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Section A - Physiology & Nutrition

A01 - Dietary intakes and nutritional status in adults with Muscular Dystrophy

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Muscular dystrophy (MD) is a group of inherited conditions causing progressive muscle weakness and wasting, for which no widely implementable treatment currently exists, although resistance training (Bostock et al., 2019, Frontiers in Neurology, 10) and corticosteroid treatment (Angelini, 2007, Muscle & Nerve, 36, 424-435), have been shown to improve health-related quality of life (HQoL). Compared to physical activity, dietary manipulation may be more modifiable to improve dystrophic populations HQoL as disease outcomes often restrict physical capabilities. Data exploring the relationship between diet, disease and HQoL outcomes in adults with MD is insufficient. This study evaluated the habitual dietary intake of a sex-inclusive dystrophic population, to identify possible links between dietary intake, HQoL, and physical function. Participants included 5 women (age 65 ± 14 yrs, BMI 23.2 ± 2.7 kg/m^2) and 10 men (age 55 ± 19 yrs, 31.6 ± 7.9 kg/m^2) with different MDs (varied distribution and severity of muscle weakness). Participants' dietary intake data was collected using 3-day food records: analysed using Nutritics. Dominant hand maximal grip strength was measured using a hand-held dynamometer; upper extremity function and pain were assessed using the upper extremity functional index-15 and visual analogue scale, respectively. QoL was assessed through three tools: SF-36V2, Barthel Index and EQ5D, previously used in dystrophic populations. We observed that 50% of men and 20% of women did not meet the recommended daily intake (RDI) for protein (0.8 g·kg^{-1}), however women (1.13 ± 0.26 g·kg^{-1}) had increased protein intake compared to men (0.82 ± 0.27 g·kg^{-1}, $p < 0.05$). Of all participants 40% had a daily fat intake exceeding the RDI, with women having significantly higher relative average fat intakes (women = 1.03 ± 0.36 g·kg^{-1}, men = 0.68 ± 0.29 g·kg^{-1}, $p < 0.05$). RDI for calcium was met by 46% participants (1000 mg) whilst all failed to meet the vitamin D RDI (10 μg). Positive correlations between age and protein intake as a percentage of RDI ($r^2 = 0.82$), protein ($r^2 = 0.82$), carbohydrate intake ($r^2 = 0.55$) relative to body mass, vitamin D intake ($r^2 = 0.54$), and total caloric intake ($r^2 = 0.59$, all $p < 0.05$) were observed. No other significant associations between dietary habits, physical function or HQoL outcomes were apparent. Despite these findings being observed in a small population it is apparent that many adults with muscular dystrophy may fail to meet RDI for protein, vitamin D, and calcium. This places this population at risk for nutritional deficiencies, incurring negative impacts on the musculoskeletal system. Further study of nutritional status in a larger population sample is needed to confirm these findings.

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A02 - Exploring the factors that influence the food choices of 14- to 16-year-old competitive cyclists in the UK

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The natural growth and maturation process for young people is metabolically taxing and, for young athletes, there is added pressure to ensure sufficient energy to sustain sporting pursuits. Adolescence is also a time of increasing independence coupled with a continued dependence upon guardians. There is an increasing understanding of the physiology and expected nutritional needs of the competitive youth cyclist, however understanding of their nutrition knowledge and behaviours lags behind. The aim of this study was to explore the factors which influence the food choices of 14- to 16-year-old competitive cyclists in the UK, to inform the development of effective and sustainable nutrition support frameworks for this demographic. To do this, one-to-one semi-structured interviews were conducted in-person or online with these athletes. Questions focussed on understanding the athletes' sources of information, perspectives, and perceived level of agency surrounding their food practices. Interviews were conducted with a total of five athletes (female = 4, male = 1). Audio recordings were transcribed and inductively coded by hand to check for saturation before being compiled into a larger data set which was analysed for concepts and themes. The final codes were interrogated by an external researcher to further increase their validity. Data analysis revealed five key themes for this sample: influence, practice, personal narrative, opportunity, and optimal support. Subthemes for influence were parents, coaches, experiential learning, community, the external cycling world, peers, and externally contracted support. Subthemes for practice were fluid and hydration, carbohydrates, protein, caffeine, and food culture within cycling. Subthemes for personal narrative were application of knowledge, categorisation, lack of motivation, personal control, food as enjoyment, and superstition and ritual. Subthemes for opportunity were family support, independence, and planning. Subthemes for optimal support were guidance wanted and bespoke solutions. Though saturation was not achieved, the sample showed homogeneity across a number of areas and across sexes. Participants expressed a desire for nutrition guidance and, in particular, solutions tailored to their circumstances. They would prefer to receive nutrition support from trusted coaches who know them and their training loads, in an informal manner rather than through formal nutrition support from a professional. There was scepticism about the ability of a nutritionist to understand their unique sporting needs. Recommendations include further research into this population and also an examination of the knowledge and support required by guardians and coaches of youth cyclists to develop a practical approach that supports the athletic triangle.

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A03 - Non-targeted analysis of the plasma proteome between early and late rugby playing career

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Plasma proteomics can offer objective biological insight into the physiological responses of athletes. Rugby players may be repeatedly exposed to high-impact collisions that could predispose them to a higher risk of neurodegenerative conditions. The potential mechanisms underlying the heightened risk are unclear and discovery proteomics could provide unbiased insight into the pathways involved. Plasma extracellular vesicles (EV) are a novel system of intercellular communication which have been implicated in the propagation of misfolded proteins in the brain and could carry putative diagnostic biomarkers. This project investigates whether differences in plasma EV proteome exist between early and late career rugby players. Twenty-four male participants were recruited, including 8 academy players (18 ± 1 years), 8 rugby players (33 ± 5 years) with 10-year professional rugby career and 8 CrossFit athletes (32 ± 5 years) with no history of collision-related sports injuries. Participants gave their informed consent to the ethically approved procedures. Venous blood samples were collected in EDTA blood sample tubes, according to standard operating procedures. Hyper-porous strong-anion exchange magnetic microparticles (MagReSyn® SAX) were used to capture membrane-bound particles (i.e. EV) from plasma. EV-enriched samples were digested with trypsin and analysed using nano-flow liquid chromatography and high-resolution tandem mass spectrometry (Thermo, U3000 and Q-Exactive mass spectrometer). Label free quantitation was performed using Progenesis QI-P (Waters Corp) and proteins were identified by Mascot (Matrix Sci) searches of the UniProt Knowledge base. Statistical differences were investigated by one-way analysis of variance (with correction for multiple testing) in R (v4.3.2). Functional enrichment analysis was performed using ShinyGO (0.80). In total, 449 proteins were confidently identified (false discovery rate; FDR <1%) and gene ontology profiling confirmed 414 of these proteins were of EV origin (Jensen COMPARTMENTS). One-way ANOVA highlighted 192 significantly ($P < 0.05$, $q < 0.02$) different proteins across the 3 participant groups, of which 24 proteins were specific to professional rugby players. Functional enrichment analysis revealed key pathways related to Vitamin digestion and absorption, complement and coagulation cascade, inflammatory response, neuron death and negative regulation of cell death (FDR=5%).In conclusion, proteomic profiling is able to detect robust differences between the plasma EV proteome of long-serving professional rugby players compared to younger rugby players or age-matched athletes that did not have a history of collision-related sports injuries. Our findings shed new light on processes affected by a professional rugby playing career, further exploitation of this type of analysis could be used to discover sport-specific biomarkers.

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Section B - Sport & Performance

B01 - The effect of sleep on swimming performance

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There has been extensive research on sleep, including the stages, deprivation, and importance. The benefits of sleep have been known for a long period of time and the recommended 8h is widely accepted. There is limited research into the importance of sleep for athletes, especially swimmers. There is also very little research into university athletes. It is important to understand the effect on student-athletes as their lifestyle, diet and general day-to-day life differ from elite athletes. The aim of the study was to investigate if quality of sleep affects swimming performance in university level swimmers. Ethical approval was given by the Northumbria University Faculty of Health and Life Science Ethics Committee. 11 student-athletes from the Northumbria University swimming team were recruited for the study. The sample size was determined by the size of the swimming team and those who volunteered. Participants completed a 50 and 200 m freestyle timed swim in the morning and the Pittsburgh Sleep Quality Index (PSQI) questionnaire. The times were compared between morning and evening, and between those deemed to have good quality sleep compared to poor quality sleep. The data was tested for normality and analysed using a paired t-test and Wilcoxon, depending on the normality of the data. For the 200 m swim, performance was quicker in the evening (P = 0.013). Eight out of the 11 swimmers (66%) were deemed to have poor quality sleep, one of those having a sleeping disorder. These results are in line with another study looking at the time of day on swimming performance (Nunes, et al. [2021]. Chronobiology International., 38, 1), where a significant difference was found in performance in a 400 m swim (between morning and evening), and no difference in a 50 m swim. As 66% of participants were found to have poor quality sleep, this highlights the importance of sleep and understanding the effects of sleep deprivation. The findings of the study reveal that the athletes performed better in the evening (18:00 hrs) compared to the morning (07:00 hrs). This is important when planning competitions and training programs. By understanding that athletes perform better in the evening when they're more motivated and alert, coaches can plan more sessions in the evening than in the morning. This can also be considered for BUCS events, as the performance standard will be higher later in the day.

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B02 - Does upper body static stretching in warm up effect repeated sprint ability in boxers?

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Boxing is a high intensity intermittent sport consisting of multiple 2 or 3 minute rounds. For a boxer to win, they must perform a higher quantity of strikes on their opponent. The mechanics of a punch draws power from the feet and lower body via rotation and ground force generation, however, the action still utilises the upper body predominantly (Beattie & Ruddock. 2022, J Strength Cond Res, 36, 2957-2969). The ability to perform repeated bouts of maximal effort with limited recovery may be indicative of success. Static 'developmental' stretches are suggested by England Boxing for use in post-exercise cool-down, although without detailed justification (England Boxing. 2023, Level 1 coaching handbook). Static stretching in warm-up has also been explored in other practices with mixed results (Haddad et al; 2014, J Strength Cond Res, 28, 140-146) and is yet to be researched for boxing. Arm-cranking has previously been used as a sport-specific measurement for upper body power output in amateur boxers. (Venckunas et al; 2022, J Strength Cond Res, 36, 717-722). The aim of this study is to investigate the effects of static stretching in warm-up on upper-body repeated maximal effort arm crank ability in boxers. It is hypothesised that a static stretching intervention in warm-up will improve boxers' repeated maximal effort ability. For this repeated-measures design, a sample of male "development" level boxers (England Boxing. 2023, England Boxing Development Championship) will be recruited. Following institutional ethical approval, participants will partake in 2 sessions where they will perform 7 repetitions of 6s arm-crank maximal-effort sprints separated by 13 s recovery. This time duration simulates the activity:recovery ratio and intensity of a boxing bout (Davis et al., 2017, J Strength Cond Res). Peak power (W) will be measured in each sprint, with fatigue index (FI%) and decrement score calculated to assess participant fatigue over the 7 maximal efforts. There will be a light 1-minute sport-specific warm-up (Shadowboxing) before the first session, then a week later the participants repeat the warm up but with an additional stretching intervention. The static stretches include 2 repetitions of 30 s upper-body focussed static stretches until mild discomfort (upper limbs and shoulders, back and chest) (Liguori et al., 2021, ACSM's guidelines for exercise testing and prescription). Peak power, FI% and decrement score will be compared Pre-Post stretching intervention using paired samples t-test and Cohen's d effect size using SPSS.

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B03 - An investigation into the effects of cryo-compression versus TECAR therapy on symptoms of exercise-induced muscle damage

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Exercise-induced muscle damage (EIMD) results from unaccustomed exercise in which the observed effects are reported to last up to 96h (Peake et al., 2017, J Appl Physiol, 122). The use of both cryotherapy and thermal interventions have been explored for reducing the symptoms of EIMD however their effectiveness has been debated with conflicting views on the efficacy of both interventions. This study aimed to directly contrast the effectiveness of cryotherapy and thermal applications on symptoms of EIMD. Ethical approval was granted by the University of Northampton Sport and Exercise Ethics Committee. Twenty-eight (N=28, 10 female) moderately active participants (120-180 min a week; age 19.9 ±1.38 years, stature 174.8 ± 8.9 cm, mass 73.8 ± 15.5 kg) participated in an independent-subject design trial. At 0 h participants performed baseline tests (VAS, MVIC, CMJ and MTC) and then a fatigue protocol (20 × 5 box drop-jumps at 60 cm). Measures of EIMD were assessed over 96 h before random allocation to 15-min of TECAR (0 h= 10%, 24 h= 20%, 48 h= 30%, 72 h= 40%), Game-Ready (1˚C with an average pressure of 50 mmhg over 180 s) or control groups (seated rest). A two-way mixed model ANOVA with Bonferroni post-hoc pairwise comparison analyses were conducted. A Friedmans ANOVA was conducted for combined VAS data with a post-hoc Wilcoxon test. Within-group analysis revealed significant differences in MVIC (P = 0.001, n^2 = 0.573) with interaction effect by condition (P = 0.021, n^2 = 0.161). Pairwise comparisons revealed effects following TECAR at 0-24 h, P=0.009 (−10.2%), 0-48 h, P=0.033 (−9.5%), Game-Ready at 0-24 h, P = 0.001 (−15.0%), 0-48 h, P = 0.001 (−16.5%), 0-72 h, P = 0.001 (−12.3%) and control at 0-24 h, P = 0.001 (−12.8%), 0-48 h, P=0.008 (-10.8%). No significant differences were found at baseline between VAS scores (P=0.154), but significant differences were found at all other time points for all conditions (P < 0.05). TECAR resulted in the least performance decrements but experienced the greatest pain, compared to the Game-Ready, which resulted in the greatest performance loss but experienced the least pain. Neither TECAR nor Game-Ready appear advantageous over each other in attenuating symptoms of EIMD.

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B04 - Seasonal variation of physical, perceptual, and cognitive function measures in professional academy soccer players

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Soccer match play and training have been documented to significantly impair players' physical function and affect their perceptual wellness, indicating the necessity of evaluating the response to mixed-content training across a soccer season (Deely et al., 2022, Front Physiol, 13, 911009; Brownstein et al., 2017, Front Physiol, 8, 831; Thomas et al., 2017, Med Sci Sports Exer, 49, 955-964). This study aimed to assess seasonal variation in physical, perceptual, and cognitive functions in response to training among professional academy soccer players, to identify whether players develop increased physical robustness or encounter greater physiological and psychological impairments due to the demanding training and match schedule. Ethical approval was granted for sixteen academy players (age: 18 ± 1 years) to undergo a range of tests at three seasonal points - early, mid, and late - at baseline, immediately post-strenuous training, and at 24, 48, and 72 h. The testing regime encompassed physical performance (countermovement jump [CMJ], ten-to-five repeated jump test [10/5 RJT]), cognitive function (Stroop task, Four-Choice Reaction Time [FCRT] test, Corsi Block Test), and perceptual responses via an adapted Short Questionnaire of Fatigue (SQF). Linear mixed modelling (LMM) was employed to analyse the impact of season phase and testing time-points on training response, incorporating testing measures as dependent variables. Jump performance varied across time-points, with performance maintained immediately post-training, although displaying decrements at 24 h ($P < 0.001$), 48 h ($P < 0.01$), and remained unresolved at 72 h ($P < 0.05$). Season phase exerted a fixed effect on physical function, with vertical jumps decreasing from both early- ($P = 0.033$, CMJ; $P < 0.001$, 10/5 RJT) and mid-season ($P < 0.001$, CMJ; $P < 0.001$, 10/5 RJT) to late-season. Perceptual measures—soreness, fatigue, and readiness to train—varied across the week, with immediate post-session impairments recovering by 48 and 72 hours. Cognitive function remained relatively stable across the training week, with only a decline in Corsi Block performance noted immediately post-session. An improvement in FCRT from early to mid-season was observed, though accuracy decreased from early to late-season. No interaction between season phase and training week time-points was found across any variable, indicating a consistent training response throughout the season, despite substantial impairments in physical function and declines in perceptual wellness observed post-training. The decrease in physical function during the late-season phase underscores the need for enhanced recovery focus and training load monitoring as the season progresses.

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B05 - Exploring the impact of sleep on physical performance among junior soldiers in Army basic training

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Good quality sleep is essential for optimal cognitive and physical performance during basic training (BT), reducing risk of injury and preventing musculoskeletal injuries. Research shows junior soldiers (JS) still experience inadequate sleep duration and poor sleep quality throughout BT. Traditional military culture often normalises sleep restriction, being perceived as a method to 'harden' recruits during BT. However, evidence highlights poor sleep's negative consequences on recovery, wellbeing and performance, emphasising the need to prioritise sleep health in military training. The aim of this study is to explore the relationship between sleep duration and physical performance among JS in BT. This was achieved by investigating the effects of extended morning wake-times on JS behaviour and performance during their 40-week course. A two-arm clustered, parallel trial with baseline data (recorded from week 1 - 10 of training) was employed to quantify the effects of extended-morning wake times of JS performance. Approved by the Ministry of Defence Research Ethics Committee, data was collected from JS from the Army Foundation College, Harrogate (AFC(H)). Morning wake time was extended by ~90 min (07:00) in the intervention group (EXP; n 221, age: 16.9 ± 0.5 years) from week 11. The control group (CON; n 255, age: 17.1 ± 0.2 years) followed typical wake-times (05:30). Pseudo-objective sleep-wake indices were collected using wrist-worn actigraphy (Actigraph wGT3X-BT) each night. Online surveys captured perceptions of sleep quality, stress and daytime sleepiness during BT, which were descriptively analysed. Actigraphy sleep characteristic data was extracted using ActiLife software, processed using Excel and analysed in SPSS (v2.9). This was a preliminary analysis covering the first cohort. AFC (H) provided discipline reports and physical performance data from role fitness tests at entry (RFT(E)) and the end of BT (RFT (BT)). There were no significant differences in total sleep time (TST) or perceptual outcomes between groups at baseline (average TST EXP: 06:40 ± 0.38 mins; CON: 06:32 ± 0.36mins). Sleep duration was inadequate, and when grouped, 85% and 95% reported "poor" sleep quality and excessive daytime sleepiness, respectively. We hypothesise that extending-morning wake times will positively impact sleep duration, associated perceptual outcomes of stress and sleepiness; and result in better disciplinary and physical performance outcomes of EXP compared to CON. The baseline data supports recent literature that JS experience insufficient, poor quality sleep during training. Regarding the intervention, it is expected that extended wake-times will improve RFT performance, stress, sleep quality and daytime sleepiness.

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B06 - Musculoskeletal injury and medical discharge prevalence during Army basic training

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Musculoskeletal injuries (MSKIs) pose the primary health and operational risk to the military trainee population particularly those within basic training, leading to several issues such as reduced training time, chronic morbidity, and inevitably increased medical discharge. The purpose of the study was to investigate the current incidence, prevalence, and nature of MSKIs across British Army basic training. In addition to identifying the prevalence of MSKI medical discharges concerning the type and nature of the injury. A retrospective analysis of the Army Recruiting and Initial Training Command MSKI and Medical Discharge database was undertaken. Injury data was collected from Primary Care Rehabilitation Facilities at British Army training units, using a standardised procedure. A multiple-choice questionnaire was used within the initial consultation with the clinician to determine the severity and progression of the injury, whilst consenting to a data privacy notice. Prevalence of MSKIs (% recruits) was articulated in relation to the total number of recruits starting each training year. Over the past decade MSKIs have declined from a peak of 47% in men and 58% in women in 2013/14, to 22% in men and 21% in women in the 2022/23 training year, with the prevalence of female MSKIs being lower than male counterparts for the first time in this population. Trauma and overuse injuries correspond for 48% and 52% of these MSKIs respectively in 2022/2023, whereas historically overuse injuries have been responsible for a greater proportion. These overuse and trauma injuries were most common in the early stages of training. Lower limb injuries were more prevalent throughout training, resembling 2021/22 data where lower limb injuries accounted for c.80% of total MSKIs among both sexes. The total number of MSKIs resulting in medical discharges was 70, constituting 1.1% of all recruits. Among these discharges, 54 were observed in men and 16 in women. The prevalence of MSKIs resulting in medical discharges was 4.5% in men and 12.4 % in women. The gap between MSKI prevalence between sexes has decreased with recent data showing prevalence being similar. Despite this, women had an increased risk of medical discharge, suggesting gender differences in the severity of MSKIs. To reduce MSKI prevalence, strategies should focus on lower limb injuries, with an emphasis on the early stages of training.

