Intégré	Mois	Titre	Abstract	Section cours
	2023-06	2023-Ertman-Alterations in Achilles tendon stress and strain across a range of running velocities	Running has a high incidence of overuse injuries. Achilles tendon (AT) injuries may occur due to high forces and repetitive loading during running. Foot strike pattern and cadence have been linked to the magnitude of AT loading. The effect of running speed on AT stress and strain, muscle forces, gait parameters and running kinematics is not well addressed in recreational runners with lower pace of running. Twenty-two female participants ran on an instrumented treadmill between 2.0 and 5.0 m/s. Kinetic and kinematic data were obtained. AT cross-sectional area data were collected using ultrasound imaging. Inverse dynamics with static optimization was used to calculate muscle forces and AT loading. AT stress, strain and cadence increased with greater running speed. Foot inclination angle indicated a rearfoot strike pattern among all participants, which increased as running speed increased but the latter plateaued after 4.0 m/s. The soleus contributed more force in running compared to the gastrocnemius throughout all speeds. Highest running speeds had the most stress on the AT, with changes to foot inclination angle and cadence. Understanding the relation of AT loading variables with running speed may aid in understanding how applied load may influence injury.	Tendon d'Achille
	2023-06	2023-Fortune-Does orthotics use improve comfort, speed, and injury rate during running? A randomised control trial	Background: Running is a hugely popular sport. Unfortunately, running-related injury (RRI) rates are high, particularly amongst amateur and recreational runners. Finding ways to reduce RRI rates and maximise comfort and performance for runners is important. Evidence regarding whether orthotics can successfully improve these parameters is limited and contradicting. Further research is required to provide runners with clearer guidance on the usefulness of orthotics. Aim: To investigate the effect of Aetrex Orthotics on comfort, speed and RRI rates during recreational running. Methods: One hundred and six recreational runners were recruited on a voluntary basis via running clubs and social media pages and randomised into either the intervention or control group. Participants in the intervention group ran with Aetrex L700 Speed Orthotics inserted in their usual running shoes, whilst participants in the control group ran in their usual running shoes with no orthotics. The study ran for an 8-wk period. Participants provided data relating to running comfort, distance, and time during weeks 3-6. Participants provided data relating to any RRIs they sustained during all 8 wks. Running distance and time were used to calculate running speed in miles per hour (mph). For each outcome variable, 95% confidence intervals and P values were calculated to assess the statistical significance between the groups. For comfort and speed data, univariate multi-level analysis was performed, and for outcome variables with significant between group differences, multi-level multivariate analysis was performed to evaluate any confounding effects of gender and age. Results: Ninety-four participants were included in the final analysis (drop-out rate = 11%). Comfort and speed from 940 runs and 978 injury data reports were analysed. Participants who ran with orthotics reported, on average, speeds 0.30 mph faster ($P = 0.20$) and comfort scores 1.27 points higher ($P \leq 0.001$) than participants who ran with no orthotics. They were also 2.22 times less likely to sustain an injury ($P = 0.08$) than participants who ran with no orthotics. However, findings were only significant for comfort and not for speed or injury rates. Age and gender were found to be significant predictors of comfort. However, the improvements in comfort reported by participants who ran with orthotics were still significant after adjusting for age and gender. Conclusion: This study found orthotics to improve comfort and speed and prevent RRIs whilst running. However, these findings were only statistically significant for comfort	Prévention et orthèses
	2023-06	2023-Lavigne-The Role of Footwear, Foot Orthosis and Training-Related Strategies in the Prevention of Bone Stress Injuries- A Systematic Review and Meta-Analysis	Objective: To evaluate the effectiveness of footwear, foot orthoses and training-related strategies to prevent lower extremity bone stress injury (BSI). Design: Systematic review and meta-analysis. Data sources: Four bibliographic databases (from inception until November 2021): Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE and CINAHL. Eligibility criteria: Randomised controlled trials (RCTs) that assessed the risk of developing a BSI when using particular footwear, foot orthoses or training-related strategies such as muscle strengthening, stretching, and mechanical loading exercises. Results: Eleven studies were included in this systematic review. When wearing foot orthoses, the risk ratio of developing a BSI on any lower extremity bone is 0.47 (95% CI 0.26 to 0.87; $p = 0.02$). When doing pre-exercise dynamic stretching, the risk ratio of suffering a tibial BSI is 1.06 (95% CI 0.67 to 1.68; $p = 0.79$). No meta-analyses could be performed for footwear or training-related strategies. The quality of evidence for all these results is low considering the high risk of bias in each study, the low number of studies and the low number of cases in each study. Conclusion: This systematic review reveals the lack of high-quality studies in BSI prevention. Based on studies at high risk of bias, foot orthoses could potentially help prevent BSIs in the military setting. It is still unknown whether footwear and training-related strategies have any benefits. It is crucial to further investigate potential BSI prevention strategies in women and athletes. Research is also needed to assess the influence of running shoes and loading management on BSI incidence.	Chaussures & orthèses prévention

2023-06	2023-Burke-Aetiological Factors of Running-Related Injuries: A 12 Month Prospective “Running Injury Surveillance Centre” (RISC) Study	Background Running-related injuries (RRIs) are a prevalent issue for runners, with several factors proposed to be causative. The majority of studies to date are limited by retrospective study design, small sample sizes and seem to focus on individual risk factors in isolation. This study aims to investigate the multifactorial contribution of risk factors to prospective RRIs. Methods Recreational runners (n = 258) participated in the study, where injury history and training practices, impact acceleration, and running kinematics were assessed at a baseline testing session. Prospective injuries were tracked for one year. Univariate and multivariate Cox regression was performed in the analysis. Results A total of 51% of runners sustained a prospective injury, with the calf most commonly affected. Univariate analysis found previous history of injury < 1 year ago, training for a marathon, frequent changing of shoes (every 0–3 months), and running technique (non-rearfoot strike pattern, less knee valgus, greater knee rotation) to be significantly associated with injury. The multivariate analysis revealed previous injury, training for a marathon, less knee valgus, and greater thorax drop to the contralateral side to be risk factors for injury. Conclusion This study found several factors to be potentially causative of injury. With the omission of previous injury history, the risk factors (footwear, marathon training and running kinematics) identified in this study may be easily modifiable, and therefore could inform injury prevention strategies. This is the first study to find foot strike pattern and trunk kinematics to relate to prospective injury. Key points One in two runners sustained a prospective running-related injury during a 12 month surveillance period, with the calf most commonly affected. Running technique factors such as non-rearfoot strike pattern, less knee valgus, greater knee rotation and greater thorax drop to the contralateral side relate to prospective running-related injuries. Training-related risk factors for injury which warrant caution include training for a marathon and frequent changing of footwear, however, these factors are easily modifiable for runners.	Facteurs risque blessures
2023-06	2023-Song-Patellofemoral Joint Loading Progression Across 35 Weightbearing Rehabilitation Exercises and Activities of Daily Living	Background: Exercises that provide progressive therapeutic loading are a central component of patellofemoral pain rehabilitation, but quantitative evidence on patellofemoral joint loading is scarce for a majority of common weightbearing rehabilitation exercises. Purpose: To define a loading index to quantify, compare, rank, and categorize overall loading levels in the patellofemoral joint across 35 types of weightbearing rehabilitation exercises and activities of daily living. Study design: Descriptive laboratory study. Methods: Model-estimated knee flexion angles and extension moments based on motion capture and ground-reaction force data were used to quantify patellofemoral joint loading in 20 healthy participants who performed each exercise. A loading index was computed via a weighted sum of loading peak and cumulative loading impulse for each exercise. The 35 rehabilitation exercises and daily living activities were then ranked and categorized into low, moderate, and high "loading tiers" according to the loading index. Results: Overall patellofemoral loading levels varied substantially across the exercises and activities, with loading peak ranging from 0.6 times body weight during walking to 8.2 times body weight during single-leg decline squat. Most rehabilitation exercises generated a moderate level of patellofemoral joint loading. Few weightbearing exercises provided low-level loading that resembled walking or high-level loading with both high magnitude and duration. Exercises with high knee flexion tended to generate higher patellofemoral joint loading compared with high-intensity exercises. Conclusion: This study quantified patellofemoral joint loading across a large collection of weightbearing exercises in the same cohort. Clinical relevance: The visualized loading index ranks and modifiable worksheet may assist clinicians in planning patient-specific exercise programs for patellofemoral pain rehabilitation.	Exercices DFP

2023-06	2023-Maetz-Systematic Review and Meta-analyses of Randomized Controlled Trials Comparing Exercise Loading Protocols With Passive Treatment Modalities or Other Loading Protocols for the Management of Midportion Achilles Tendinopathy	Background: There is no clear consensus as to which intervention to prioritize for midportion Achilles tendinopathy (AT), although recent clinical practice guidelines have recommended eccentric exercises. Purpose/hypothesis: The purpose of this study was to (1) compare exercise loading protocols with passive treatment modalities for the management of midportion AT and (2) compare different exercise loading protocols. We hypothesized that loading exercises would be associated with a greater decrease in pain and symptoms compared with passive treatment modalities but that no loading protocols would be associated with improved results. Study design: Systematic review; Level of evidence, 1. Methods: Following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, we searched the MEDLINE, EMBASE, CINHAL, and Web of Science databases for randomized controlled trials (RCTs) and compared eccentric loading protocols with passive treatment modalities or different eccentric loading protocols as an intervention for midportion AT. A total of 5126 articles were identified after the initial search. After selection, the risk of bias (RoB) and the Grading of Recommendations, Assessment, Development and Evaluation approach were applied to pooled studies for quantitative analysis. The outcomes of interest were pain and function, which were measured using the visual analog scale and the Victorian Institute of Sport Assessment-Achilles scale. Mean differences (MDs) and 95% CIs were calculated using random effects (significant heterogeneity) or fixed effects (nonsignificant heterogeneity) inverse variance models. Results: In this study, 12 RCTs (N = 543 participants) were included, of which 2 had a high RoB and 10 showed some concerns of bias. Passive interventions resulted in greater pain reduction in the short term compared with eccentric loading protocols (n = 4 studies; n = 212 participants; pooled MD, 10.22 [95% CI, 2.18 to 18.25]; P = .01). For function, there was a nonsignificant trend in favor of eccentric loading in the short- (n = 3 studies; n = 144 participants; pooled MD, -7.91 [95% CI, -16 to 0.19]; P = .06) and midterm follow-up (n = 5 studies; n = 258 participants; pooled MD, -6.78 [95% CI, -14.23 to 0.68]; P = .07). Meta-analyses of RCTs comparing different types of exercise loading protocols showed no significant differences in the short, mid-, and long term with regard to pain and function. Conclusion: Our meta-analyses did not highlight the superiority of one treatment over another for midportion AT.	Exercices et tendinopathies
2023-05	2023-Nguyen-Conservative treatment for iliotibial band syndrome: Are we facing a research gap? A scoping review of 98 studies with clinical perspectives	Objectives To identify which treatment modalities are described in the literature for the conservative management of ITBS (1) and to identify research gap (2). Databases The following electronic databases were searched: MEDLINE/Pubmed, Embase, Scopus and Cochrane Library. Eligibility criteria The included studies had to report at least one conservative treatment on a human population suffering from ITBS. Results 98 studies reached the included criteria and seven categories of treatment were identified, i.e., stretching, adjuvants, physical modalities, injections, strengthening, manual techniques and education. Only 32 studies were designed as original clinical studies within which only 7 were randomized controlled trials, while 66 were review studies. Education, injections and medications as well as stretching were the most cited therapies. However, there was a clear discrepancy design. For example, stretching modalities were reported in 31% and 78% for clinical and review studies, respectively. Conclusions There is an objective research gap in the literature concerning conservative ITBS management. The recommendations are mostly based on expert opinions and review article. More high-quality research studies should be performed for enhancing the ITBS conservative management understanding.	ITBS
2023-05	2023-Popp-Impact loading in female runners with single and multiple bone stress injuries during fresh and exerted conditions	Background: Bone stress injuries (BSIs) are common in female runners, and recurrent BSI rates are high. Previous work suggests an association between higher impact loading during running and tibial BSI. However, it is unknown whether impact loading and fatigue-related loading changes discriminate women with a history of multiple BSIs. This study compared impact variables at the beginning of a treadmill run to exertion and the changes in those variables with exertion among female runners with no history of BSI as well as among those with a history of single or multiple BSIs. Methods: We enrolled 45 female runners (aged 18-40 years) for this cross-sectional study: having no history of diagnosed lower extremity BSI (N-BSI, n = 14); a history of 1 lower extremity BSI (1-BSI, n = 16); and diagnosed by imaging, or a history of multiple (≥3) lower extremity BSIs (M-BSI, n = 15). Participants completed a 5-km race speed run on an instrumented treadmill while wearing an Inertial Measurement Unit. The vertical average loading rate (VALR), vertical instantaneous loading rate (VILR), vertical stiffness during impact via instrumented treadmill, and tibial shock determined as the peak positive tibial acceleration via Inertial Measurement Unit were measured at the beginning and the end of the run. Results: There were no differences between groups in VALR, VILR, vertical stiffness, or tibial shock in a fresh or exerted condition. However, compared to N-BSI, women with M-BSI had greater increase with exertion in VALR (-1.8% vs. 6.1%, p = 0.01) and VILR (1.5% vs. 4.8%, p = 0.03). Similarly, compared to N-BSI, vertical stiffness increased more with exertion among women with M-BSI (-0.9% vs. 7.3%, p = 0.006) and 1-BSI (-0.9% vs. 1.8%, p = 0.05). Finally, compared to N-BSI, the increase in tibial shock from fresh to exerted condition was greater among women with M-BSI (0.9% vs. 5.5%, p = 0.03) and 1-BSI (0.9% vs. 11.2%, p = 0.02). Conclusion: Women with 1-BSI or M-BSIs experience greater exertion-related increases in impact loading than women with N-BSI. These observations imply that exertion-related changes in gait biomechanics may contribute to risk of BSI.	VLR et blessures

2023-05	2023-Gawel-Rehabilitation and return to activity criteria after operative management of chronic exertional compartment syndrome of the leg: a systematic review	Objectives: Endurance athletes with chronic exertional compartment syndrome (CECS) frequently require fasciotomy to return to activity, but there are no existing comprehensive evidence-based rehabilitation guidelines. We aimed to summarize rehabilitation protocols and return to activity criteria after CECS surgery. Methods: Through a systematic literature review, we identified 27 articles that explicitly defined physician-imposed restrictions or guidelines for patients to resume athletic activities following CECS surgery. Results: Common rehabilitation parameters included running restrictions (51.9%), postoperative leg compression (48.1%), immediate postoperative ambulation (44.4%), and early range of motion exercises (37.0%). Most studies (70.4%) reported return to activity timelines, but few (11.1%) utilized subjective criteria for guiding return to activity. No studies utilized objective functional criteria. Conclusions: Rehabilitation and return to activity guidelines after CECS surgery remain poorly defined, and further investigation is needed to develop such guidelines that will enable endurance athletes to safely return to activities and minimize recurrence.	CECS
2023-05	2023-Pavlova-Effect of resistance exercise dose components for tendinopathy management: a systematic review with meta-analysis	Objective: To investigate potential moderating effects of resistance exercise dose components including intensity, volume and frequency, for the management of common tendinopathies. Design: Systematic review with meta-analysis and meta-regressions. Data sources: Including but not limited to: MEDLINE, CINAHL, SPORTDiscus, ClinicalTrials.gov and ISRCTN Registry. Eligibility criteria for selecting studies: Randomised and non-randomised controlled trials investigating resistance exercise as the dominant treatment class, reporting sufficient information regarding ≥2 components of exercise dose. Results: A total of 110 studies were included in meta-analyses (148 treatment arms (TAs), 3953 participants), reporting on five tendinopathy locations (rotator cuff: 48 TAs; Achilles: 43 TAs; lateral elbow: 29 TAs; patellar: 24 TAs; gluteal: 4 TAs). Meta-regressions provided consistent evidence of greater pooled mean effect sizes for higher intensity therapies comprising additional external resistance compared with body mass only (large effect size domains: β BodyMass: External = 0.50 (95% credible interval (CrI): 0.15 to 0.84; p=0.998); small effect size domains (β BodyMass: External = 0.04 (95% CrI: -0.21 to 0.31; p=0.619)) when combined across tendinopathy locations or analysed separately. Greater pooled mean effect sizes were also identified for the lowest frequency (less than daily) compared with mid (daily) and high frequencies (more than once per day) for both effect size domains when combined or analysed separately (p≥0.976). Evidence for associations between training volume and pooled mean effect sizes was minimal and inconsistent. Summary/conclusion: Resistance exercise dose is poorly reported within tendinopathy management literature. However, this large meta-analysis identified some consistent patterns indicating greater efficacy on average with therapies prescribing higher intensities (through inclusion of additional loads) and lower frequencies, potentially creating stronger stimuli and facilitating adequate recovery	Exercices
2023-05	2023-van der Does-Can running-related injuries be prevented through an online behavioural intervention in adult novice runners	Objective To evaluate the effectiveness of the Runfitcheck on time until the onset of a new running-related injury (RRI) among adult novice runners. Methods A three-arm randomised controlled trial was conducted over 7 months. Adult novice runners completed a baseline online questionnaire on their characteristics, running activity, RRIs and injury preventive behaviour. Runners were randomly allocated to one of two intervention groups or the control group (n=238). One intervention group obtained access to the Runfitcheck (n=252), an online intervention to encourage injury preventive behaviour, and was fortnightly promoted to use Runfitcheck; the other intervention group (n=251) was directed towards the Runfitcheck once. Runners were followed for 4 months, not all starting at the same time over 7 months. The main outcome measure was time to a new RRI using the Oslo Sports Trauma Research Centre Overuse Injury Questionnaire, and was analysed with survival analysis Cox regression. Generalised estimating equations (GEE) were used to gain insight into the effectiveness of the Runfitcheck. Results The time to the occurrence of the first RRI did not differ between the study groups (Wald $\chi 2$=0.893). GEE analysis showed no difference in the risk of a new RRI in the group that was referred to the Runfitcheck once (OR 1.22, 95% CI 0.86 to 1.74) nor in the active approach group (OR 1.01, 95% CI 0.71 to 1.45) compared with the control group. Furthermore, the onset of the new RRIs did not change over time (OR 0.96, 95% CI 0.91 to 1.01). Conclusions The online intervention Runfitcheck was ineffective in reducing the instantaneous risk of new RRIs in adult novice runners. More research is needed to determine how injuries in novice runners can be prevented	Prévention

