  $700 \pm 120$  W IsoTon,  $900 \pm 80$  W in IsoMet, finally  $800 \pm 132$  W Cont group respectfully. Mean average power  $550 \pm 45$  W in IsoTon and  $780 \pm 50$  W in IsoMet, finally  $653 \pm 84$  W Cont group respectfully.

## **The effect of graduated compression tights on the energy cost of sub-maximal running in moderately trained male runners**

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It has been suggested that graduated compression garments (GC) may improve running economy (RE) by improving mechanical efficiency during running (Bringard et al., 2006: *International Journal of Sports Medicine*, **27**, 373-378). However, there is a paucity of evidence to support this suggestion and published results have been inconclusive (Kemmler et al., 2009: *Journal of Strength and Conditioning Research*, **23**, 101-105). Despite this, GC are marketed with claims of improved muscular efficiency and reduced energy expenditure during exercise. Therefore, the aim of this study was to examine the effects of GC on RE in a group of trained runners. Following ethics committee approval, six moderately trained male runners (mean  $\pm$  S.D. age =  $30.2 \pm 9.2$  years, mass =  $73.5 \pm 2.1$  kg, maximal oxygen uptake ( $\dot{V}O_2 \text{ max}$ ) =  $59.2 \pm 4.4$  ml kg<sup>-1</sup>·min<sup>-1</sup>) volunteered to participate in the study and gave informed consent. After initial determination of  $\dot{V}O_2 \text{ max}$ , subjects performed two running tests in a randomised order, either with (control) or without (intervention) wearing GC. Each test consisted of four, four-minute stages at speeds that elicited 60%, 70%, 80% and 90% of each individuals  $\dot{V}O_2 \text{ max}$  with 10 s rest between each stage. Oxygen uptake, heart rate, ratings of perceived exertion and blood lactate concentration were determined during the final 60 s of each incremental stage. Following checks for underlying assumptions, data was analysed using a repeated measures ANOVA and Post hoc t-tests with a Bonferroni correction. Significance was set at  $P < 0.05$ . Results show no significant differences in oxygen uptake, heart rate, perceived exertion or blood lactate levels between clothing conditions. These findings suggest that RE is not affected by wearing GC during running exercise.

## High speed ultrasonic monitoring of joint kinematics of athlete

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Limb actions are performed under the conscious control of movement. The depiction of deviations in joint movement patterns is essential in selecting and implementing an appropriate protocol for an individual (Trew, 2001: *Human Movement: An Introductory Text*. Edinburgh: Churchill Livingstone). Quantification of limb action in sports is of high importance. Wide variety of techniques and types of sensors are used to monitor limb action. Novel ultrasonic detection scheme that has already been used to quantify the muscle dynamics (Zakir et al., 2008: *Proceeding SPIE*, **3**, 6935-76) is employed to quantify the joint kinematics. Individual maximum and setting sound beep/light blink rhythm 120 rep/min in metronome; lateral expansion and dilatation of the biceps muscle for full flexion and extension is detected through ultrasonic transmission following detection which allows to quantify the joint motion with high spatial resolution of  $\pm .15^\circ$ . One of the monitored athlete's range of motion (ROM) is observed between  $106.26^\circ$  to  $111.30^\circ$  and maximum observed ROM is  $144.46^\circ$ . Maximum possible flexion and extension speed is found to be  $447.21^\circ/\text{s}$ ,  $-638.85^\circ/\text{s}$  respectively. Maximum flexion and extension speed with sound and light rhythm are observed  $277.92^\circ/\text{s}$ ,  $-213.63^\circ/\text{s}$  and  $222.48^\circ/\text{s}$ ,  $-174.43^\circ/\text{s}$  respectively. With the quantification of joint kinematics; associated neuromuscular quantity e.g. Stress; endurance; coordination; balance ability; rhythm ability; optimum repetition for preferred action could also be monitored with this novel detection scheme.