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B07 - The Relative Age Effect presents an opportunity for Scottish football to be "better than FC Barcelona"

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An overrepresentation of athletes born earlier in the year compared with those born later in the year is known as the relative age effect (RAE). A ten year analysis of professional players across ten of the top European leagues showed the existence of an RAE in the ten years from 2000 (29.3 vs 19.8%, $p<0.01$) to 2010 (31.9 vs 18.4%, $p<0.01$) with the RAE becoming more pronounced with time. A sample from the FC Barcelona Model (Doncaster et al., 2020. Front Sports Act Liv, 2, 91) showed a strong RAE within their male football academy in all youth groups becoming less prevalent with increasing age (Q1 Jan-Mar = 0.53 Q2 Apr-Jun = 0.27; Q3 Jul-Sep = 0.14; and Q4 Oct – Dec = 0.06 [χ_3^2= 53.6, p<0.001]). Despite solutions being proposed in the literature, this indicates these solutions are not being utilised effectively within Europe's top clubs such as FC Barcelona. Our previous work (Craig and Swinton, 2020, Eur J Sports Sci, 21, 1101-1110) identified strong relative age bias in players awarded professional contracts between 2006 and 2016 in a Scottish academy (Q1 = 0.50; Q2 = 0.26; Q3 = 0.20; and Q4 = 0.05 [χ_3^2= 40.9, $p<0.001$]). Scottish clubs have limited resources in comparison with Barcelona meaning academy efficiency is paramount. The main study aim was therefore to assess any changes in the relative age effect over a ten-year period in an elite Scottish football academy within the academy player pool. A secondary aim was to establish if physical differences exist across each quarter to assess the impact of any potential RAE. Following ethical approval, a retrospective analysis of 512 academy players (from 2006 to 2016) from a Scottish Academy was assessed for anthropometric, physical performance and RAE impact. The range of players in each quarter was Q1 37.0-42.9% versus Q2 22.8-32.4%, Q3 11.9-26.0% and Q4 7.1-14.3%. Odds Ratio analysis indicate a greater chance of selection within the academy when assessing Q1 vs Q4 players quarter comparisons (ranging 3.2-5.2 time more likely to be part of the academy). There was no impact of time on the RAE over the ten years ($p=0.3127$). When controlling for age group multilevel modelling showed there were no significant differences across quarters in physical measures. Underrepresented Q4 players who transition through academy soccer can match physically their older peers. The finding that there is no improvement in the RAE with time underpins an efficiency that can be integrated. Using established interventions and corrective procedures can ensure no potential is being removed unnecessarily from the development pathway on the basis of RAE, addressing challenges in financially restricted environments such as Scottish football that resource rich environments such as FC Barcelona have not yet overcome.

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B08 - The effect of the goal kick rule change on the team's performance in ball possession and goal scoring in elite male football

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Goalkeepers have always played an important role Defensively. Due to rule changes and tactical transitions, goalkeepers now also have an influence on attacking aspects of the game (Szwarc et al., 2023, Baltic J Health Phys Act). The most recent rule change allows attacking players in the box during goal kicks, which creates extra space for the attacking team at the time of the goal kick without direct pressure from the opponent. This is beneficial for teams in the build-up who try to increase space to create goal scoring opportunities in advantageous positions eventually high up the pitch (Goes et al., 2019, Big Data, 7, 57-70). This latest rule change gives the attacking team an extra 640 m^2 of space to displace the opposition defence in deeper positions to create scoring opportunities. As of date, no research has looked at the goal kick rule change and its effect on the distribution tendencies and tactical approaches implemented, when attempting to progress the ball up the field from a goal kick. This research aims to analyse the distribution tendencies of Premier League teams in the 2022/2023 season and compare goal kick and build-up behaviour between teams, depending on their finishing position in the season. A secondary data analysis will be conducted on Premier League matches during the 2022/2023 season, including 2136 goal kick sequences cropped from 760 games. The location of the first pass of the goal kick, number of passes during the build-up, duration of the build-up phase, and the amount of goalkeeper touches after the initial goal kick will be analysed. Additionally, the outcome of successful goal kicks will be analysed considering the action and location of the action. All data analysis will be done using HUDL Sportscode (v12.29.0., Hudl, USA). Statistical analysis will evaluate the effect of team's league table position on the start of the goal kick, build up phase, and the outcome of the goal kick.

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B09 - The impact of various massage gun percussive therapy protocols on physiological adaptations

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Current protocols for delivering percussive therapy (PT) using massage guns are heterogenetic creating a need to establish the impact of study design on physiological measures and the standardisation of future research. This study aimed to determine the most effective protocol on lower body strength, net impulse, and flexibility, and to support the provision of protocol validation for future research. With institutional ethics approval, a convenience sample of recreationally active healthy adults (n = 35; a-priori calculation suggested 34 participants) with no lower body massage gun PT experience, undertook two main protocols; three sessions per week at 2100 rpm or increasing the speed for each session: 1750 to 2100 to 2400 rpm. PT was applied at tolerable pressure for 60 s to each of the quadriceps, gluteals, hamstrings and calves of both legs. Paired-samples t tests (alpha levels: P = .05) assessed pre- and post-intervention data for strength, net impulse, and flexibility. These were collected in all sessions using a dynamometer, My Jump 2 app and goniometer allowing changes for eight different protocols to be reported with Cohen's d. After three sessions a week involving increments in speed, results showed significant improvements in strength (dominant; non-dominant) of quadriceps (P = .005, d = 0.51; P < .001, d = 0.77), hamstrings (P = .001, d = 0.61; P = .006, d = 0.49) and calves (P <.001, d = 0.69; P = .015, d = 0.44), and flexibility of hamstrings (P < .001, d = 1.14; P < .001, d = 0.74) and calves (P = .04, d = 0.36; P = .005, d = 0.51). Combined lower body muscle strength (quadriceps, hamstrings and calves) increased on average by 10.1% (mean ± 2.14 kg, range ± 1.30-2.98 kg) and flexibility (hamstrings and calves) increased on average by 5.8% (mean ± 1.77°, range ± 1.70-5.66°). A significant improvement (P = 0.33, d = 0.36) was seen in net impulse after three treatments a week at 2100rpm, an increase of 3.2% (mean ± 4.75 N·s). The most effective protocol for gains in lower body strength and flexibility is applying massage gun PT three times a week with increased speeds across sessions (1750, 2100, 2400rpm). For gains in net impulse, the most effective protocol is three applications a week at 2100 rpm. Practitioners using these protocols could target specific improvements in physiological adaptations and in addition, and in addition researchers may wish to adopt these protocols to allow homogenous analysis across study populations in future research.

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B10 - A Contemporary analysis of tackle height: Implications for head injury risk and tackler technique in Rugby Union

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Rugby tackles pose significant head injury risks, raising concerns for players' well-being. Despite advocating for lower tackle heights for safety, limited research exists explaining how tackle height influences head characteristics and tackler technique. This study aimed to investigate the effects of two tackle heights, aligned with recent law changes in the community game, on head and joint kinematics for both tackler and the ball carrier. To strengthen ecological validity, innovative techniques were employed, including markerless motion capture and Inertial Measurement Units (IMUs), for tracking of the tackler's joint kinematics and head accelerations until ground contact, addressing a key limitation in previous research. Ethical approval was granted by Cardiff Metropolitan University. Ten male participants (mean ± SD age: 22 ± 3 years, stature: 184 ± 10 cm, mean mass: 94 ± 15 kg) alternated between tackler and ball carrier roles, executing upper and lower body tackles. Theia3D markerless motion capture software (Theia3Dv2022.1.0.2309, Theia Markerless, Inc., Kingston, ON, Canada) and Vicon IMeasureU Blue Trident dual-G IMUs measured tackle height's impact on head and joint kinematics. Discrete joint angles at key events and continuous joint angles normalised from 0% at Step 1 to 100% at Contact were exported. Peak head accelerations and continuous normalised head acceleration data were exported. Statistical analyses included a paired t-test for discrete joint angle data and the Wilcoxon Rank Sum Test for peak linear and angular accelerations. Cohen's d and effect sizes were calculated for respective analyses. One-dimensional statistical parametric mapping (SPM) and one-dimensional statistical non-parametric mapping (SnPM) facilitated statistical differences across continuous variables of interest. Significant increases ($P < 0.05$) were noted in ball carriers' inertial head kinematics in the upper body tackle, while no such distinctions were observed for tacklers. The low tackle condition consistently exhibited substantial reductions in bilateral hip flexion, particularly during contact (Effect size; lead: −1.866; rear: −1.977). Lumbopelvic flexion significantly decreased in each event for the low tackle condition, with the largest effect size during contact (−3.91). These findings underscore the heightened inertial loading with higher tackles, indicating an elevated risk of head injury, despite current tackle height regulations. The adjustments made by the tackler in response to varying tackle heights are not evident in knee flexion. Increased knee flexion during the preparatory phase could alleviate the necessity for such a flexed lumbopelvic angle. This study, utilising innovative techniques, highlights the potential for more ecologically valid approaches to biomechanical research in rugby tackling.

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B11 - Deconstructing the physical output between tapering sessions, match days, and post-match training sessions: A single case report

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Talented adolescent professional soccer players can experience multiple within-career transitions during the course of a competitive season in Major League Soccer. Consequently, players may shift between multiple team environments, including the first team (FT), reserve team (RT) and youth national team (NT). When changing environments, players must adapt and cope with increased physical demands associated with training and competing in the FT (Morris et al., 2016, J Appl Sport Psych, 28, 375-391), as well as the NT (McKay et al., 2022, J Appl Sport Psych, 34, 1272-1294). Consequently, the aim of this single case report was to analyse the physical output during matches, tapering and post-match sessions from a professional adolescent shifting between multiple team environments. External load data were collected via Global Positioning Systems (GPS) for an entire competitive season in three different environments (FT, RT, NT) across tapering sessions (MD-2 and MD-1), match days (MD), and post-match training sessions (MD+1/+2; ≥60 and <60 minutes played). The following intensity related measures (i.e., relative distance covered in meters, which is divided by the duration of the training session or match in minutes) were extracted for analysis: total distance covered, distance covered in multiple speed zones (Zone 1: 0-0.6 km/h; Zone 2: 0.7-7.1 km/h; Zone 3: 7.2-14.3 km/h; Zone 4: 14.4-.19.7 km/h; Zone 5: 19.8-25.1 km/h; Zone 6: >25.1 km/h), moderate speed running distance (>Z4; MSRD), and high speed running distance (>Z5; HSRD). A multivariate analysis of variance with physical output variables as dependent variables and session type (MD+/-) as fixed factors was conducted. The results indicated that the session type had a significant effect on all variables ($F_{8,128}$ = 22.14-158.86; P < 0.01; ES = 0.41-0.83), as well as the environment ($F_{2,128}$ = 3.8-26.7; P < 0.5; ES = 0.06-0.30) except relative distance covered in Z6 and SPD (P > 0.05). However, the interaction between session type and environment had no significant effect on any variable (P > 0.05), except for total distance ($F_{8,128}$ = 2.33; P = 0.02; ES = 0.13) and distance covered in Z1 ($F_{8,128}$ = 5.32; p<0.001; ES = 0.25). In conclusion, the adolescent professional player was exposed to different relative intensities in training and matches across multiple team environments over the course of a competitive season. In particular, the adolescent player recorded greater relative intensities in the FT environment relative to the RT and NT environments.

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B12 - Sex differences of 12 lead electrocardiographic findings of the rugby football league athlete

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Cardiac electrical adaptations occur within athlete populations. Sex-related variations in the normal athlete electrocardiogram (ECG) have been observed, with males exhibiting increased QRS and PR intervals, while females have demonstrated increased QTc intervals in university-level athletes. Male athletes also maintain greater weekly training hours compared to female athletes, which is associated with increased ECG changes. The presence of these differences within Rugby Football League (RFL) athletes is unknown. This study aimed to investigate any sex-related variations in the 12-lead ECG in RFL athletes. Fifty nine RFL athletes (32 males [age = 25 ± 5 years] and 27 females [age = 24 ± 5 years]) were included in the study. One female was excluded with inferior T wave inversion and was referred for further investigation. The 12-lead ECG was collected as part of the athlete's pre-season cardiac screening alongside completion of a health questionnaire, assessment of height and weight and brachial artery pressure. Continuous variables (i.e. heart rate, PR interval, QRS interval etc.), were analysed using an independent t-test or a Mann-Whitney U test as appropriate. For assessment of nominal data (i.e. incidence of early repolarisation and junctional rhythm etc.) a chi-squared test or Fishers exact test were used. A Spearman's correlation coefficient was used to determine any association between training hours and ECG findings. Ethics approval was obtained from Liverpool John Moores University Ethics Committee. Height (183 ± 5 vs. 169 ± 5 cm, P <0.001), weight (95 ± 11 vs. 77 ± 11 kg, P <0.001) and weekly training hours (18 ± 5 vs. 12 ± 5 hrs, P = 0.001) were higher in male athletes. PR interval (156 ± 34 vs. 142 ± 19 ms, P = 0.002), QRS duration (98 ± 9 vs. 88 ± 7 ms, P <0.001) and incidence of early repolarisation (47% vs. 11%, P = 0.004) were greater in males. Heart rate (57 ± 9 vs. 63 ± 11 bpm P = 0.016) and QTc interval (391 ± 20 vs. 414 ± 17 ms, P <0.001) were greater in females. There was a significant negative correlation between weekly training hours and QTc interval (rs = −0.355, P = 0.009) only. In conclusion, there are significant sex-related ECG differences within RFL athletes that partially mirror previous research. These findings emphasise the importance of considering sex-related variations, during cardiac screening on RFL athletes and enhance our understanding of the normal RFL athlete ECG.

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Section C - Sport Psychology

C01 - "You must succeed!": The role of leader irrational language on follower irrationality.

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Extant literature has shown the impact of leadership styles on followers' cognitive, behavioural, and emotional outcomes. Irrational beliefs are a set of thoughts about oneself, others, and the world, that are rigid, extreme, illogical, and non-empirical. Literature has demonstrated that holding irrational beliefs can be detrimental to one's well-being and performance (Ellis, David, & Lynn (2010). Rational and Irrational Beliefs: A historical and Conceptual Perspective. In Ellis, David, & Lynn (Eds). Rational and Irrational Beliefs: Research, Theory, and Clinical Practice (pp. 3-22). Oxford, UK: Oxford University Press.). However, the extent to which the use of irrational language by leaders can influence the irrational thoughts of followers remains unexplored. Using a performance context, this study investigated the leader-follower belief transaction and its impact on participants' cognition and performance in a Stroop test competition. We explored the differential effects of rational vs irrational leadership language styles on psychological outcomes and performance. This is the first study to examine the effects of manipulating language styles (rational vs irrational) on followers' irrational beliefs. We hypothesised that participants in the irrational leader condition would: (1) endorse greater performance-related irrational beliefs, (2) demonstrate a greater performance decline from baseline to competition, (3) report a greater increase in performance anxiety compared to the rational condition, (4) report a greater increase in negative appraisal towards the performance compared to the rational condition, (5) report a greater decrease in performance-related self-efficacy compared to the rational condition. We recruited 73 participants (24 ± 5 years) from undergraduate (N=49), postgraduate (N=18), and doctorate level (N=6) cohorts. Participants were recruited using convenience and snowball sampling via university platform (Moodle), SONA-system and Prolific. The participants came from MMU (N=10), Staffordshire (N=1), Salford University (N=2) and other universities (N=60). The study was granted institutional ethical approval and all participants completed informed consent before data collection. All data were collected using an online questionnaire (Qualtrics), a performance task (PsychoPy), and data were analysed using SPSS. Results demonstrate no significant between-groups differences in performance-related irrational beliefs ($P = 0.158$), performance-related appraisal ($P = 0.640$), performance anxiety ($P = 0.587$), self-efficacy ($P = 0.392$), or performance scores ($P = 0.448$). In other words, participants' approach to performance was not impacted by leaders' language style. Our null findings have several implications. First, the manipulation was not strong enough and maybe too subtle. Hence, we should consider making the language style more explicit in the next study. Secondly, it is possible that a single interaction with the leader is not enough. After all, we were observing acute responses to leadership behaviour and should consider observing the long-term effect of exposure to irrational language. Finally, the performance task was maybe deemed as not relevant or purposeful enough for the participants.

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C02 - 'Strength in Solitude? Investigating the potential effects of isolation on the performance and wellbeing of student athletes'

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Following the global COVID-19 pandemic, the topic of isolation has been a lot more prevalent in society (Jukic et al., 2020, 8). People have described being negatively affected both mentally and physically as a result of suffering from isolation during the pandemic (Fancourt, Steptoe, & Bu 2021, Lancet Psychiatry, 8, 141-149). However, isolation has been something that a lot of people have faced well before Covid emerged (West, Kellner, & Moore-West, 1986, Comp Psychiatry, 27, 351-363). Research shows that people who suffer from loneliness described feelings of isolation and were more likely to seek help from mental healthcare organisations (West, Kellner, & Moore-West 1986, Comp Psychiatry, 27, 351-363). The aim of this research project is to develop a greater understanding of isolation, the meaning of isolation to different individuals and what effects it may have on an athlete's performance or wellbeing. Previous research highlighted how susceptible students can be to suffering from isolation (Lim & Vighnarajah, 2018, SHS web of conferences, 53). It was suggested that greater awareness should be provided for isolation and how best to manage it. Lim & Vighnarajah (2018, Per Acad Soc Psych Dev) also found that a student's needs should consider a broad range of influences, as every aspect can be linked to enhancing a students' success in their education. As this research was conducted solely on students, it would be of interest to investigate what influence sporting participation could have on education, and vice versa. The effects of isolation will also be compared in both educational and sporting settings as well as what setting is more likely to onset isolation. The student athletes will are provided with an opportunity to describe how they cope with isolation and maintain high levels of performance.

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C03 - Exploring boxers' experiences of fear using Reflexive Thematic Analysis: Fear can be a longtime companion, guide and motivator

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Injury, and the pain associated with it, are recurrent elements in boxing, differentiating it from other sports in that they expose the athlete to an unavoidable existential threat (Sarkar & Fletcher, 2014, J Sports Sci, 32). Limited literature exists on the experiences of fear within the context of sport and on how it differs from anxiety (Hanin, 2000, Emotions in Sport, Champaign, Il: Human Kinetics; Nicholls & Polman, 2007, J Sports Sci, 25, 11-31). This study used a reflexive thematic analysis (Braun & Clarke, 2006, Qual Res Psych, 3; Braun et al., 2016, in B. Smith & A. Sparks (Ed.) Routledge Handbook of Qualitative Research in Sport and Exercise (195-203). London, New York: Routledge) to investigate how the two concepts are different from one another and how they are made sense of among professional boxers. The living individual experiences of boxers facing these stressors qualified them to be suitable subjects to learn from on the topic through a generic qualitative interpretative approach (Smith & Sparks, 2016) underpinned by relativist ontology and constructivist epistemology (Sandberg, 2005, Org Res Meth, 8, 41-68). The analysis of sixteen podcasts (available online; Alberton, 2022, Martial Attitude Voice: Spotify), with professional boxers (male/female) of different weight divisions, produced four overarching themes: 1. Fear and anxiety go hand in hand; Although nuanced as different, they can be perceived as one, apprehensive anticipation of future protective reactions to an immediate direct threat. It is argued that this anxiety/fear fusion to be a novel kind of appraisal; 2. Fear keeps us alive; Fear was re-framed as intrinsic/extrinsic greater motivator, as the boxers described how it guided and enabled them to prepare for matches with discipline. Moreover, fear was depicted as a useful tool weaponized by the boxers, providing important feedback. 3. The fear of losing everything is right there in boxers' faces; Fear of injury is theorized to be a pivotal stressor feeding fears of possible future disabilities or death, that is the ultimate failure in life as much as in the ring; 4. Coping with fear is to be comfortable in uncomfortable situations. Self-efficacy mediated structured resilience whilst discipline was the rationalized tool to withstand the emotional task of the physical fight. Fear as an inherent component of professional boxing is highlighted as important for policymaking, whilst alternative approaches could address present limitations. Theoretical/practical implications for future interventions bespoke to boxing is considered.

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C04 - Green2Gold: Piloting 'Team GB Family Activity Trails' as a green exercise project for improving wellbeing and outdoor physical activity engagement in the East Riding of Yorkshire

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Systematic review evidence suggests that participation in green exercise (GE; Coventry et al., 2021, SSM-Population Health, 16, 100934) including walking (Hanson and Jones, 2015, Brit J Sports Med, 49, 710-715) can positively impact health and wellbeing. The aim of the project, titled 'Green2Gold', was to collaborate with The British Olympic Association to co-create 'Team GB Family Activity Trails', a novel GE intervention, in two locations. Signposts were installed along the walking routes containing co-designed activities linked to Olympic sports, physical activity (PA), and nature. Each signpost contained a unique QR code to provide users with additional PA and education opportunities on the project's website. The purpose of this study was to assess the impact of trail engagement on health, wellbeing, and physical activity outcomes. An a priori power analysis (G*Power 3.1) using small effect sizes suggested a sample size of at least 34 participants. With institutional ethical approval, 37 participants age 5+ were recruited to test the trails three times within a six-week period, using a within-subjects repeated-measures experimental design. Pre- and post-intervention changes in perceived health, mental wellbeing, and PA and nature engagement were collected and analysed using Wilcoxon signed-rank tests. Additional post-intervention feedback on enjoyment, motivators, and barriers were collected, with frequencies and crosstabulations calculated. In-the-moment changes in perceived health, mental wellbeing, and enjoyment were measured before and after each walk and compared using two-way repeated measures ANOVAs. Analyses were conducted using JASP software (v18.1). Single-item scores for general health ($P < .001$), measures of mental health ($P = 0.006$ to 0.015), and number of days engaging in nature ($P = .004$) improved for both adults and children. Furthermore, significant pre-to-post intervention improvements in the perceived value of exercise and being outdoors ($P = 0.015$ to 0.031) and the number of days walking per week ($P = 0.034$) were reported for adults, with children demonstrating significantly improved future PA intention ($P = .043$). Overall, a significant effect of 'Time' was present for measures of perceived physical and mental health, fitness, nature connection, and feelings of inspiration ($P < 0.05$) when assessed from pre-to-post walk on three occasions. No significant effect for 'Walk*Time' was present. The study provides preliminary evidence to support 'Activity Trails' endorsed by a well-recognised sporting body, such as an Olympic Association, as a free, self-directed activity to elicit positive perceived health, mental wellbeing, and nature engagement outcomes at a community level, with potential scalability options to other greenspaces in the UK.