2023-04	2023-Zajac-Instructions Promoting an External Focus Are More Effective for Altering Impact Forces in Female Runners	Context: Previous studies have found that instructions promoting an external focus (EF) tend to be more effective for movement pattern retraining compared to instructions promoting an internal focus (IF), for a variety of movement tasks. However, few studies have examined how different types of instructions affect running mechanics associated with running-related injury risk. Therefore, the purpose of this study was to compare the effects of instructions promoting different attentional foci on impact forces during running. Design: Cross-sectional study. Methods: Twenty uninjured female recreational runners ran at a self-selected speed with their typical pattern (no instructions condition) on an instrumented treadmill that measured ground reaction forces. Next, they were given 2 sets of instructions intended to alter their running pattern; one promoted an IF and the other promoted an EF. Repeated-measures analysis of variance was used to compare impact peaks and loading rates across the conditions (no instructions, IF, and EF), with post hoc tests conducted in the case of a significant omnibus test. Results: There were differences among the conditions in the impact peaks ($P < .001$) and loading rates ($P < .001$). Impact peaks were lower for the IF ($P = .002$) and EF ($P < .001$) conditions compared to the no instructions condition. Loading rates were lower for the EF condition compared to the no instructions ($P < .001$) and IF ($P < .001$) conditions; there was no difference between the IF and no instructions conditions ($P = .24$). Conclusions: Our findings indicate that instructions promoting an EF may be more effective at reducing loading rates during running compared to instructions promoting an IF. Clinicians should consider these findings when attempting to retrain a runner's running pattern.	Modifications patron course
2023-04	2023-Nunes-ARE CHANGES IN DYNAMIC KNEE MOVEMENT CONTROL RELATED TO CHANGES IN PAIN OR FUNCTION IN PEOPLE WITH KNEE DISORDERS? A SYSTEMATIC REVIEW AND META-ANALYSIS	OBJECTIVE: To study whether changes in dynamic knee valgus or varus are associated with changes in pain or function in people with knee disorders. DESIGN: Systematic review with meta-analysis. LITERATURE SEARCH: Medline, Embase, CINAHL, SPORTDiscus, Cochrane Library and Web of Science, from inception up to January 2023. STUDY SELECTION CRITERIA: Randomized controlled trials investigating the effects of non-surgical (including non-pharmacological) interventions for knee disorders on frontal and transverse plane knee and hip movements during functional tasks, which reported pain and/or function outcomes. DATA SYNTHESIS: The relationship between changes in kinematics and pain/function was analyzed using a two-stage structural equation modelling approach (TSSEM). RESULTS: From 42,202 records, 48 trials met the eligibility criteria. For people with patellofemoral pain (PFP) (25 trials, n=894), there was moderate evidence that changes in the knee and hip movements were significantly correlated with changes in pain and function (r= -0.69 to 0.73), except for the knee transverse plane movements and for the relationship between hip transverse plane movement and function. For people with knee osteoarthritis (OA) (15 trials, n=704) and anterior cruciate ligament (ACL) injuries (eight trials, n=198), the evidence was limited and uncertain. CONCLUSION: The relationship between changes in movement control and clinical outcomes was consistent in people with PFP. For people with knee OA or ACL injuries, there was a paucity of evidence that precluded a proper evaluation of the relationship between dynamic knee movement control, and pain and function.	Renforcement et cinématique
2023-04	2023-Patoz-Concurrent endurance training with either plyometric or dynamic body-weight training both improve running economy with minimal or no changes in running biomechanics	We compared the effects of two 8-week concurrent strength and endurance trainings (CSETs) on running economy (RE) and running biomechanics, and we explored whether the effects on running biomechanics were mediated by responder status [high vs low responder based on -2.6% change in RE]. Thirty-one male recreational runners were randomly assigned to a standard endurance running training combined with either plyometric (CSET-PLY) or dynamic body-weight (CSET-DYN) training. RE and running biomechanics [contact (tc) and flight (tf) time, step frequency (SF), duty factor (DF), and leg stiffness (kleg)] were measured pre- and post-intervention. RE significantly improved following CSET ($RE = -2.1 \pm 3.9\%$; $p = 0.005$) and no changes in tc, DF, SF, and kleg ($p \geq 0.10$) but a shorter tf ($p \geq 0.03$) from pre- to post-intervention were seen. The prevalence of high responders was 42% ($RE = -5.7 \pm 2.4\%$). Among high responders, there were no changes in running biomechanics except participants following CSET-DYN who increased their SF (+3%). These results indicate that improvements in RE obtained through CSET-PLY and CSET-DYN involve minimal to no changes in running biomechanics and that there was not a training modality, which was better than the other. More detailed biomechanical assessments involving kinematics, kinetics, and electromyography could shed light on the underlying mechanisms of RE improvement.	Renforcement
2023-04	2023-Hagen-Increasing Step Frequency Reduces Patellofemoral Joint Stress and Patellar Tendon Force Impulse more at Low Running Speed	Purpose: Patellofemoral pain syndrome and patellar tendinopathy are important running-related overuse injuries. This study investigated the interaction of running speed and step frequency alterations on peak and cumulative patellofemoral joint stress (PFJS) and patellar tendon force (PTF) parameters. Methods: Twelve healthy individuals completed an incremental running speed protocol on a treadmill at habitual, increased and decreased step frequency. Peak PFJS and PTF, peak rate of PFJS and PTF development and PFJS and PTF impulse per kilometre (km) were calculated using musculoskeletal modelling. Results: With increasing running speed, peak PFJS ($p < 0.001$) and PTF ($p < 0.001$) and peak rate of PFJS ($p < 0.001$) and PTF ($p < 0.001$) development increased, while PFJS ($p < 0.001$) and PTF ($p < 0.001$) impulse per km decreased. While increasing step frequency by 10%, the peak PFJS ($p < 0.001$) and PTF ($p < 0.001$) and the PFJS ($p < 0.001$) and PTF ($p < 0.001$) impulse per km decreased. No significant effect of step frequency alteration was found for the peak rate of PFJS ($p = 0.008$) and PTF ($p = 0.213$) development. A significant interaction effect was found for PFJS ($p < 0.001$) and PTF ($p < 0.001$) impulse per km suggesting that step frequency alteration was more effective at low running speed. Conclusions: The effectiveness of step frequency alteration on PFJS and PTF impulse per km is dependent on the running speed. With regard to peak PFJS and PTF, step frequency alteration is equally effective at low and high running speeds. Step frequency alteration was not effective for peak rate of PFJS and PTF development. These findings can assist the optimisation of patellofemoral joint and patellar tendon load management strategies.	Cadence

2023-04	2023-Udin-Time course of muscle activation, energetics and mechanics of running in minimalist and traditional cushioned shoes during level running	The study aimed to compare the ankle muscles activation, biomechanics and energetics of running in male runners during submaximal level run using minimalist (MinRS) and traditional cushioned (TrdRS) running shoes. During 45-min running in MinRS and TrdRS, the ankle muscles pre- and co-activation, biomechanics, and energetics of running of 16 male endurance runners (25.5 ± 3.5 yr) were assessed using surface electromyography (tibialis anterior and gastrocnemius lateralis), instrumented treadmill and indirect calorimetry, respectively. The net energy cost of running (Cr) was similar for both conditions ($P = 0.25$) with a significant increase over time ($P < 0.0001$). Step frequency ($P < 0.001$), and total mechanical work ($P = 0.001$) were significantly higher in MinRS than in TrdRS with no evolution over time ($P = 0.28$ and $P = 0.85$, respectively). The ankle muscles pre- and co-activation during the contact phase did not differ between the two shoe conditions ($P \geq 0.33$) or over time ($P \geq 0.15$). In conclusion, during 45-min running, Cr and muscle pre- and co-activation were not significantly different between MinRS and TrdRS with significantly higher step frequency and total mechanical work noted in the former than in the latter. Moreover, Cr significantly increased during the 45-min trial in both shoe conditions along with no significant change over time in muscle activation and biomechanical variables.	Chaussires minimalistes
2023-04	2023-Impellizzeri-Understanding Training Load as Exposure and Dose	Various terms used in sport and exercise science, and medicine, are derived from other fields such as epidemiology, pharmacology and causal inference. Conceptual and nomological frameworks have described training load as a multidimensional construct manifested by two causally related subdimensions: external and internal training load. In this article, we explain how the concepts of training load and its subdimensions can be aligned to classifications used in occupational medicine and epidemiology, where exposure can also be differentiated into external and internal dose. The meanings of terms used in epidemiology such as exposure, external dose, internal dose and dose-response are therefore explored from a causal perspective and their underlying concepts are contextualised to the physical training process. We also explain how these concepts can assist in the validation process of training load measures. Specifically, to optimise training (i.e. within a causal context), a measure of exposure should be reflective of the mediating mechanisms of the primary outcome. Additionally, understanding the difference between intermediate and surrogate outcomes allows for the correct investigation of the effects of exposure measures and their interpretation in research and applied settings. Finally, whilst the dose-response relationship can provide evidence of the validity of a measure, conceptual and computational differentiation between causal (explanatory) and non-causal (descriptive and predictive) dose-response relationships is needed. Regardless of how sophisticated or "advanced" a training load measure (and metric) appears, in a causal context, if it cannot be connected to a plausible mediator of a relevant response (outcome), it is likely of little use in practice to support and optimise the training process.	Load Capacity
2023-03	2023-Mesas-Is daytime napping an effective strategy to improve sport-related cognitive and physical performance and reduce fatigue? A systematic review and meta-analysis of randomised controlled trials	Objective: To estimate the association between daytime napping and cognitive and physical sport performance and fatigue after normal sleep and partial sleep deprivation (less sleep duration than necessary). Design: Systematic review and meta-analysis. Data sources: The PubMed, Scopus, Web of Science, Cochrane Central, SportDiscus and PsycINFO databases. Eligibility criteria for selecting studies: Randomised controlled trials on the effect of daytime napping on sport performance and fatigue available from inception to 2 December 2022. Standardised mean differences (SMD) and their 95% compatibility intervals (CI) were estimated with the DerSimonian-Laird method through random effect models. Results: In the 22 included trials, 291 male participants (164 trained athletes and 127 physically active adults) aged between 18 and 35 years were studied. When performed after a normal night of sleep, napping from 12:30 hours to 16:50 hours (with 14:00 hours being the most frequent time) improved cognitive (SMD=0.69, 95% CI: 0.37 to 1.00; I2=71.5%) and physical performance (SMD=0.99, 95% CI: 0.67 to 1.31; I2=89.1%) and reduced the perception of fatigue (SMD=-0.76, 95% CI: -1.24 to -0.28; I2=89.5%). The positive effects of napping were also confirmed after partial sleep deprivation. Overall, the benefits were higher with a nap duration between 30 and <60 min and when the time from nap awakening to test was greater than 1 hour. Conclusions: After a night of normal sleep or partial sleep deprivation, a daytime nap between 30 and <60 min has a moderate-to-high effect on the improvement of cognitive performance and physical performance and on the reduction of perceived fatigue.	Sommeil
2023-03	2023-Zhou-Surface effects on kinematics, kinetics and stiffness of habitual rearfoot strikers during running	The surface effects on running biomechanics have been greatly investigated. However, the effects on rearfoot strike runners remain unknown. The purpose of this study was to investigate the effects of surfaces on the running kinematics, kinetics, and lower-limb stiffness of habitual rearfoot strikers. Thirty healthy male runners were recruited to run at 3.3 ± 0.2 m/s on a customized runway covered with three different surfaces (artificial grass, synthetic rubber, or concrete), and their running kinematics, kinetics, and lower-limb stiffness were compared. Differences among the three surfaces were examined using statistical parametric mapping and one-way repeated-measure analysis of variance. There were no statistical differences in the lower-limb joint motion, vertical ground reaction force (GRF), loading rates, and lower-limb stiffness when running on the three surfaces. The braking force (17%-36% of the stance phase) and mediolateral GRF were decreased when running on concrete surface compared with running on the other two surfaces. The moments of ankle joint in all three plane movement and frontal plane hip and knee joints were increased when running on concrete surface. Therefore, habitual rearfoot strikers may expose to a higher risk of running-related overuse injuries when running on a harder surface.	Surfaces
2023-03	2023-Trovato-The influence of different sports on cartilage adaptations: A systematic review	Molecular composition and structural adaptation are changes in the cartilage tissue after different stimuli. Sports activities with different loads at different angles, speeds, and intensities can modify the molecular composition of the articular cartilage, hence it is crucial to understand the molecular adaptations and structural modifications generated by sports practice and this review aims to synthesize the current evidence on this topic. A systematic search until July 2022 was performed on the database Medline, Pubmed, Scopus, and Web of Science with a collection of 62,198. After the screening process, the included articles were analyzed narratively. Thirty-one studies have been included in the analysis. From the results emerged that running, swimming, ballet and handball were not correlated with detrimental structural or molecular cartilage adaptation; instead, soccer, volleyball, basketball, weightlifting, climbing, and rowing showed signs of cartilage alteration and molecular adaptation that could be early predictive degeneration's signs. From the included studies it came to light that the regions more interested in morphological cartilage changes were the knee in athletes from different disciplines. In conclusion, different sports induce different cartilage modifications both at a molecular and structural level and it is important to know the risks correlated to sports to implement preventive strategies.	Sports et arthrose

2023-03	2023-Kayll-Do biomechanical foot-based interventions reduce patellofemoral joint loads in adults with and without patellofemoral pain or osteoarthritis? A systematic review and meta-analysis	Objective: To evaluate the effects of biomechanical foot-based interventions (eg, footwear, insoles, taping and bracing on the foot) on patellofemoral loads during walking, running or walking and running combined in adults with and without patellofemoral pain or osteoarthritis. Design: Systematic review with meta-analysis. Data sources: MEDLINE, CINAHL, SPORTdiscus, Embase and CENTRAL. Eligibility criteria for selecting studies: English-language studies that assessed effects of biomechanical foot-based interventions on peak patellofemoral joint loads, quantified by patellofemoral joint pressure, reaction force or knee flexion moment during gait, in people with or without patellofemoral pain or osteoarthritis. Results: We identified 22 footwear and 11 insole studies (participant n=578). Pooled analyses indicated low-certainty evidence that minimalist footwear leads to a small reduction in peak patellofemoral joint loads compared with conventional footwear during running only (standardised mean difference (SMD) (95% CI) = -0.40 (-0.68 to -0.11)). Low-certainty evidence indicated that medial support insoles do not alter patellofemoral joint loads during walking (SMD (95% CI) = -0.08 (-0.42 to 0.27)) or running (SMD (95% CI) = 0.11 (-0.17 to 0.39)). Very low-certainty evidence indicated rocker-soled shoes have no effect on patellofemoral joint loads during walking and running combined (SMD (95% CI) = 0.37) (-0.06 to 0.79)). Conclusion: Minimalist footwear may reduce peak patellofemoral joint loads slightly compared with conventional footwear during running only. Medial support insoles may not alter patellofemoral joint loads during walking or running and the evidence is very uncertain about the effect of rocker-soled shoes during walking and running combined. Clinicians aiming to reduce patellofemoral joint loads during running in people with patellofemoral pain or osteoarthritis may consider minimalist footwear.	Chaussures et biomécanique
2023-03	2023-Dhillon-Effects of Running on the Development of Knee Osteoarthritis: An Updated Systematic Review at Short-Term Follow-up	Background: Some studies have suggested that running increases the risk of knee osteoarthritis (OA), while others believe it serves a protective function. Purpose: To perform an updated systematic review of the literature to determine the effects of running on the development of knee OA. Study design: Systematic review; Level of evidence, 4. Methods: A systematic review was performed by searching the PubMed, Cochrane Library, and Embase databases to identify studies evaluating the effect of cumulative running on the development of knee OA or chondral damage based on imaging and/or patient-reported outcomes (PROs). The search terms used were "knee AND osteoarthritis AND (run OR running OR runner)." Patients were evaluated based on plain radiographs, magnetic resonance imaging (MRI), and PROs (presence of knee pain, Health Assessment Questionnaire-Disability Index, and the Knee injury and Osteoarthritis Outcome Score). Results: Seventeen studies (6 level 2 studies, 9 level 3 studies, and 2 level 4 studies), with 7194 runners and 6947 nonrunners, met the inclusion criteria. The mean follow-up time was 55.8 months in the runner group and 99.7 months in the nonrunner group. The mean age was 56.2 years in the runner group and 61.6 years in the nonrunner group. The overall percentage of men was 58.5%. There was a significantly higher prevalence of knee pain in the nonrunner group (P < .0001). Although 1 study found a significantly higher prevalence of osteophytes in the tibiofemoral (TF) and patellofemoral (PF) joints within the runner group, multiple studies found no significant differences in the prevalence of radiographic knee OA (based on TF/PF joint-space narrowing or Kellgren-Lawrence grade) or cartilage thickness on MRI between runners and nonrunners (P > .05). One study found a significantly higher risk of knee OA progressing to total knee replacement among nonrunners (4.6% vs 2.6%; P = .014). Conclusion: In the short term, running is not associated with worsening PROs or radiological signs of knee OA and may be protective against generalized knee pain.	Course et arthrose
2023-02	2023-Burfield-The association between running volume and knee osteoarthritis prevalence: A systematic review and meta-analysis	There is conflicting evidence regarding whether regular running is associated with knee osteoarthritis prevalence. Previous evidence reports lower knee osteoarthritis prevalence in recreational runners compared with professionals (with a higher training volume) and controls (who have a lower training volume). The aim of this systematic review and meta-analysis was to determine if weekly running volume is associated with knee osteoarthritis prevalence. Four databases (PubMed, Web of Science, Scopus and SPORTDiscus) were searched from earliest record to November 2021. Included studies must i) recruit participants who ran regularly and recorded weekly running volume; ii) include a control group (running <8 km per week); iii) record knee osteoarthritis prevalence (either by radiological imaging or self-reported diagnosis from a doctor or physiotherapist). Study bias was assessed using the Newcastle-Ottawa Scale (NOS). Pooled effects were estimated using a random effects model. Odds ratios with 95% prediction and confidence intervals are reported. Nine observational case control studies with a total of 12,273 participants (1272 runners) were included in the meta-analysis. Most of the included studies were rated as having a very high (n = 2) or high (n = 3) risk of bias on the Newcastle Ottawa Scale. There was no difference in knee osteoarthritis prevalence between runners and controls (OR = 0.97, 95% CI = 0.56 to 1.68). Runners undertaking 8-32.1 km (OR = 1.17, 95% CI = 0.77 to 1.80), 32.2-48 km (OR = 1.04, 95% CI = 0.48 to 2.31) or > 48 km per week (OR = 0.62, 95% CI = 0.35 to 1.10) did not exhibit higher knee osteoarthritis prevalence compared with controls. It is unclear whether running volume is associated with increased knee osteoarthritis prevalence, future large-scale, high quality prospective studies are required.	Course et arthrose

