

371 CHANGES IN CYCLING KINEMATICS IN FUNCTION OF EXERCISE INTENSITY AND ASSOCIATION WITH INJURY PREVALENCE IN AMATEUR ROAD CYCLISTS: A 3D KINEMATIC MOTION ANALYSIS STUDY USING STATISTICAL PARAMETRIC MAPPING

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10.1136/bjsports-2021-IOC.338

Background Road cycling is one of the most popular endurance sports worldwide. Due to its cyclic character, the prolonged flexion posture and significant training volumes, it is associated with a high overuse injury prevalence. To prevent these injuries, control of cycling posture is thought to be imperative. To what extent cycling posture relates with susceptibility to injury, has not been investigated so far.

Objective This study wanted to assess how cycling posture and kinematics vary in function of exercise intensity, and how this relates to the prevalence of overuse injuries.

Design Cross-sectional observational study (three-dimensional (3D) kinematic analysis).

Setting Comprehensive kinematic analysis of trunk and lower limb during cycling task of increasing intensity.

Patients (or Participants) 67 recreational road cyclists.

Interventions (or Assessment of Risk Factors) Participants were submitted to an exertional cycling protocol, using their own race bike on a stationary ergometer system. Throughout the test, 3D kinematic data of lower limb and trunk were captured at constant time-intervals. Afterwards, data on power, heart rate, power-related kinematic changes and the presence of cycling-specific complaints were submitted to statistical analysis.

Main Outcome Measurements Power-increment-related kinematic changes and their association with overuse injuries.

Results Results revealed that kinematic patterns changed significantly in function of power output ($p < 0.024$). More so, frontal plane control of trunk and pelvis during down stroke were significantly associated with injury prevalence ($p < 0.042$). This kinematic variability presented no direct association with the slope of the heart rate curve nor maximal power output.

Conclusions Cycling kinematics differ significantly in function of power and the presence of physical complaints, irrespective of performance capacity. This might have repercussions on comfort, performance and injury susceptibility in cycling. Besides a carefully customized bike-fit, control in the trunk and pelvis are suggested to be essential to optimize comfort and reduce injury risk.

372 23% OF RACE ENTRANTS IN A MASS-PARTICIPATION COMMUNITY-BASED 100 MILE CYCLING RACE REPORT A PRE-RACE LONG-TERM MEDICAL CONDITION

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10.1136/bjsports-2021-IOC.339

Background Medical encounters in mass-participation community-based cycling events are not uncommon and may be related to underlying chronic disease or risk factors for chronic disease in race participants.

Objective To describe the prevalence of medical conditions, including cardiovascular disease (CVD) risk factors, amongst participants in a mass-participation community-based cycling race.

Design Cross-sectional observational study.

Setting 100-mile mass-participation community-based cycling race.

Participants All participants who had registered to take part in the event were invited to complete an online medical survey in the week before the event. 4099 cyclists (16.8% of 24431 finishers) completed the survey and were included in the analysis.

Assessment of Risk Factors Prevalence (%) of cyclists with risk factors including age and gender, medical history, smoking and use of medication.

Results The average age of respondents was 46 years (range 18–80 years; 41% were >50 years) and 76% were male. Respondents trained for an average 83 miles per week over 16 weeks for the event. 28% of all respondents reported using a prescription medication while the prevalence of a long-term medical condition (LTMC) was 23%. The prevalence of specific CVD risk factors or medical conditions in all respondents was: males > 50 years (34.8%; $n=1428$), current or ex-smokers (32.1%; $n=1314$), hypertension (4.2%; $n=171$), a known cardiac disease (including atrial fibrillation and myocardial infarction) (2.2%; $n=91$). 3.6% were taking medication for hyperlipidaemia ($n=149$).

Conclusions In a sample of entrants for a mass-participation community-based 100-mile cycling event, approximately 1 in 3 participants reported prescription medication use, and 1 in 4 reported a long-term medical condition. Risk factors for CVD were reported by a third of entrants, while 2.2% reported a known CVD. Medical teams at such events should be prepared to manage medical complications related to long term medical conditions and CVD risk.

373 ENDURO MOUNTAIN BIKING INJURIES DURING THE ENDURO WORLD SERIES: A TWO-SEASON PROSPECTIVE STUDY

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10.1136/bjsports-2021-IOC.340

Background The sport of Enduro is the newest Union Cycliste Internationale (UCI) sanctioned discipline in mountain biking and there has been a surge in its popularity and participation. Although there are a number of studies reporting mountain biking injury the study methods vary widely, there are few at elite level, and there are none currently detailing injuries at elite level Enduro mountain biking.

Objective To determine the rate, severity and nature of rider injury during racing and official training at the Enduro World Series (EWS).

Design 2-season prospective epidemiology study (2017 & 2018).

Setting Male and female riders competing in the EWS.

Patients (or Participants) 2,010 (90.3% male) under-21, senior and masters riders from 46 countries, during 10 race events.

Interventions (or Assessment of Risk Factors) Rider injury during EWS Enduro mountain biking.

Main Outcome Measurements Injury prevalence.