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C05 - Exploring British student-athletes' receptivity to sport psychology consultation

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Student-athlete's receptivity to sport psychology (SP) is a significant contributor to effective SP service delivery. Previous studies among American student-athletes suggests that stigma and negative beliefs, which affect receptivity, remain significant barriers to seeking SP support. However, there is a paucity of research focusing on the British student-athlete population. The aim of this study was to explore how demographic factors affect British student-athletes' receptivity to SP consultation. Following institutional ethics approval, student-athletes (n = 96, 48 males and 48 females) completed a series of demographic questions and the Sport Psychology Attitudes Revised Form (SPAR-R) (25 items answered on a seven-point Likert scale). The survey measured stigma tolerance (Cronbach's alphas (α) = 0.821), confidence in SP consultation (α = 0.882), personal openness (α = 0.462) and cultural preference (α = 0.534). A one-way multivariate analysis of variance (MANCOVA) was used to examine the relationship between demographic constructs and the SPAR-R responses. Compared to females, males reported significantly higher scores in personal openness (P = 0.44, P < 0.05, mean difference [MD]: 0.54), and cultural preference (P = 0.01, P < 0.05, MD: 0.54). Compared to athletes who compete in a team sport, individual athletes reported significantly higher scores of confidence in SP consultation (P = 0.013, P < 0.05, MD: 0.7). There were no influences of age and level of sporting competition on confidence in SP and cultural preference, respectively (P > 0.05). The results suggest that males and athletes who compete in a team sport may be less receptive towards SP consultation than females and athletes who compete in an individual sport. These results are similar to those found within an American student-athlete population yet provide applied SP practitioners with novel insights into working with British student-athletes. Future research should focus on student-athletes from various ethnic backgrounds and further expand methodological approaches to understanding why demographic factors affect receptivity to SP consultation. In conclusion, these results could inform and encourage practitioners to adopt a tailored approach when providing SP consultation to persons possessing different demographic characteristics.

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C06 - Successful sport psychology within 1st team football: Perceptions of senior strategic stakeholders at elite football clubs

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This study focussed on the perceptions of senior strategic stakeholders (e.g, sporting director, head of performance, manager, coach) working within 1st team football at elite professional clubs (English Premier League & Championship). Although recent research has made progress within the practitioner professional development literature it has, so far, failed to gain an explicit understanding of the perceptions around 'successful sport psychology' or what makes a sport psychologist successful - in their respective sporting environments. Therefore, the main purpose of this research was to gain an explicit insight into what senior strategic stakeholders perceived makes a sport psychologist successful within their role at an elite football club, at 1st team level. Following institutional ethical approval, purposeful sampling was used and semi-structured interviews were conducted with five senior strategic stakeholders. Following data collection, a thematic analysis was conducted and 19 general dimensions were arranged across three phases: (a) knowledge and experiences of sport psychology in elite football, (b) explicit understanding of sport psychology success in elite football and (c) perceived barriers and challenges to sport psychology in an elite football club. In particular, senior strategic stakeholders' explicit understanding of sport psychology success in elite football included 7 general dimensions: (1) importance of role clarity during induction into new role, (2) success viewed as subjective due to difficulty quantifying influence of work, (3) success perceived as best judged by individuals worked with most closely, (4) preference for club appointed full time sport psychologist, (5) implementation of balanced approach perceived as successful, (6) implementation of forceful approach perceived as unsuccessful and (7) success attributed to positive influence on culture and player performances. Thus, it's recommended that sport psychologists aspiring to work in applied football contexts should consider the findings of this research to positively influence their entry and/or practice in an elite football environment, at 1st team level. Similarly, it's equally recommended that senior strategic stakeholders within elite football clubs use these findings to help develop their knowledge and understanding of sport psychology so they're better informed and aware of the perceived key attributes of successful sport psychology provision within 1st team football. Consequently, this may assist with navigating the diversity of challenges perceived to be associated to the presence of a sport psychologist, within an elite 1st team football environment, and therefore increase and improve utilisation of sport psychology services across players, coaches, and wider footballing staff.

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C07 - Exploring purposeful outdoor physical activity and mindfulness for wellbeing: a practitioners' perspective

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Mindfulness training can improve one's capacity for self-regulation, including attentional processes, behaviour, and mood control (Tang, Hölzel & Posner, 2015, Nature Rev Neurosci, 16, 213-225). Green exercise has been shown to enhance both physiological and mental health measures with all populations, including adults with long-term diseases or mental health problems, benefiting from outdoor, nature-based interventions (Coventry et al., 2021, Pop Health, 16, 100934; Pretty, Peacock, Sellens & Griffin, 2005, Int J Health Res, 15, 319-337). Engaging in outdoor activities and developing an affective relationship with nature is a key mechanism on the path to wellbeing benefits that go beyond the advantages of simply visiting or being in nature (Richardson & McEwan, 2018, Front Psych, 9, 1500). The aim of the study is to gain insight into how purposeful outdoor physical activity can be used as a form of mindfulness and its potential impact on wellbeing from a practitioner's perspective. 6-8 exercise professionals aged 18 and over, who have sufficient knowledge of exercise and wellbeing, for example exercise psychologists or health and wellbeing coaches will be recruited for this study. Recruitment for this study will take place by word of mouth and contact directly through a company or LinkedIn. Exercise psychologists must be BASES or BPS accredited. Data will be collected through interviews either at a location to suit the participant or remote (over Microsoft Teams) and analysed using thematic analysis. Interviews will be recorded using the voice memos app on an iPhone and then written up using the dictate function on Microsoft Word. Information collected in addition to the interview will be, participants sex and job title, including how long they have been in their position for. Interviews with each participant will include the following topic areas; discussion around their job and experiences so far within their job, outdoor physical activity and what it means to them, challenges or barriers they have observed from working with clients around physical activity, exploring their opinions on outdoor physical activity in green space, personal experiences being physically active in green space, self-development as a practitioner in the exercise psychology or health and wellbeing and any future recommendations for either other practitioners to think about when working with clients or individuals to think about when trying to include green space in their current physical activity routines.

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C08 - Physiological and cognitive responses to load carriage in the cold

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Load carriage is a vital role related task for military, emergency service, and search and rescue personnel, through the transport of critical equipment. From an external validity perspective, a common oversight in previous research is the effect of multiple stressors during load carriage; for example, the inclusion of adverse environmental conditions and/or concurrent cognitive tasks. Therefore, this study aimed to quantify physiological and cognitive changes over time during military specific fast-paced lower-weight load carriage in a cold environment. With approval from the University of Chichester's Ethics Committee, nine participants completed a load carriage task consisting of 20 min walking at 5.1 $km \cdot h^{-1}$, 40 min walking at 6.5 $km \cdot h^{-1}$, followed by 8 × 9 s shuttles running at 11 $km \cdot h^{-1}$ in an environmental temperature of −10°C. Participants wore overalls whilst carrying 16 kg of external load (10 kg belt-webbing, 6 kg body armour). Throughout, measurements were taken of heart rate, core and skin temperatures, expired gas (VO_2), and ratings of physical exertion and thermal comfort. Six military-specific auditory n-back tasks (MSANT) were completed across the trial. The rating scale of mental effort (RSME) quantified mental exertion during the load carriage task. Statistical differences within variables were evaluated using a one-way repeated measures ANOVA with post-hoc analysis employed to identify differences between timepoints. Heart rate and VO_2 behaved as expected, with increases after the 5.1 to 6.5 $km \cdot h^{-1}$ speed escalation ($P_{bonf} < 0.001$); heart rate also increased during the shuttles compared to the first 6.5 $km \cdot h^{-1}$ collection ($P_{bonf} = 0.003$). A main effect rise for core temperature was evident ($P_{bonf} < 0.001$), increasing after 25 min at 6.5 $km \cdot h^{-1}$ ($P_{bonf} = 0.009$). Skin temperature presented a main effect ($P_{bonf} < 0.001$) with an initial decrease and plateau occurring after 15 min. There was no main effect for MSANT or RSME at MSANT completion timepoints (P's= 0.935 and 0.368 respectively). However, during non-MSANT completion timepoints, RSME was greater from 25 min onwards compared to 5 min ($P_{bonf} < 0.05$) signifying an increase in inter-task cognitive demand, oppose to a period of relative mental recovery. This reduced efficiency could be exacerbated during concurrent or extended physical and cognitive tasks. This study is the first to examine physiological and cognitive responses to fast-paced lower-weight load carriage in the cold, progressing understanding of occupational performance in representative environments. These performance data can inform training protocols and operation approaches by highlighting higher inter-task cognitive demand, potentially emphasising an avenue for mitigation strategies.

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Section D - The Female Athlete

D01 - The influence of menstrual cycle phase on isokinetic strength of the knee flexors and extensors

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The increased incidence of anterior cruciate ligament (ACL) injury in female football players has been associated with hormonal variations during the menstrual cycle (MC). The MC has potential to compromise the functional characteristics of thigh muscle with implications for strength, knee joint stability and ACL injury risk. The isokinetic dynamometer is the gold standard for assessing strength, but previous studies have considered only concentric knee flexor and extensor strength. This lacks functional relevance to the mechanism of ACL injury and negates the role of eccentric hamstring strength. Furthermore, isokinetic studies typically report peak torque as the objective measure of strength which limits analysis of the strength curve to a single, maxima. The aim of the current study was to evaluate the influence of MC phase on the strength profile of female football players, utilising a range of speeds to reflect the varying demands of football and adopting more contemporary metrics to quantify the strength curve. Eight, eumenorrheic, recreational football players completed eccentric knee flexor and concentric knee extensor trials at 60 and 240°·s^{-1} during the follicular (Day 2), ovulation (Day 14) and luteal (Day 21) phases of their MC. In a pre-experimental test, MC tracking app via mobile phone and ovulation strips were used to identify the phases of the MC. The experimental protocol has been previously approved by Edge Hill university ethics committee. Peak torque and corresponding angle of peak torque were maintained across all phases of the MC, irrespective of testing modality and speed. Strength ratios defined using peak torque were also not sensitive to MC phase. However, Functional Range in eccentric knee flexion was significantly lower during the follicular phase (16.36 ± 5.15°), compared to ovulation phase (21.15 ± 5.02°; P = 0.009) and luteal phase (20.69 ± 4.62°; P = 0.018), which were themselves not different (P = 0.797) at both testing speeds. This supports epidemiological observations but highlights the importance of analysing isokinetic data beyond the peak of the strength curve. The reduced Functional Range reflects a reduction in eccentric hamstring strength towards knee extension, where the ACL injurious mechanism is likely to occur. Interpretation of isokinetic data should therefore focus on points of 'weakness' as opposed to maximum strength, whilst (p)rehabilitative strategies should consider strength through range of motion, and at different speeds. Eccentric hamstring strength was observed to decrease significantly at the higher speed, contrary to observations in elite male players, and potentially reflecting a differential training adaptation.

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D02 - Novel associations between within-day energy balance (WDEB) and relative energy deficiency in sport (RED-S) in recreationally active women

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Relative energy deficiency in sport (RED-S) is a syndrome whereby physiological process are downregulated to regain energy balance under conditions of low energy availability (LEA). There is a growing body of research investigating the diverse health and performance complications in relation to energy availability calculated over 24-h. However this may conceal energy deficient periods in the day, which could contribute to RED-S symptoms. There is a handful of research suggesting such periods of deficiency are associated with changes in body composition, and menstrual and endocrine dysfunction, however many RED-S symptoms are yet to be explored in this area. This study therefore aimed to explore within-day energy balance (WDEB) in relation to a variety of, yet to be investigated, RED-S consequences in recreationally active women. Following ethical approval from the Manchester Metropolitan University Ethics Committee, 16 women (age, 27 ± 6 years, stature, 1.67 ± 0.05 m, and mass, 63.5 ± 8.2 kg) engaging in 4-6-h per week moderate-vigorous physical activity were recruited via social media, word of mouth, and posters. Seven-day food and training diaries alongside accelerometery and heart rate were used to estimate 24-h energy availability and hourly WDEB. The largest within-day energy surplus and deficit, the number of hours spent in a surplus and deficit, and the maximum number of consecutive hours in each, were calculated daily and averaged across the 7-days. Quantitative ultrasound of bone, haematocrit, haemoglobin, total cholesterol, maximum voluntary contraction of the knee during flexion and extension, $\dot{V}O_2$peak and lactate profile were all assessed. Gastrointestinal health was assessed via questionnaire. Correlational analysis between WDEB variables and RED-S symptoms was done accounting for 24-h energy availability. Of all 16 participants, 87.5% did not have adequate energy availability (<45 kcal·kgFFM·day^{-1}); 12.5% had low energy availability (<30 kcal·kgFFM·day^{-1}), and 75% had subclinical energy availability (30-45 kcal·kgFFM·day^{-1}), typically associated with weight loss. Gastrointestinal dysfunction was negatively correlated with within-day energy surpluses (r_{13} = −0.479, P = 0.035) and positively correlated with within-day energy deficit variables (r_{13} = 0.499 to 0.534, $P \leq 0.029$). These correlations were maintained after also accounting for anxiety. Haemoglobin levels were negatively correlated with within-day energy deficit variables (r_{13} = −0.477 to −0.490, $P \leq$ 0.036). Radius and tibia, T- and Z-scores were positively correlated with energy surplus values (r_{13} = 0.593 & 0.681, P = 0.004 & 0.013, respectively). To conclude, this was the first study to show WDEB to be associated with gastrointestinal, haematological, and bone health, illustrating that WDEB in relation to RED-S warrants further research as it may have health and performance implications that are overlooked when assessing LEA alone.

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D03 - The effect of exercise on gastrointestinal symptoms and body composition at different phases of the menstrual cycle

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Women commonly experience bloating, stomach cramps, water retention, and weight gain at the beginning of their menstrual cycle, which cause fluctuations in body composition through extracellular changes, this may affect osmotic pressure, leading to gastrointestinal (GI) symptoms. The aim of this study was to investigate the effect of the menstrual cycle phase on extracellular changes and GI symptoms in females in response to exercise. Seven healthy premenopausal female recreational athletes (maximal O_2 consumption: 50 ± 5.8 $ml \cdot kg^{-1}$) performed two running trials in an experimental crossover design during two distinct phases of the menstrual cycle, early follicular phase (EFP) and the mid-luteal phase (MLP). Each trial consisted of 120 min of running, 60 min at 110% lactate threshold and 60 min at 90%. Determination of cycle was calculated from calendar-based counting and urinary ovulation detection kits. The EFP was determined by self-reporting onset of menses. The day before each trial, participants followed a low FODMAP diet and completed a gastrointestinal symptom rating scale questionnaire. On the morning of the trial, a standard breakfast was consumed, upon arrival at the laboratory, body composition was recorded. Each hour, finger prick samples were taken to measure lactate and ensure performance did not exceed maximum, every 15 minutes, a visual analog scale (VAS) of subjective ratings between 0-10 cm of gut comfort was taken. Data was analysed using mean and standard deviation (subsequent statistical analysis will be conducted if an n = 10 is reached prior to the conference). During exercise, participants experienced a higher prevalence of GI issues throughout the EFP compared with the MLP. The most common complaints reported from the VAS were nausea; EFP 1 ± 1 cm, MLP 0 ± 0 cm. Flatulence; EFP 4 ± 3 cm, MLP 1 ± 1 cm, and stomach cramps; EFP 3 ± 2 cm, MLP 1 ± 1 cm. Total body weight (TBW) differences were noted between the EFP and MLP. TBW EFP pre-exercise was higher than MLP pre-exercise phase EFP pre-exercise: 38.7 ± 2.8 L compared to MLP pre-exercise at 35.8 ±5.5 L. Similar differences were demonstrated with extra cellular water pre-exercise EFP; 16.1 ± 1.1 L MLP; 15.2 ±1.0 L. During the EFP fluid retention is known to be higher than the MLP, and results are as expected. While the data suggests a seemingly minimal variation in GI symptoms, individually, there appears to be a higher level of difference. More gastrointestinal symptoms were reported during exercise, which is consistent with the findings. There is a slight difference in GI symptoms between the EFP and MLP at this stage, indicating a slight shift in total body water.

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D04 - The effects of sodium bicarbonate ingestion and sports performance in female athletes during different phases of the menstrual cycle

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Sodium Bicarbonate (SB) is recognised as an effective ergogenic aid for enhancing high-intensity exercise capacity and performance. However, the lack of consistency in scientific research findings involving female participants and SB, attributed to the variations in hormonal profiles during the menstrual cycle (MC), has led to a disproportionate focus on studies exclusively conducted in a male population. Purpose: The purpose of the present study is to assess the effects of SB ingestion and sports performance in female athletes during different phases of the MC. There is currently no evidence showing whether different phases of the MC would enhance exercise performance following SB ingestion. Given this gap in the literature, it yet remains unclear that if different hormonal fluctuations throughout the MC affected absorption, nutrient capacity, or exercise performance, the stimulating effect of buffering agents could be further enhanced in future research, by identifying optimal administration strategies of SB, as well as investigating if different phases of the MC impacted exercise performance, however this is still unknown. Methods: In a double-blind, randomised, placebo-controlled trial, six eumenorrheic female athletes will complete four all-out 30-second sprints on the Wattbike, each separated by a 5-minute recovery period after receiving either 0.3g/kg body mass (BM) of SB or a placebo containing plain flour in enteric coated capsules. Performance variables collected across the duration of the experimental trials are, rate of perceived exertion (RPE), peak power output (PPO), relative peak power (RPP), heart rate (HR), anaerobic capacity (AC), and fatigue index (FI). Experimental trials will be performed in each of the following two phases of a participant's individually characterised MC: (i) the follicular phase and (ii) the luteal phase. MC phase will be determined by using a set of home ovulation strips for the whole duration of the study. In order to control any dietary variables, participants are asked to record a 24-hour food diary for the days prior to exercise testing and are encouraged to replicate identical food and fluid intake on the day prior to experimental testing to ensure a similar metabolic state. The development of this study in this area of research could greatly enhance our understanding of how the MC and the ingestion of SB may impact female athletes and performance outcomes. Furthermore, this study would provide valuable insights into the potential impact of different MC phases on athletes and help optimise their training and performance strategies.

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Section E - Physical Activity for Health

E01 - Short term step-reduction induces mitochondrial impairments which are not restored after reambulation, in habitually active adults

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Inactivity causes physiological impairments to skeletal muscle mitochondria and disrupts metabolic homeostasis, which has predominantly been investigated through models of severe disuse. The impacts of less-restrictive inactivity through step-reduction (SR) suggests a decline in markers of mitochondrial content without a loss of function (Edwards et al. [2021]. J Appl Physiol, 131, 1653-1662). However, the impact of varying durations of SR and reambulation (RA) on skeletal muscle oxidative capacity are poorly understood. Therefore, this study aimed to investigate the effects of 14 days of SR, followed by 14 days of RA on markers of mitochondrial content and function, and also explore correlations between these markers. A cohort of 12 habitually active adults were studied from previous research (Bowden Davies et al. [2018]. Diabetologica, 61, 1282-1294), for which ethical approval was obtained from NRES Committee North West – Liverpool Central (REC:14/NW/1147). Skeletal muscle biopsy samples from the vastus lateralis were obtained at baseline (BSL), after SR and following RA, which were analysed through immunoblotting/calorimetric assays for markers of mitochondrial content (citrate synthase (CS) activity) and function (OXPHOS, PDH and CPT1A). In vivo mitochondrial function tests using ^{31}P magnetic resonance spectroscopy (^{31}P-MRS) was conducted in a subset of 7 participants. Markers of mitochondrial content and function were significantly reduced following SR (15-34% lower; low to medium effect size 0.3-0.5; COX I ($P = 0.009$), COX III ($P = 0.03$), COX IV ($P = 0.03$), ^{31}P-MRS ($P = 0.04$)). COX III ($P = 0.01$) and ^{31}P-MRS ($P = 0.03$) were lower after RA when compared to BSL. Although not significant, other markers of mitochondrial content and enzymes involved in glucose and fatty acid oxidation were numerically lower after SR (CS activity 17% lower, PDH 23% lower, CPT1A 15% lower). The changes in several complexes of OXPHOS, PDH and CPT1A were positively correlated with CS activity (r^2= 0.35 to 0.53, $P < 0.05$) and ^{31}P-MRS (r^2 = 0.46 to 0.76, $P < 0.05$). The results suggest that a short term reduction in physical activity causes impairments to both mitochondrial content and function which are not completely restored after RA, although further studies are needed to understand the mechanisms that underpin these changes. The findings highlight the deleterious physiological consequences of just reducing physical activity, which manifests as metabolic diseases such as type 2 diabetes in the long run. This prompts for the revision of physical activity guidelines to include the importance of minimising sedentary time.