2023-03	2023-Konrad-The Relationship Between Lower Limb Passive Muscle and Tendon Compression Stiffness and Oxygen Cost During Running	Studies have reported that a stiff triceps surae muscle and tendon-aponeurosis and also a more compliant quadriceps muscle and tendon-aponeurosis, are related to lower oxygen cost during running. However, to date, no study has investigated in a single experiment how oxygen cost during running is related to the stiffness of the free tendons (Achilles tendon, patellar tendon) and all the superficial muscles of two major muscle groups for running (i.e., quadriceps, triceps surae). Thus, 17 male trained runners/triathletes participated in this study and visited the laboratory on three occasions. On the first day, the participants were familiarized with the tests. On the second day, the passive compression stiffness of the triceps surae muscle (i.e., gastrocnemii), Achilles tendon, quadriceps muscle (i.e., vastii, rectus femoris), and patellar tendon was non-invasively measured using a digital palpation device (MyotonPRO). In addition, an incremental test was applied to test the VO2max of the participants. Thereafter, in the third visit, after at least 48-h of rest, participants performed a 15-min run on the treadmill with a speed reflecting a velocity of 70% VO2max, to assess oxygen costs during running. The Spearman correlation showed a significant negative correlation between passive Achilles tendon compression stiffness and running oxygen consumption, with a large effect size (rρ = -0.52; CI (95%) -0.81 to -0.33; P = 0.03). Moreover, no further significant relationship between oxygen cost during running and the passive compression stiffness of the quadriceps muscle and patellar tendon, as well as the triceps surae muscle, was detected. The significant correlation indicates that a stiffer passive Achilles tendon can lead to a lower oxygen cost during running. Future studies will have to test the causality of this relationship with training methods such as strength training that are able to increase the Achilles tendon stiffness.	Stiffness et économie
2023-03	2023-Hernandez-Martinez-Warm-up stretching exercises and physical performance of youth soccer players	This study aims to compare the effects of standard warm-up versus warm-up using stretching exercises on the physical performance of male youth soccer players. Eighty-five male soccer players (age: 10.3 ± 4.3 years; body mass index: 19.8 ± 4.3 kg/m2) were assessed for countermovement jump height (CMJ, cm), 10 m, 20 m and 30 m running sprint speed (s) and ball kicking speed (km/h) for the dominant and non-dominant leg under five (randomized) warm-up conditions. Using 72 h of recovery between conditions, the participants completed a control condition (CC) and four experimental conditions, including static stretching (SSC), dynamic stretching (DSC), ballistic stretching (BSC), and proprioceptive neuromuscular facilitation (PNFC) exercises. All warm-up conditions had a duration of 10 minutes. The main results indicate that no significant differences ($p > 0.05$) were found between warm-up conditions compared to CC in CMJ (CC = 28.1 ± 4.9; SSC = 28.4 ± 4.9; DSC = 30.9 ± 4.8; BSC = 30.9 ± 5.2; PNFC = 28.4 ± 5.0), 10 m sprint (CC = 2.42 ± 0.4; SSC = 2.50 ± 0.4; DSC = 2.30 ± 0.3; BSC = 2.27 ± 0.3; PNFC = 2.53 ± 0.4), 20 m sprint (CC = 5.42 ± 0.9; SSC = 5.59 ± 0.9; DSC = 5.37 ± 0.9; BSC = 5.40 ± 0.9; PNFC = 5.44 ± 0.9), 30 m sprint (CC = 8.05 ± 1.3; SSC = 8.27 ± 1.3; DSC = 8.01 ± 1.3; BSC = 8.00 ± 1.3; PNFC = 8.12 ± 1.3), ball kicking speed for dominant (CC = 56.2 ± 4.9; SSC = 55.3 ± 5.2; DSC = 56.9 ± 5.8; BSC = 57.3 ± 5.8; PNFC = 55.7 ± 5.2) and non-dominant leg (CC = 52.8 ± 3.4; SSC = 51.8 ± 4.6; DSC = 53.5 ± 5.4; BSC = 53.6 ± 4.9; PNFC = 52.5 ± 4.0). In conclusion, compared to standard warm-up, stretching-based warm-up exerts no effect on male youth soccer players jump height, sprint speed and ball kicking speed.	Échauffement / stretching
2023-02	2023-Li-The Effect of Real-Time Tibial Acceleration Feedback on Running Biomechanics During Gait Retraining: A Systematic Review and Meta-Analysis	Objectives: To explore the immediate and retention effect of real-time tibial acceleration feedback on running biomechanics during gait retraining. Methods: Five electronic databases were searched to identify relevant studies published before May 2022. The included studies were evaluated for methodological quality and bias risk, and data were extracted. A meta-analysis was conducted on the primary outcomes, including peak tibial acceleration (PTA) and vertical ground reaction force. Subgroup analysis was performed by gender, feedback criterion, mode, dosage, fading, retention period, and running environment to evaluate the source of heterogeneity. Qualitative analysis was performed to describe other variables. Results: Fourteen studies (174 participants) were eligible. Meta-analysis showed that real-time tibial acceleration feedback reduced PTA ($P < .01$, $P < .01$), vertical impact peak ($P = .004$, $P < .01$), vertical average loading rate ($P < .01$, $P < .01$), and vertical instantaneous loading rate ($P < .01$, $P < .01$) after feedback and during retention period (5 min-12 mo). Subgroup analysis showed that the immediate effect of vertical impact peak was more noticeable with mixed gender ($P = .005$) and fading feedback ($P = .005$) conditions, and the retention effect of PTA was more noticeable with high feedback dosage ($P < .01$) and fading feedback ($P < .01$) conditions. Conclusions: Real-time tibial acceleration feedback can reduce PTA and vertical ground reaction force during gait retraining, and for periods of 5 minutes to 12 months when the feedback is removed.	Modifications patron course
2023-02	2023-Mills-Transitioning to Barefoot Running Using a Minimalist Shoe Intermediary: A Prospective Cohort Study	Objectives: To investigate the probability of runners successfully transitioning from running in a traditional shoe to barefoot. Second, to identify prognostic indicators of failure of transition to barefoot running. Methods: Over 20-weeks, 76 healthy runners (Female: 40, age: 35.04 years (SD 8.9), body weight: 69.9 kg (SD 13.4)) attempted to transition from running in traditional shoes to running barefoot. A minimalist shoe was utilised as an intermediary. Participants ran for 4-weeks exclusively in provided traditional shoes followed by 4-weeks of transitioning to minimalist shoes. This process was repeated to transition to barefoot running. Participants were followed until they withdrew from the study or successfully transitioned to running barefoot. A survival analysis examined the weeks of successful transition. Along with sex and age, baseline measures of traditional shoe overall comfort, footstrike pattern, midfoot width mobility and plantar foot pressure pain threshold were examined as prognostic variables for failure to transition using Cox regression. Results: The cumulative probability of successful transition to running barefoot was 70.8% (95% CI 61% to 83%). The primary footwear-related reason for withdrawal was pain, primarily in the foot (n = 7), two runners had confirmed injuries. Runners exhibiting a rearfoot strike pattern and higher midfoot width mobility were more likely to fail to transition (Hazard ratios (HR) 4.02, 95% CI 1.33 to 12.16 and HR 1.22, 95% CI 1.05 to 1.42). Conclusions: Most runners who wish to run barefoot will be able to transition. Our study indicates that there may be biomechanical and anatomical characteristics that are prognostic of failing to transition when using a 20-week transition period and an intermediary minimalist shoe. Whether a different transition process increases the probability of a success remains to be seen.	Transition chaussures MINI

2023-02	2023-Foch-Lower extremity kinematics during running and hip abductor strength in iliotibial band syndrome: A systematic review and meta-analysis	Background: Iliotibial band syndrome is a common overuse injury that is twice as likely to affect female runners compared to male runners. It is unclear if there is a consistent running pattern and strength profile exhibited by female and male runners with iliotibial band syndrome. Research question: The purpose of this systematic review and meta-analysis was to determine if any differences existed in lower-extremity kinematics and hip strength between runners who retrospectively, currently, or prospectively had iliotibial band syndrome. Methods: Papers included must have reported three-dimensional kinematic running data and/or hip strength data that were statistically analyzed between runners that never developed iliotibial band syndrome and runners with iliotibial band syndrome. Meta-analysis was performed for each kinematic or strength variable reported in at least three studies. Female and male runners were analyzed separately and grouped into three cohorts (retrospective, current, prospective). Results: Seventeen articles were included in this systematic review. Data from 10 cross-sectional studies were included for meta-analysis. Female runners with current iliotibial band syndrome exhibited smaller peak hip internal rotation angles and lower isometric hip abductor strength compared to controls. Significance: Although limited biomechanical evidence exists, risk factors for ITBS are different between female and male runners and may vary according to injury status. Specifically, transverse plane hip motion and hip abductor strength weakness may be biomechanical risk factors in female runners with current iliotibial band syndrome only.	Force et blessures (mauvaise étude)
2023-02	2023-Esculier-Running gait modifications can lead to immediate reductions in patellofemoral pain	Gait modifications are commonly advocated to decrease knee forces and pain in runners with patellofemoral pain (PFP). However, it remains unknown if clinicians can expect immediate effects on symptoms. Our objectives were (1) to compare the immediate effects of gait modifications on pain and kinetics of runners with PFP; (2) to compare kinetic changes in responders and non-responders; and (3) to compare the effects between rearfoot strikers (RFS) and non-RFS. Sixty-eight runners with PFP (42 women, 26 men) ran normally on a treadmill before testing six modifications: 1- increase step rate by 10%; 2- 180 steps per minute; 3- decrease step rate by 10%; 4- forefoot striking; 5- heel striking; 6- running softer. Overall, there were more responders (pain decreased ≥1/10 compared with normal gait) during forefoot striking and increasing step rate by 10% (both 35%). Responders showed greater reductions in peak patellofemoral joint force than non-responders during all conditions except heel striking. When compared with non-RFS, RFS reduced peak patellofemoral joint force in a significant manner ($P < 0.001$) during forefoot striking (partial $\eta 2 = 0.452$) and running softer (partial $\eta 2 = 0.302$). Increasing step rate by 10% reduced peak patellofemoral joint force in both RFS and non-RFS. Forty-two percent of symptomatic runners reported immediate reductions in pain during ≥1 modification, and 28% had reduced pain during ≥3 modifications. Gait modifications leading to decreased patellofemoral joint forces may be associated with immediate pain reductions in runners with PFP. Other mechanisms may be involved, given that some runners reported decreased symptoms regardless of kinetic changes.	Modifications patron course
2023-01	2023-Castellanos-Salamanca-Effects of the Nike ZoomX Vaporfly Next% 2 shoe on long-interval training performance, kinematics, neuromuscular parameters, running power and fatigue	We analyzed the effects of the Nike ZoomX Vaporfly (VPF) on long-interval training performance, kinematic parameters, running power and fatigue compared to a traditional running shoe. Twelve well-trained men (mean ± SD: 32.91 ± 7.50 years; 69.29 ± 7.55 kg and 172.73 ± 5.97 cm) performed two long-interval training sessions (5 × 1000 m with 90s recovery period) 7 days apart, with the VPF shoe or a traditional running shoe (CON) in random order. The countermovement jump (CMJ) height was measured before and after the training sessions and heart rate, spatiotemporal parameters, running power and leg stiffness was measured during training sessions. Running-related pain was assessed prior and post-24 h of each training session. Long-interval training performance improved 2.4% using the VPF shoe compared to CON ($p = 0.009$; ES = 0.482). Step length, contact time and leg stiffness were higher ($p < 0.05$; ES = 0.51, ES = 0.677, ES = 0.356) while flight time was lower ($p < 0.001$; ES = 0.756) when using VPF. Running power decreased in a similar way in both conditions throughout the training session. Vertical power was significantly higher in the VPF condition ($p = 0.023$, ES = 0.388). CMJ height decreased in both conditions after training (4.7 vs. 7.2%, for the VPF and control, respectively, $p < 0.001$; ES = 0.573), Finally, the perceived muscle pain was influenced by the shoe model condition (chi-square 5.042, $P = 0.025$). VPF shoes improved the long-interval training performance with similar running power, heart rate and neuromuscular fatigue, and reduced subjective perceived muscle pain compared to regular training shoes.	Chaussures et performance
2023-01	2023-Fokkema-Factors Associated With Running-Related Injuries in Recreational Runners With a History of Running Injuries	Objective: To identify the incidence and characteristics associated with a higher injury risk in recreational runners who suffered a running-related injury (RRI) in the previous 12 months. Design: Prospective cohort study among recreational runners who registered for a Dutch running event (5-42.2 km) and suffered an RRI in the 12 months before inclusion. Setting: Open population. Participants: Recreational runners with a previous reported injury. Assessment of risk factors: At baseline, information on demographics, training characteristics, health complaints, and RRI history was collected. Main outcome measures: With 3 follow-up questionnaires (2 weeks before, 1 day after, and 1 month after the running event), the occurrence of new RRIs was registered. Results: In total, 548 participants (55.1%) sustained a new RRI during follow-up. In total, 20.5% of the new RRIs was located at the same anatomical location as the previous RRI. Runners who registered for a marathon had a higher chance to sustain a new RRI [odd ratio (OR) 1.72; 95% confidence intervals (CIs), 1.17-2.53]. Also previous RRIs in the upper leg (OR 1.59; 95% CI, 1.15-2.19) and lower leg (OR 1.61; 95% CI, 1.18-2.21) were associated with an increased injury risk. Conclusions: Especially being a marathon runner and the anatomical location of previous RRIs seem to be associated with the injury risk in recreational runners with a previous RRI.	Facteurs risque blessures

2023-01	2023-Perrin-Increasing Shoe Longitudinal Bending Stiffness Is Not Beneficial to Reduce Energy Cost During Graded Running	Purpose: Carbon plates have been used to increase running shoes' longitudinal bending stiffness (LBS), leading to reductions in the energy cost of level running (Cr). However, whether or not this is true during uphill (UH) running remains unknown. The aim of our study was to identify the effect of LBS on Cr during UH running. Methods: Twenty well-trained male runners participated in this study. Cr was determined using gas exchange during nine 4-minute bouts performed using 3 different LBS shoe conditions at 2.22 and 4.44 m/s on level and 2.22 m/s UH (gradient: + 15%) running. All variables were compared using 2-way analyses of variance (LBS × speed/grade effects). Results: There was no significant effect of LBS ($F = 2.04$; $P = .14$, $\eta p2 = .11$) and no significant LBS × grade interaction ($F = 0.31$; $P = .87$, $\eta p2 = .02$). Results were characterized by a very large interindividual variability in response to LBS changes. Conclusions: The current study contributes to a growing body of literature reporting no effect of LBS on Cr during level and UH running. Yet, the very large interindividual differences in response to changes in LBS suggest that increasing shoe LBS may be beneficial for some runners.	Chaussures et performance (stiffness)
2023-01	2023-Desai-Effectiveness of an 18-week general strength and foam-rolling intervention on running-related injuries in recreational runners	Rationale: More research is needed to uncover the effectiveness of combined strength and foam-rolling interventions to prevent running-related injuries. Objectives: To evaluate effectiveness of an 18-week general strength and foam-rolling intervention on the incidence of running-related injuries. Method: This is an 18-week observational comparative study. A total of 433 recreational runners participated (n = 203 female). The intervention group (n = 228) performed general strength and foam-rolling exercises twice weekly for 18 weeks, the control group (n = 205) maintained their regular training habits. Running volume and running-related pain were reported weekly. Secondary analyses were performed on the subgroups of the intervention group based on compliance; low compliance (n = 100), intermediate compliance (n = 63), and high compliance (n = 65). Cumulative incidence proportions were calculated and time-to-event statistics were performed to compare survival times between groups. Univariate cox proportional hazards ratio was calculated to estimate the risk of running-related injuries at 18 weeks. Results: A total of 100 running-related injuries were sustained. The cumulative incidence proportion for the control and intervention groups was 27.1% (95% CI: 21.4-33.9) and 23.0% (95% CI: 17.8-29.4), respectively. No statistically significant difference was found between the overall intervention group and control group (log-rank $p = 0.31$). A significant difference existed between the high-compliance subgroup and the control group (log-rank $p = 0.00$). Highly compliant runners were 85% less likely (hazard rate ratio = 0.15; 95% CI: 0.05-0.46) to sustain an injury during the study compared with controls. Conclusion: Recreational runners highly compliant with the intervention were 85% less likely and took on average 57 days longer to sustain a running-related injury when compared with controls, with a cumulative incidence proportion of 4.6% after 18 weeks.	Renforcement et prévention blessures
2023-01	2023-Joubert-Effects of Highly Cushioned and Resilient Racing Shoes on Running Economy at Slower Running Speeds	Purpose: The Nike Vaporfly line of running shoes improves running economy by ∼2.7% to 4.2% at running speeds of 13 to 18 km·h-1. It is unclear whether similar benefits are conferred at slower speeds. Our purpose was to determine the effects of the Nike ZoomX Vaporfly Next% 2 (VFN2) on running economy at 10 and 12 km·h-1 compared with a mass-matched control (CTRL) shoe. Methods: Sixteen runners completed 4 × 5-minute trials at both 10 and 12 km·h-1 on the same day. Each shoe was tested twice at each speed in a counterbalanced, mirrored sequence. Data are displayed as mean (SD). Results: A 2-way repeated-measures analysis of variance showed a significant shoe × speed interaction for oxygen consumption ($P = .021$). At 12 km·h-1, oxygen consumption (in mL·kg-1·min-1) was lower (-1.4% [1.1%]; $P < .001$) for VFN2 (35.8 [1.7]) relative to CTRL (36.4 [1.7]). That was greater in magnitude than the differences observed at 10 km·h-1 (-0.9% [1.8%]; $P = .065$) between VFN2 (29.4 [1.9]) and CTRL (29.6 [1.9]). Conclusions: From these data, it appears that the VFN2 still enhances running economy at 10 and 12 km·h-1; however, these benefits are smaller in magnitude compared with previous research at faster speeds.	Chaussure et performance
2022-12	2022-Madsen-Anxiety state impact on recovery of runners with lower extremity injuries	This prospective cohort study examined the impact of high anxiety levels on psychological state and gait performance during recovery in runners with lower body injuries. Recreational runners diagnosed with lower body injuries who had reduced running volume (N = 41) were stratified into groups using State Trait Anxiety Inventory (STAI) scores: high anxiety (H-Anx; STAI ≥40 points) and low anxiety (L-Anx; STAI <40 points). Runners were followed through rehabilitation to return-to-run using monthly surveys. Main outcome measures included kinesiophobia (Tampa Scale of Kinesiophobia, TSK-11), Positive and Negative Affect Schedule (PANAS; Positive and negative scores), Lower Extremity Function Scale (LEFS), running recovery (University of Wisconsin Running Injury and Recovery Index [UWRI]) and CDC Healthy Days modules for general health, days of anxiety/tension, disrupted sleep and work/usual activities. Running biomechanics were assessed at baseline and the final visit using 3D motion capture and a force-plated treadmill. The time to return-to-running for was 5.0±3.1 and 7.9±4.1 months for L-Anx and H-Anx, respectively and participants who withdrew (n = 15) did so at 7.7±6.2 months. L-Anx maintained low anxiety and H-Anx reduced anxiety from baseline to final visit (STAI = 31.5 to 28.4 points, 50.4 to 37.8 points, respectively), whereas the withdrawn runners remained clinically anxious at their final survey (41.5 to 40.3 points; $p < .05$). Group by time interactions were found for PANAS positive, LEFS UWRI, general health scores, and days feeling worry, tension and anxiety (all $p < .05$). Final running performance in L-Anx compared to H-Anx was most improved with cadence (8.6% vs 3.5%; $p = .044$), impact loading rate [-1.9% vs +8.9%] and lower body stiffness [+14.1% vs +3.2%; all $p < .05$). High anxiety may identify runners who will experience a longer recovery process, health-related functional disruptions, and less optimization of gait biomechanics during rehabilitation after a lower extremity injury.	Facteurs psychosociaux