Results Overall 8.9% of riders were injured during the two EWS seasons (9.35 injuries per 100 riders) with on average 12.3 days time-loss per injury. Female rider injury prevalence was higher, but severity lower compared with male riders (11.3%, 6.4 days; 8.7%, 13.2 days, respectively). Two-thirds (64%) of injuries occurred during racing, with 31.4% of injuries reported in inexperienced (1-race) riders. The shoulder/clavicle (13.3% of all injuries) followed by the hand (9.0%) and head (9.0%) were the most common affected anatomical locations, with concussion injury most frequent (7.2% of all injuries) and shoulder/clavicle fracture causing the greatest burden (442 total days). Of those displaying concussion symptoms 29% continued racing, of those diagnosed with concussion 43% reported no time-loss (i.e. time off) post-race.

Conclusions The overall rate and severity of rider injury during EWS race events was low, but targeted injury prevention strategies, around shoulder injury pre- and rehabilitation, concussion education, and new/inexperienced rider qualification criteria may help to reduce the rate, severity and overall burden of some injuries.

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USING A MOTIFS INTERVENTION TO INFLUENCE PATIENT-REPORTED OUTCOMES: A RANDOMIZED CROSS-OVER PLAUSIBILITY STUDY

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10.1136/bjsports-2021-IOC.341

Background Injury prevention training focuses on physical execution of movement, but does not typically address mental aspects important for sport. A novel training model with integrated mental training, MOTOr Imagery to Facilitate Sensorimotor Re-Learning (MOTIFS), is a potential method of addressing important mental and physical training aspects.

Objective To evaluate enjoyment of MOTIFS training. The primary hypothesis was that participants would report greater enjoyment following MOTIFS training than injury prevention (IP) training exercises.

Design Block-randomized 2x2 cross-over trial.

Setting Recreational Swedish athletes tested at a university lab.

Patients (or Participants) Thirty athletes (18–31 years, 50% women) currently or previously active in team ball sports were included. Participants with pain or injury preventing jump and/or directional changes were excluded.

Interventions (or Assessment of Risk Factors) MOTIFS training integrated equipment and sport-specific experiences into physical exercises to increase individualized realism and meaning. The IP training exercise condition included solely physical exercise.

Main Outcome Measurements The main outcome was the Physical Activity Enjoyment Scale (PACES). Secondary outcomes included Self-Assessment Manikin (SAM; subscales Valence, Arousal, Dominance), Borg's scale of perceived exertion (RPE), training duration, and maximum pulse.

Results PACES scores were better following MOTIFS training compared with IPT (mean diff 24.67; 95% CI 30.34;-19.00). SAM Valence (median 2, quartiles 1–3), Arousal (median 1;

quartiles 0–2.25), and Dominance (median 0.5; quartiles 0–2), as well as RPE (med 1; quartiles -0.25–2), and maximum (median 7.50; quartiles 0.25–16.75) pulse were higher following MOTIFS training. MOTIFS training took 5.34 minutes longer (95% CI -0.17;-0.73).

Conclusions Athletes perceived MOTIFS training as more enjoyable and reported more positive psychological responses than IP training exercises. Results indicate MOTIFS training is more fun and increases physical exertion, potentially improving IP training exercise quality and adherence by increasing athlete involvement and sport relevance. MOTIFS training took more time, so this should be taken into account during planning of exercises.

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THE TEST-RETEST RELIABILITY OF BILATERAL AND UNILATERAL FORCE PLATE DERIVED PARAMETERS OF THE COUNTERMOVEMENT PUSH UP (CMPU) IN ELITE GB BOXERS

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10.1136/bjsports-2021-IOC.342

Background Upper limb muscular power output is a fundamental aspect across a number of explosive short duration sports such as boxing. Regular consistent production of high muscular power is a highly desirable characteristic and essential pre-requisite. Despite this importance, there is at present no gold standard test for upper limb force development performance, knowledge of normative performances is important for proper evaluation of risk factors for injury, return to play and programming.

Objective The aim of this study was to investigate the test-retest reliability of force plate derived measures of counter-movement push-up (CMPU) in Elite Boxers.

Design Test-Retest reliability approach.

Setting World Class Programme and Podium Potential Athletes within training environment.

Patients (or Participants) 18 Elite Great British (GB) Boxers participated within this study.

Main Outcome Measurements Kinetic data collected included peak force (PF), mean force (MF), flight time (FT), rate of force development (RFD), Impulse and Vertical Stiffness.

Results No significant differences between the two trial occasions for any of the derived performance measures. Intraclass Correlation Coefficients (ICCs) indicated moderate to high reliability (ICC = 0.68–0.98) and low co-efficient of variation (CV = 3–10%), mean force demonstrated the greatest reliability (CV = 3%).

Conclusions Reliable and purposeful methods of assessment are integral to understanding individual's performance potential but to also monitor training programme affects, long-term development and talent identification. Results highlight upper limb power output in elite level GB boxers can be reliably assessed by practitioners using force-plate and force-time derived parameters, and that unilateral data can be reliably extrapolated from the bilateral condition. When using CMPU to monitor training programme affects, no difference between limbs should be noted. This will be useful if completed prior to any injury, as if any deficits or subsequent injury occurs, CMPU can be used to better appraise and guide injury rehabilitation until the athlete returns to improved performance levels.