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E02 - The prevalence and factors associated with knee pain in a sample of cyclists within the United Kingdom: A cross sectional study

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The study aimed to determine: (i) the lifetime and period prevalence of knee pain, (ii) the prevalence and nature of medical attention cycling- related injuries, (iii) and the risk factors associated with knee pain and in a sample of competitive and non-competitive cyclists in the UK. A cross-sectional questionnaire was used to collect data on knee pain, medical attention injuries, and potential risk factors associated with knee pain. Participants were competitive and non-competitive cyclists aged 18 years and older and were recruited through cycling clubs and online advertisement. Binary logistic regression was used to assess for potential risk factors associated with knee pain. Crude and adjusted odds ratios were reported in staged adjustment models, controlling for potential confounders of age and sex. Keele University Ethics Committee approved this study. A total of 115 respondents completed the questionnaire. Lifetime knee pain prevalence was 48%, with period prevalence 26.1% (past-month) and 18.3% (past-week). Aged 40 and over was the only factor found to be associated with knee pain, although this was no longer significant after adjustment for sex. The most prevalent site and type of injury was the lower back and fracture (traumatic), respectively. Knee pain prevalence is high in this sample of cyclists, particularly in those aged 40 years and over. Injury prevention strategies should target the lower back and fractures. Longitudinal research is needed to identify if there are modifiable risk factors that may reduce the occurrence of both knee pain and traumatic fractures in cyclists.

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E03 - Cardio-pulmonary exercise testing aids chronic obstructive pulmonary disease diagnosis in the perioperative evaluation of patients undergoing radical cystectomy

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Chronic Obstructive Pulmonary Disease (COPD) is a chronic lung condition distinguished by structural changes and mucus build-up which causes dyspnoea. COPD is universally diagnosed by a spirometry test. A Forced Expiratory Volume in one second (FEV1)/Forced Vital Capacity (FVC) of <0.7, is often used to justify COPD diagnosis (Hopkinson et al., 2019, Brit Med J, 366, l4486). Reliance on spirometry tests alone may only highlight airway obstruction and not identify other consequences of COPD like impaired gas exchange which is implicated in the development of postoperative pulmonary complications. Cardio-pulmonary exercise testing (CPET) provides a more detailed look into the pathophysiology of COPD and is routinely used in perioperative settings to determine a patient's fitness for surgery. The aims of this study were to 1) identify the number of bladder cancer patients with undiagnosed COPD, and 2) compare COPD-related CPET variables between bladder cancer patients medically diagnosed with COPD (COPDMED) who had the potential to be diagnosed at the time of CPET (COPDCPET) and those without COPD (non-COPD). All testing was performed per the American Thoracic Society/American College of Chest Physicians guidelines (2003, Am J Resp Crit Care Med, 167, 211-277). COPD-related CPET variables recorded included Minute Ventilation ($\dot{V}E$; $L \cdot min^{-1}$), Peak Oxygen Consumption ($\dot{V}O_2peak$; $mL \cdot kg^{-1} \cdot min^{-1}$), the Anaerobic Threshold (AT; $mL \cdot kg^{-1} \cdot min^{-1}$), Ventilatory Equivalence for Carbon Dioxide ($\dot{V}E/\dot{V}CO_2$), Breathing Reserve (BR; %). Eighty-two patients with bladder cancer (COPDMED [n=9], non-COPD [n=73]) underwent preoperative spirometry and CPET. In the non-COPD patients, 21 (29%) had an FEV1/FVC< 0.7, indicative of COPD and thus groups as COPDCPET. Within the COPDCPET group, 8 (40%) had an FEV1 between 50-70% of predicted which indicated moderate COPD. There was no difference found in all CPET variables measured between COPDMED and COPDCPET ($P > 0.05$). When COPDMED and COPDCPET were combined and compared against the non-COPD, there was a difference found in their median (95% CI) $\dot{V}E$rest (13.3 [12.3-14.2] vs 11.75 [11.2-12.6] $L \cdot min^{-1}$, $P = 0.02$, g = 0.28). $\dot{V}O_2peak$ (14.95 [13.64-18.12] vs 17.16 [16.35-19.11] $mL \cdot kg^{-1} \cdot min^{-1}$, $P = 0.049$, g = 0.29). $\dot{V}E/\dot{V}CO_2$ at the AT (38 [36-40] vs 36 [34-37], $P = 0.04$, g = 0.49). There was also a difference in mean +/- SD BR (36 +/- 17 % vs 47 +/- 14 %, $P = 0.004$, g = 0.69). This study demonstrates the underdiagnosis of COPD in perioperative settings. Future research should assess the use of targeted COPD optimisation preoperatively.

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E04 - Effects of unstable load vs stable load on muscle activation and bar velocity during a bench press

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Unstable load (UL) resistance exercises have gained popularity due to the potential to increase strength and neural development compared to traditional resistance exercises (Costello, 2022, J Strength Cond Res, 36, 881-887). It is assumed that training with an UL will increase the recruitment and activation of stabilising muscles, which is beneficial for daily activities and sport performance Kohler et al. (2010, J Strength Cond Res, 24, 313-321). Despite the recent increase in popularity, there is a limited amount of research that has been conducted using a UL and its impact on primary mover muscle activity. The purpose of this study was to investigate if a UL increases muscle activity of primary movers (pectoralis major sternocostal head [PEC] and triceps brachii long head [TRI]) during a bench press compared to a stable load (SL), measured via a Biopac electromyography (EMG) device. Additionally, bar velocity (m/s) using a GymAware device was compared between both UL and SL conditions. Following ethical approval, thirteen resistance-trained males were recruited (age = 21 ± 2 years; height = 178 ± 3 cm; mass = 79 ± 12 kg). Participants attended a familiarisation session, where 1RM and EMG maximum voluntary contraction (MVC) were determined. Following this, participants took part in a randomized crossover design at pre-determined loads. For the SL trial, participants performed 3 sets of 8 repetitions at 65% 1RM using a standard Olympic barbell. The US trial followed an identical protocol; however, an earthquake bar was loaded with 50% 1RM. The two-way repeated measures ANOVA revealed a significant interaction effect for the PEC activation, where there was an increase during UL but not SL condition (P = 0.001, ŋ2 = 0.633). No difference was found in the TRI between conditions (P > 0.05). There was a significant 17% loss in velocity in the UL condition (P = 0.022, ŋ2 = 0.273). A significant difference was revealed in the eccentric phase for the UL condition (P = 0.001, ŋ2 = 0.473). In conclusion, muscle activation was increased in the pectoralis major muscle during the UL compared to SL resistance training. There was also an increase in velocity loss during the UL. In addition, the time of the eccentric phase was significantly longer during the UL condition. Therefore, despite the reduction in intensity, a UL may elicit greater activation of primary movers when compared to traditional resistance training alone.

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E05 - Training load monitoring and wellness tracking of student athletes

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The evolution of Strength and Conditioning (S&C) has been significant in enhancing athletic performance, especially with a more recent shift in considering holistic athlete wellness which encompasses physical, emotional, and psychological aspects. Understanding the multifaced nature of athlete wellness allows an insight into the holistic wellbeing of athletes. Despite this, student-athletes are an understudied population who face unique challenges due to academic pressures, financial challenges, and intense training schedules in contrast to the established professional athlete. This study aims to investigate the correlation between S&C training loads and various wellness metrics (sleep quality, muscle soreness, mood and educational stress) in student athletes. Understanding how student athlete wellness varies over the academic year allows S&C coaches to tailor training loads to better compliment wellness and improve psychological, physical wellbeing and ultimately athletic performance. With institutional ethics approval from University of Derby, a mixed methods approach was adopted using an online questionnaire which 50 student athletes filled out multiple times a day over the academic year. Sports included were men's & women's volleyball, badminton and men's futsal. Data collected by the survey included sleep duration and quality, muscle soreness ratings, mood surveys, illness reports, training load measurements, stress and anxiety evaluations. This comprehensive data set enables a detailed analysis of trends over time. It is anticipated that the study will reveal significant relationships between training loads and various wellness indicators. Specific trends, such as the impact of academic stress on training effectiveness or the role of sleep quality in recovery and performance, are expected to emerge. These insights will provide valuable information for tailoring S&C programs to better support student athletes. Understanding the complex relationship of training loads and wellness in student athletes is crucial for optimising their performance and overall well-being. This study aims to contribute to a more intricate understanding of these relationships, informing the development of more effective, individualised training and wellness strategies. Ultimately, the research will provide an understanding for the importance of a holistic approach in athlete development, considering both physical and psychological aspects for optimal performance enhancement.

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E06 - The effect of programmed resistance training on the muscle myofibrillar proteome

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Resistance training increases muscle size but little is known about the dynamic processes that underpin the gains in muscle mass. We investigated rat muscle during 30 days of unilateral programmed resistance training (PRT) using the stable isotope (deuterium oxide; D2O) in vivo and proteomics. Three-month-old, male Wistar rats (body weight 348 ± 20 g) were assigned to four groups (n = 4, in each), including a control group and experimental groups that received D2O for 10, 20 or 30 days. Under ethically approved procedures, deuterium was administered, and a stimulating device was surgically implanted to activate the left peroneal nerve and cause maximal contraction of the dorsiflexors (inc. tibialis anterior; TA) and partial contraction of the plantar flexors. PRT consisted of 1 bout per day of 5 sets of 10 repetitions (1 repetition consisted of 2 s stimulation at 100 Hz with 2 s rest between repetitions and 2.5 min between sets). One hour after the final training bout (i.e. day 10, 20, or 30) animals were killed and the left (stimulated) and right (contralateral control) TA were extracted and weighed. Muscles were fractionated into myofibrillar and sarcoplasmic components. Protein content was calculated via Bradford assay and proteomic analysis of myofibrillar proteins was conducted via liquid chromatography-tandem mass spectrometry of peptide digests. Statistical analysis was conducted using R (v4.3.2.) and functional annotation was performed using the STRING database. Two-way mixed ANOVA was used to investigate differences between condition (stimulated vs contralateral control) and time (0, 10, 20, or 30 days). The protein content of stimulated TA increased ($P < 0.05$) from 0.579 ± 0.05 mg at day zero to 1.096 ± 0.15 mg after 30 days of PRT, whereas the protein content of control TA (0.618 ± 0.04 mg) was consistent across the 30-day experimental period. Proteomic analysis encompassed 244 proteins and the abundance of 45 proteins exhibited a significant ($P < 0.05$) interaction between condition and time. Stimulated muscle was enriched in mitochondrial enzymes. For example, the beta-subunit of ATPase synthase (ATPB) increased from 14.6 ± 4.5 to 74 ± 15.6 μg in stimulated TA and was 17 ± 5 in control TA. PRT also increased the abundance of neonatal myosin heavy chain (MYH8), four-and-a-half LIM domains protein 1 (FHL1) and muscular LMNA interacting protein (MLIP). These findings suggest the energy requirements of daily PRT are met by mitochondrial metabolism and PRT may be associated with activation of the muscle developmental programme.

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Section F - Technology in Sport & Health

F01 - A study into the feasibility of replicating and improving the mechanical properties of the Wavecel helmet liner using additively manufactured auxetic structures

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In the event of a cycling accident, there is evidence supporting the bicycle helmet's role in reducing the risk of traumatic brain injury (TBI). Despite this, there is ambiguity surrounding the effectiveness and integrity of specific helmet liner technologies which claim to reduce concussion risk, such as Wavecel. This research project seeks to explore the feasibility of replicating the mechanical properties of the Wavecel metamaterial using an additively manufactured (AM) honeycomb structure. Wavecel, introduced in 2019 by Trek Bicycle Co. as part of the Bontrager sub-brand, is a helmet liner technology. Consisting of a collapsible cellular metamaterial, it functions through a network of interconnected shock absorbers that link the user's head to the helmet shell. Upon its announcement, Wavecel claimed that its cellular lattice structure helmet liner is up to 48× more effective at preventing concussion than a standard helmet, reducing the likelihood of concussion to 1.2% during a laboratory simulated head impact (Bliven et al., 2019, Acc Analysis Prev, 124, 58-65). As one of the most commercially successful metamaterial helmet liners available on the consumer market, Wavecel is a clear demonstration that a metamaterial protection system can be mass-produced, well received by consumers and profitable for a business. To conduct this research, the properties of the Wavecel liner will be defined through impact testing. Computer-aided design (CAD) will then be used to produce several prototypes of a honeycomb structure. These prototypes will then undergo identical impact tests, aiming to replicate the mechanical properties of the Wavecel helmet liner. Comparisons will include elastic stiffness, column buckling, and response to off-axis impact. The collected data will serve as evidence for evaluating the performance and mechanical attributes of these structures, contributing to the advancement of next-generation helmet liners and sports personal protective equipment (PPE). The findings will also benefit businesses looking to develop helmets incorporating metamaterials in their liner technology.

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F02 - Chainmail inspired metamaterials for use in protective sports equipment

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Contact sports and action sports require intense performance yet also include a high risk of injury. Subsequently, protective equipment for those sports usually must trade flexibility for protection and vice versa. Chainmail inspired mechanical metamaterials could be a solution to this dilemma. Chainmail is a type of body armour, consisting of a structured fabric made up of thousands of interlocking metallic rings. Chainmail inspired materials have recently been made from connected 3D shapes, rather than the typical 2D (flat) rings. This chainmail inspired material is flexible when relaxed but stiff when the chains are compressed together. This ability to control the material's stiffness means chainmail is a type of mechanical metamaterial. Mechanical metamaterials are engineered structures which derive their properties from the structure of the material, not the material itself. In relation to protective equipment, this means that these chainmail materials or fabrics, can be flexible during normal use but stiffen when indented or impacted. The flexibility of these materials can be influenced by changing the size and shape of the connecting chains but to what extent and the effect this has on their stiffness is unknown. This type of structure could improve sporting protective equipment, where (as stated before) there are various trade-offs. The aim of this project was to develop a chainmail inspired material and test the effect of varying cell sizes has on the flexibility and indentation resistance of the material. Additive manufacturing was used to create the chainmail materials and a range of indenters were used to test them, the results of which indicate that as cell size decreases and number of cells increase; their flexibility and formability increases while also maintaining a good degree of indentation resistance, when compared to larger cell sizes. Based on this work, these structures could be tailored to different sporting protective equipment where flexibility, support, and stiffness requirements may vary between normal use and collisions or falls. These chainmail inspired materials could have various applications in contact sports such as rugby, American football and ice hockey where protection for players is key to reduce the severity of injuries. Similarly, action sports such as mountain biking, skateboarding, skiing and snowboarding also necessitate a high degree of protection. An Alternative application for these materials could be as a first aid device, where the material would be formed around the injury site as a brace and stiffened with compression, such as a vacuum pack.

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F03 - How athletes' biomechanical running characteristics effect running economy during the use of running shoes with and without carbon inserts

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To maximise running economy (RE), shoe manufacturers placed carbon plates within the midsole of shoes. Shoe technology research is limited on understanding the variability of individual responses to carbon-plated shoes and how these responses vary across running velocities. Little research on same shoe characteristics with and without a stiff element has been completed. This study aimed to investigate how running shoes with carbon versus without a carbon composite stiff element alter individual running biomechanics and the metabolic cost of running. Ethical approval was gained from Cardiff Metropolitan University Ethics Committee. Ten male athletes (69 ± 9 kg; 174 ± 4 cm; 28 ± 9 years) completed two submaximal incremental treadmill runs. One test was completed in a shoe without carbon (C1), the other test was completed in carbon shoes (C2), the order of testing for each shoe were randomised. Running velocity started at 9 km/h and increased by 1 km/h every four mins, blood lactate samples were taken after every stage. Once 4 $mmol \cdot L^{-1}$ (OBLA; the second lactate turn point) had been reached one more stage was completed. Gas exchange was analysed throughout the whole test. The first 15 s of the final 2 minutes of each stage was recorded using Theia3D markerless motion capture software (Theia3Dv2022.1.0.2309, Theia Markerless, Inc., Kingston, ON, Canada). Data were analysed in 4 stages, the initial stage, pre-OBLA, OBLA and post-OBLA. Physiology data were averaged over the final two mins of each stage. Discrete joint angles were taken from each stage, and an average of the 15 s recording was taken for spatiotemporal measure. Data were analysed using a four-way repeat measures ANOVA, to show individual differences. Non-parametric data were analysed using Wilcoxon signed-rank test. Hedges g calculations were completed to calculate effect size (ES). Results showed significant increase in flight time (FT; P = 0.04, ES = 0.20) in the pre-OBLA stage when using C2. Metatarsophalangeal joint (MTP) dorsiflexion showed significant increase during the initial stage in C2 (P = 0.05, ES = 0.8), and ankle dorsiflexion had significant increase in the post-OBLA stage in C2 (P = 0.03, ES = 0.2). The were no significant differences present in the physiology data. Across the physiological, spatiotemporal and kinematics, high dispersions around the mean were exhibited. Findings suggest that to improve RE, mechanical and spatiotemporal changes need to be present when using C2. Further findings show carbon shoes elicit highly individual responses to both RE and mechanics of running.

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Section G - Biomechanics & Motor Behaviour

G01 - Quantifying the traverse: a comprehensive kinematic analysis of climbing technique

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Biomechanical analysis plays a pivotal role in enhancing performance and preventing injuries in rock climbing. Despite a recent increase in popularity, there remains a lack of research quantifying full-body movements, resulting in uncertainty regarding biomechanical demands and variability. It should be noted that there is a scarcity of data in climbing research to quantify optimal techniques, particularly for traverses. This study aims to address this gap by examining the demands of a traverse in a controlled setting using Vicon marker-based three-dimensional (3D) motion capture. Fourteen experienced climbers (32 ± 13 years, 70 ± 9 kg) with varying skill levels (intermediate to advanced) and climbing backgrounds (sport climbing, trad climbing and bouldering) completed a two-minute standardised traverse on a custom-built Lattice circuit (2440 × 2440 × 1220 mm). A twelve-camera (200 Hz, Vantage) motion analysis system (Vicon, Motion Systems Ltd. Oxford, United Kingdom) acquired kinematic data. Retroreflective markers were attached to anatomical landmarks of the upper and lower body. The trials were preceded by a 10-minute self-selected warmup. This data will be analysed to assess the degree of inter-participant variability, observing if there is the possibility of quantifying an optimal traversing technique. Intra-participant variability will be assessed, to measure the effect of fatigue on the climbing movement. Previous literature has alluded to the possibility of fatigue increasing the use of the legs when climbing as compensation. Comparing the beginning of the traverse to the end, data should further substantiate this claim. This research will offer insights into the kinematic demands of rock climbing, laying the groundwork for further studies on a larger scale to assess the possibility of optimising technique, performance, and injury strategies. This study contributes to bridging the vast gap between biomechanical research and practical applications in the climbing community, facilitating a more evidence-based approach to performance.

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G02 - Variability in depth for national-level swimmers' freestyle dive starts, push starts and tumble turns

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The dive start and tumble turn are key skills in freestyle swimming and are the fastest part of a race (Higgs, Pease & Sanders, 2016, J Sports Sci, 35, 995-1003). Consistency in performing them, to a high-level, is crucial when races can be won by <0.1s. Many studies have investigated dives, tumble turns and underwater undulatory swimming performance, however, very few have examined the effect of depth (West et al., 2022, Sports Med Open, 8). Swimming depth will affect wave drag, total distance travelled underwater and, possibly, kick amplitude. Collectively, these will impact dive and tumble turn performance. The current project aims to quantify the variability of a swimmer's freely chosen depth when performing a freestyle dive start, push start and turn. Ethics approval for this study was provided by the School of Medicine's Research ethics board. We aim to recruit 14 participants (7=male, 7=female), over the age of 16 and currently competing at a national level in freestyle events. After a 10-min self-determined warm-up, participants are asked to perform three freestyle dives, push starts, and tumble turns in a randomised order. There are three minutes rest between each task and five minutes between three tasks. Each of the nine tasks will be recorded using a custom-built CONTEMPLAS camera system, using 12 cameras filming at 100Hz. Participants are provided with 5-min to complete a self-determined cool-down. Video recordings will be analysed using SIMI Motion capture to perform manual digitisation. A coefficient of variance analysis and a repeated measures Anova and intraclass correlation to quantify the variability in depth within the dives, push starts and the turns at both an individual and group level. As part of this study, we are also assessing the reliability and validity of an automated digitising software package. The validity and reliability of the automatic digitisation method versus the manual digitisation method was analysed via a Bland Altman analysis to obtain the limits of agreement between the two methodologies. The results are pending, although they will be used to assign individual swimmers with target depth ranges for subsequent experiments that aim to identify the optimum depth for these skills.