2022-12	2023-Wayner-Gait asymmetry and running-related injury in female collegiate cross-country runners	Background: Running biomechanics are commonly linked to injury. There is limited evidence on the effects of running speed on asymmetry and the prospective association of asymmetry and injury. The purposes of this study were to describe the degree in asymmetry in biomechanical variables commonly associated with injury, examine the effect of speed on asymmetry, and determine if there were any significant differences in pre-season measures of asymmetry between runners who went on to sustain an injury during the competitive season compared to those who remained healthy. Methods: Three-dimensional running biomechanics were obtained from twenty-two female collegiate cross-country runners at four different running speeds prior to their season. Asymmetry was quantified using the Symmetry Angle. Participants were followed over the twelve-week season and all time-loss injuries were identified. Findings: There was no significant effect of velocity on asymmetry. Additionally, there were no significant differences in symmetry between runners who sustained an injury (n = 7) and those that remained injury-free (n = 15) during the cross-country season. Interpretation: Clinicians working with runners should expect a high degree of symmetry in running biomechanics when performing gait analyses across running speeds. In regards to injury, caution should be used when linking injury to asymmetry.	Symétrie
2022-12	2022-Klingert-Exercise-Associated Hyponatremia in Marathon Runners	Exercise-associated hyponatremia (EAH) was first described as water intoxication by Noakes et al. in 1985 and has become an important topic linked to several pathological conditions. However, despite progressive research, neurological disorders and even deaths due to hyponatremic encephalopathy continue to occur. Therefore, and due to the growing popularity of exercise-associated hyponatremia, this topic is of great importance for marathon runners and all professionals involved in runners' training (e.g., coaches, medical staff, nutritionists, and trainers). The present narrative review sought to evaluate the prevalence of EAH among marathon runners and to identify associated etiological and risk factors. Furthermore, the aim was to derive preventive and therapeutic action plans for marathon runners based on current evidence. The search was conducted on PubMed, Scopus and Google Scholar using a predefined search algorithm by aggregating multiple terms (marathon run; exercise; sport; EAH; electrolyte disorder; fluid balance; dehydration; sodium concentration; hyponatremia). By this criterion, 135 articles were considered for the present study. Our results revealed that a complex interaction of different factors could cause EAH, which can be differentiated into event-related (high temperatures) and person-related (female sex) risk factors. There is variation in the reported prevalence of EAH, and two major studies indicated an incidence ranging from 7 to 15% for symptomatic and asymptomatic EAH. Athletes and coaches must be aware of EAH and its related problems and take appropriate measures for both training and competition. Coaches need to educate their athletes about the early symptoms of EAH to intervene at the earliest possible stage. In addition, individual hydration strategies need to be developed for the daily training routine, ideally in regard to sweat rate and salt losses via sweat. Future studies need to investigate the correlation between the risk factors of EAH and specific subgroups of marathon runners.	Hyponatrémie
2022-12	2023-Garcia-Hermoso-Adherence to aerobic and muscle-strengthening activities guidelines: a systematic review and meta-analysis of 3.3 million participants across 31 countries	Objective: To estimate the global prevalence of meeting the WHO guidelines for both aerobic and muscle-strengthening activities (MSA) in populations aged ≥5 years, and whenever possible to explore this prevalence according to sociodemographic and lifestyle factors. Design: A systematic review and meta-analysis. Data sources: Five databases were systematically searched for studies published from inception to September 2022. Eligibility criteria for selecting studies: Articles with representative samples aged ≥5 years reporting the prevalence of meeting both aerobic and MSA guidelines were included. Results: Twenty-one studies comprising 3 390 001 individuals from 31 countries were included. Overall adherence to the aerobic and MSA guidelines was 17.15% (95% CI 15.44% to 18.94%) in adults ≥18 years (n=3 337 603). Among adolescents aged 12-17 years, adherence to both guidelines was 19.45% (95% CI 16.34% to 22.75%) (n=52 398). No studies reported data for children aged 5-11 years. Women, older age, low/medium education levels, underweight or obesity, and poor and moderate self-rated health were associated with lower adherence to the physical activity guidelines ($p<0.001$) among adults, although the prevalence remained very low in all cases. Subgroup analyses were not conducted with children and adolescents due to a lack of studies. Conclusions: Only one out of five adolescents and adults met the recommended combined aerobic and MSA guidelines. Large-scale public health interventions promoting both types of exercise are needed to reduce the associated burden of non-communicable diseases.	Introduction

2022-12	2022-Milner-Biomechanics associated with tibial stress fracture in runners: A systematic review and meta-analysis	Background: Tibial stress fracture (TSF) is an overuse running injury with a long recovery period. While many running studies refer to biomechanical risk factors for TSF, only a few have compared biomechanics in runners with TSF to controls. The aim of this systematic review and meta-analysis was to evaluate biomechanics in runners with TSF compared to controls. Methods: Electronic databases PubMed, Web of Science, SPORTDiscus, Scopus, Cochrane, and CINAHL were searched. Risk of bias was assessed and meta-analysis conducted for variables reported in 3 or more studies. Results: The search retrieved 359 unique records, but only the 14 that compared runners with TSF to controls were included in the review. Most studies were retrospective, 2 were prospective, and most had a small sample size (5-30 per group). Many variables were not significantly different between groups. Meta-analysis of peak impact, active, and braking ground reaction forces found no significant differences between groups. Individual studies found larger tibial peak anterior tensile stress, peak posterior compressive stress, peak axial acceleration, peak rearfoot eversion and hip adduction in the TSF group. Conclusion: Meta-analysis indicated that discrete ground reaction force variables were not statistically significantly different in runners with TSF compared to controls. In individual included studies, many biomechanical variables were not statistically significantly different between groups. However, many were reported by only a single study, and sample sizes were small. We encourage additional studies with larger sample sizes of runners with TSF and controls and adequate statistical power to confirm or refute these findings.	VLR et blessures
2022-12	2023-Ribeiro-Lopes-How Much Does Sleep Deprivation Impair Endurance Performance? A Systematic Review and Meta-analysis	Sleep deprivation causes a moderate deleterious effect on endurance performance.Sleep deprivation similarly impairs endurance performance in untrained, recreationally-trained, and trained people, but its effect on well-trained and professional endurance athletes is unknown.One or more nights of partial sleep deprivation or one night of total sleep deprivation similarly compromise endurance performance. Uncertainties about the effect of more than one night of total sleep deprivation warrant more studies.Sleep deprivation impairs walking, running, and cycling endurance performance regardless of the exercise endpoint being unknown (i.e., incremental or constant load tests) or known (i.e., time trial tests) and assessment time. However, sleep deprivation causes a more deleterious effect on endurance performance in exercises lasting more than 30 min.	Sommeil
2022-11	2022-Augustine-Efficacy of an Audio-Based Biofeedback Intervention to Modify Running Gait in Female Runners	Context: A variety of gait retraining interventions are available to modify running mechanics associated with musculoskeletal injuries. These often require specialized equipment and/or personnel to prompt the runner toward specific strategies. Objective: To determine whether instructing female recreational runners to "run quietly" could decrease impact force characteristics. Design: Cohort. Setting: Research laboratory. Participants: Fifteen healthy female recreational runners (24 [7] y) volunteered. Interventions: Baseline testing occurred on day 1 (baseline), a posttraining assessment occurred on day 2 (training), and a final assessment occurred 1 week after training on day 3 (follow-up). A smartphone decibel measuring app was used to provide biofeedback on the decibel level of foot strike on day 2 (training). Main outcomes: Peak vertical force, impact transient, peak and average vertical loading rate, ground contact time, and running economy were collected on each day and compared via repeated-measures analyses of variance. Results: Vertical ground reaction force was lower at follow-up (2.30 bodyweights [BW]) versus baseline (2.39 BW, P = .023) and training (2.34 BW, P = .047). Maximal loading rate decreased from baseline (69.70 BW·s-1) to training (62.24 BW·s-1, P = .021) and follow-up (60.35 BW·s-1, P = .031). There was no change in running economy. Conclusions: Our findings demonstrate that simple instructions to "run quietly" can yield immediate and sustained reductions in impact force profiles, which do not influence running economy.	Gait retraining

2022-11	2022-Eihara-Heavy Resistance Training Versus Plyometric Training for Improving Running Economy and Running Time Trial Performance: A Systematic Review and Meta-analysis	Background: As an adjunct to running training, heavy resistance and plyometric training have recently drawn attention as potential training modalities that improve running economy and running time trial performance. However, the comparative effectiveness is unknown. The present systematic review and meta-analysis aimed to determine if there are different effects of heavy resistance training versus plyometric training as an adjunct to running training on running economy and running time trial performance in long-distance runners. Methods: Electronic databases of PubMed, Web of Science, and SPORTDiscus were searched. Twenty-two studies completely satisfied the selection criteria. Data on running economy and running time trial performance were extracted for the meta-analysis. Subgroup analyses were performed with selected potential moderators. Results: The pooled effect size for running economy in heavy resistance training was greater (g = - 0.32 [95% confidence intervals [CIs] - 0.55 to - 0.10]: effect size = small) than that in plyometric training (g = -0.13 [95% CIs - 0.47 to 0.21]: trivial). The effect on running time trial performance was also larger in heavy resistance training (g = - 0.24 [95% CIs - 1.04 to - 0.55]: small) than that in plyometric training (g = - 0.17 [95% CIs - 0.27 to - 0.06]: trivial). Heavy resistance training with nearly maximal loads (≥ 90% of 1 repetition maximum [1RM], g = - 0.31 [95% CIs - 0.61 to - 0.02]: small) provided greater effects than those with lower loads (< 90% 1RM, g = - 0.17 [95% CIs - 1.05 to 0.70]: trivial). Greater effects were evident when training was performed for a longer period in both heavy resistance (10-14 weeks, g = - 0.45 [95% CIs - 0.83 to - 0.08]: small vs. 6-8 weeks, g = - 0.21 [95% CIs - 0.56 to 0.15]: small) and plyometric training (8-10 weeks, g = 0.26 [95% CIs - 0.67 to 0.15]: small vs. 4-6 weeks, g = - 0.06 [95% CIs 0.67 to 0.55]: trivial). Conclusions: Heavy resistance training, especially with nearly maximal loads, may be superior to plyometric training in improving running economy and running time trial performance. In addition, running economy appears to be improved better when training is performed for a longer period in both heavy resistance and plyometric training.	Renforcement et performance
2022-11	2022-Warden-Not all bone overuse injuries are stress fractures: it is time for updated terminology	No abstract.	Fractures de stress
2022-11	2022-Coburn-Is running good or bad for your knees? A systematic review and meta-analysis of cartilage morphology and composition changes in the tibiofemoral and patellofemoral joints	Background: The general health benefits of running are well-established, yet concern exists regarding the development and progression of osteoarthritis. Aim: To systematically review the immediate (within 20 minutes) and delayed (20 minutes to 48 hours) effect of running on hip and knee cartilage, as assessed using magnetic resonance imaging (MRI). Method: Studies using MRI to measure change in hip or knee cartilage within 48 hours pre- and post-running were identified. Risk of bias was assessed using a modified Newcastle-Ottawa Scale. Percentage change in cartilage outcomes were estimated using random-effects meta-analysis. Certainty of evidence was evaluated with the Grading of Recommendations Assessment, Development and Evaluation tool. Results: Twenty-four studies were included, evaluating 446 knees only. One third of studies were low risk of bias. Knee cartilage thickness and volume decreased immediately after running, with declines ranging from 3.3% (95% confidence interval [CI]: 2.6%, 4.1%) for weight-bearing femoral cartilage volume to 4.9% (95% CI: 4.43.6%, 6.2%) for patellar cartilage volume. T1ρ and T2 relaxation times were also reduced immediately after running, with the largest decline being 13.1% (95% CI: -14.4%, -11.7%) in femoral trochlear cartilage. Tibiofemoral cartilage T2 relaxation times recovered to baseline levels within 91 minutes. Existing cartilage defects were unchanged within 48 hours post-run. Conclusions: There is very low certainty evidence that running immediately decreases the thickness, volume, and relaxation times of patellofemoral and tibiofemoral cartilage. Hip cartilage changes are unknown, but knee changes are small and appear transient suggesting that a single bout of running is not detrimental to knee cartilage.	Course et arthrose
2022-11	2022-Esculier-Recreational running is not bad for healthy people's joints - it is time to study the safety of running in people with osteoarthritis	The body of research investigating the effects of running on lower-limb joint health has grown steadily in conjunction with the rapidly increasing prevalence of symptomatic knee osteoarthritis. This work is vital, considering the major physical and psychological health benefits of running, and the high participation rates. There is a widespread belief that running is detrimental to kneejoint health, possibly due to high impact forces while running, alongside high rates of knee injury among runners. A survey of 502 members of the general public and 329 healthcare professionals in Canada4 found that both groups were often uncertain whether running participation increased or decreased the likelihood of developing knee osteoarthritis. Around half of the respondents were also uncertain whether people with knee osteoarthritis who keep running would increase their pain levels, or accelerate the need for knee-joint replacement surgery.	Course et arthrose

2022-11	2022-DeJong Lempke-Sensor-based gait training to reduce contact time for runners with exercise-related lower leg pain: a randomised controlled trial	Objectives To assess the effects of a 4-week randomised controlled trial comparing an outdoor gait-training programme to reduce contact time in conjunction with home exercises (contact time gait-training feedback with home exercises (FBHE)) to home exercises (HEs) alone for runners with exercise-related lower leg pain on sensor-derived biomechanics and patient-reported outcomes. Design Randomised controlled trial. Setting Laboratory and field-based study. Participants 20 runners with exercise-related lower leg pain were randomly allocated into FBHE (4 male (M), 6 female (F), 23±4 years, 22.0±4.3 kg/m2) or HE groups (3 M, 7 F, 25±5 years, 23.6±3.9 kg/m2). Interventions Both groups completed eight sessions of HEs over 4 weeks. The FBHE group received vibrotactile feedback through wearable sensors to reduce contact time during outdoor running. Primary and secondary outcome measures Patient-reported outcome measures (PROMs) and outdoor gait assessments were conducted for both groups at baseline and 4 weeks. PROMs were repeated at 6 weeks, and feedback retention was assessed at 6 weeks for the FBHE group. Repeated measures analyses of variance were used to assess the influence of group and timepoint on primary outcomes. Results The FBHE group reported increased function and recovery on PROMs beyond the HE group at 6 weeks ($p<0.001$). There was a significant group by time interaction for Global Rating of Change ($p=0.004$) and contact time ($p=0.002$); the FBHE group reported greater subjective improvement and reduced contact time at 4 and 6 weeks compared with the HE group and compared with baseline. The FBHE group had increased cadence (mean difference: 7 steps/min, $p=0.01$) at 4 weeks during outdoor running compared with baseline. Conclusion FBHE was more effective than HE alone for runners with exercise-related lower leg pain, manifested with improved PROMs, reduced contact time and increased cadence.	Modifications patron course
2022-11	2022-Xu-The Effects of Minimalist Shoes on Plantar Intrinsic Foot Muscle Size and Strength: A Systematic Review	Minimalist shoes are proposed to prevent injury and enhance performance by strengthening intrinsic foot muscles, yet there is little consensus on the effectiveness of minimalist shoes in increasing muscle strength or size. This systematic review assesses using minimalist shoes as an intervention on changes in plantar intrinsic foot muscle size and strength. PubMed, CINHAL, Scopus, and SPORT Discus were systematically searched for articles from January 2000 to March 2022. Studies were included if they had an intervention of at least 2 weeks with a control group and examined the effect of minimalist shoes on plantar intrinsic foot strength or size (either volume, cross-sectional area, or thickness). Nine studies were included. There were significant increases and percent changes in foot muscle strength, volume, cross-sectional area, and thickness. Strength increased between 9-57%, and size increased between 7.05-10.6%. Minimalist shoes may effectively increase intrinsic foot muscle size and strength in healthy individuals, and they may also be more convenient than implementing time-intensive physical therapy programs. Future research is needed to explore using minimalist shoes as an intervention in clinical populations who would benefit from increased IFM strength and function. It will also be vital to improve upon IFM assessment methods.	Chaussures et force pied
2022-10	2022-Taylor-Haas-Cadence in youth long-distance runners is predicted by leg length and running speed	Background: Lower cadence has been previously associated with injury in long-distance runners. Variations in cadence may be related to experience, speed, and anthropometric variables. It is unknown what factors, if any, predict cadence in healthy youth long-distance runners. Research question: Are demographic, anthropometric and/or biomechanical variables able to predict cadence in healthy youth long-distance runners. Methods: A cohort of 138 uninjured youth long-distance runners (M = 62, F = 76; Mean ± SD; age = 13.7 ± 2.7; mass = 47.9 ± 13.6 kg; height = 157.9 ± 14.5 cm; running volume = 19.2 ± 20.6 km/wk; running experience: males = 3.5 ± 2.1 yrs, females = 3.3 ± 2.0 yrs) were recruited for the study. Multiple linear regression (MLR) models were developed for total sample and for each sex independently that only included variables that were significantly correlated to self-selected cadence. A variance inflation factor (VIF) assessed multicollinearity of variables. If VIF≥ 5, variable(s) were removed and the MLR analysis was conducted again. Results: For all models, VIF was > 5 between speed and normalized stride length, therefore we removed normalized stride length from all models. Only leg length and speed were significantly correlated ($p < .001$) with cadence in the regression models for total sample ($R2 = 51.9$ %) and females ($R2 = 48.2$ %). The regression model for all participants was Cadence = -1.251 *Leg Length + 3.665 *Speed + 254.858. The regression model for females was Cadence = -1.190 *Leg Length + 3.705 *Speed + 249.688. For males, leg length, cadence, and running experience were significantly predictive ($p < .001$) of cadence in the model ($R2 = 54.7$ %). The regression model for males was Cadence = -1.268 *Leg Length + 3.471 *Speed - 1.087 *Running Experience + 261.378. Significance: Approximately 50 % of the variance in cadence was explained by the individual's leg length and running speed. Shorter leg lengths and faster running speeds were associated with higher cadence. For males, fewer years of running experience was associated with a higher cadence.	Cadence et biomec

2022-10	2023-Darendeli-Comparison of EMG Activity in Leg Muscles between Overground and Treadmill Running	Introduction: Treadmills have been widely used for training and performance testing during which the treadmill grade is usually set to 0-2% grade. The purpose of our study was to compare the level of activation of lower body muscles when running at two speeds in an overground condition and on a treadmill at 0%, 1%, and 2% grades. Methods: We recorded electromyography (EMG) data of 8 lower body muscles from 13 recreationally active individuals during overground and treadmill running at 2.92 and 4.58 m.s-1. Maximal voluntary contraction (MVC) tests were performed (3 × 6 s) to identify maximal torque and EMG values. The stride cycles, from one footstrike to the next, were identified using a pair of triaxial accelerometers. A 2-way repeated measures ANOVA was used to examine the differences in EMG activity across running conditions and speeds. Cohen's d effect size was calculated to indicate the difference between the overground and treadmill running conditions. Results: The effect sizes were moderate to negligible for differences between the EMG integral values for overground running and the three treadmill grades. The coefficient of variation for stride time during overground running was significantly larger than that of the treadmill running at 4.58 m.s-1. Conclusions: The results showed that the overall EMG profiles of the thigh and shank muscles were similar for the overground and treadmill conditions, but the similarity was greatest for thigh muscles when running on the treadmill at 1% grade and for shank muscles at 2% grade. The variability in stride time was greater during overground running than when running on a treadmill and was associated with elevated EMG activity of some muscles.	Treadmill vs. overground
2022-10	2022-Konrad-Quadriceps or triceps surae proprioceptive neuromuscular facilitation stretching with post-stretching dynamic activities does not induce acute changes in running economy	Previous studies reported that both a more compliant quadriceps tendon and a stiffer Achilles tendon are associated with better running economy. While tendon stiffness can be decreased by a single bout of proprioceptive neuromuscular facilitation (PNF), post-stretching dynamic activities (PSA) can counteract the potential stretch-induced force loss. Thus, the purpose of this study was to investigate if a single, moderate duration, (4 × 15 s), bout of PNF stretching of either the quadriceps or triceps surae muscles followed each by PSA, causes either an improvement or impairment in running economy. Eighteen trained male runners/triathletes visited the laboratory five times. The first two visits were to familiarize the participants and to test for maximal oxygen consumption (VO2max) respectively. The further three appointments were randomly assigned to either 1.) quadriceps PNF stretching + PSA or 2.) triceps surae PNF stretching + PSA or 3.) no stretching + PSA. Following the interventions, participants performed a 15-min run on the treadmill with a speed reflecting a velocity of 70% VO2max to assess oxygen consumption (i.e., running economy) and running biomechanics. Our results showed neither a difference in oxygen consumption ($p = 0.15$) nor a change in any variable of the running biomechanics ($p > 0.33$) during the steady-state (i.e., last 5 min) of the 15-min run. Athletes can perform moderate duration PNF stretching of the quadriceps or triceps surae + PSA prior to a running event, without affecting running economy. Future studies should emphasize long-term training effects on tendon stiffness adaptations and running economy.	Stretching
2022-10	2022-Mason-Wearables for Running Gait Analysis: A Systematic Review	Background: Running gait assessment has traditionally been performed using subjective observation or expensive laboratory-based objective technologies, such as three-dimensional motion capture or force plates. However, recent developments in wearable devices allow for continuous monitoring and analysis of running mechanics in any environment. Objective measurement of running gait is an important (clinical) tool for injury assessment and provides measures that can be used to enhance performance. Objectives: We aimed to systematically review the available literature investigating how wearable technology is being used for running gait analysis in adults. Methods: A systematic search of the literature was conducted in the following scientific databases: PubMed, Scopus, Web of Science and SPORTDiscus. Information was extracted from each included article regarding the type of study, participants, protocol, wearable device(s), main outcomes/measures, analysis and key findings. Results: A total of 131 articles were reviewed: 56 investigated the validity of wearable technology, 22 examined the reliability and 77 focused on applied use. Most studies used inertial measurement units (n = 62) [i.e. a combination of accelerometers, gyroscopes and magnetometers in a single unit] or solely accelerometers (n = 40), with one using gyroscopes alone and 31 using pressure sensors. On average, studies used one wearable device to examine running gait. Wearable locations were distributed among the shank, shoe and waist. The mean number of participants was 26 (± 27), with an average age of 28.3 (± 7.0) years. Most studies took place indoors (n = 93), using a treadmill (n = 62), with the main aims seeking to identify running gait outcomes or investigate the effects of injury, fatigue, intrinsic factors (e.g. age, sex, morphology) or footwear on running gait outcomes. Generally, wearables were found to be valid and reliable tools for assessing running gait compared to reference standards. Conclusions: This comprehensive review highlighted that most studies that have examined running gait using wearable sensors have done so with young adult recreational runners, using one inertial measurement unit sensor, with participants running on a treadmill and reporting outcomes of ground contact time, stride length, stride frequency and tibial acceleration. Future studies are required to obtain consensus regarding terminology, protocols for testing validity and the reliability of devices and suitability of gait outcomes.	Analyse biomécanique terrain