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G03 - An investigation on sex-based disparities in male and female collegiate athlete reactive strength index

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Reactive strength is the ability to effectively use a fast stretch shortening cycle (SSC) with the eccentric into a concentric contraction (Rebelo et al., 2022, Healthcare, 10, 593). A fast SSC is determined to be <200 ms due to a preliminary study by (Schmidtbleicher & Komi, 1992, Encyclopedia Sports Med. Vol. 3 Strength and Power in Sport) reviewing muscular contractions. Reactive strength is determined through two different metrics used within the literature which are ground contact time (GCT) and jump height (JH) allowing for understanding on how an athlete can utilise the myotatic reflex to react with the floor. Reactive Strength Index (RSI) is typically measured via drop jump (DJ) and 10/5 reactive pogo jumps. A novel way to measure RSI is via a rebound countermovement jump (RCMJ) which utilises RSI-Modified and includes time to take off instead of ground contact time. RSI is an important metric to measure because it has implications within sport-specific metrics like sprinting and jumping (Jarvis et al., 2022, Sports Med, 52, 301-330). However, some of the limitations of RSI are it is a ratio metric, and therefore RSI can mask underpinning metrics. As a result, additional metrics such as such a force, velocity and power can help better understand athlete development and the underpinning key performance indicators. However, many metrics within reactive jumps remain unsearched. Data will be collected from around 16 university athletes aged 18-25 currently competing in sport with at least one year's experience in resistance training. Data will be collected using Hawkins dynamic force plates, sampling at 1000 Hz, and has recently been reported to be valid and reliable (Badby et al., 2023, Sports, 23, 4820) Participants will be asked to complete 3 DJ, RCMJ and 10/5 jump trials on two separate occasions separated by a minimum of 48 hours. Athletes will be instructed to perform a quiet standing period for 1 second before and after each jump to calculate body weight by the 5 × standard deviation method. Therefore, the study aims to compare the disparities between all three jumps aswell, sexes and the potential implications on performance. Previous studies displayed significant disparities between male and female participants. Therefore, the null hypothesis for this study is to display a non-significant difference across sexes aswell as between jumps. A limitation to this study is controlling the standardisation of variables such as squat depth during all tests.

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G04 - The effect of the conventional deadlift and Romanian deadlift on muscle activation and joint angles at submaximal intensity

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For fitness professionals delivering strength and conditioning programmes and recreational athletes designing their own programmes, exercise selection and an appropriate loading stimulus over time are the cornerstones of an effective resistance training programme. The conventional deadlift (CD), a compound, closed-chain movement, is prescribed to increase the strength of the posterior chain and the quadriceps. The Romanian Deadlift (RDL) is an isolated knee variation of the CD, whereby the knee angle is stable throughout the movement (Lee et al., 2018, J Exer Sci Fit, 16, 87-93). The RDL is a key movement in weightlifting training and is a commonly used developer of posterior chain muscles (Weaver and Kerksick, 2017, Strength Cond J, 39, 85-90). Studies comparing the CD and RDL are limited. Using surface EMG 2D motion analysis of the lower limb, we aim to determine if (i) biceps femoris activation is greater than the vastus lateralis during the RDL, (ii) there is a higher activation of both vastus lateralis and biceps femoris during the CD, and (ii) whether an injury is more likely to occur during a CD or RDL using the angles and range of motion (ROM) of the hip, knee, and ankle. 15 recreationally active adults with experience with the CD and RDL were recruited. Surface EMG sensors were placed on the vastus lateralis and biceps femoris, and markers were placed for 2D motion analysis in the sagittal plane. MVC data were collected for three repetitions of both lifts at 70% RDL 1RM. Five repetitions at 50% RDL 1RM were used for analysis. Statistical analysis was conducted using a paired t-test and Wilcoxon signed-rank test. The results show greater activation of the vastus lateralis in the CD than the RDL ($P < 0.05$) but no difference in the biceps femoris. No differences were found in hip angles during ascent or descent at mid-thigh and knee height ($P = 0.343$), but there were differences at the bottom position. Knee angles during ascent and descent at the mid-thigh were different ($P = 0.027$) but not at knee height. No differences at the ankle joint were found at the mid-thigh ($P = 0.12$), but differences were found at knee height and bottom position. Finally, ROM at the hip, knee, and ankle during ascent and descent were significantly different ($P = 0.002$). The findings may help fitness professionals and recreational athletes make decisions such as exercise selection, load management, and injury prevention strategies based on the comparative effectiveness and risks of the CD and RDL.

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G05 - Do lower limb kinetic and kinematic differences in drop jump landings persist when players have returned to sport following knee ligamentous injuries?

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Knee injuries (KI) are identified as one of the most burdensome lower limb injuries in football with long and complicated rehabilitation and high re-injury risk. Current research often describes technique deficits being present upon RTS, often being a result of poor return to sport (RTS) testing procedures. More recently, research has advocated the use of single leg vertical jump assessments, due to the specificity of the movement to injury mechanisms and the ability to consider different phases of the task to inform practitioners of joint contributions to the propulsion and landing phases. The aim of this research is to identify whether these functional deficits exist 12-24 months post RTS authorisation, to help inform future RTS in applied practice. Twenty-four semi-professional male footballers (mean ± SD: age 25 ± 4 years; stature 182 ± 7 cm; body mass 80 ± 8 kg) were recruited into a previously injured and a control group. Participants completed 5 repetitions of single leg drop jump (SLDJ). Jump height, ground contact time, reactive strength index, peak moments, angles and power contributions for the hip, knee and ankle were measured using Qualisys Track Manager then exported to Visual 3D. This study was approved by the Edge Hill University Ethics Committee. No significant findings were identified for landing one however, during the propulsion phase there was a difference between groups (P = 0.026, d=1.14) for knee flexion at take-off. Most differences were identified during landing two bilaterally in both groups. Within the injured group, differences were identified for peak hip (P = 0.011, d = 0.028) and knee powers (P < 0.001, d = 1.269), hip (P < 0.001, d = 1.924) and knee power contribution % (P < 0.001, d = 1.269). No differences were identified for the performance measures or through performing statistical parametric mapping for hip and knee powers for all three phases. Joint coupling analysis was conducted for the total ground contact time amalgamating the landing and propulsion phase, this was analysed as Hip-Knee, Hip-Ankle and Knee-Ankle, with significant findings in Hip-Knee and Hip-ankle. Both groups elicited bilateral differences however, no differences between the injured limb and dominant control limb were identified. To better apply this form of analysis to RTS testing, functional movements such should be undertaken when athletes are injury free to provide baseline measurements to refer to if undertaking rehabilitation from KI. Likewise, the current study identified that joint contributions could be identified in a more applied setting using the range of motion data from each joint.

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G06 - The exploration of the upper body kinematics and kinematic asymmetries during forwards and backwards wheelchair propulsion

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The current literature available on the kinematic asymmetries in the upper body during wheelchair propulsion remains limited (Slowick, Requejo, Mulro. & Neptune, 2015, Front Bioeng Biotech, 3, 86-86). This research provides an opportunity to add to this limited area and help provide an understanding of the how the upper body movements change when faced with a change in speed and direction. The present cross-sectional laboratory study aimed to explore the kinematics and kinematic asymmetries during forwards and backwards wheelchair propulsion in able bodied individuals. This study investigated the effect of changes in speed and quantified the upper body kinematics of forwards and backwards wheelchair propulsion. Upon ethical approval, five able bodied participants, 3 male and 2 female (age = 21 ± 1 years, stature = 173 ± 8 cm, mass = 73 ± 7 kg) provided written informed consent and participated in this study. Participants took part in exercise regularly but had no prior wheelchair experience. Individual measurements (Height, weight, weekly exercise levels, injury history, dominant hand and upper body pain via the musculoskeletal pain questionnaire) were taken then participants took part in a series of trials in a wheelchair. Four Inertial Measurement Units (IMeasureU, Blue Trident, VICON, Oxford, UK) were placed on the participant's 7th cervical vertebrae, underneath the wheelchair seat and on the lateral side of each humerus above the elbow joint. Before testing began, participants were given a five-minute familiarisation period on the wheelchair. The testing consisted of ten forwards and ten backwards self-paced wheelchair propulsions on an Invictus Active Trainer (Invictus Active, Wolverhampton, UK), a 20 metre sprint overground on a track (with verbal encouragement throughout the sprint) and a single arm 3 kg medicine ball throw. All tests were performed from a stationary start and shoulder angles were measured to 180° before each test began. This research expects to see a difference in angular velocity between each participant's arms, with a greater level of asymmetry as speed increases. Participants are required to work harder in order to gain speed and as a result their propulsion technique will change to meet the new demands. The other expectation is to see the same side as the participants dominant hand have a higher level of force production during propulsion compared to their arm with the non-dominant hand.

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Section H - Psychology & Skill Acquisition

H01 - Optimization of older adults' home spaces to enhance their physical activity level and minimize sedentary behaviour: A qualitative study

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There is a lack of studies focused explicitly on the impact of the home environment on older adults' sedentary behaviour (SB) and physical activity (PA). The present study aims to investigate older adults' perception of their home environment and its impact on their PA and SB. A qualitative exploratory research design was employed to conduct 33 in-depth interviews (IDIs) and five focus group (FGs; n=16) with older adults (mean age 71.7 ± 5.2 years). Using reflexive thematic analysis as an inductive coding approach, four themes were generated from the data set and were interpreted using the socio-ecological model (SEM): (I) Home layout and PA, (II) Space designation within the home, (III) Electronic equipment, furniture and material within the home space, (IV) Changing infrastructure within the home space. The findings highlight the significance of person-environment interaction at different layers of the SEM. Older adults have a significant influence on the physical environment of the home and how it is organized in terms of allocating space and equipment. However, utilization of space, and its intentional use (for active or sedentary behaviour) is also crucial, emphasizing individuals' autonomy, freedom and control within the home environment. Moreover, both interpersonal and intrapersonal factors act as facilitators or barriers regarding necessary modifications within the home space to promote a conducive environment for PA. The current findings provide insight into the interaction of personal, social, community, and physical environment factors to these older adults' PA and SB in their homes. Moreover, motivating older adults to develop more intention to have positive control over their environment is important. Further, promoting the notion of 'think small for large effects' within the home space will enable older adults to map out small-scale activities (such as avoiding screens in the bedroom or moving PA equipment to a convenient place) instead of making large-scale, less realistic infrastructure changes.

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H02 - Parental perspectives of early adolescent neighbourhood outdoor play and physical activity: barriers and facilitators

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Introduction: Outdoor neighbourhood play supports physiological and psychological health among early adolescents (EA), typically aged 10-14. Existing research is often grounded in socioecological theory emphasising the interconnectedness of individuals and their environments. It has also typically focused on parental perspectives of facilitators and barriers of neighbourhood play in younger children. Aims: This study aimed to ascertain facilitators and barriers of outdoor neighbourhood play as perceived by EA parents. Methods: A purposive sample (n=11) of parents engaged in individual semi-structured interviews online via Microsoft Teams. Transcripts underwent reflexive inductive thematic analysis, identifying six themes aligned with the research question within a socioecological framework. Results: Most parents (n=10) demonstrated an awareness and appreciation of the advantages of outdoor neighbourhood play. They identified barriers and facilitators to outdoor neighbourhood play across intrapersonal, interpersonal, community and policy levels. Safety concerns emerged as a barrier to outdoor play. However, technology mediated reported concerns and was perceived as a facilitator to outdoor play when combined with age-appropriate community clubs and improved built environment facilities. Conclusion: Parents acknowledged the advantages of outdoor neighbourhood play. Parents may restrict their EA's participation due to safety concerns. The study highlighted a deficiency in age-appropriate facilities supporting safe outdoor neighbourhood play. Future research should focus on developing appropriate facilities and improving social cohesion to mitigate perceived safety concerns of parents. Such attempts may benefit from using technology to assuage parental safety concerns further and enhance overall safety of neighbourhood outdoor play experiences for EA.

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H03 - Effect of high intensity, intermittent exercise on EyeGuide Focus smooth pursuit assessments in amateur female rugby union athletes

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Ocular assessment tools provide insights into neurological functioning when diagnosing sport-related concussions (SRCs). Emerging technologies such as EyeGuide Focus have attempted to improve on pre-existing clinical tools however the reliability of the tool is currently uncertain and it is unclear if physical exertion may affect the validity of the device as seen with similar ocular assessments. The aim of this study was to determine if EyeGuide Focus accuracy is affected by high-intensity, intermittent exercise. Seven amateur female rugby union athletes were recruited (Mean age [± SD] = 23 ± 5 years; stature = 172 ± 4 cm, mass = 87 ± 20 kg). Athletes completed baseline testing on the unit which included two to four familiarisation trials and three official tests on the unit measured in arbitrary units (AUs). Testing was completed in a dark room free from distraction, and participants wore noise-cancelling headphones (BOSE QC45) during assessment. The athlete then performed a brief warmup before beginning the exercise protocol by Whyte et al. (2022, Phys Therapy Sport, 58, 126-133) which involves repeated circuits of acceleration, deceleration, backpedalling, change of direction, jumping, and side shuffling. This protocol has previously displayed significant effects on Vestibular Ocular Motor Screening testing. Athletes repeated circuits until they reported 17-18/20 on the Borg Scale with 30s between each circuit. Athletes then completed three more trials at five- and 10-mins post-exercise cessation. Data were exported to Microsoft Excel and Statistical Packages for the Social Sciences for analysis. Athletes completed an average of 03:15 ± 23 s total work in circuits. Significant differences existed between athlete's heart rate at rest and post-warmup, post individual circuits, and five mins post-test ($P < 0.05$) but not 10 mins post-test ($P > 0.05$). Mean EyeGuide Focus scores were 23443.29 ± 8082.18, 35684.04 ± 13279.40, and 22927.64 ± 6377.61 AUs at baseline, 5 mins post-test, and 10 mins post-test respectively. Scores were significantly different between baseline and 5 mins post-test ($P < 0.001$), and between 5- and 10-mins post-test ($P < 0.001$), but not baseline and 10 mins post-test ($P > 0.848$). Three mins of high-intensity, intermittent exercise was sufficient to induce significant changes in amateur female athletes' EyeGuide Focus scores, returning to baseline after 10 mins of rest. The findings indicate that physical activity can impact on EyeGuide Focus scores and thus sufficient rest is required when assessing athletes for SRCs. Future research should investigate if sport-related contact or collisions also impact scoring on this device.

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Section I - Physiology

I01 - Investigating the relationship between minute ventilation and metabolic contribution in long COVID: A retrospective cohort study utilizing cardiopulmonary exercise testing

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Long COVID (LC) presents as a complex and debilitating condition characterized by persistent, episodic symptoms that significantly impact individuals' quality of life and functional capabilities (Brown et al., 2021, BMJ Glob Health, 6). There are several hypotheses for the underlying pathophysiology and mechanisms of long COVIDs nature. This study aims to explore the association between minute ventilation and metabolic contribution in individuals experiencing long-term COVID-19 symptoms. Utilising cardiopulmonary exercise testing (CPET), acknowledged as precise, non-invasive prognostic tools, to evaluate cardio-respiratory response to incremental exercise, aiding in the assessment of impaired cardio-respiratory function and perfusion. A cohort observation study was conducted, involving patients with confirmed COVID-19 diagnoses and persistent symptoms three months post-infection, aged between 18 to 65 years. Patients undergo three visits at the university: a baseline assessment, followed by two sessions involving the CPET, spaced 24 hours apart. The baseline visit includes gathering anthropometric data, lung function tests (MIP/MEP), questionnaires, symptom profiling and functional capacity assessments (6MWT and TUG). Data from these assessments determine CPET starting loads based on three stratas: Strata I (6MWD < 350 m, starting load of 10 W), Strata II (6MWD 350-400 m, starting load of 20 W), and Strata III (6MWD > 400 m, starting load of 30 W). Subsequent sub-maximal CPET sessions are conducted to test integrated physiological responses to exercise while preventing PEM/PESE. Measurements include pulmonary gas exchange, ventilation, ventilatory thresholds, and blood profiling. Analysis at present is ongoing. No adverse events or serious adverse events occurred during data collection. Results from this investigation provide insights into the physiological mechanisms underlying long COVID and contribute to the development of tailored management strategies for affected individuals. CPET is the gold standard for assessing cardiorespiratory fitness (CRF) and is vital for understanding LC treatment (Faghy et al., 2024, Prog Card Disease). The use of 2-day CPET methods are increasingly used to identify aerobic deficits and physiological deficits in chronic diseases like ME/CFS and LC. Despite risks, CPET measurements offer insight into pulmonary-vascular function and CRF impairment post-COVID-19 infection (Faghy et al., 2020, Brit J Anaes, 125, 447-449).

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I02 - Physiological, perceptual and neuromuscular responses to 15 vs. 30 s work durations during short high intensity interval training

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High intensity interval training (HIIT) is an extremely potent stimulus for physiological adaptation offering a low volume training approach that can be easily accommodated into an individual's training schedule. A key feature that drives physiological adaptation is the time the individual spends at or around their individual $\dot{V}O_{2max}$ during HIIT. This can be influenced by several variables, including the work bout duration (Buchheit & Laursen, 2013, Sports Med, 43, 318-338). The use of short duration HIIT intervals (i.e., < 60 s) are popular due to their ability to facilitate a high oxygen uptake while minimising fatigue (Buchheit & Laursen, 2013, Sports Med, 43, 318-338). However, the physiological response to different short duration HIIT formats has not yet been investigated. The aim of this study was to measure the physiological, perceptual and neuromuscular responses to two traditional short duration (i.e., 15 and 30 s) HIIT formats in trained athletes. With ethics approval, 10 well-trained male and female team sport players (mean + SD; age: 22 ± 1 years; body mass: 78 ± 6 kg; stature: 176 ± 4 cm) were recruited to the study and visited the laboratory on three separate occasions. After an incremental test to exhaustion on a cycle ergometer to establish $\dot{V}O_{2max}$ (52.3 ± 5.7 ml·kg^{-1}·min^{-1}) and peak power output at $\dot{V}O_{2max}$ ($p\dot{V}O_{2max}$; 313 ± 21 W), two HIIT sessions (15 s effort: 15 s passive recovery and 30 s effort: 30 s passive recovery) were completed in a randomised order. HIIT interventions comprised 15 s or 30 s at 120% $p\dot{V}O_{2max}$ followed by 15 or 30 s passive recovery, repeated for 2 × 6 min with 5 min active recovery at 40% $p\dot{V}O_{2max}$. $\dot{V}O_2$, time >90% $\dot{V}O_{2max}$, heart rate, and RPE were measured during the HIIT session and blood lactate concentration recorded 5 minutes afterwards. Measures of knee extensor maximal voluntary contraction (MVC) were measured immediately before and after each HIIT session.

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I03 - The cardiovascular implications for exercise intolerance and dyspnoea in electronic cigarette users

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Background: Electronic cigarettes (EC) have been proposed as a safe alternative to tobacco smoking, however, several studies have shown adverse health effects of EC. The chronic implications of EC on cardiorespiratory response and exertional dyspnoea are unknown. Aim: To examine the chronic effects of electronic cigarettes (EC) and tobacco cigarettes (TC) on resting vascular function, inflammatory markers, cardiorespiratory responses during exercise and exertional dyspnoea. Methodology: Three groups of young adults (16 each) with normal spirometry (EC users, TC smokers, and never-smokers [NS]) consented to participate in this study following institutional ethics approval. Participants performed spirometry and an incremental cardiopulmonary exercise test (CPET) 20W/2mins on an electronically braked cycle ergometer with blood lactate (BLa) measurements. Flow-mediated dilation (FMD%) of the brachial artery was assessed using Doppler ultrasonography. Venous blood samples were collected to assess inflammatory biomarkers associated with vascular function. Results: EC and TC groups had a lower peak work rate compared to NS controls (184 ± 30; 185 ± 35 vs. 228 ± 44 W, respectively; $P < 0.05$). During submaximal exercise, EC and TC groups displayed higher ventilation (VE), higher ratings of dyspnoea and more intense leg fatigue compared to NS controls (e.g. 140 W, VE: 62 ± 10; 64 ± 12 vs. 54 ± 7 L/min, Dyspnoea: 5.0 ± 1.9; 6.1 ± 1.9 vs. 3.4 ± 1.7 Borg units, 6.1 ± 2.05; 7.0 ± 1.9 vs. 4.1 ± 2.1 Borg units, respectively; all $P < 0.05$). The TC group displayed lower ventilatory efficiency (higher $\dot{V}E/\dot{V}CO_2$) and higher blood lactate compared to NS during submaximal exercise (e.g. 140 W, $\dot{V}E/\dot{V}CO_2$: 31.8 ± 5.6 vs. 28.2 ± 2.41, Blood lactate: 6.5 ± 2.4 vs. 4.3 ± 2.5 mmol/L, respectively; $P < 0.05$ for both). Like the TC group, the EC group showed a trend for lower ventilatory efficiency and higher BLa during submaximal exercise, but they did not reach statistically significant differences compared to NS controls ($P = 0.07$ for both). FMD was significantly lower in EC and TC groups compared with NS controls (5.4 ± 2.4; 4.6 ± 2.9 vs. 7.9 ± 3.4%, respectively; $P < 0.05$) and that was associated with elevated Thrombospondin-1 levels. Conclusion: EC and TC impair vascular function and cardiorespiratory responses to exercise and exertional dyspnoea similarly. EC has a detrimental impact on vascular function and exercise capacity and should not be recommended as a 'healthier' alternative to TC.