2022-10	2022-Shen-Effects of a 12-week gait retraining program combined with foot core exercise on morphology, muscle strength, and kinematics of the arch: A randomized controlled trial	Objective: This study aims to explore the effects of a 12-week gait retraining program combined with foot core exercise on arch morphology, arch muscles strength, and arch kinematics. Methods: A total of 26 male recreational runners with normal arch structure who used rear-foot running strike (RFS) were divided into the intervention group (INT group) and control group (CON group) (n = 13 in each group). The INT group performed a 12-week forefoot strike (FFS) training combined with foot core exercises. The CON group did not change the original exercise habit. Before and after the intervention, the arch morphology, as well as the strength of hallux flexion, lesser toe flexion, and the metatarsophalangeal joint (MPJ) flexors were measured in a static position, and changes in the arch kinematics during RFS and FFS running were explored. Results: After a 12-week intervention, 1) the normalized navicular height increased significantly in the INT group by 5.1% ($p = 0.027$, Cohen's $d = 0.55$); 2) the hallux absolute flexion and relative flexion of the INT group increased significantly by 20.5% and 21.7%, respectively ($p = 0.001$, Cohen's $d = 0.59$; $p = 0.001$, Cohen's $d = 0.73$), the absolute and relative strength of the MPJ flexors of the INT group were significantly improved by 30.7% and 32.5%, respectively ($p = 0.006$, Cohen's $d = 0.94$; $p = 0.006$, Cohen's $d = 0.96$); 3) and during RFS, the maximum arch angle of the INT group declined significantly by 5.1% ($p < 0.001$, Cohen's $d = 1.49$), the arch height at touchdown increased significantly in the INT group by 32.1% ($p < 0.001$, Cohen's $d = 1.98$). Conclusion: The 12-week gait retraining program combined with foot core exercise improved the arch in both static and dynamic positions with a moderate to large effect size, demonstrating the superiority of this combined intervention over the standalone interventions. Thus, runners with weak arch muscles are encouraged to use this combined intervention as an approach to enhance the arch.	FFS / FiveFingers effects on foot morphology
2022-10	2022-Pamboris-Influence of dynamic stretching on ankle joint stiffness, vertical stiffness and running economy during treadmill running	The purpose of the present study was to investigate whether and how dynamic stretching of the plantarflexors may influence running economy. A crossover design with a minimum of 48 h between experimental (dynamic stretching) and control conditions was used. Twelve recreational runners performed a step-wise incremental protocol to the limit of tolerance on a motorised instrumented treadmill. The initial speed was 2.3 m/s, followed by increments of 0.2 m/s every 3 min. Dynamic joint stiffness, vertical stiffness and running kinematics during the initial stage of the protocol were calculated. Running economy was evaluated using online gas-analysis. For each participant, the minimum number of stages completed before peak O2 uptake ($\dot{V}O2peak$) common to the two testing conditions was used to calculate the gradient of a linear regression line between $\dot{V}O2$ (y-axis) and speed (x-axis). The number of stages, which ranged between 4 and 8, was used to construct individual subject regression equations. Non-clinical forms of magnitude-based decision method were used to assess outcomes. The dynamic stretching protocol resulted in a possible decrease in dynamic ankle joint stiffness (-10.7%; 90% confidence limits ±16.1%), a possible decrease in vertical stiffness (-2.3%, ±4.3%), a possibly beneficial effect on running economy (-4.0%, ±8.3%), and very likely decrease in gastrocnemius medialis muscle activation (-27.1%, ±39.2%). The results indicate that dynamic stretching improves running economy, possibly via decreases in dynamic joint and vertical stiffness and muscle activation. Together, these results imply that dynamic stretching should be recommended as part of the warm-up for running training in recreational athletes examined in this study.	Stretching
2022-10	2022-Esculier-Do the General Public and Health Care Professionals Think That Running Is Bad for the Knees? A Cross-sectional International Multilanguage Online Survey	Background: Running is a popular sport with widely recognized health benefits. Given the high rates of knee injury in runners and the growing prevalence of knee osteoarthritis (KOA), it may be useful to assess perceptions about running and knee joint health. Purpose: The objectives of this study were to (1) explore and compare the perceptions of the general public (PUB) and health care professionals (HCPs) on the topic of running and knee health and (2) explore recommendations about running and knee health provided by HCPs. Study design: Cross-sectional study. Methods: We conducted an online survey between June 18 and October 1, 2020. The questionnaire included questions on running and knee health, and HCPs were asked about their typical recommendations and level of confidence in providing recommendations on the topic. Perceptions (proportions) were compared between the PUB and HCPs using the chi-square test. Results: In total, 4521 responses (PUB, n = 2514; HCPs, n = 2007) were analyzed. A greater proportion of HCPs perceived regular running as healthy for knees (86% vs 68%; $P < .001$). More of the PUB than HCPs ($P < .001$) believed that running frequently (29% vs 13%), long distances (54% vs 45%), and on hard surfaces (60% vs 36%) increased the risk of developing KOA. Running for those with KOA was perceived by the PUB as posing an increased risk of getting more knee pain (48%) and needing joint replacement surgery (38%), more so than by HCPs (26% and 17%, respectively). The majority of HCPs reported being relatively confident in providing evidence-based recommendations about running and knee health and mostly recommended that runners with KOA modify training parameters instead of quit. Conclusion: More HCPs perceived running as healthy for knees when compared with the PUB. Most HCPs felt confident in providing evidence-based recommendations about running and knee health.	Course et arthrose

2022-10	2022-Venable-Relationships between Running Biomechanics, Hip Muscle Strength, and Running-Related Injury in Female Collegiate Cross-country Runners	Background: Female collegiate cross-country (XC) runners have a high incidence of running-related injury (RRI). Limited reports are available that have examined potential intrinsic factors that may increase RRI risk in this population. Purpose: To examine the relationships between RRI, hip muscle strength, and lower extremity running kinematics in female collegiate XC runners. Study design: Prospective observational cohort. Methods: Participants included twenty female NCAA collegiate XC runners from Southern California universities who competed in the 2019-20 intercollegiate season. A pre-season questionnaire was used to gather demographic information. Hip muscle strength was measured with isokinetic dynamometry in a sidelying open-chain position and normalized by the runner's body weight (kg). Running kinematic variables were examined using Qualisys 3D Motion Capture and Visual 3D analysis. RRI occurrence was obtained via post-season questionnaires. Independent t-tests were used to determine mean differences between injured and non-injured runners for hip abductor muscle strength and selected running kinematics. Pearson correlation coefficients were calculated to examine relationships between hip muscle performance and kinematic variables. Results: End-of-the-season RRI information was gathered from 19 of the 20 participants. During the 2019-20 XC season, 57.9% (11 of 19) of the runners sustained an RRI. There were no significant differences between mean hip abductor normalized muscle strength (p=0.76) or mean normalized hip muscle strength asymmetry (p=0.18) of injured and non-injured runners during the XC season. Similarly, no significant differences were found between mean values of selected kinematic variables of runners who did and who did not report an RRI. Moderate relationships were found between hip abductor strength variables and right knee adduction at footstrike (r=0.50), maximum right knee adduction during stance (r=0.55), left supination at footstrike (r=0.48), right peak pronation during stance (r=-0.47), left supination at footstrike (r=0.51), and right peak pronation during stance (r=-0.54) (all p≤0.05). Conclusions: Hip abduction muscle strength, hip abduction strength asymmetry, and selected running kinematic variables were not associated with elevated risk of RRI in female collegiate XC runners.	Force vs. blessures
2022-10	2022-Dillon-Are impact accelerations during treadmill running representative of those produced overground?	Background: Although many runners train overground, measuring impact accelerations on a treadmill may be advantageous for researchers and clinicians. Previous investigations of peak and rate of acceleration (peakaccel, rateaccel) during treadmill running compared to overground running have not examined both the relative consistency and absolute agreement of these measures, or the effect of treadmill stiffness. Research question: (1) Are peakaccel and rateaccel produced during running on a stiff and less stiff treadmill 'representative' of those produced during overground running? (2) Are peakaccel and rateaccel measured on treadmills of different stiffness 'representative' of each other? Methods: Eighteen participants ran at a self-selected pace on three surfaces: Treadmill 1 (reduced stiffness), Treadmill 2 (increased stiffness) and overground on asphalt, whilst peakaccel and rateaccel were recorded at the shank and lower back. Relative consistency (ICC (3,1)), absolute agreement (Bland-Altman analysis) and systematic differences (ANOVA/Friedman's Tests) were assessed. Results: ICCs revealed moderate to excellent relative consistency in peakaccel and rateaccel between surfaces, with higher consistency for measures at the lower back. Absolute agreement was low, with the Bland Altman limits of agreement exceeding the clinical acceptable range for all comparisons. For systematic differences in means, peakaccel and rateaccel at the shank were significantly higher overground than on either treadmill; with no difference evident at the lower back. No differences were found for surface with respect to shank or lower back peakaccel and rateaccel between treadmills. Significance: Moderate to excellent relative consistency of peakaccel and rateaccel between the surfaces suggests that using different surfaces in research involving rank ordering of participants by acceleration magnitude may be acceptable (e.g. prospective studies examining if impact accelerations are related to injury). However, low absolute agreement indicates that data collected on treadmills of different stiffness and overground should not be used interchangeably (e.g. running-retraining studies).	Treadmill vs. overground
2022-09	2022-Beltran-The Influence of Footwear Longitudinal Bending Stiffness on Running Economy and Biomechanics in Older Runners	Purpose: This study assessed the effects of footwear longitudinal bending stiffness on running economy and biomechanics of rearfoot striking older runners. Methods: Nine runners over 60 years of age completed two running bouts at their preferred running pace in each of three footwear conditions: low (4.4 ± 1.8 N·m-1), moderate (5.7 ± 1.7 N·m-1), and high (6.4 ± 1.6 N·m-1) bending stiffness. Testing order was randomized and a mirror protocol was used (i.e., A,B,C,C,B,A). Expired gases, lower limb kinematics, and ground reaction forces were collected simultaneously and lower limb joint kinetics, running economy (i.e., VO2), leg stiffness, and spatio-temporal variables were calculated. Results: Running economy was not different among stiffness conditions (p = 0.60, p = 0.53 [mass adjusted]). Greater footwear stiffness reduced step length (p = 0.046) and increased peak vertical ground reaction force (p = 0.019) but did not change peak ankle plantarflexor torque (p = 0.65), peak positive ankle power (p = 0.48), ankle positive work (p = 0.86), propulsive force (p = 0.081), and leg stiffness (p = 0.46). Moderate footwear stiffness yielded greater peak negative knee power compared to low (p = 0.04) and high (p = 0.03) stiffness. Conclusions: These novel findings demonstrate that increasing footwear longitudinal bending stiffness using flat carbon fiber inserts does not improve running economy and generally does not alter lower limb joint mechanics of rearfoot strike runners over 60 years. Future studies should investigate how other footwear characteristics (e.g., midsole material, plate location, and sole curvature) influence economy and biomechanics in this population.	Plaques carbone

2022-09	2022-Hensley-Reliability and validity of 2-dimensional video analysis for a running task: A systematic review	Objective: Evaluate the reliability and validity of 2-dimensional (2D) video-based motion analysis during running. Methods: A systematic search of MEDLINE, Cochrane Library, EMBASE, CINAHL, PEDro, SPORTDiscus, and IEEE Xplore was conducted in March 2020 and updated in May 2021. We included studies assessing reliability and/or validity of 2D video-based motion analysis (gold standard: 3D motion analysis) during running. Results: 11 studies (251 runners; mean age range: 18.7-37.0 years; 57.4% female; 63.7% injury-free) met inclusion criteria. Eight studies examined kinematics of the pelvis/hip, eight of the knee, and six of the ankle/foot. Low-to-moderate risk of bias was present in all studies. Heterogeneous study designs, measurement methods, and statistical approaches across studies precluded statistical synthesis. Intrarater reliability [Interclass correlation coefficient (ICC) range: 0.56-1.00; kappa range: 0.49-0.81] was better than interrater reliability (ICC range: 0.31-1.00; kappa range 0.00-0.85). ICC values for validity were poor to good (0.06-0.89). One study examining foot strike pattern found good to excellent validity (using Gwet AC statistics) when movement kinematics were categorized. Conclusions: A wide range of methods were reported in 2D video-based motion analysis of joint angular kinematics during a running task. Further research to develop standardized 2D video-based motion analysis for running is needed. Categorizing movement patterns may be more useful than angularly quantifying joint kinematics.	Évaluation course
2022-09	2022-Toresdahl-Training patterns associated with injury in New York City Marathon runners	Objective: Training patterns are commonly implicated in running injuries. The purpose of this study was to measure the incidence of injury and illness among marathon runners and the association of injuries with training patterns and workload. Methods: Runners registered for the New York City Marathon were eligible to enrol and prospectively monitored during the 16 weeks before the marathon, divided into 4-week 'training quarters' (TQ) numbered TQ1-TQ4. Training runs were tracked using Strava, a web and mobile platform for tracking exercise. Runners were surveyed at the end of each TQ on injury and illness, and to verify all training runs were recorded. Acute:chronic workload ratio (ACWR) was calculated by dividing the running distance in the past 7 days by the running distance in the past 28 days and analysed using ratio thresholds of 1.3 and 1.5. Results: A total of 735 runners participated, mean age 41.0 (SD 10.7) and 46.0% female. Runners tracked 49 195 training runs. The incidence of injury during training was 40.0% (294/735), and the incidence of injury during or immediately after the marathon was 16.0% (112/699). The incidence of illness during training was 27.2% (200/735). Those reporting an initial injury during TQ3 averaged less distance/week during TQ2 compared with uninjured runners, 27.7 vs 31.9 miles/week (p=0.018). Runners reporting an initial injury during TQ1 had more days when the ACWR during TQ1 was ≥1.5 compared with uninjured runners (injured IQR (0-3) days vs uninjured (0-1) days, p=0.009). Multivariable logistic regression for training injuries found an association with the number of days when the ACWR was ≥1.5 (OR 1.06, 95% CI (1.02 to 1.10), p=0.002). Conclusion: Increases in training volume ≥1.5 ACWR were associated with more injuries among runners training for a marathon. These findings can inform training recommendations and injury prevention programmes for distance runners.	ACWR
2022-09	2022-Massie-The Effects of Cadence Manipulation on Joint Kinetic Patterns and Stride-to-Stride Kinetic Variability in Female Runners	Altering running cadence is commonly done to reduce the risk of running-related injury/reinjury. This study examined how altering running cadence affects joint kinetic patterns and stride-to-stride kinetic variability in uninjured female runners. Twenty-four uninjured female recreational runners ran on an instrumented treadmill with their typical running cadence and with a running cadence that was 7.5% higher and 7.5% lower than typical. Ground reaction force and kinematic data were recorded during each condition, and principal component analysis was used to capture the primary sources of variability from the sagittal plane hip, knee, and ankle moment time series. Runners exhibited a reduction in the magnitude of their knee extension moments when they increased their cadence and an increase in their knee extension moments when they lowered their cadence compared with when they ran with their typical cadence. They also exhibited greater stride-to-stride variability in the magnitude of their hip flexion moments and knee extension moments when they deviated from their typical running cadence (ie, running with either a higher or lower cadence). These differences suggest that runners could alter their cadence throughout a run in an attempt to limit overly repetitive localized tissue stresses.	Cadence
2022-09	2022-Bonacci-The effect of footwear on mechanical behaviour of the human ankle plantar-flexors in forefoot runners	Purpose: To compare the ankle plantar-flexor muscle-tendon mechanical behaviour during barefoot and shod forefoot running. Methods: Thirteen highly trained forefoot runners performed five overground steady-state running trials (4.5 ± 0.5 m.s-1) while barefoot and shod. Three-dimensional kinematic and ground reaction force data were collected and used as inputs for musculoskeletal modelling. Muscle-tendon behaviour of the ankle plantar-flexors (soleus; medial gastrocnemius; and lateral gastrocnemius) were estimated across the stance phase and compared between barefoot and shod running using a two-way multivariate analysis of variance. Results: During barefoot running peak muscle-tendon unit (MTU) power generation was 16.5% ($p = 0.01$) higher compared to shod running. Total positive MTU work was 18.5% ($p = 0.002$) higher during barefoot running compared to shod running. The total sum of tendon elastic strain energy was 8% ($p = 0.036$) greater during barefoot compared to shod running, however the relative contribution of tendon and muscle fibres to muscle-tendon unit positive work was not different between conditions. Conclusion: Barefoot forefoot running demands greater muscle and tendon work than shod forefoot running, but the relative contribution of tendon strain energy to overall muscle-tendon unit work was not greater.	Chaussures vs pieds nus

2022-09	2022-Chen-Effects of footwear with different longitudinal bending stiffness on biomechanical characteristics and muscular mechanics of lower limbs in adolescent runners	Background: Running shoes with carbon plates have been identified to have positive effects on improving running performance from a biomechanical perspective. However, the specific difference between the effects of carbon plates with different longitudinal bending stiffness (LBS)on biomechanical characteristics and muscular mechanics of lower limbs in adolescent runners remains unclear. This study aimed to identify the difference in biomechanical characteristics and muscular mechanics in lower limbs during running stance phases between wearing shoes with low longitudinal bending stiffness (Llbs) and high longitudinal bending stiffness (Hlbs) carbon plates in adolescent runners. Methods: 10 male adolescent runners with a habit of daily running exercise (age: 13.5 ± 0.6 years; height: 166.3 ± 1.9 cm; bodyweight: 50.8 ± 3.1 kg; foot length: 25.4 ± 0.2 cm) were recruited and asked to conduct two times of tests by wearing shoes with Llbs and Hlbs carbon plates in a randomized order. Paired t-test and statistical parametric mapping (SPM) analysis were used to identify the difference in biomechanical characteristics and muscular mechanics in lower limbs during running stance phases. Result: Under the condition of wearing shoes with Hlbs, the time of foot contact significantly increased, whereas the range of motion (ROM) of hip and metatarsophalangeal (MTP) in the sagittal plane significantly reduced as well as the peak moment of ankle joint in the sagittal plane. The activations of vastus medialis, vastus lateralis, flexor digitorum brevis (flex dig brevis), and flexor hallucis longus (flex hall long) significantly increased under the condition of wearing shoes with Hlbs. According to the results of the SPM analysis, the joint angles (hip, ankle, and MTP), the net joint moments (knee, ankle, and MTP), and the muscle forces (gluteus maximus and tibialis anterior) were significant difference during the running stance phase between conditions of wearing shoes with Hlbs and Llbs. Conclusion: Running shoes with Llb carbon plates are appropriate for adolescent runners due to the advantages of biomechanical characteristics and muscular mechanics.	Plaques carbone
2022-09	2022-Anderson-What is the Effect of Changing Running Step Rate on Injury, Performance and Biomechanics? A Systematic Review and Meta-analysis	Background: Running-related injuries are prevalent among distance runners. Changing step rate is a commonly used running retraining strategy in the management and prevention of running-related injuries. Objective: The aims of this review were to synthesise the evidence relating to the effects of changing running step rate on injury, performance and biomechanics. Design: Systematic review and meta-analysis. Data sources: MEDLINE, EMBASE, CINAHL, and SPORTDiscus. Results: Thirty-seven studies were included that related to injury (n = 2), performance (n = 5), and biomechanics (n = 36). Regarding injury, very limited evidence indicated that increasing running step rate is associated with improvements in pain (4 weeks: standard mean difference (SMD), 95% CI 2.68, 1.52 to 3.83; 12 weeks: 3.62, 2.24 to 4.99) and function (4 weeks: 2.31, 3.39 to 1.24); 12 weeks: 3.42, 4.75 to 2.09) in recreational runners with patellofemoral pain. Regarding performance, very limited evidence indicated that increasing step rate increases perceived exertion (- 0.49, - 0.91 to - 0.07) and awkwardness (- 0.72, - 1.38 to - 0.06) and effort (- 0.69, - 1.34, - 0.03); and very limited evidence that an increase in preferred step rate is associated with increased metabolic energy consumption (- 0.84, - 1.57 to - 0.11). Regarding biomechanics, increasing running step rate was associated with strong evidence of reduced peak knee flexion angle (0.66, 0.40 to 0.92); moderate evidence of reduced step length (0.93, 0.49 to 1.37), peak hip adduction (0.40, 0.11 to 0.69), and peak knee extensor moment (0.50, 0.18 to 0.81); moderate evidence of reduced foot strike angle (0.62, 034 to 0.90); limited evidence of reduced braking impulse (0.64, 0.29 to 1.00), peak hip flexion (0.42, 0.10 to 0.75), and peak patellofemoral joint stress (0.56, 0.07 to 1.05); and limited evidence of reduced negative hip (0.55, 0.20 to 0.91) and knee work (0.84, 0.48 to 1.20). Decreasing running step rate was associated with moderate evidence of increased step length (- 0.76, - 1.31 to - 0.21); limited evidence of increased contact time (- 0.95, - 1.49 to - 0.40), braking impulse (- 0.73, - 1.08 to - 0.37), and negative knee work (- 0.88, - 1.25 to - 0.52); and limited evidence of reduced negative ankle work (0.38, 0.03 to 0.73) and negative hip work (0.49, 0.07 to 0.91). Conclusion: In general, increasing running step rate results in a reduction (or no change), and reducing step rate results in an increase (or no change), to kinetic, kinematic, and loading rate variables at the ankle, knee and hip. At present there is insufficient evidence to conclusively determine the effects of altering running step rate on injury and performance. As most studies included in this review investigated the immediate effects of changing running step rate, the longer-term effects remain largely unknown.	Cadence

2022-09	2022-Fuchs-Postexercise cooling impairs muscle protein synthesis rates in recreational athletes	Key points: Protein ingestion and cooling are strategies employed by athletes to improve postexercise recovery and, as such, to facilitate muscle conditioning. However, whether cooling affects postprandial protein handling and subsequent muscle protein synthesis rates during recovery from exercise has not been assessed. We investigated the effect of postexercise cooling on the incorporation of dietary protein-derived amino acids into muscle protein and acute postprandial (hourly) as well as prolonged (daily) myofibrillar protein synthesis rates during recovery from resistance-type exercise over 2 weeks. Cold-water immersion during recovery from resistance-type exercise lowers the capacity of the muscle to take up and/or direct dietary protein-derived amino acids towards de novo myofibrillar protein accretion. In addition, cold-water immersion during recovery from resistance-type exercise lowers myofibrillar protein synthesis rates during prolonged resistance-type exercise training. Individuals aiming to improve skeletal muscle conditioning should reconsider applying cooling as a part of their postexercise recovery strategy. Abstract: We measured the impact of postexercise cooling on acute postprandial (hourly) as well as prolonged (daily) myofibrillar protein synthesis rates during adaptation to resistance-type exercise over 2 weeks. Twelve healthy males (aged 21 ± 2 years) performed a single resistance-type exercise session followed by water immersion of both legs for 20 min. One leg was immersed in cold water (8°C: CWI), whereas the other leg was immersed in thermoneutral water (30°C: CON). After water immersion, a beverage was ingested containing 20 g of intrinsically (l-[1-13 C]-phenylalanine and l-[1-13 C]-leucine) labelled milk protein with 45 g of carbohydrates. In addition, primed continuous l-[ring-2 H5]-phenylalanine and l-[1-13 C]-leucine infusions were applied, with frequent collection of blood and muscle samples to assess myofibrillar protein synthesis rates in vivo over a 5 h recovery period. In addition, deuterated water (2 H2 O) was applied with the collection of saliva, blood and muscle biopsies over 2 weeks to assess the effects of postexercise cooling with protein intake on myofibrillar protein synthesis rates during more prolonged resistance-type exercise training (thereby reflecting short-term training adaptation). Incorporation of dietary protein-derived l-[1-13 C]-phenylalanine into myofibrillar protein was significantly lower in CWI compared to CON (0.016 ± 0.006 vs. 0.021 ± 0.007 MPE; P = 0.016). Postexercise myofibrillar protein synthesis rates were lower in CWI compared to CON based upon l-[1-13 C]-leucine (0.058 ± 0.011 vs. 0.072 ± 0.017% h-1 , respectively; P = 0.024) and l-[ring-2 H5]-phenylalanine (0.042 ± 0.009 vs. 0.053 ± 0.013% h-1 , respectively; P = 0.025). Daily myofibrillar protein synthesis rates assessed over 2 weeks were significantly lower in CWI compared to CON (1.48 ± 0.17 vs. 1.67 ± 0.36% day-1 , respectively; P = 0.042). Cold-water immersion during recovery from resistance-type exercise reduces myofibrillar protein synthesis rates and, as such, probably impairs muscle conditioning.	Cold water immersion
2022-09	2022-Fortune-Does orthotics use improve comfort, speed and injury rate during running? Preliminary analysis of a randomised control trial	Background: Evidence regarding the effectiveness of using orthotics in improving comfort, increasing running speed and helping to reduce injury rate during running is limited and mixed. Alongside the increasing popularity of running is the increasing rate of running-related injuries (RRIs). Further research into whether orthotics could be used to help reduce RRIs would be highly beneficial for those affected. Additionally, there is a need to clarify whether orthotics use increases comfort during running and helps improve running speed. Aim: To investigate whether running with Aetrex Orthotics improves comfort and performance and reduces injury whilst running. Methods: Runners were recruited on a voluntary basis if they were 18 or older with no serious health conditions, ongoing foot pain or deformity, previous foot surgery in their lifetime or any surgery in the past 6 mo. Participants were randomly assigned to either an intervention group or a control group. All participants were asked to complete runs and provide quantitative data regarding comfort during running, running time and distance, and any RRIs over an 8-wk study period. Participants in the intervention group ran with Aetrex L700 Speed Orthotics, whilst participants in the control group ran without orthotics. Other than the addition of orthotics for participants in the intervention group, all participants were asked to run as they usually would. This report presents preliminary data from the first 47 participants recruited for this study. Running speed was calculated from running distance and time and given in miles per hour. For each outcome variable, the mean for each group, effect size and 95% confidence interval were calculated, and a t-test was performed to determine if between-group differences were statistically significant. Results: Data for all three primary outcomes was provided from a total of 254 runs by the 23 participants in the intervention group and a total of 289 runs by the 24 participants in the control group. Participants in the intervention group reported higher comfort scores (8.00 ± 1.41 vs 6.96 ± 2.03, P ≤ 0.0001), faster running speeds (6.27 ± 1.03 vs 6.00 ± 1.54, P = 0.013), and lower RRI rates (0.70 ± 1.01 vs 1.21 ± 1.53, P = 0.18) than those in the control group. These findings were statistically significant for comfort and running speed but not for RRI rate, with statistical significance considered if P < 0.05. No adjustments were made for group differences in age, gender, tendency for RRIs or usual running speed. Conclusion: This preliminary report provides evidence for orthotics use in increasing comfort levels and running speed, but no significant difference in RRI rate.	Orthèses et course
2022-08	2022-Hébert-Losier-Advancements in running shoe technology and their effects on running economy and performance – a current concepts overview	Advancements in running shoe technology over the last 5 years have sparked controversy in athletics as linked with clear running economy and performance enhancements. Early debates mainly surrounded ‘super shoes’ in long-distance running, but more recently, the controversy has filtered through to sprint and middle-distance running with the emergence of ‘super spikes’. This Current Concepts paper provides a brief overview on the controversial topic of super shoes and super spikes. The defining features of technologically advanced shoes are a stiff plate embedded within the midsole, curved plate and midsole geometry, and lightweight, resilient, high-energy returning foam that – in combination – enhance running performance. Since the launch of the first commercially available super shoe, all world records from the 5 km to the marathon have been broken by athletes wearing super shoes or super spikes, with a similar trend observed in middle-distance running. The improvements in super shoes are around 4% for running economy and 2% for performance, and speculatively around 1% to 1.5% for super spikes. These enhancements are believed multifactorial in nature and difficult to parse, although involve longitudinal bending stiffness, the ‘teeter-totter effect’, the high-energy return properties of the midsole material, enhanced stack height and lightweight characteristic of shoes.	Technologies

2022-08	2022-Esculier-Immediate Effects of Manipulating Footwear or Cadence on the Lower Limb Biomechanics of Female Masters Runners	The objective of this study was to compare the immediate effects of modifications to footwear or cadence on lower limb biomechanics of female Masters runners. After analyzing habitual treadmill running biomechanics in 20 female runners (52.4 [8.3] y), we assessed the effects of 5 conditions: (1) barefoot running, (2) Merrell Vapor Glove, (3) Merrell Bare Access, (4) Brooks Pure Flow, and (5) increasing cadence by 10%. In comparison with habitual biomechanics, greater vertical loading rates of the ground reaction force were observed during running barefoot or with a Merrell Vapor Glove or Bare Access. There was high variability among participants as to changes in foot kinematics during the conditions. Running barefoot (-26.0%) and with a Merrell Vapor Glove (-12.5%) reduced sagittal plane knee moments, but increased sagittal plane ankle moments (both 6.1%). Increasing cadence by 10% resulted in a more modest decrease in knee flexion moments (-7.7%) without increasing peak external ankle dorsiflexion moments. When asked if they would prefer minimalist shoes or increasing cadence, 11 participants (55%) chose cadence and 9 (45%) chose footwear. Minimalist footwear decreased sagittal knee moments, but increased vertical loading rate and sagittal ankle moments. Increasing cadence may be useful to lower sagittal knee moments without increasing ankle moments.	Chaussures / Cadence / Biomécanique
2022-08	2022-Voinier-Walking, running, and recreational sports for knee osteoarthritis: An overview of the evidence	Objective: We provided an overview of narrative reviews, systematic reviews, and meta-analyses that summarize primary evidence of how physical activity (PA) relates to structural progression of knee osteoarthritis (OA). This overview can serve as a resource for healthcare providers when recommending PA to patients with, or at risk, for knee OA. Methods: We searched the PubMED database for publications on "exercise" [MeSH Terms] and "knee osteoarthritis" [MeSH Terms]. We restricted our search to review articles, originally published in English, from 2005 to 2020. We then added several original studies to provide more detailed support of the findings of the review articles, based on the authors familiarity with the literature. Results: We summarized the findings of 20 reviews and an additional 12 original studies. We found consistent evidence that common forms of PA (walking, running, and certain recreational sports) are not related to structural progression of knee OA, and can be safely recommended to patients with, or at risk, for knee OA. Conclusion: Healthcare providers can refer to this overview of the evidence, as well as current PA guidelines, when recommending PA to their patients with, or at risk for, knee OA. Future studies can support PA guidelines that target preserving the structural integrity of the knees.	Arthrose
2022-08	2022-Seijas-Otero-Effects of taping in patellofemoral pain syndrome: A systematic review	Background: Patellofemoral pain syndrome (PPS) is defined as a condition in the patellofemoral joint that can present with pain, functional deficit, crepitus, and instability. Its etiology appears to lie in excessive loading of the patellofemoral joint due to mispositioning of the patella. The application of taping has recently increased, to manage PPS. However, the level of scientific evidence in this sense is unknown. Objective: To determine the effect of different types of taping in subjects with PPS. Methods: A bibliographic search was carried out in January and February 2021 in Scopus, Web of Science, PubMed, Medline, SPORTDiscus, PEDro and CINAHL. Results: A total of 13 studies were included for qualitative analysis. The mean score on the PEDro scale was 5.30 points. Most of the articles reflect a decrease in pain after the taping intervention, while variables such as functionality, muscle activity and biomechanical modification do not show positive effects. Conclusion: Taping appears to have positive effects on pain in subjects with PPS. However, the evidence is contradictory with the rest of the variables studied.	Traitement DFP
2022-08	2022-van den berghe-Motor retraining by real-time sonic feedback: understanding strategies of low impact running (PhD Academy Award)	The aims of this thesis were (1) to develop and (2) to validate a wearable system for impact reduction with the use of real-time music-based biofeedback and (3) to evaluate its effectiveness in a gait retraining context and to gain insight into possible strategies for low impact running.	Patron de course

2022-08	2022-Relph-Running shoes for preventing lower limb running injuries in adults	Background: Lower-limb running injuries are common. Running shoes have been proposed as one means of reducing injury risk. However, there is uncertainty as to how effective running shoes are for the prevention of injury. It is also unclear how the effects of different characteristics of running shoes prevent injury. Objectives: To assess the effects (benefits and harms) of running shoes for preventing lower-limb running injuries in adult runners. Search methods: We searched the following databases: CENTRAL, MEDLINE, Embase, AMED, CINAHL Plus and SPORTDiscus plus trial registers WHO ICTRP and ClinicalTrials.gov. We also searched additional sources for published and unpublished trials. The date of the search was June 2021. Selection criteria: We included randomised controlled trials (RCTs) and quasi-RCTs involving runners or military personnel in basic training that either compared a) a running shoe with a non-running shoe; b) different types of running shoes (minimalist, neutral/cushioned, motion control, stability, soft midsole, hard midsole); or c) footwear recommended and selected on foot posture versus footwear not recommended and not selected on foot posture for preventing lower-limb running injuries. Our primary outcomes were number of people sustaining a lower-limb running injury and number of lower-limb running injuries. Our secondary outcomes were number of runners who failed to return to running or their previous level of running, runner satisfaction with footwear, adverse events other than musculoskeletal injuries, and number of runners requiring hospital admission or surgery, or both, for musculoskeletal injury or adverse event. Data collection and analysis: Two review authors independently assessed study eligibility and performed data extraction and risk of bias assessment. The certainty of the included evidence was assessed using GRADE methodology. Main results: We included 12 trials in the analysis which included a total of 11,240 participants, in trials that lasted from 6 to 26 weeks and were carried out in North America, Europe, Australia and South Africa. Most of the evidence was low or very low certainty as it was not possible to blind runners to their allocated running shoe, there was variation in the definition of an injury and characteristics of footwear, and there were too few studies for most comparisons. We did not find any trials that compared running shoes with non-running shoes. Neutral/cushioned versus minimalist (5 studies, 766 participants) Neutral/cushioned shoes may make little or no difference to the number of runners sustaining a lower-limb running injuries when compared with minimalist shoes (low-certainty evidence) (risk ratio (RR) 0.77, 95% confidence interval (CI) 0.59 to 1.01). One trial reported that 67% and 92% of runners were satisfied with their neutral/cushioned or minimalist running shoes, respectively (RR 0.73, 95% CI 0.47 to 1.12). Another trial reported mean satisfaction scores ranged from 4.0 to 4.3 in the neutral/ cushioned group and 3.6 to 3.9 in the minimalist running shoe group out of a total of 5. Hence neutral/cushioned running shoes may make little or no difference to runner satisfaction with footwear (low-certainty evidence). Motion control versus neutral / cushioned (2 studies, 421 participants) It is uncertain whether or not motion control shoes reduce the number of runners sustaining a lower-limb running injuries when compared with neutral / cushioned shoes because the quality of the evidence has been assessed as very low certainty (RR 0.92, 95% CI 0.30 to 2.81). Soft midsole versus hard midsole (2 studies, 1095 participants) Soft midsole shoes may make little or no difference to the number of runners sustaining a lower-limb running injuries when compared with hard	Chaussures et blessures
2022-08	2022-Fisher-Running Gait Training Improves Outcomes at United States Air Force Basic Military Training	Introduction: The aim is to investigate the impact of large-group, motor learning-based running gait training on injury risk in United States Air Force (USAF) Basic Military Training (BMT). Design: A prospective quasi-experimental program evaluation is used. Materials and methods: Medical providers taught running gait form to groups of trainees in the first week of training of BMT from August 2020 to March 2021. The main outcome measures included risk ratio of reported injuries, removal from training because of injury, and separation from service because of injury. Results: Of BMT trainees, 2,205 underwent group, motor learning-based running gait training; this was compared with two intake groups (nA = 3,941 and nB = 2,041) who were only given introductions to sports medicine staff in a classroom setting. Reported pain complaints increased ($\chi2$ = 27.4A and 20.83B, P < .001). Risk ratios for more severe injuries necessitating time out of training or separation from USAF were reduced, although these were statistically not significant (13%, P = .48 and 22%, P = .29, respectively). Leadership implemented gait training across BMT, and data from the following 8 weeks of intake (n = 6,223) demonstrated similar trends in increases in patient reports of pain ($\chi2$ = 67.25, P < .001) but significantly reduced risk ratios of removal from training (32%, $\chi2$ = 16.35, P < .001) or separation (32%, $\chi2$ = 12.54, P < .001). Conclusions: While not previously shown to mitigate injury, large-group, running gait training was associated with a significant reduction in injury severity defined by training delays and separation from service in USAF BMT.	Gait retraining
2022-07	2022-Xiang-Shock Acceleration and Attenuation during Running with Minimalist and Maximalist Shoes: A Time- and Frequency-Domain Analysis of Tibial Acceleration	Tibial shock attenuation is part of the mechanism that maintains human body stabilization during running. It is crucial to understand how shock characteristics transfer from the distal to proximal joint in the lower limb. This study aims to investigate the shock acceleration and attenuation among maximalist shoes (MAXs), minimalist shoes (MINs), and conventional running shoes (CONs) in time and frequency domains. Time-domain parameters included time to peak acceleration and peak resultant acceleration, and frequency-domain parameters contained lower (3-8 Hz) and higher (9-20 Hz) frequency power spectral density (PSD) and shock attenuation. Compared with CON and MAX conditions, MINs significantly increased the peak impact acceleration of the distal tibia (p = 0.01 and p < 0.01). Shock attenuation in the lower frequency depicted no difference but was greater in the MAXs in the higher frequency compared with the MIN condition (p < 0.01). MINs did not affect the tibial shock in both time and frequency domains at the proximal tibia. These findings may provide tibial shock information for choosing running shoes and preventing tibial stress injuries.	Chaussures et biomécanique
2022-06	2022-Ruiz-Alias-A systematic review of the effect of running shoes on running economy performance and biomechanics analysis by brand and model	This systematic review aims to synthesise the effects of current shoe models in each shoe category and their specific features on running economy, performance and biomechanics. Electronic databases such as Web of Science, SPORTDiscuss, PubMed and Scopus were used to identify studies from 2015 to date. Due to the existing lack of consensus to define running shoes, only studies that specified the shoe brand and models used to assess their effect over runners with a certain level of fitness and training routine were included. Quality assessment of cross-sectional and intervention studies was conducted by three independent raters using a modified version of the Quality Index and the PEDro scale, respectively. A total of 36 articles were finally included, involving the analysis of 61 different shoe models over 10 different topics (i.e., running economy, running performance, spatiotemporal parameters, ground reaction forces, joint stiffness, achilles tendon, plantar pressure, tibiofemoral load, foot strike pattern and joint coordination). With this review, runners and practitioners in the field that are concerned about selecting a suitable shoe for performance, training, or injury prevention functionality have clear information about the effects of the current shoe models and their specific features.	Chaussures & performance & biomécanique