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I04 - The effect of staged versus rapid immersion on the cardio-respiratory components of the cold-shock response

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Drowning is one of the leading causes of accidental death. Sudden cold-water immersion (CWI) leads to the stimulation of cutaneous cold receptors causing the cold-shock response (CSR) which includes a gasp, hyperventilation, and tachycardia for several minutes. Only one study has investigated staged CWI (Hayward and French, 1989, Av Space Env Med, 60, 1163-1165) and found a reduction in minute ventilation ($\dot{V}E$) and respiratory frequency (fB) occurred when immersed to the waist for 30 s followed by to the shoulders. However, it is unclear whether a staged entry with a longer or shorter period at the waist would elicit a greater or lesser CSR. Thus, the aim of this study is to establish whether a staged immersion with a longer period immersed to the waist would attenuate the initial cardio-respiratory responses associated with CWI, when compared with rapid immersion. Ethical approval was gained from the University of Portsmouth Science Faculty Research Ethics Committee (SHFEC 2020-070). Seven male participants completed two, 5 min immersions that occurred at the same time of day (± 2 h) to avoid circadian variation in internal body temperature: a staged immersion (immersion to the iliac crest for 2 min prior to immersion to the acromion process); a rapid immersion (immersion to the acromion process for 5 min). Participants were lowered into stirred water (15°C) at a rate of 4 s to the waist, 4 s to the shoulder. Inspiratory and expiratory data were collected using a ventilatory turbine module and Douglas bags, respectively, whilst heart rate data was collected using a three-lead ECG. Variables were analysed over the first 30 s of immersion by a one-way ANOVA and a Tukey post hoc test. Effect sizes were calculated using Cohen's d. Staged immersion to the waist resulted in a significantly lower fB ($P < 0.05$; $d = 1.54$) and $\dot{V}E$ ($P < 0.01$; $d = 1.96$) over the first 30 s epoch, when compared to rapid immersion. Staged immersion to the shoulders resulted in a lower ventilatory equivalent of oxygen ($P < 0.005$; $d = 1.95$). There was no difference in heart rate between immersions. A staged immersion to the waist resulted in a 36.2% lower $\dot{V}E$ and 29.4% lower fB, potentially due to fewer cutaneous cold receptors being stimulated. This reduces the potential to aspirate water due to a lower ventilatory drive, therefore, could reduce drowning incidence attributed to the CSR.

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Section J - Posters

J01 - The role of inspiratory muscle fatigue and its impact on strength and respiratory function

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Inspiratory muscles are essential for breathing and during exercise. However, excessive effort on the respiratory system can cause the inspiratory muscles, such as the external intercostals and the diaphragm, to become fatigued, therefore impairing performance (Wuthrich et al., 2013, Exp Physiol, 12, 1705–1717). Inspiratory muscle fatigue is when there is a loss in the capacity to produce force and/or velocity in a muscle, meaning they become tired and weak due to increased work demands (Tsukamoto et al., 2019, J Phys Ther Sci, 31, 318–325). Inspiratory muscle fatigue impacts performance because the force produced by the inspiratory muscles starts to decline which therefore causes them to fatigue as they cannot work to the maximum capacity no longer. This is vital in aerobic exercises such as rowing, cycling and running as the demand for oxygen is higher to perform the tasks. The diaphragm is the most dominant respiratory muscle involved in inspiration, alongside the external intercostal muscles. During inspiration, the diaphragm contracts and flattens, and the external intercostal muscles contract, pulling the ribcage up and outwards. The main function of these muscles is to allow a maximum amount of oxygen into the lungs by increasing the surface area in the thoracic cavity (Siafakas et al., 1999, Thorax, 54, 458–465). Several studies have explored delaying muscle fatigue by using inspiratory muscle training in healthy individuals. This is because it improves the strength of the respiratory muscles by increasing the endurance and capacity of the diaphragm. Results highlighted that maximum inspiratory pressure increased between 16 and 18% (Segizbaeva et al., 2014, Hum Physiol, 40, 683-689), a 7% increase in inspiratory muscle strength (Smith et al., 2021, Am J Physiol, 312, 1013-1018), a delay in muscle fatigue, and an improvement in performance. There is limited research on cycling, rowing, and running; therefore, this study aims to determine whether any of these exercises delay or increase muscle fatigue and to determine if maximal inspiratory pressure and maximal expiratory pressure improve respiratory function. This study aims to recruit 9–12 participants, which will involve four visits to the laboratory. Exercises include a 10-kilometre cycling session, a 3-kilometre treadmill running session, and a 2-kilometre rowing session, and these will be done in a randomised order. Visit 1 includes familiarisation; visit 2 involves baseline measures being recorded and test 1 being conducted; visit 3 includes test 2 being administered; and visit 4 involves test 3 being conducted. The measurements that will be collected at each kilometre are heart rate, rate of perceived exertion, and dyspnea. Blood lactate, maximal inspiratory pressure, and maximum expiratory pressure, however, will be collected before and after each test. At this present time, results are pending. My hypothesis for this study would be that all the cardio-based exercises will see an improvement in respiratory function and strength, with treadmill running having the biggest improvement as, throughout the 4 weeks, adaptation would have occurred.

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J02 - Evaluation of pilocarpine iontophoresis vs. exercise-induced sweat sodium concentrations at different exercise intensities

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Differences between passive versus active sweat sodium concentration ([Na+]) may alter sodium replacement strategies. The primary purpose of this pilot trial was to compare pharmacologically induced sweat [Na+] (passive) with exercise-induced sweat [Na+] (active) at three different exercise intensities. Methods: This was an internal validation trial, reviewed by Wayne State University's IRB (IRB 23-02-5555). WSU's IRB determined that this retrospective, observational, data collection did not fall within the scope of human research regulations. As such, fifteen endurance cyclists participated in four cycling trials (different days, separated by a week) at three exercise intensities (50, 75, and 100% of functional threshold power/FTP) for 20 minutes. Sweat was collected prior to each trial via pilocarpine iontophoresis (passively induced sweat). Then, a macroduct™ (Wescor Inc, Logan, UT) sweat collector was affixed to the same forearm (at a different location than the passively induced sweat collection) and the athlete cycled at the given intensity to collect exercise-induced sweat. Sweat samples were analysed for sweat [Na+] immediately (Sweat Chek Conductivity Analyzer, Wescor Inc, Logan UT), which was the main outcome variable. One-way ANOVA was utilised to detect differences in passive and active sweat [Na+] levels across different exercise intensities. Statistical significance was set a priori at $P < 0.05$. Results: Fifteen highly trained cyclists between 19-45 years (10 male, 5 female, weight 69 ± 9 kg, FTP 4.16 ± 0.56 W/kg, passive sweat [Na+] 55.6 ± 18.5 mmol/L [range 30-89 mmol/L]) completed this trial. No statistically significant differences were noted between pre (passive) to post (active) sweat [Na+] levels during the 50% FTP, 75% FTP, or 100% FTP conditions. However, when assessing exercise-induced sweat [Na+] minus passive-induced sweat [Na+], significant differences were noted between the 50% (−12.4 ± 7.6mmol/L), 75% (1.3 ± 6.2mmol/L) and 100% FTP (7.5 ± 6.8 mmol/L) exercise intensity conditions ($P < 0.001$; $R^2 = 0.61$). Although sweat rate was different between the 50% (0.62 ± 0.21 L/h), 75% (1.26 ± 0.34 L/h), and 100% FTP (1.89 ± 0.50 L/h) conditions; $P < 0.001$; $R^2 = 0.68$, there were no significant associations between sweat rate versus sweat [Na+] change except for the 100% FTP condition ($R^2 = 0.29$; $P = 0.04$). Conclusions: Exercise-induced sweat approximates pharmacologically induced sweat at cycling intensities around 75% FTP, with lower sweat [Na+] readings at lower (50% FTP) intensities and higher sweat [Na+] readings at higher (100% FTP) cycling intensities.

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J03 - Comparing IMU outputs between 1st team and U18 female soccer players throughout preseason

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With growth in professionalism, popularity and revenue in women's soccer, greater investment is being made throughout academy environments to ensure young players can reach the physical, physiological, and technical demands of the sport. However, limited evidence exists to support the transition at club level between youth academy and senior players, and there is ambiguity in determining differences in physical loading. Thus, this study aimed to compare physical inertial measurement units (IMU) outputs between female U18 academy players and professional soccer players throughout pre-season. Participants were recruited from the same Scottish women's soccer team U18 squad (n = 19, mean ± SD age = 16.5 ± 0.6 years) and 1st Team (n= 23, mean ± SD age = 25.1 ± 5.6 years) during the 2023/24 season. Top speed (m/s), distance covered (m), sprint count (n), and count of acceleration and deceleration actions (n) from IMU output were analysed (Playermaker). Descriptive statistics summarised key findings, with inferential methods utilised to determine variances between squads. Multivariate tests reported statistical significance at $P < 0.05$ between squads for physical metrics measured from 66 training sessions and 10 games. Results found mean weekly distance was significantly higher for U18 players in comparison to 1st team (6,252 ± 1,480 vs. 5,076 ± 2,064 m, $P < 0.01$). Mean weekly top speed was significantly higher in 1st team in comparison to U18 squad (6.33 ± 0.34 vs. 6.03 ± 0.34 $m \cdot s^{-1}$, $P < 0.01$). Mean weekly sprint count was significantly higher in 1st team versus U18 (11 ± 10 vs. 5 ± 5, $P < 0.01$). No significant differences were highlighted for count of acceleration and deceleration actions between squads ($P > 0.05$). These findings show that although U18s are exposed to a greater volume, this is performed at lower intensities within the pre-season window, and therefore potentially not replicating the high intensity intermittent nature of the game. These findings suggest the introduction of individualised speed thresholds appropriate for developmental state. Furthermore, formatting future training to incorporate more anaerobic physiological adaptations to help prepare academy players for the physical demands of professional soccer.

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J04 - An exploration of the deceptive effects of caffeine on morning performance

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To compete in evening finals, athletes typically compete in competition heats or quarterfinals in the morning when their bodies are biologically weaker. Performance related qualities that are greater in the evening include force production, power output (~3-14% variation), time-trial performance, and repeated sprints which is ~3 and 5% greater (Drust et al., 2005, Acta Physiol Scand, 183, 181-190). The body clock, motivation and higher core and muscle temperatures in the evening are all related to this daily fluctuation in performance. The most effective nutritional ergogenic for performance is caffeine. The aim of this study was to investigate the effects of deception, a placebo pill vs. No Pill on repeated sprint performance (RSP) and grip strength (GP). The experimental protocol was approved by the institution ethics board. Nine participants ingested 1 pill (maltodextrin) at 06:30 h, entered the laboratory at 07:00 h and had their ear temperature recorded. They then completed a Perceived Onset of Mood questionnaire followed by measures of right- and left-hand grip strength followed by a repeated sprints protocol (10 × 20m, 30 s rest periods). Blood lactate, glucose levels and ear temperature were recorded three times during the protocol – with heart rate, rating of perceived exertion and finishing times (Witty GATE, Microgate Srl, Bolzano, Italy) measured at the end of each sprint. The data was analysed by General Linear modelling with repeated measures.

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J05 - The association of the ACE gene I/D polymorphism and in-game performance in elite Rugby Union players

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Genetic variation has been proposed as a factor in human athletic performance. The angiotensin converting enzyme (ACE) gene has been studied extensively albeit with heterogeneous results. The insertion (I) and deletion (D) alleles have been associated with altered serum and tissue ACE, as well as endurance- and power-based performance respectively. It is suggested the distinction in rugby union performance can be partly attributed to variations in the ACE gene. The aim of this study was to identify associations between the ACE I/D genetic polymorphism and in-game performance in elite (≥ 5 games at top-flight) rugby union athletes. The athlete cohort consisted of 347 Caucasian men, divided into positional groups (backs and forwards) and positional subgroups (front five, back row, halves, centres, and back three). Ethical approval was provided by Manchester Metropolitan University with written informed consent obtained from all participants. Genotyping and genotype analysis was performed using a combination of the X9 High-Throughput Genomics System (Standard BioTools) and the StepOnePlus™ Real-Time PCR System (Applied Biosystems) and their respective corresponding software. IBM SPSS Statistics 28 (SPSS, Chicago, IL) software was used to conduct Pearson's Chi-square ($\chi 2$) test of independence comparing genotype and allelic frequencies and the Kruskal-Wallis H and Mann-Whitney U tests to investigate differences between genotypes. Genotypic and allelic frequencies did not differ at the population level, nor at the positional group/subgroup levels. Performance did not differ between genotypes nor alleles at the population and positional group levels. Back row II genotypes beat more defenders than IDs (P = 0.008) but completed fewer tackles than both IDs (P = 0.05) and DDs (P = 0.013). Halfback DDs missed fewer tackles than both IDs (P = 0.003) and IIs (P = 0.01). Centre DD genotypes made more carries than IIs (P = 0.006). Back three IIs scored more tries than both IDs (P = 0.005) and DDs (P = 0.007) and made more clean breaks than IDs (P = 0.004). Most of the existing literature has been concerned with identifying the ACE gene as a marker of elite performance. To our knowledge, this is the first study to elucidate how the inter-personal differences in rugby union performance are influenced by the ACE I/D polymorphism. The findings from this study may provide novel insight into the specialisation of training and rehabilitation modalities for athletes, based on their genetic makeup.

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J06 - Can caffeine improve early morning physical performance in team athletes?

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Team-athletes often perform sub-optimally in early morning qualifiers and competitions (Drust et al., 2005, Chron Int, 22, 21-24). This study investigated whether caffeine could improve morning physical performance. Ten team-sport male athletes underwent four sessions [age (mean ± SD) 21 ± 1 years, stature 180 ± 5 cm, body mass 79 ± 9 kg]. These included two familiarisation sessions, one control (no pill) session and a caffeine pill (3 mg/kg body mass) session. Participants woke at 06:30h for all conditions (consuming the caffeine at 06:30 h) before arriving in the laboratory at 07:00 h. Temperature, lactate and glucose were recorded prior to mood states (POMS) and hand-grip strength. Thereafter, a warm -up (10 km/h for 5-mins on a treadmill), 10-mins of dynamic stretching and three build up 20m sprints of 50, 70, and 90% effort were undertaken. Temperature, lactate, and glucose were then measured. The repeated sprint performance (RSP) test was undertaken in 10 × 20 m RS on an indoor runway with 30 s recovery. Following each sprint; time was recorded via cameras and reflectors (Witty, UK); heart rate (HR) was recorded via a heart rate monitor on the upper arm connected to the POLAR app; thermal comfort and RPE were taken from participant verbal feedback. After the RSP, temperature, lactate and glucose were taken a final time. It was found that caffeine did not have an effect on sprint time ($F_{1, 9}$ = 1.33, P = 0.278, ES = 0.129). However, sprint time for caffeine (3.16 m/s, s = 0.2) was quicker than that of no pill (3.18 m/s, s = 0.2). There was no difference (95% CI of the mean difference= −1.527 to 0.267) between caffeine and no pill on RPE. Handgrip strength for caffeine (45.65 kg, s = 9) was higher than that of no pill (44.48 kg, s = 10) and glucose levels for caffeine were higher and lactate levels lower than that of no pill, although not significantly. There was an effect of caffeine on 'happy' POMS score (P = 0.006). These results showed that caffeine did improve early morning physical performance for team-athletes, although not significantly. The effectiveness of caffeine as an ergogenic aid to improve early morning physical performance was challenged but needs to be investigated further, with a larger sample, to establish levels of significance.

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J07 - Early morning bright light therapy: its next-day effects on early morning physical performance, temperature, and mood.

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Many different popular sports such as swimming, rowing or team-based sports involve having to perform whether in training or competition at a high level in the early morning (Olympics.com, 2023). Various research papers in the past have shown that there is a distinct diurnal variation in physical performance. Finding ways to improve early morning performance would greatly benefit many athletes and teams in multiple disciplines. 11 active males [mean ± SD: age, 21 ± 1 years, body mass, 78 ± 8 kg and stature, 180 ± 5 cm) volunteered, completed two familiarisations. Then two experimental sessions randomly allocated in a counterbalanced order 1) bright light therapy/ 2) no bright light therapy was administered at 07:00 h for 1 h the next morning (07:00 h) participants came into the laboratory where Intra-aural temperature, mood was assessed using the Perceived Onset Mood State questionnaire and right and left grip strength using a hand grip dynamometer were taken. Finally, participants undertook a warmup, the completed 10 × 20 m repeated sprints (RS) with 30 s recoveries on an indoor running track, with heart rate, finishing time and perceived exertion measured every sprint. Blood lactate was measured at rest, after the warm-up and post RS. Data were analysed using general-linear models.

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J08 - Effects of caffeine on early morning physical and cognitive performance

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Anaerobic and gross muscular performance is significantly greater in the evening that in the morning, due to the body clock and higher muscle and core temperatures in the evening compared to the morning (Ayala et al. 2021., Chron Int, 38, 1522-1536). However, little is known on the effect of caffeine supplementation on early morning gross muscular and cognitive performance, and whether this can mask the performance limitations imposed by the morning hours. Eight healthy, active male participants (mean ± SD: age, 21 ± 1 years; body mass, 78 ± 7 kg; stature, 178 ± 4 cm) volunteered and completed 2 familiarisation sessions and two experimental sessions. Experimental sessions 1) caffeine pill condition and 2) no pill condition was counterbalanced in order of administration (separated by >48h). The sessions began at 07:00h. During each session, intra-aural temperature was taken after participants had reclined for 30-min at the start of the protocol. Questionnaires were also provided to assess mood and sleep, then cognitive performance was assessed via the Stroop test. Agility was assessed using the Whitty SEM micrograte system, grip strength was measured using a hand grip dynamometer and finally 3x countermovement jumps and 3x squat jumps were recorded using a Jump mat. The aims of the study were to assess the effects of caffeine supplementation on 1) gross muscular and 2) cognitive assessments.

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J09 - Peak angular momentum of pirouettes by a university-level contemporary dance cohort

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Turning movements are an important movement to master in many dance styles. For advanced or professional dancers, the pirouette (completing one or more turns with a specific stylistic form) is difficult to master and increasing the revolutions heightens difficulty further. The purpose of this study was to investigate peak angular momentum generation (PAM) of completing single- and attempting triple-revolution pirouettes for contemporary dance students. Adaptations made by dancers whilst rotating and imbalances within the centre of mass over the base of support were identified. Ethical approval was received. Seven female university-level contemporary dance students completed five successful single-revolution pirouettes en dehors (PeDh) and attempting to complete five successful triple-revolution PeDh whilst being recorded using a three-dimensional VICON motion capture system. PAM and torso lean (TL) and a two-dimensional foot vector (FV) were then calculated using a six degree of freedom model (Visual3D). A one-way ANOVA ($P < 0.05$) compared mean variance between single-, double-, and triple-revolution pirouettes. Significant effects were determined for all variables in each pirouette condition. A Tukey post-hoc test ($P < 0.05$) determined overall significant differences between PAM ($F_{2, 37} = 15.8$, $\omega^2 = 0.426$), TL ($F_{2, 37} = 3.4$, $\omega^2 = 0.108$), and FV ($F_{2, 30} = 4.9$, $\omega^2 = 0.192$) for the midpoint turn of each pirouette condition. Independent samples T-Tests ($\alpha < 0.05$) were conducted to compare PAM ($t_{11} = 1.8$, $d = 1.026$), TL ($t_{11} = 0.1$, $d = 0.030$), and FV ($t_6 = 0.6$, $d = 0.433$) between successful and unsuccessful double pirouettes, with no differences reported. This test was repeated for successful and unsuccessful triple pirouettes. Again, no differences were observed for PAM ($t_{15} = -2.2$, $d = -1.093$), TL ($t_{15} = -1.6$, $d = -0.802$), and FV ($t_{15} = -1.3$, $d = -0.648$). This study concluded that PAM increased as the number of pirouette revolutions increased. Furthermore, a minimum threshold for PAM was calculated to produce successful double (0.597 $kg \cdot ms^{2-1}$) and triple (0.637 $kg \cdot ms^{2-1}$) pirouettes. Observations from the pirouette trials and FV data illustrated that dancers 'hop' when an imbalance is sensed, in an attempt to regain balance and continue pirouette revolutions. However, this method predominately produced unsuccessful pirouettes as the initial PAM was not achieved. This research can be applied to dance coaching as it provides an initial insight into mechanisms to support successful pirouette technique.

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J10 - Changes over a decade of fitness within a Scottish soccer academy and the impact of first team relegation on academy physical profiles

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Introduction: academy soccer practitioners have a responsibility to prepare youth players for the demands of first team. The development of physical capabilities to sustain the high intensity locomotor activities that have been reported in elite soccer is essential. Challenges exist monitoring locomotor targets as resource limitations mean that often academies will not have locomotor data, instead relying on physiological testing to assess whether a player is ready for first team transition. Physiological testing results have a direct relationship with locomotor activity. Physical development has been shown over various longitudinal periods with established progression in speed, change of direction, lower body power and endurance in elite Austrian youths, increases in VO_{2max} in an elite regional French academy and in the interval shuttle run test of over 50% in elite Dutch academy. The success of a club's academy can lead to increased resource allocation however some organisational challenges such as relegation can have a severe financial impact. The initial aim of the present study was to establish whether previously observed changes in physical capacity were observed in a professional Scottish soccer academy over a ten-year period. A further aim was to assess the impact of first team relegation on academy physical profiles considering the resource implications of relegation. Methodology: a retrospective analysis was completed where Linear Mixed Effect (LME) Models were fitted to explain variation across each measure of physical capacity. Model selection was undertaken with Likelihood Ratio Tests where initial complex models were compared to simpler nested models to arrive at the final model by maximum likelihood. The impact of relegation was assessed by LME models to assess whether physical capacity measures changed post relegation. Ethical approval was granted. Results: 5 m best time reduced by 0.0055 s per year (t = −11.8, p < 0.001), 10 m best time reduced by 0.008 s per year (t = −9.2, p < 0.001), 20 m best time reduced by 0.011 s per year (t = −7.8, p < 0.001). CMJ increased each year depended on age group with the older cohorts showing greater improvement and the YYIR1 distance increased each year varying across age group. Performance of aforementioned physical capacity measures significantly reduced with relegation, except 20 m best time (t = −1.4, p = 0.16). Application: reference values within clubs that establish first team requirements will contribute to appropriate transition strategies. By conducting analyses related to uncontrollable challenges, practitioners can use these results to protect against criticism and withdrawal of resource when physical progression is negatively impacted.