2022-06	2022-Chen-The effect of foot orthoses for patients with patellofemoral pain syndrome: A systematic review and meta-analysis	Objective: This research quantitatively studied the benefits of foot orthoses for patients with patellofemoral pain syndrome (PFPS) from five aspects: pain intensity, knee function, sport and recreation function, knee symptoms, and knee related quality of life. Data sources: Potential articles were retrieved using five electronic databases (Web of Science, PubMed, Scopus, China National Knowledge Infrastructure, and Wanfang). The search period was from inception to October 17, 2021. Review methods: Two researchers independently completed record retrieval and selection, data extraction, and methodological quality assessment. Pooled effect sizes were calculated using a random-effects model or fixed-effect model and a 95% confidence interval (95% CI). Data from six randomized controlled trials (RCT) meeting the inclusion criteria were extracted for meta-analysis with methodological quality assessment scores ranging from seven to ten. Results: Results showed that compared to the control group, foot orthoses can significantly improve knee function (SMD = -0.45[-0.74, -0.16], P = 0.002, I 2 = 0%), and improve sport and recreation function (SMD = -0.54[-1.04, -0.03], P = 0.04, I 2 = 0%). But the foot orthoses had no significant effect in pain intensity (SMD = -0.01[-0.32, 0.30], P = 0.95, I 2 = 64), knee injury symptoms (SMD = -0.36[-0.86, 0.14], P = 0.16, I 2 = 0%), and knee related quality of life (SMD = -0.45[-0.95, 0.05], P = 0.08, I 2 = 0%).Subgroup analysis of pain intensity showed that foot orthoses had some effect compared to flat/soft inserts (SMD = -0.28[-0.57, 0.00], P = 0.05, I 2 = 0%). The effect of other treatments (physiotherapy and gait retraining) was significantly better than that of foot orthoses (SMD = 0.45[0.09, 0.80], P = 0.01, I 2 = 46%). Compared with exercise alone, the effect of foot orthoses combined with exercise was more significant (SMD = -0.98[-1.64, -0.32], P = 0.004). Conclusion: The findings suggested that foot orthoses significantly improved knee function and sport and recreation function in patients with PFPS, but had no significant effect on pain intensity, knee injury symptoms, and knee related quality of life. This study supported the positive therapeutic effect of foot orthoses on PFPS.	Orthèses et DFP
2022-06	2022-Zhang-Influence of Shod and Barefoot Running on the In Vivo Kinematics of the First Metatarsophalangeal Joint	The biomechanics of the first metatarsophalangeal joint (MTPJ) is affected by different shoe conditions. In the biomechanical research field, traditional skin marker motion capture cannot easily acquire the in vivo joint kinematics of the first MTPJ in shoes. Thus, the present study aims to investigate the differences of the first MTPJ's six-degree-of-freedom (6DOF) kinematics between shod and barefoot running by using a high-speed dual fluoroscopic imaging system (DFIS). In total, 15 healthy male runners were recruited. Computed tomography scans were taken from each participant's right foot for the construction of 3D models and local coordinate systems. Radiographic images were acquired at 100 Hz while the participants ran at a speed of 3 m/s ± 5% in shod and barefoot conditions along an elevated runway, and 6DOF kinematics of the first MTPJ were calculated by 3D-2D registration. Paired sample t-tests were used to compare the kinematic characteristics of the first MTPJ 6DOF kinematics during the stance phase between shod and barefoot conditions. Compared with barefoot, wearing shoes showed significant changes ($p < 0.05$): 1) the first MTPJ moved less inferior at 50% but moved less superior at 90 and 100% of the stance phase; 2) the peak medial, posterior, and superior translation of the first MTPJ significantly decreased in the shod condition; 3) the extension angle of the first MTPJ was larger at 30-60% but smaller at 90 and 100% of the stance phase; 4) the maximum extension angle and flexion/extension range of motion of the first MTPJ were reduced; and 5) the minimum extension and adduction angle of the first MTPJ was increased in the shod condition. On the basis of the high-speed DFIS, the aforementioned results indicated that wearing shoes limited the first MTPJ flexion and extension movement and increased the adduction angle, suggesting that shoes may affect the propulsion of the first MTPJ and increase the risk of hallux valgus.	Shoe fit vs. hallux valgus
2022-06	2022-Johnson-What differentiates rearfoot strike runners with low and high vertical load rates?	Background: Runners with a rearfoot strike pattern typically show high vertical ground reaction force loading rates (LRs), that are associated with injuries, compared with forefoot strikers. However, some runners with a rearfoot strike pattern run in a way that reduces LRs. Our purpose was to identify differences in running mechanics between rearfoot strike runners with high and low vertical LRs. Methods: 42 healthy runners, 21 with high (≥ 80.5 BW/s) and 21 with low (≤ 46.3 BW/s) LRs, were included in the current study. Lower extremity kinematic and kinetic data were then collected while participants ran along a 30 m runway. Running mechanics were calculated, including sagittal plane knee stiffness during early stance, the components of knee stiffness (Δ knee flexion and flexion moment), sagittal joint angles at initial contact, as well as cadence. The two LR groups were compared for differences in outcome variables using independent t-tests or Mann Whitney U tests. Findings: Knee stiffness was significantly lower in the low LR group ($p < 0.01$, $d = 0.87$), due to higher knee flexion excursion ($p < 0.01$, $d = 1.38$). At initial contact, the low LR group showed lower hip and knee flexion, but greater ankle and foot dorsiflexion ($p = 0.01$-0.04, $d = 0.64$-0.93). No differences were found in cadence. Interpretation: These results provide potential targets, related to gait kinematics and kinetics, for gait retraining aimed at reducing LRs in rearfoot strike runners.	Foot strike & impact (subtle heel)

2022-06	2022-Keast-Acute Effects of Gait Interventions on Tibial Loads During Running: A Systematic Review and Meta-analysis	Introduction: Changing running technique or equipment can alter tibial loads. The efficacy of interventions to modify tibial loads during running is yet to be synthesised and evaluated. This article reviewed the effect of running technique and footwear interventions on tibial loading during running. Methods: Electronic databases were searched using terms relevant to tibial load and running. Interventions were categorised according to their approach (i.e., footwear; barefoot running; speed; surface; overground versus treadmill; orthotics, insoles and taping; and technique); if necessary, further subgrouping was applied to these categories. Standardised mean differences (SMDs) with 95% confidence intervals (CIs) for changes in tibial loading were calculated and meta-analyses performed where possible. Results: Database searches yielded 1617 articles, with 36 meeting the inclusion criteria. Tibial loading increased with (1) barefoot running (SMD 1.16; 95% CI 0.50, 1.82); (2) minimalist shoe use by non-habitual users (SMD 0.89; 95% CI 0.40, 1.39); (3) motion control shoe use (SMD 0.46; 95% CI 0.07, 0.84); (4) increased stride length (SMD 0.86; 95% CI 0.18, 1.55); and (5) increased running speed (SMD 1.03; 95% CI 0.74, 1.32). Tibial loading decreased when (1) individuals ran on a treadmill versus overground (SMD - 0.83; 95% CI - 1.53, - 0.12); and (2) targeted biofeedback was used (SMD - 0.93; 95% CI - 1.46, - 0.41). Conclusions: Running barefoot, in motion control shoes or in unfamiliar minimalist shoes, and with an increased stride length increases tibial loads and may increase the risk of a tibial stress injury during periods of high training load. Adopting interventions such as running on a treadmill versus overground, and using targeted biofeedback during periods of high loads could reduce tibial stress injury.	Gait retraining / pathos de charge
2022-06	2022-Andreyo-Influence of Minimalist Footwear on Running Performance and Injury	Runners and clinicians have long sought to enhance distance running performance and reduce the occurrence of running-related injuries. Footwear selection often comes to the forefront in such pursuits, yet remains a common source of controversy in the literature and practice. In particular, the utilization of minimalist footwear has fluctuated in popularity over the last several decades, with some proponents suggesting that it can promote improvements in running economy and reduce injury rates. However, a closer look at the literature shows anything but straightforward and consistent recommendations. The purpose of this article is to outline the effects of minimalist footwear on running performance and injury, with a focus on its associated impact on running mechanics. The authors also aim to identify who may be the ideal client to transition to minimalist running and how to minimize the risk of injury during the transition.	Chaussures minimalistes
2022-05	2022-Nielsen-Carbon Plate Shoes Improve Metabolic Power and Performance in Recreational Runners	This study compared metabolic power (MP) and time trial (TT) running performance between Adidas Adizero Adios (AAA) and Nike VaporFly 4% (NVP). Thirty-seven runners completed three laboratory sessions and two field sessions (n=30). After familiarization (visit 1), participants completed eight 6-min treadmill running bouts (four with each shoe, counterbalanced) at their preferred pace, and MP was assessed using indirect calorimetry (visits 2 and 3). During visits 4 and 5, participants completed two outdoor TTs (~3.5 km) in NVP and AAA (counterbalanced). Compared with AAA, NVP exhibited superior MP (NVP: median=13.88 (Q1-Q3=12.90-15.08 W/kg; AAA: median=14.08 (Q1-Q3=13.12-15.44 W/kg; z=-4.81, p<.001, effect size=.56) and TT (NVP=793±98 s; AAA=802±100 s, p=.001; effect size=.09). However, there was no relationship between changes in MP and changes in TT between shoes (r=.151 p=.425, 95% confidence interval=[-.22; .48]). Our results demonstrate that NVP, compared with AAA, improves MP and TT in recreational runners. The lack of correlation between changes in MP and TT indicates that factors other than improved MP contribute to faster short-distance TT with NVP.	Chaussures & performance
2022-04	2022-Derie-Biomechanical adaptations following a music-based biofeedback gait retraining program to reduce peak tibial accelerations	Purpose: The present study aimed to determine whether runners can reduce impact measures after a six-session in-the-field gait retraining program with real-time musical biofeedback on axial peak tibial acceleration (PTAa) and identify the associated biomechanical adaptations. Methods: Twenty trained high-impact runners were assigned to either the biofeedback or the music-only condition. The biofeedback group received real-time feedback on the PTAa during the gait retraining program, whereas the music-only condition received a sham treatment. Three-dimensional gait analysis was conducted in the laboratory before (PRE) and within one week after completing the gait retraining program (POST). Subjects were instructed to replicate the running style from the last gait retraining session without receiving feedback while running overground at a constant speed of 2.9 m·s-1 . Results: Only the biofeedback group showed significant reductions in both PTAa ($\Delta\bar{x}$ = -26.9%, p = 0.006) and vertical instantaneous loading rate ($\Delta\bar{x}$ = -29.2%, p = 0.003) from PRE to POST. In terms of biomechanical adaptations, two strategies were identified. Two subjects transitioned toward a more forefoot strike. The remaining eight subjects used a pronounced rearfoot strike and posteriorly inclined shank at initial contact combined with less knee extension at toe-off while reducing vertical excursion of the center of mass. Conclusions: After completing a music-based biofeedback gait retraining program, runners can reduce impact while running overground in a laboratory. We identified two distinct self-selected strategies used by the participants to achieve reductions in impact.	Gait retraining
2022-04	2022-Casado-Training Periodization, Methods, Intensity Distribution, and Volume in Highly Trained and Elite Distance Runners: A Systematic Review	Purpose: This review aimed to determine (1) performance and training characteristics such as training intensity distribution (TID), volume, periodization, and methods in highly trained/elite distance runners and (2) differences in training volume and TID between event distances in highly trained/elite distance runners. Methods: A systematic review of the literature was carried out using the PubMed/MEDLINE, Scopus, and Web of Science databases. Results: Ten articles met the inclusion criteria. Highly trained/elite distance runners typically follow a pyramidal TID approach, characterized by a decreasing training volume from zone 1 (at or below speed at first ventilatory/lactate threshold [LT]) to zone 2 (between speeds associated with either both ventilatory thresholds or 2 and 4 mmol·L-1 LTs [vLT1 and vLT2, respectively]) and zone 3 (speed above vVT2/vLT2). Continuous-tempo runs or interval training sessions at vLT2 in zone 2 (ie, medium and long aerobic intervals) and those in zone 3 (ie, anaerobic or short-interval training) were both used at least once per week each in elite runners, and they were used to increase the number of either vLT2 or z3 sessions to adopt either a pyramidal or a polarized approach, respectively. More pyramidal- and polarized-oriented approaches were used by marathoners and 1500-m runners, respectively. Conclusions: Highly trained and elite middle- and long-distance runners are encouraged to adopt a traditional periodization pattern with a hard day-easy day basis, consisting in a shift from a pyramidal TID used during the preparatory and precompetitive periods toward a polarized TID during the competitive period.	Périodisation

2022-03	2022-Vogels-Association Between Intracompartmental Pressures in the Anterior Compartment of the Leg and Conservative Treatment Outcome for Exercise-Related Leg Pain in Military Service Members	Objective: To explore the relationship between a single the intracompartmental pressure (ICP) value in the anterior compartment of the leg 1 minute after provocative exercise and the outcome of a conservative treatment program in a cohort of military service members with chronic exercise-related leg pain. Design: Retrospective cohort study. Setting: Department of military sports medicine at a secondary care facility. Participants: In the years 2015 through 2019, the conservative treatment program was completed by 231 service members with chronic exercise-related leg pain, of whom 108 patients with 200 affected legs met all inclusion criteria (N=108). Interventions: All patients completed a comprehensive conservative treatment program, consisting of 4-6 individual gait retraining sessions during a period of 6-12 weeks. In addition, patients received uniform homework assignments, emphasizing acquisition of the new running technique. Main outcome measures: The primary treatment outcome was return to active duty. The duration of treatment, occurrence of acute on chronic compartment syndrome, and patient-reported outcome measures were considered secondary treatment outcomes. Potential risk factors for the primary treatment outcome were identified with a generalized logistic mixed model. Results: Return to active duty was possible for 74 (69%) patients, whereas 34 (31%) needed further treatment. The multivariable analysis showed that the absolute values of ICP in the anterior compartment were not associated with the treatment outcome (odds ratio, 1.01; P=.64). A lower Single Assessment Numeric Evaluation score at intake was negatively associated with the potential to successfully return to active duty (odds ratio, 0.95; P=.01). No acute on chronic compartment syndromes were reported. Conclusions: A single postexercise ICP value in the anterior compartments of the lower leg of military service members with chronic exercise-related leg pain was not associated with the outcome of a secondary care conservative treatment program and can be safely postponed.	Compartiment antérieur
2022-03	2022-Goto-Foot strike patterns and running-related injuries among high school runners: a retrospective study	Background: There is a possible relationship between foot strike patterns and running-related injuries; however, this relationship among high school runners remains uninvestigated. Therefore, this retrospective cohort study examined this relationship among high school runners. Methods: Overall, 123 male Japanese high school runners participated in this study and completed a questionnaire regarding their characteristics, running habits, and running-related injury (RRI) histories. We filmed their habitual high-intensity training sessions from a lateral side. Participants' foot strike patterns were visually classified, and they were divided into the non-rearfoot strike (forefoot strike and midfoot strike) and rearfoot strike groups. An independent sample t-test or Welch's t-test was used to compare participant characteristics, running habits, the number of running-related injuries in the past 1 year, and the running speed at the filmed training sessions between both groups. A Chi-square test was used to examine the relationship between running-related injury histories and foot strike patterns in both groups. Results: The number of running-related injuries in the past 1 year was not significantly different between both groups; however, RRI incidence was significantly associated wit non-rearfoot strike ($p<0.05$). Furthermore, non-rearfoot strike was significantly associated with a history of achillodynia ($p<0.05$). Other running-related injuries, such as medial tibial pain, lateral knee pain, and heel pain, were not significantly associated with foot strike patterns. Conclusions: Our study revealed that rearfoot strike runners did not have a higher risk of running-related injury compared to that of non-rearfoot strike runners, and that non-rearfoot strike was associated with achillodynia.	FSP & blessures
2022-03	2022-Luedke-Plank Times and Lower Extremity Overuse Injury in Collegiate Track-and-Field and Cross Country Athletes	Trunk muscle endurance has been theorized to play a role in running kinematics and lower extremity injury. However, the evidence examining the relationships between static trunk endurance tests, such as plank tests, and lower extremity injury in athletes is conflicting. The purpose of this study was to assess if collegiate cross country and track-and-field athletes with shorter pre-season prone and side plank hold times would have a higher incidence of lower extremity time-loss overuse injury during their competitive sport seasons. During the first week of their competitive season, 75 NCAA Division III uninjured collegiate cross country and track-and-field athletes (52% female; mean age 20.0 ± 1.3 years) performed three trunk endurance plank tests. Hold times for prone plank (PP), right-side plank (RSP) and left-side plank (LSP) were recorded in seconds. Athletes were followed prospectively during the season for lower extremity overuse injury that resulted in limited or missed practices or competitions. Among the athletes, 25 (33.3%) experienced a lower extremity overuse injury. There were no statistically significant mean differences or associations found between PP, RSP or LSP plank test hold times (seconds) and occurrence of lower extremity overuse injury. In isolation, plank hold times appear to have limited utility as a screening test in collegiate track-and-field and cross country athletes.	Force et blessures
2022-03	2022-Lum-Effects of Isometric Strength and Plyometric Training on Running Performance: A Randomized Controlled Study	Purpose: The aim of the study was to compare the effects of isometric strength (IST) and plyometric training (PT) on endurance running performance. Methods: Twenty-six endurance runners (18 males and 8 females; age 36 ± 6 years, stature 1.69 ± 0.05 m body mass 61.6 ± 8.0 kg, VO2max 50.4 ± 5.8 ml·kg-1·min-1) completed the countermovement jump (CMJ), isometric mid-thigh pull (IMTP), 2.4 km run time trial (2.4kmTT), running economy test (RE) and a graded exercise test measures at baseline. They were then randomly assigned to three groups, the control (CON), PT or IST group, and completed the circuit, plyometric or isometric training, respectively, twice a week for 6 weeks, while still continuing to perform their planned running training. They then completed the same set of measures performed at baseline post-intervention. Results: Significant time x group interactions and time main effect were observed for 2.4kmTT ($P = .002$, $\eta2p = .45$ and $P < .001$, $\eta2 = 0.72$), maximal aerobic speed (MAS) ($P = .006$, $\eta2p = .39$), CMJ height ($P < .001$, $\eta2p = .55$) and IMTP relative peak force ($P = .001$, $\eta2p = .50$) in favor of PT and IST. Significant main effect for time was observed for 2.4kmTT ($P < .001$, $\eta2p = .72$), RE ($P = .048$, $\eta2p = .17$), VO2max ($P = .047$, $\eta2p = .18$), MAS ($P < .001$, $\eta2p = .63$), CMJ height ($P < .001$, $\eta2p = .51$) and IMTP relative peak force ($P < .001$, $\eta2p = .58$). Conclusion: In conclusion, both PT and IST were similarly effective at enhancing running endurance performance. However, IST resulted in greater improvement to RE.	Renforcement et performance