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J11 - The pre-season variation in physical performance of an elite level female cricket squad

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Cricket is as an endurance sport comprising intermittent bursts of speed and power. The introduction of new formats of varying duration and intensity means the physical demands of cricket can vary. Regardless of format, it is agreed that the high-intensity efforts involved in elite level cricket require high levels of lower-body strength and power, and upper-body strength and rotational power (Herridge et al., 2020, J Strength Cond Res, 34, 2285-2293). Previous research has demonstrated that physical qualities can vary throughout seasonal periods (Herridge et al., 2020; Carr et al., 2017, Int J Sports Phys Perf, 12, 50-55) due to training effects. Based on this small body of research, physical performance in common performance tests seem to plateau or decrease across a season, whereas performance tends to increase in the off- and pre-season. This suggests that the off- and pre-season are key phases whereby practitioners can positively influence physical qualities of cricketers. However, despite the growth of the female format, the only studies to have explored the variations in physical qualities have been focused on male cricket. Therefore, the aim of this study was to assess the pre-seasonal variation in the physical performance of female cricket players. 10 elite level female cricketers (age = 23 ± 4 years, stature = 166 ± 7 cm, mass = 71 ± 7 kg) performed a testing battery at 3 points during the pre-season (October – Time point (TP) 1, December – TP 2, February – TP 3). Three trials of bilateral countermovement jumps (CMJ), unilateral CMJ (UCMJ), squat jump (SJ), 10/5 repeated jump test (RJT), Nordic hamstring test (NHT), and isometric mid-thigh pull (IMTP). Data were analysed via a repeated measure ANOVA with post-hoc analysis where appropriate. Improvements ($P < 0.005$) were evident in peak CMJ and mean jump height, right UCMJ peak jump height, and peak and mean force in the left and right leg in the NHT. Non-significant improvements were seen in several other metrics across time points. The ES for differences in physical tests between T1 and T2 ranged from ES = −0.09 to 0.61, T1 and T3 ranged from ES = −0.05 to 1.04, and T2 and T3 ranged from ES = −0.03 to 0.83. The results of this study showed select strength-power metrics in elite female cricketers significantly changed across time points during the pre-season, suggesting desirable adaptations to strength-based training phases.

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J12 - The validation of inertial measurement units in upper limb movement during wheelchair activity

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Introduction: 3D motion capture is accepted to be the gold standard approach to all data collection for the production of accurate data, however, in recent literature the ecological validity of 3D systems has come into question. This has brought about the use of Inertial measurement units (IMU's) and the investigation into their accuracy in enabling accurate real life scenario data collection. The depth of research on IMU's in wheelchair data collection is limited, and at current there is limited attempts at a validation in comparison to an established data collection software. This research aims to validate basic upper body motions seen within wheelchair propulsion in an attempt to identify the current limitations of IMU's. Methods: numerous IMU placements and calibration stances were investigated for the collection of elbow flexion and shoulder flexion. IMU's for elbow flexion were placed at the wrist and central on the forearm. For shoulder flexion the IMU was placed 1 cm above the elbow joint. During the calibration phase, standing anatomical position with thumbs forwards, palms outwards, bent elbow and straight arms outwards at 90° for elbow and shoulder flexion, respectively. For both shoulder and elbow flexion, the participant started at a neutral position and moved through to 90° of flexion and returned to starting position. Quintic was used as the validated software. Results: the wrist placed IMU determined elbow flexion more accurately than the forearm placed IMU. Range of motion for both shoulder and elbow flexion were well calculated within several degrees when using the anatomical thumbs forwards calibration pose; with 99.97 and 89.69°, respectively compared to 88.48 and 97.32°. However, the degree of elbow flexion was overestimated with a difference of 27.78°, with the IMU being 91.11° and quintic being 63.33°. Similar results were also seen for the prediction of elbow flexion during the starting phase with a difference of 26.58°. Discussion: with range of motion accurately calculated in comparison to quintic, and shoulder flexion maximum and minimum values also being similar when segment angle was calculated. Then the differences are likely due to error in the calculation of joint angle using a calculation of global coordinate system from the IMU coordinate system during data processing. Therefore, future research should target alternate approaches to data processing in order to reduce the errors seen.

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J13 - Does caffeine improve team-based morning performances more than habituation?

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Repeated sprint performance (≤6 s) has a 3-10% diurnal variation of an evening compared to a morning (17:00-19:00 vs. 06:00-10:00 h; Pullinger et al., 2019). Research distinguishing the effect of habit in comparison to other stimuli on morning performance is unestablished. Therefore, the present study investigates whether caffeine can improve team-based morning performance of 20 m repeated sprints, more than habituation. Eight team-based participants (age: 21 ± 1 years, body mass: 83 ± 9 kg, stature: 181 ± 5 cm) participated in this study. The participants retired at 22:30 h and raised at 06:30 h to be in the laboratory for 07:00 h throughout the study period. The participants completed with two familiarisations and were randomly allocated to two experimental conditions either 1) having taken caffeine on waking (300 mg at 06:30 h), then enter the laboratory at 07:00 h or, 2) The participant rose and retire as above but enter the laboratory at 07:00 h to sit on a cycle ergometer (60 mins) prior to the day of testing. They return the following day at 07:00 h. On entering the laboratory participants were seated, completed sleep questionnaires and mood was assessed using Perceived Onset Mood State (POMS) questionnaire. After 30-min Intra-aural temperature and fingertip blood glucose and lactate measured (as well as post warm-up and immediately after the RSP test). Thereafter, right- and left-hand grip strength (the best of 3 were recorded) and maximal repeated sprint performance measures were taken (RSP, 10 x 20m, 30s recovery period). Heart rate (HR), thermal comfort (TC), and rating of perceived exertion (RPE) were all recorded after each sprint. Data were analysed using a general-linear model.

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J14 - The physical capabilities of national league female American Flag Football players

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Flag Football is the fastest growing format of American Football and is a recent addition to the 2028 Olympics. The Flag format is a non-contact version of American Football, where tackles are made by removing flags from players hips. Activity profiles in the NFL (Sanchez et al., 2013, App Sci, 13:9278; Wellman et al., 2016, J Strength Cond Res, 30, 11–19) have highlighted the need for high levels of strength, power, and speed. Given the similarities within Flag, these physical capabilities may be equally applicable to Flag players. However, a lack of literature on the Flag format, and the paucity of research in female football, irrespective of format, exists. Therefore, the aim of this study was to explore the physical fitness capabilities of a national league Women's Flag Football team. Fourteen participants (age 28 ± 5 years; stature 166 ± 8 cm; mass 79 ± 29 kg) from a national league Women's Flag team took part in a physical fitness testing battery comprising; countermovement jump (CMJ), squat jump (SJ), broad jump (BJ), 20-yard sprint and shuttle, and the Isometric mid-thigh pull (IMTP). Participants were familiarised with testing procedures and initially completed a standardised warm-up. Mean and SD results from the jump assessments were as follows; CMJ jump height 25.1 ± 5.9 cm, peak power 39.1 ± 7.1 w/kg; SJ jump height 24.6 ± 6.3 cm, peak power 39.3 ± 6.6 w/kg; broad jump 1.89 ± 0.28 m. Absolute and relative peak force in the IMTP was 2201 ± 422 N and 30.1 ± 4.1 N/kg respectively. The Dynamic Strength Index (DSI) calculated from CMJ and IMTP peak force was 0.76 ± 0.12. Lastly, 20-yard sprint and shuttle times were 3.43 ± 0.28 and 5.36 ± 0.38 s respectively. Significant correlations were found between mean CMJ jump height and mean sprint time (p 0.001; r = −0.780), between mean CMJ jump height and mean shuttle time (p <.001; r −0.857), between mean BJ distance and mean shuttle time (p <0.01; r = 0.870) and between mean BJ distance and CMJ jump height (p <.001; r = −0.911). This study is the first of its kind to report the physical capabilities of female flag football players. The findings of this study may help develop the understanding of a growing and soon to be Olympic sport.

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J15 - Exploring the use of music during ultramarathons using a think-aloud procedure

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Introduction: ultrarunning is a rapidly growing sport and is receiving increased attention in scientific literature. Ultrarunning is the act of running ultramarathons, defined as any distance over a marathon (42.2 km). Some ultramarathons are run over a set time e.g., 12 hours. Ultrarunners face many different challenges throughout their races, including injuries and pain, thoughts of quitting, and boredom (Holt et al., 2014, Sport Psych, 28, 22-35). The application of music during sports and exercise has been shown to be a powerful psychological and ergogenic aid, however, there is a dearth of studies exploring how music is applied in ultrarunning. Previous research around ultramarathons has typically used interviews or a range of scales to collect data (Watkins et al., 2022, Psych Sport Ex, 63, 102271). Think-Aloud (TA) procedures have been used in studies involving shorter distance running (Johnson et al., 2023, Int J Sport Ex Psych) but have not yet been applied to ultrarunning. Accordingly, the present study uses a TA approach to capture ultramarathoners' thoughts and feelings during an event where they listen to music. Method: ten participants completed a two-stage training procedure of TA to conform with established procedures (McGreary et al., 2024, Sport Ex Perf Psych). The TA procedure permits recording of real-time thoughts. The first stage consists of two problems: a multiplication problem, and an anagram-based problem. The second stage involves thinking aloud for a short period while on a training run. Following the training, participants recorded their thoughts at six time points around their event: before the race, after 1 mile, at 30, 60, and 90% into the race, and within five minutes of race completion. Data Analysis: thematic analysis will be undertaken on the transcribed data and will follow standard procedures. Applications: TA has not been applied in ultrarunning previously and its use in the present study can offer evidence to its future feasibility for similar research. Findings of this study will inform the practical application of music around ultramarathon events, with insights offered for athletes and coaches. Moreover, recommendations will be made as to when music could be applied during an event to maximise its effects. These findings will be couched within contemporary conceptual frameworks for applying music in sport and exercise contexts and offer fresh insight into how these models could be expanded to consider ultra-endurance events more fully.

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J16 - High vs. low glycaemic index pre-exercise feeding

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Carbohydrates are proven to be the most important energy source to skeletal muscle during endurance exercise. However, the glucose that carbohydrates provide the muscle with can differ in how quickly they are digested and released into the bloodstream. High glycaemic index (GI) carbohydrates are released into the bloodstream in a rapid burst following digestion whereas low GI carbohydrates are released into the bloodstream at a constant rate after consumption. The effects of low and high GI carbohydrate consumption pre-exercise on endurance exercise performance are not comprehensively understood. Therefore, the aim of this study is to identify the impact of low vs high GI pre-exercise feeding on maximal effort endurance exercise performance. With institutional ethics approval, twelve physically active, healthy males aged 18-40 years attended the laboratory on four separate occasions. On the first occasion, participants underwent a $\dot{V}O_{2max}$ test to identify their maximal aerobic capacity. The final three lab visits consisted of the participants undergoing trials under three differing conditions upon arrival in the fasted state (participants were instructed to not consume food or drink other than water 6 h before arrival). The trial entailed of 20 km cycling followed by 5 km running with 2 min rest in between. Upon arrival, the participants received a carbohydrate beverage, either 40 g high GI, 40 g low GI, or a placebo, 15 min before exercising. Before consumption of the beverage, before the onset of exercise, after each 5 km during the cycle and following the run, heart rate and RPE were recorded, and a finger prick blood sample was taken to analyse for blood glucose and blood lactate concentrations throughout the exercise bout. However, the primary performance indicator was the overall time to complete the trial (bike and run minus 2 min rest). The final order of mean completion time across conditions from fastest to slowest went low GI, high GI, placebo. There was no significant difference between the mean time to completion in the low GI and high GI conditions. However, the low GI condition resulted in a faster time to completion than the placebo condition (P = 0.02) as well as the high GI condition resulting in a faster time to completion than the placebo condition (P = 0.043). Therefore, this could demonstrate that the presence of any carbohydrate type is more influential on endurance exercise performance rather than the glycaemic index of such carbohydrates.

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J17 - Influence of head-mounted virtual reality (VR) on psychological and physiological responses in the heat

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Evidence suggests that vision may play a role in the perception of temperature in humans (Mayes et al., 2023, J Therm Bio, 112, 103488). Virtual reality (VR) has garnered attention for its potential applications in various domains, including sports training and rehabilitation. However, the psychophysiological effects of using VR in hot environments remain relatively unexplored. The present study tested the hypothesis that a 'cold' visual environment would decrease thermal perception when compared to a 'hot' visual environment during passive heat exposure. Twelve healthy participants (2 females) [mean ± SD, age: 24 ± 5 years; stature: 174 ± 9 cm; mass: 72 ± 8 kg] provided their written informed consent to participate in this study. Ethical approval was obtained from the Faculty of Science and Health's Ethics Committee at The University of Portsmouth. In a within-participant, randomised, controlled crossover design participants completed a familiarisation visit followed by three experimental sessions in 40°C (50% r.h.). The three conditions were: no virtual reality (NoVR), virtual reality displaying an arid landscape (HotVR), and virtual reality displaying a snow-covered landscape (ColdVR). Thermal sensation, thermal comfort, skin wetness, heart rate, rectal temperature, and four-site skin temperature were recorded. Mean skin temperature and mean body temperature were subsequently calculated. Data were analysed using a 3 (Condition [NoVR, VRHot, VRCold]) × 7 (Time [Pre, 5-, 10-, 15-, 20-, 25-, 30-min post-VR exposure]) repeated measures ANOVA. The main effects of condition, time, and their interaction were explored, with statistical significance accepted at $P < 0.05$. The use of VR in the heat resulted in increased thermal sensation, skin wetness, mean skin temperature, mean body temperature, and heart rate over time (all $P < 0.05$). However, the manipulation of the visual environment did not alter perceptual or physiological variables (all $P > 0.05$). Significant interaction effects were observed for mean skin temperature and mean body temperature; however, these minimal differences were considered not meaningful. In conclusion, these novel data indicate that using VR to manipulate the virtual environment in the heat does not meaningfully alter perceptual or physiological responses. These findings also suggest that VR may be used within settings such as the military and elite-sport without any deleterious effects. Future work should look to examine the effects of using VR whilst exercising on perceptual and physiological measures.

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J18 - Team trust as a predictor of collective efficacy in female rugby players

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According to Bandura's (1997) social cognitive theory, "the higher the sense of collective efficacy, the better the team performance". Bandura also states that collective efficacy is greater than the sum of its individual self-efficacies due to it being influenced by other cognitive factors, including trust (1986, 1997, J Cog Psychother, 13, 158-166). Therefore, the purpose of this study was to investigate the influence of team trust on the construct of collective efficacy within a sport context. It is proposed that team trust is an important cognitive factor that may precede the relationship between collective efficacy and group performance. With institute ethical approval (BREO:33249-A-Nov/2023-47988-1), 21 female college rugby players voluntarily completed the four factor Team Trust Scale (Costa & Anderson, 2011. Eur J Work Org Psych, 20, 119-154) and the five factor Collective Efficacy Questionnaire for Sport (Short, Sullivan. & Feltz, 2005, Meas Phys Ed Ex Sci, 9, 181-202) to measure the correlation between levels of team trust and collective efficacy and determine if team trust is indeed a valid predictor of collective efficacy. Linear regression analyses were conducted and correlation coefficients calculated using Pearson's correlation. It was predicted that a positive correlation would be shown between the two constructs and that team trust is a significant predictor of collective efficacy. Assuming a positive hypothesis, the study recommends that rugby teams and interdependent sport teams, generally, should develop a high-quality environment of trust both on and off the pitch, given its relationship with collective efficacy and subsequent impact on performance. Relatively little research has been carried out into the effect of intrateam trust within sport and, therefore, this study serves to widen the exploration of this construct and its impact on other social constructs such as collective efficacy and their impact on team performance.

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J19 - Does electronic cigarette use adversely affect cardiac autonomic function?

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Introduction: tobacco cigarette (TC) smoking is a predominant risk factor for cardiovascular disease and a leading preventable cause of death (Kondo et al., 2019, Circ J, 83, 1980-1985). Electronic Cigarette (EC) use has increased significantly in recent years (King et al., 2015, Nic Tob Res, 17, 219-227), mainly as it is considered a safer alternative to TC. A low heartrate variability (HRV) is an independent marker of adverse cardiovascular morbidity and all-cause mortality (Fang et al., 2020, Bio Res Nur, 22, 45-56). TC smokers have a lower HRV, and similar responses have now also been observed in EC smokers (Arastoo et al., 2020, Am J Physiol Heart Circ Physiol, 319, 262-270). However, the influence of cognitive / psychological stress on HRV in TC and EC users remains unexplored. As such, this study aims to assess the impact of cognitive stress on Time and Frequency domain measures of HRV. Methods: upon receiving ethical approval, HRV data was collected through electrocardiogram (ECG) recordings of healthy controls (HC), TC and EC smokers which were recorded using lead II ECG at 1000 Hz on LabChart during periods of rest (5 min) and cognitive stress (serial subtraction; 5 min). Time and frequency domain measures of HRV were assessed with LabChart. Data will be compared between groups using one-way analysis of variance (ANOVA) and two-way mixed methods ANOVA as appropriate. Conclusions: we hypothesise that EC smokers will present similar impaired autonomic function and reduced HRV as TC smokers during rest and cognitive stress in comparison to HC.

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J20 - Lattice use in rugby headguards

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This project is related to the design of rugby headguards. The World Rugby regulations limit the ability of headguards to reduce impact force. As such, World Rugby approved headguards are not intended to reduce the risk of serious injuries, like concussion or skull fracture. Rather, current headguards only limit the risk of superficial injuries to the soft tissue, like lacerations and contusions. With concussions linked to CTE (Chronic traumatic encephalopathy), an improvement in headguards could lead to an increased quality of life for all rugby players. With about a quarter of all rugby union injuries being concussion in the 2021/2022 season, there is justification to explore new headguard designs with potential to reduce the risk of such injuries. With World Rugby and the RFL recently introducing new rules for tackle height to try to reduce concussion rates, headguards that offer more protection could also help to reduce concussion rates. A lattice is a structure made from connected cells. When used within protective devices, lattices have potential advantages over the materials traditionally used, such as foams, from reducing the overall mass to allowing forces to be spread more evenly throughout the structure. The aim of this study was to design and comparatively impact test a lattice against foam in relation to rugby headguards. Prior data was limited as most studies on lattices focused on combining materials to have either a hollow lattice or a filled lattice which is not applicable to this study due to World Rugby regulations on protective equipment which states no sandwich material. The FEA results show that the force is more equally distributed through the lattice then it is foam allowing a lower force to hit the base.

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J21 - Using inertial measurement units to estimate ground reaction force and knee angular velocity during decelerations

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Despite undergoing anterior cruciate ligament (ACL) reconstruction, athletes continue to present altered ground reaction force (GRF) and knee angular velocities (AV) for 6-24 months as they return to highly demanding tasks such as rapid decelerations (Schmitt et al., 2015, Med Sci Sports Ex, 47, 1426). In-field identification of GRF and knee AV during such deceleration tasks is challenging due to the laboratory restrictions of force platforms and 3D motion capture. Therefore, the use of inertial measurement units (IMU) has been suggested as an appropriate alternative to estimate such variables in the field (Pratt & Sigward, 2018. Sensors, 3460). The study aimed to establish whether IMU-derived measures can be used to estimate GRF and knee AV that are indicative of ACL injury risk during decelerations. Following ethical approval from the Cardiff Metropolitan Ethics Committee, ten male team-sport athletes performed five maximal decelerations at three approach speeds (100, 85, and 70% relative to maximal attainable speed), for a total of fifteen trials per athlete. GRF and kinematics were measured using four Kistler force platforms and Theia3D markerless motion capture. Pearson's correlation coefficient was used to determine the relationship between IMeasureU Blue Trident IMUs mounted at the thigh or shank and vertical GRF, horizontal GRF, and knee AV during the first step of deceleration. A measure was considered field-viable if a very large significant correlation ($r \geq 0.7$; $P \leq 0.05$) was observed. At approach speeds of 85 and 70%, shank AV had a very large significant correlation ($r = 0.79, 0.76$; $P = 0.001, 0.01$, respectively) to vertical GRF, a moderate to large significant correlation to horizontal GRF ($r = 0.46, 0.51$; $P = 0.04, 0.02$, respectively), and a moderate significant correlation to knee AV ($r = 0.46, 0.40$; $P = 0.004, 0.02$, respectively). At 100% approach speeds, shank AV had no significant correlation to GRF ($r < 0.3$; $P > 0.05$) and a moderate correlation to knee AV ($r = 0.40$; $P = 0.02$). This study was the first to find a strong association between shank AV and vertical GRF for whole-body decelerations at 85 and 70% approach speeds. This supports the use of IMUs in sport-specific settings (e.g., football pitches) to better quantify vertical GRF deficits during decelerations. This can further enhance in-field monitoring of GRF deficits and better assess athletes' readiness to return to sport following ACL reconstruction. However, alternative methods are required to accurately estimate horizontal GRFs and knee AV in the field.

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J22 - Chronobiological approaches and habitual routine: effect on morning physical performance in male team sport players

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Achieving peak morning physical performance for team sport players is vital due to the vast degree of performances tend to take place in the morning. It has been well-documented that undertaking chronobiological approaches and having a habitual routine can have an impact on performance, however the combination of the two have not been clearly interpreted. Therefore, the aim of the present study was to examine how combined chronobiological approaches and habitual routine had an influence on morning physical performance. Using a double-blinded, randomized counterbalanced design, team sport male participants (n = 12) were recruited, with institutional ethics approval, and completed five sessions: (i) two familiarization sessions; (ii) one bright light (BL) morning exercise condition; (iii) two testing conditions either: habitual (the morning after BL), or No pill. The morning physical performance tests carried out were as followed: Intra-aural temperature and fingertip blood glucose and lactate, taken throughout: at rest, post warm-up and immediately after the RSP test, mood assessed using Perceived Onset Mood State (POMS) questionnaire, 3 right and 3 left hand grip strength measures, and a maximal repeated sprint performance (RSP) protocol (10 × 20 m, 30 s recovery period). Heart rate (HR), thermal comfort (TC), and rating of perceived exertion (RPE) were all recorded after each sprint. Data were analysed using a general-linear model.

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J23 - Coach–athlete relationship as a predictor of contextual motivation in weightlifters

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Coach behaviour is an important predictor of athlete motivation (Jowett, 2017). The coach–athlete relationship can be defined as a dynamic interaction wherein the feelings, thoughts and behaviours of both athlete and coaches are mutually and causally interconnected (Jowett and Shanmugam, 2016, In Schinke, McGannon & Smith (Eds.), Routledge International Handbook of Sport Psychology, Relational Coaching in Sport: Its psychological underpinnings and practical effectiveness (pp. 471–484). Routledge). This present study explored the coach–athlete relationship through the lens of Self-Determination Theory. This multidimensional theory underscores various facets of motivation suggesting that coaches' behaviours influence athletes' motivation by directly influencing their three basic psychological needs (Deci & Ryan, 2008, Can Psych, 49, 182–185). The study builds on previous research highlighting the pivotal role of coaches in shaping positive sporting environments and the significance of closeness, commitment and compatibility in the coach–athlete relationship (Jowett & Nezlek, 2012, J Soc Pers Rel, 29, 287–301). The purpose of the present study was to further understanding of the association between the coach–athlete relationship and contextual motivation among weightlifters. Previous studies have expounded a motivational model of the coach–athlete relationship that outlined a sequence wherein coaches' actions bear influence on athletes' intrinsic and self-determined extrinsic motivation by shaping their perceptions of autonomy, competence, and relatedness (Mageau & Vallerand, 2003, J Sports Sci, 21, 883–904). It was hypothesised that a coach–athlete relationship scores would be a negative predictor of amotivation and external regulation (H1). It would, however, be a positive predictor of more intrinsic forms of motivation (H2). Specifically, those who perceive their coaches as supportive, understanding and competent will report higher levels of intrinsic motivation within the training environment. Following institutional ethical clearance (33249-A-Nov/2023-47988-1), a sample of male and female weightlifters (N = 20; females = 11) were asked to complete an 11-item version of Coach–Athlete Relationship Questionnaire (CART-Q; Jowett & Ntoumanis, 2003) and the 18-item Sports Motivation Scale (SMS-2; Pelletier et al., 2013). There was no time gap in the administration of the two questionnaires. A series of standard linear regression analyses was computed using CART-Q subscales as predictor variables and each SMS-2 subscale as the dependent variable. H1 was not supported, as the CART-Q subscales were not a significant negative predictor of amotivation and external forms of motivation. H2 was supported given that the CART-Q subscales were positive predictors of intrinsic motivation subscales.

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J24 - The integration of first-year women XV rugby scholars and the socialisation tactics used

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Cohesion is an important element of team environments, as it provides the bedrock for trust and communication among team members to be established. This allows for a platform to be created where conflicts can be addressed, strategies are shared and collaboration is enhanced, ultimately leading to improved team performance. Research indicates that when a team allows time for the socialisation of newcomers, performance is directly facilitated (Schuth et al, 2023, J App Psych, 108, 1046–1059). Furthermore, transitioning into a university environment is a crucial phase in an individual's life, which poses many challenges. Therefore, having support from teammates and a sense of community may ease this period of adjustment. There is a dearth of research that investigates the integration of new teams and the consequences or enhancements of the different tactics. The main purpose of this study was to assess the integration of first-year university rugby scholars into an existing team environment using the Sports Team Socialization Tactics Questionnaire (STSTQ; Benson & Eys, 2017, J Sport Ex Psych, 39, 13–28.) It was hypothesised that there would not be a significant difference ($P < 0.05$) in the perceived level of socialisation between the first-year rugby scholars and the other rugby scholars. Twenty female participants were recruited from the Brunel University London women's rugby union 1XV team, using a convenience sampling method. With institutional ethics approval, the participants completed the STSTQ and demographics form. They were split into two groups; first-year rugby scholars and other rugby scholars. The participants completed the STSTQ. This measure evaluates three dimensions on a 9-point Likert scale: the serial tactics subscale ($\alpha = .85$), the social inclusionary tactics subscale ($\alpha = .74$), the coach-initiated role communication tactics subscale ($\alpha = .87$). The multivariate tests revealed no effect of scholar status on the combined socialization tactics ($F = 0.75$, $P = 0.539$). The Univariate tests showed no differences for coach tactics ($F = 1.67$, $p = 0.212$, serial tactics ($F = 0.03$, $P = 0.873$), or social inclusionary tactics ($F = 0.25$, $P = 0.625$). In conclusion, there were no differences between the new and existing players' ratings of the effectiveness of the socialization tactics used. For practitioners and coaches, the results provide insights into players' perceptions of integration tactics that could inform adjustments for future seasons, especially as this top team aims for promotion where cohesion is critical. A limitation was collecting data mid-season after a break from games, rather than across multiple time points. Furthermore, additional testing is still needed to understand the specific processes that enabled this cohesive team environment despite integrating many new players.

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J25 - Comparing group cohesion in interactive and coactive exercise classes

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Exercise classes are provided in the majority of gym memberships and provide both physical activity and social interactions. By exploring group cohesion, whether members feel part of a group when exercising. This study aims to add to current research by investigating the extent in which group cohesion differs in those who attend, an interactive group exercise class compared to those who attend a coactive group exercise class. 10 members from a pump class and 10 members from a circuit class were asked about their levels of group cohesion using the Physical Activity Group Environment Questionnaire. Results revealed that there was a higher group cohesion level in the circuits class compared to the pump class. However, there was no significant differences between classes when investigating individual attraction to group-task. The results provide implications on which exercise classes a gym should run to encourage exercise and social behaviours.

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J26 - Perception of coach leadership style as a predictor of team cohesion in elite women's touch rugby

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Coach leadership style can hold a bearing on the development of a cohesive and integrated team, which can influence performance goals. Cohesion, as explored in Chelladurai's Multidimensional Model of Leadership (MML), is defined as the ability for a team to remain united in the pursuit of shared goals (Burke et al., 2014, In Beauchamp & Eyes (Eds.) Group Dynamics in Exercise and Sport Psychology (pp. 213). Taylor & Francis). To date, numerous studies have explored the impact of coach leadership styles on team cohesion, typically inferring detrimental effects of autocratic leadership styles. However, there is limited research conducted with an elite female sample, particularly in amateur international competition settings. Therefore, the purpose of the study was to assess the relationship between perceived leadership behaviour and team cohesion within the Scotland women's team at the European Touch Rugby Championships in 2022. Accordingly, it was hypothesised that: H1 Leadership behaviours of training and instruction, social support, positive feedback and democratic leadership would be positive predictors of task cohesion, and H2 Autocratic leadership behaviour would be negative predictors of both social and task cohesion. After securing institutional ethical approval (Ref: 33249-A-Nov/2023-47988-1) and permission from the board of Scottish Touch Association, members of the Scotland Women's team competing at the European Championships in 2022 were contacted to take part in the study (N= 15). Participants completed the Leadership Scale for Sports (LSS) that assessed coach leadership behaviours and the Group Environment Questionnaire (GEQ) that assessed cohesion. Data were checked for univariate outliers and the Mahalanobis test revealed no multivariate outliers. Skewness and kurtosis established normality and multiple regression analyses was used to predict cohesion from the five LSS subscales. Overall, no significant results were found for ATGT ($F_{5, 9} = 0.56$, $P > 0.05$), ATGS ($F_{5, 9} = 1.27$, $P > 0.05$), GIT ($F_{5, 9} = 0.66$, $P > 0.05$), and GIS ($F_{5, 9} = 0.70$, $P > 0.05$). In conclusion, athlete perceived leadership did not predict team cohesion, but the direction of relationships between factors partially aligns with previous research and indicates that research with a larger sample of female elite athletes is warranted under non-retrospective conditions. Further research with female samples has the potential to provide insights into the intricate relationship between leadership and cohesion, which could improve performance for elite female teams.

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J27 - The effects of music on group motivation and team cohesion among novice to intermediate collegiate rowers

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Within university level sport, the opportunity to form friendships, connect and create a sense of enjoyment is fundamental to the student experience. The use of music has been shown to have a positive motivational influence within individual and group physical activity settings when engaging in anaerobic activities. Furthermore, team cohesion can be positively influenced by group music self-selection. Within rowing, music with a high number of beats per minute (bpm) has shown to positively affect performance on an indoor rowing machine. Research within this area has primarily provided its focus towards exercisers or teams within an elite performance setting. Therefore, the aims of this study were to explore whether the introduction of music, through group self-selection and playback can have a positive effect upon the group motivation and team cohesion on novice to intermediate level university rowers when encountering a team anaerobic activity. Twenty novice and intermediate university-level rowers from the same participating university rowing club completed the Group Environment Questionnaire (GEQ) and subsequently a team relay of 2000 m, rowing 500 m each in groups of four, with no music stimulus. Eleven music tracks were selected based upon favoured bands or genres of those rowers, and that they contained at least 152 bpm. Tracks were subsequently presented to the participants who were asked to rate the effectiveness of the audio in terms of motivation and cohesion using the Brunel Group Music Rating Inventory (BGMRI). These scores determined the order of the tracks played for the repeat of the team relay. Once completed, the GEQ was readministered. All measures were used in conjunction with institutional ethics approval (33249-A-Feb/2024- 50074-1). A repeated measures MANOVA analysis found a positive difference in one of the four subscales of the GEQ, Group Integration – Social (GI-S; P = 0.03) $F_{1,19}$ = 5.54, P < 0.05, H_p^2 = 0.27). Surprisingly, a supplementary t-test demonstrated a negative difference in the average number of strokes per minute (spm) during the relay t_{19} = 2.85, P = 0.01. Whilst the data does not replicate previously reported findings when introducing music to anaerobic indoor rowing training, the significant improvement in GI-S scores highlight some real-world implications. With an understanding of the importance of social cohesion in a university environment and the crucial impact sport can create, there is potential to develop a more robust intervention as a social tool first, before becoming a performance enhancement mechanism.

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J28 - Effects of caffeine and chronobiotics on morning repeated sprint performance

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Gross muscular performance (lasting <6 s) is 3.4-10.2% higher in the evening when compared with early morning (17:00-19:00 vs. 06:00-10:00 h; Pullinger et al., 2019). However, there is limited research on the effect of caffeine and chronobioltics (bright light) on gross muscular performance, in the early hours of the morning. Twelve healthy, active male participants (mean±SD; age, 21 ± 2 years, body mass, 79 ± 6 kg; stature, 180 ± 5 cm) volunteered and completed 2 familiarisation sessions and 2 experimental sessions. Experimental condition 1: caffeine pill condition (ingested at 06:30 h and 2; Exposure to bright light for 1 h and exercising for the last 30-min on a cycle ergometer at 07:00 h the morning before morning performance; with dawn simulation exposure for 30-min prior to waking on the testing day. Participants retired at 22:30 and woke at 06:30 h throughout the experiment. Both sessions commence at 07:00 h. On entry to the laboratory participants were seated and after intra-aural temperature (IA) was recorded 30-min. During this time questionnaires were administrated regarding mood and prior sleep. Following this, participants then took part in several tests including agility, hand grip strength, counter movement jump and squat jumps. Agility was measured (Whitty SEM Microgate system, UK). Hand grip strength was measured using a dynamometer and squat and countermovement jump values were measured using a jump mat (best of 3 attempts). After this, participants then completed a warm-up (5-min at 10km/h on a motorised treadmill followed by a combination of stretches). Participants were then asked to complete 10 full effort sprints were time, rating of perceived exertion, heart rate and thermal comfort were recorded after each sprint during the 30 s rest. Blood glucose and lactate were also measured before exercise, post warm-up and post exercise. After 30-min participants were asked to cycle around 160 bpm. Heart rate, RPE and thermal comfort were recorded every 5-min. The aim of the study was to assess the effects of caffeine and chronobiotics (bright light/exercise and dawn simulation) on morning RSP and grip strength.

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J29 - Analysis of external load in professional English Football League Two players

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Previous research has utilised Global Positioning Systems (GPS) based technology to provide detailed insights on activity profiles and external demands of professional football. However, there remains minimal research exploring this in the English Football League (EFL), in particular, League Two. Considering differences such as a unique fixture frequency and congestion, and its impact of training occurrence, a study on the external physical loading of EFL League Two players is necessary. Furthermore, analysis of positional differences due to the varied activity profiles is warranted. Therefore, the aims of the current study were to explore the difference in the external demands across training mesocycles, and differences between four-, three-, or two-day training weeks. Additionally, positional differences in external demands in competitive fixtures were explored. Twenty, male, professional soccer players from the EFL League Two (27 ± 6 years, mass 81 ± 8 kg, stature 181 ± 8 cm) were monitored across 41 competitive matches during the 2023-24 season. Players were grouped into the following positional categories central defender (n=3); wide defender (n=4); central midfielder (n=5); wide midfielder (n=5) and striker (n=3). The ethics committee of the sport department at University Academy 92 approved this study. A GPS system (Apex, STATSports, Northern Ireland) was used to quantify external load data from training and match day (MD) across 5 mesocycles of the season. Total distance ranged from 92.1 ± 6.5 m·min^{-1} to 106.2 ± 8.7 m·min-1 and 44.0 ± 2.0 m·min^{-1} to 56.8 ± 4.9 m·min^{-1} across mesocycles in matches and training, respectively. Likewise, High-Speed Running also varied across mesocycles, ranging from 5.6 ± 1.9 m·min^{-1} to 6.7 ± 1.0 m·min^{-1} and 0.9 ± 0.3 m·min^{-1} to 1.3 ± 0.4 m·min^{-1} in matches and training, respectively. Significant differences ($p < 0.05$) in several external load variables were evident between four-, three-, or two-day training weeks. When analysing positional differences in matches, the CM achieved the greatest total distance (106.3 ± 17.6 m·min^{-1}), with WM exhibiting the greatest amount of distance at high speed (7.9 ± 2.1 m·min^{-1}) and total accelerations and decelerations (1.9 ± 0.3 ·min^{2}; 1.0 ± 0.3 ·min^{2}). Consequently, results from this research should allow practitioners to physically prepare players optimally in preparation for MD. In conclusion, this study highlighted that external match load performance was influenced by players' positions. Moreover, the consideration of training days in preparation for a fixture, might allow players to be in optimum physical capacity for MD.

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J30 - Nutritional and non-nutritional strategies in bodybuilding: Impact on kidney function

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Bodybuilders routinely engage in many dietary and other practices purported to be harmful to kidney health. Thus, a structured narrative review of the literature was performed. The search strategy and parameters identifying areas of importance closely followed the PRISMA statement guidelines. This resulted in 13 relevant full-text articles consisting of 8 case reports and 5 case series, published since 2000. Kidney disease was described in 75 bodybuilders, with diagnoses ranging from acute kidney injury (AKI), acute tubular necrosis , focal segmental glomerular sclerosis (FSGS), nephrocalcinosis, acute interstitial nephritis , nephrosclerosis, chronic interstitial nephritis, an assortment of other glomerulonephritides. The development of AKI, FSGS and nephrocalcinosis may be particular risks. There is little evidence that high-protein diets and moderate creatine supplementation pose risks to individuals with normal kidney function though long-term high protein intake in those with underlying impairment of kidney function is inadvisable. The links between anabolic androgenic steroid use and FSGS are stronger, and there are undoubted dangers of nephrocalcinosis in those taking high doses of vitamins A, D and E. Dehydrating practices, including diuretic misuse, and NSAID use also carry potential risks. It is difficult to predict the effects of multiple practices carried out in concert. Investigations into subclinical kidney damage associated with these practices have rarely been undertaken. Future research is warranted to identify the clinical and subclinical harm associated with individual practices and combinations to enable appropriate and timely advice.

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J31 - The effect of football heading on sidestep cutting biomechanics

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Heading is an integral part of football, with ~20 headers or aerial duels executed per game to intercept, pass or score. However, concerns have recently been raised about the potential short and long-term health impacts of repeated heading. There is evidence suggesting increased risks of sub-concussive trauma – head impacts that do not result in obvious symptoms of concussion but affect cognition and motor function (Montenigro et al., 2017, J Neurotra, 34, 328-340). Repeated heading has been demonstrated to alter brain-muscle communication and affect movement control (Parr et al., 2023, Front Hu Neuro, 17, 1145700) and mechanics of simple tasks such as jumping (Lapointe et al., 2018, Int J Psychophys, 132, 93-98). However, whether these observed cognition and motor impairments translate to the biomechanics of complex multidirectional sport-specific movements such as sidestep cutting is not known. This is an important area to understand because sidestep cutting, an acute change of direction which is ubiquitous in football, is an important performance-determining factor and also a common inciting event for lower-limb injuries (Alentorn-Geli et al., 2009, Knee Sur Sports Trauma, Arth, 17, 705-729) such as the anterior cruciate ligament (ACL) rupture. Due to its propensity to generate high multiplanar knee joint loading during the stance phase of the manoeuvre (Dempsey et al., 2009, Am J Sports Med, 37, 2194-2200), there are often high stresses on the lower limbs which can result in musculoskeletal injury. To date, a copious number of studies have analysed the biomechanics of the sidestep cutting manoeuvre, showing that knee loading is sensitive to the constraints and strategies used to manoeuvre (Dos'Santos et al., 2019, Strength Cond J, 41, 40-54). Accordingly, this present study aims to determine whether there is an effect of repeated heading on sidestep-cutting biomechanics and, if so, the nature of this effect. Participants (n=40) will perform reactive and pre-planned sidestep cutting manoeuvres before completing 15 virtual (n=20) or physical (n=20) ball-heading. They will then repeat the cutting tasks immediately after the bout of heading. Whole-body optical motion capture, ground reaction forces, tri-planar lower-limb joint angles and moments during the stance phase will be analysed to test the effects of football heading on sidestep cutting biomechanics. Results may indicate whether exposure to football heading is a potential risk factor for lower-limb/ACL injury and thus inform the development of training sessions, athlete monitoring, and organisational/national heading guidance and policy for matches and training.

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J32 - 'Hanging up the boots, picking up the whistle': An interpretative phenomenological analysis of the player-to-coach transition in elite football

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Athletes encounter a complex decision-making process when it comes to their athletic retirement. While some athletes step away from their sport entirely, others opt to pursue a coaching career within it. Recent pedagogical research has revealed the ubiquitous nature of this phenomenon within the elite academy setting. However, despite the prevalence of this coaching pathway, there remains a lack of literature concerning this unique career transition within sports psychology. By providing nuanced and textured accounts of the transition from athletic retirement to the elite coaching environment, this study sought to broaden our understanding of the lived-experience of the player-turned-coach in elite football. The subsequent study used semi-structured interviews and interpretative phenomenological analysis (IPA) to collect and analyse the first-hand accounts of elite academy coaches who were former professional footballers in the EPL and EFL. Interpretation of the coaches' own sensemaking allowed us to derive meaning through hermeneutic methods based on Heideggerian philosophical traditions, while convergent and divergent themes were revealed by applying an idiographic approach. The phenomenological, hermeneutic, and idiographic aspects of this investigation serve to underpin the epistemological and ontological tenets of the methodology applied in this study. IPA was chosen as a means of better understanding the perspective of coaches who have experienced this unique journey and how they navigated the re-negotiation of their athletic identity whilst simultaneously developing their coaching philosophy. Phenomenological methods view the participant as the "expert"; therefore, no hypothesis is required. However, we hoped to ascertain: [1] how the athletic identity carries over into coaching philosophy; [2] whether this linear transition mitigates the sense of loss often associated with athletic retirement; [3] how returning to coach at the club in which they developed influences the independent formation of beliefs and practices; and [4] whether there is a risk of perpetuation of practice, as clubs favour their former players over outside candidates. This study sought to understand the lived experience of the player-to-coach transition and aimed to provide insight into this process to better facilitate the athletes and coaches on either side of this phenomenon.

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