2022-03	2022-Schmida-Vertical Loading Rate Is not Associated with Running Injury, Regardless of Calculation Method	Introduction: Loading rate (LR), the slope of the vertical ground reaction force (vGRF), is commonly used to assess running-related injury risk. However, the relationship between LR and running-related injuries, including bone stress injuries (BSI), is unclear. Inconsistent findings may result from the numerous LR calculation methods that exist and their application across different running speeds. Purpose: Assess the influence of calculation method and running speed on LR values and determine the association of LR during healthy running with subsequent injury. Methods: Healthy preseason running data and subsequent injury records from Division I cross country athletes (n = 79) over four seasons (2015-2019) at 2.68 m/s, preferred training pace, and 4.47 m/s were collected. LR at each speed was calculated four ways: 1) maximum and 2) average slope from 20-80% of vGRF magnitude at impact peak (IP), 3) average slope from initial contact to IP, and 4) average slope from 3-12% of stance time. Linear mixed effects models and generalized estimation equations were used to assess LR associations. Results: LR values differed depending on speed and calculation method (p-value <0.001). The maximum slope from 20-80% of the vGRF at 4.47 m/s produced the highest LR estimate and the average slope from initial contact to IP at 2.68 m/s produced the lowest. Sixty-four injuries (20 BSI) were observed. No significant association was found between LR and all injuries or BSI across any calculation method (p-values ≥0.13). Conclusions: Calculation method and running speed result in significantly different LR values. Regardless of calculation method, no association between LR and subsequent injury was identified. Thus, healthy baseline LR may not be useful to prospectively assess running-related injury risk.	VLR
2022-03	2022-Huang-The influence of running shoes on familiarization time for treadmill running biomechanics evaluation	This study investigated treadmill familiarisation time in different shoe conditions by comparing lower limb consecutive kinematics waveforms using a trend symmetry method to calculate trend symmetry index, range amplitude ratio and range offset. Eighteen young adults (26.6 ± 3.3 years, 7 females) completed three 10-minute running trials at their preferred running speed (2.30 ± 0.17 m/s) on a treadmill with three shoe conditions (i.e., usual, minimalist and maximalist shoes) in a random order. Sagittal lower limb kinematic data were recorded using inertial measurement units. The results showed that sagittal-plane kinematic waveforms in the hip, knee and ankle remained consistent (trend symmetry > 0.95) without extreme excursions (range amplitude ratio ≈ 1) over 10 minutes within each testing shoe condition. Significant time × shoe interaction effect was observed in range offset (i.e., absolute differences in the average degree of kinematic waveforms between consecutive minutes) at ankle ($p = 0.029$, $\eta p2 = 0.096$) and knee ($p = 0.002$, $\eta p2 = 0.126$). Post-hoc analysis suggested that running with novel shoes required a shorter time to achieve stable lower limb kinematics (2 to 3 minutes) compared with usual shoes (7 minutes). In conclusion, young healthy adults need up to 3 and 7 minutes to familiarise to the treadmill when running at their preferred speed with their novel and usual running shoes.	Habituation tapis
2022-03	2022-Peterson-Biomechanical and Musculoskeletal Measurements as Risk Factors for Running-Related Injury in Non-elite Runners: A Systematic Review and Meta-analysis of Prospective Studies	Background: Running-related injury (RRI) is highly prevalent among recreational runners and is a key barrier to participation. Atypical lower limb alignment and mechanical function have been proposed to play a role in development of lower extremity injury. The purpose of this study was to investigate relationships between incidence of running-related injury (RRI) in non-elite runners with biomechanical and musculoskeletal variables. Methods: A systematic review and meta-analysis of prospective studies. Published research indexed in MEDLINE, EMBASE, CINAHL, SPORTDiscus, AMED, and The Cochrane library until 13th January 2021, grey literature, and reference lists of included studies were screened to identify prospective studies of non-elite adult runners that measured a relationship between biomechanical or musculoskeletal measures and incidence of RRI. Results: Thirty studies (3404 runners), testing over 100 discrete biomechanical and musculoskeletal risk factors for RRI, were included. Nineteen studies were pooled in twenty-five separate meta-analyses. Meta-analysis of four studies detected significantly less knee extension strength among runners who developed a RRI (SMD - 0.19, 95% CI - 0.36 to - 0.02, p = 0.03), though this may not be clinically important. A meta-analysis of two studies detected significantly lower hip adduction velocity among runners who developed a RRI (MD - 12.80, 95% CI - 25.22 to - 0.38, p = 0.04). Remaining meta-analyses found no significant relationship between biomechanical or musculoskeletal variables and RRI. Conclusion: This systematic review and meta-analysis found the currently available literature does not generally support biomechanical or musculoskeletal measures as risk factors for RRI in non-elite runners. While meta-analysis findings for knee extension strength and hip adduction velocity as risk factors for RRI were statistically significant, the associated trivial to small effects sizes suggest these findings should be treated with caution. Until further evidence emerges, recommendations for injury prevention in non-elite runners cannot be made based on biomechanical and musculoskeletal measurements alone.	Facteurs risque blessures

2022-03	2022-Willwacher-Running-Related Biomechanical Risk Factors for Overuse Injuries in Distance Runners: A Systematic Review Considering Injury Specificity and the Potentials for Future Research	Background: Running overuse injuries (ROIs) occur within a complex, partly injury-specific interplay between training loads and extrinsic and intrinsic risk factors. Biomechanical risk factors (BRFs) are related to the individual running style. While BRFs have been reviewed regarding general ROI risk, no systematic review has addressed BRFs for specific ROIs using a standardized methodology. Objective: To identify and evaluate the evidence for the most relevant BRFs for ROIs determined during running and to suggest future research directions. Design: Systematic review considering prospective and retrospective studies. (PROSPERO_ID: 236,832). Data sources: PubMed. Connected Papers. The search was performed in February 2021. Eligibility criteria: English language. Studies on participants whose primary sport is running addressing the risk for the seven most common ROIs and at least one kinematic, kinetic (including pressure measurements), or electromyographic BRF. A BRF needed to be identified in at least one prospective or two independent retrospective studies. BRFs needed to be determined during running. Results: Sixty-six articles fulfilled our eligibility criteria. Levels of evidence for specific ROIs ranged from conflicting to moderate evidence. Running populations and methods applied varied considerably between studies. While some BRFs appeared for several ROIs, most BRFs were specific for a particular ROI. Most BRFs derived from lower-extremity joint kinematics and kinetics were located in the frontal and transverse planes of motion. Further, plantar pressure, vertical ground reaction force loading rate and free moment-related parameters were identified as kinetic BRFs. Conclusion: This study offers a comprehensive overview of BRFs for the most common ROIs, which might serve as a starting point to develop ROI-specific risk profiles of individual runners. We identified limited evidence for most ROI-specific risk factors, highlighting the need for performing further high-quality studies in the future. However, consensus on data collection standards (including the quantification of workload and stress tolerance variables and the reporting of injuries) is warranted.	Biomécanique et blessures
2022-02	2022-Brake-Using beat frequency in music to adjust running cadence in recreational runners: a randomized multiple baseline design	Running with music has been shown to acutely change cadence. However, it is unclear if the increased cadence remains long-term when running without music in an in-field situation. The aim of this 12-week study was to investigate the effect of a 4-week music running program on cadence, speed and heartrate during and after the music running program. Seven recreational runners with a cadence of <170 steps per minute were randomly assigned to a baseline and post-intervention period of different durations. During the intervention phase, the participants ran with a musical beat that was 7.5-10% higher than their mean cadence at the start of the study. Cadence, heartrate and running speed were measured twice a week during a 5-kilometer run with a watch, and were analyzed using randomization tests and visual data inspection. Two participants dropped-out due to shortage of time (n = 1) and an acute calf injury (n = 1). Cadence significantly increased during the intervention period (+8.5%), and remained elevated during the post-intervention period (+7.9% (p = .001)) in comparison with the baseline period. Heartrate and running speed did not significantly change during any period. This study among five participants shows that four weeks of running with a musical beat that is 7.5-10% higher than the preferred cadence may be an effective and feasible intervention to increase running cadence. Importantly, the increased cadence occurred without simultaneous increases in running speed and heartrate, hereby potentially reducing mechanical loading without increasing metabolic load.	Cadence gait retraining
2022-02	2022-van den berghe-Foot strike determines the center of pressure behavior and affects impact severity in heel-toe running	This study assessed the centre of pressure (COP) behaviour and the relationship with impact severity during heel-toe running in conventional athletic footwear. We hypothesized that the COP behaviour depends on its location at foot strike, which would be associated with the vertical loading rate and peak tibial accelerations in heel-toe running. Ground reaction force and tibial acceleration were measured in 104 distance runners running level at ~3.2 m/s. High-speed plantar pressure captured at high temporal resolution (500 Hz) and spatial resolution (7.62 · 5.08 mm/sensor) allowed for localization of the COP directly in the footprint during running in self-selected athletic footwear. More lateral X-coordinates of the COP at first foot contact had, in general, more anterior Y-coordinates (adj.R2:0.609). In heel-toe running, a more anterior foot strike had a greater refined strike index, which was associated with a quicker roll-over in the rearfoot zone. This strike index contributed to greater maximum vertical loading rates (R2:0.121), and greater axial (R2:0.047) and resultant (R2:0.247) peak tibial accelerations. These findings indicate that (1) the COP progression is dependend on the COP location at foot strike; (2) more anterior rearfoot strikes are more likely to have greater impact severity than posterior rearfoot strikes.	Foot strike & impact (subtle heel)
2022-02	2022-Kisiolek-Sleep Duration Correlates With Performance in Ultra-Endurance Triathlon	The relationship between sleep duration, sleep quality, and race completion time during each stage of a 3-day ultra-endurance triathlon (stage 1: 10-km swim, 146-km cycle; stage 2: 276-km cycle; and stage 3: 84.4-km run) was investigated. Seventeen triathletes partook in sleep analysis throughout the ultra-endurance multiday triathlon using an actigraphy wristband. The participants wore the band to record objective sleep outcomes for approximately 4 days (1-2 d prerace, 3 race days, and 1 d postrace), except while racing. The total sleep time (TST; prerace: 414.1 [95.3] min, prestage 1: 392.2 [138.3] min, prestage 2: 355.6 [62.5] min, and prestage 3: 299.7 [107.0] min) significantly decreased over time ($P < .05$). Significant Pearson moment-product correlations were found between TST and subsequent race-day performance for race stage 1 ($r = -.577$; $P = .019$) and stage 3 ($r = -.546$; $P = .035$), with further analysis revealing that TST explained 33% and 30% of the variation in performance for stages 1 and 3, respectively. During a 3-day ultra-endurance triathlon, the TST was reduced and had a significant negative correlation to exercise performance, indicating that sleep loss was associated with slower performances. Sleep onset latency, wake episodes, and sleep efficiency did not significantly change over the course of this investigation, which may stem from the close proximity of exercise to sleep.	Sommeil

2022-02	2022-Cloosterman-Educational online prevention programme (the SPRINT study) has no effect on the number of running-related injuries in recreational runners: a randomised-controlled trial	Objectives: The aim of this study was to examine the effectiveness of an enhanced online injury prevention programme on the number of running-related injuries (RRIs) in recreational runners. Methods: We conducted a randomised-controlled trial in runners who registered for running events (distances: 10-42.195 km) in the Netherlands. Adult runners who provided informed consent were randomised into the intervention or control group. Participants in the intervention group received access to the online prevention programme, which included items to prevent RRIs. Participants in the control group followed their regular preparation for the running event. The primary outcome measure was the number of new RRIs from baseline to 1 month after the running event. To determine differences between injury proportions, univariate and multivariate logistic regression analyses were performed. Results: This study included 4050 recreational runners (63.5% males; mean (SD) age: 42.3 (12.1) years) for analyses. During follow-up, 35.5% (95% CI: 33.5 to 37.6) of the participants in the intervention group sustained a new RRI compared with 35.4% (95% CI: 33.3 to 37.5) of the participants in the control group, with no between-group difference (OR: 1.03; 95% CI: 0.90 to 1.17). There was a positive association between the number of items followed in the injury prevention programme and the number of RRIs (OR: 1.05; 95% CI: 1.00 to 1.11). Conclusion: The enhanced online injury prevention programme had no effect on the number of RRIs in recreational runners, and being compliant with the programme paradoxically was associated with a slightly higher injury rate. Future studies should focus on individual targeted prevention with emphasis on the timing and application of preventive measures.	Éducation et blessures
2022-02	2022-Doyle-The Effectiveness of Gait Retraining on Running Kinematics, Kinetics, Performance, Pain, and Injury in Distance Runners: A Systematic Review With Meta-analysis	Objective: To evaluate the effectiveness of running gait retraining on kinematics, kinetics, performance, pain, and injury in distance runners. Design: Intervention systematic review with meta-analysis. Literature search: Seven electronic databases from inception to March 2021. Study selection criteria: Randomised controlled trials that (i) evaluated running gait retraining compared to no intervention, usual training, placebo, or standard care, and (ii) reported biomechanical, physiological, performance, or clinical outcomes. Data synthesis: Random-effects meta-analyses were completed, and the certainty of evidence was judged using the GRADE criteria. We categorised interventions into step-rate, non-rearfoot footstrike, impact, ground contact time, and multi-parameter subgroups. Results: We included 19 trials (673 participants). Moderate certainty evidence indicated step rate gait retraining increased step rate (SMD 1.03 [95% CI: 0.63, 1.44]; number of trials (N): 4; I2: 0%) and reduced average vertical loading rate (SMD -0.57 [95% CI: -1.05, -0.09], N: 3; I2: 0%). Low certainty evidence indicated non-rearfoot footstrike retraining increased knee flexion at initial contact (SMD 0.74 [95% CI: 0.11, 1.37]; N: 2; I2: 0%), but did not alter running economy (SMD 0.21 [95% CI: -1.11, 1.52]; N: 3; I2: 19%).). Low certainty evidence indicated multi-parameter retraining did not alter running economy (SMD 0.32 [-0.39, 1.02]; N: 3; I2: 19%) or performance (SMD 0.14 [95% CI: -4.87, 4.58]; N: 2; I2: 18%). Insufficient trials reported on pain outcomes. Two trials demonstrated reduced 1 year injury incidence following gait retraining. Conclusions: Gait retraining interventions altered step rate and knee kinematics, lowered vertical loading rates, and did not affect running performance.	Gait retraining
2022-02	2021-Ullman-Effects of Isometric Exercises versus Static Stretching in Warm-up Regimens for Running Sport Athletes: A Systematic Review	The objective of this review was to identify studies that report the pre-exercise effects of isometric exercise versus static stretching on performance and injury rates of running athletes in comparison to their outcomes. Seven electronic databases were searched: Cochrane, PEDro, CINAHL, PubMed, MEDLINE, SportDiscus, and GoogleScholar. Data was collected using an established PICO question, and assembled logic grid. The included articles were required to (1) assess running performance or injury prevention and (2) include isometric exercises/muscle activation and/or static stretching. Articles published prior to the year 2000, non-English, and non-human studies were excluded. Quality was assessed using the PEDro quality appraisal tool for RCTs, and NIH-NHLBI appraisal tool for others. The Cochrane collaboration tool for risk of bias as well as the PRISMA 2020 statement were also used in this review. In the nine articles appraised in the study, variables assessed included running economy, injury rate, soreness levels, sprint times, and countermovement and drop jump height. Static stretching demonstrated a significant negative effect on sprint performance and countermovement/drop jump height. It also demonstrated a decrease in variables associated with injury over extended periods and no impact on running economy. Isometric holds demonstrated no significant effect on sprint performance or countermovement/drop jump height. It also demonstrated decreases in soreness levels and no impact on running economy. Isometric holds have positive effects/fewer negative results on running athletes when compared to static stretching for pre-exercise performance. Research with decreased risk of bias is needed to determine maximal benefits from timing/dosage of isometric hold in warm-up.	Stretching

2022-01	2022-Malisoux-Spatiotemporal and Ground-Reaction Force Characteristics as Risk Factors for Running-Related Injury: A Secondary Analysis of a Randomized Trial Including 800+ Recreational Runners	Background: Running biomechanics may play a role in running-related injury development, but to date, only a few modifiable factors have been prospectively associated with injury risk. Purpose: To identify risk factors among spatiotemporal and ground-reaction force characteristics in recreational runners and to investigate whether shoe cushioning modifies the association between running biomechanics and injury risk. Study design: Case-control study; Level of evidence, 3. Methods: Recreational runners (N = 848) were tested on an instrumented treadmill at their preferred running speed in randomly allocated, standardized running shoes (with either hard or soft cushioning). Typical kinetic and spatiotemporal metrics were derived from ground-reaction force recordings. Participants were subsequently followed up for 6 months regarding running activity and injury. Cox regression models for competing risk were used to investigate the association between biomechanical risk factors and injury risk, including stratified analyses by shoe version. Results: In the crude analysis, greater injury risk was found for greater step length (subhazard rate ratio [SHR], 1.01; 95% CI, 1.00-1.02; P = .038), longer flight time (SHR, 1.00; 95% CI, 1.00-1.01; P = .028), shorter contact time (SHR, 0.99; 95% CI, 0.99-1.00; P = .030), and lower duty factor (defined as the ratio between contact time and stride time; SHR, 0.95; 95% CI, 0.91-0.98; P = .005). In the stratified analyses by shoe version, adjusted for previous injury and running speed, lower duty factor was associated with greater injury risk in those using the soft shoes (SHR, 0.92; 95% CI, 0.85-0.99; P = .042) but not in those using the hard shoes (SHR, 0.97; 95% CI, 0.91-1.04; P = .348). Conclusion: Lower duty factor is an injury risk factor, especially for softer shoe use. Contrary to widespread beliefs, vertical impact peak, loading rate, and step rate were not injury risk factors in recreational runners.	Lien biomécanique - blessures
2022-01	2022-Clermont-The influence of midsole shear on running economy and smoothness with a 3D-printed midsole	The objectives of this study were to first determine whether a newly designed 3D-printed midsole, configured with a mechanism to increase anterior-posterior deformation, could increase anterior midsole shear during the stance phase of running. We then wanted to determine whether these shoes could affect running economy and smoothness. Two footwear conditions, differing in midsole technology, were used in this study. The control condition consisted of a thermoplastic polyurethane midsole (TPU-Control), whereas the prototype shoes (3D-Shear) were constructed with a 3D-printed lattice midsole designed for greater anterior foot displacement during early to mid-stance. Twenty male participants ran on a treadmill for 6 min in each condition, and data were collected during the final 2 min. Midsole shear was measured using 3D kinematic data; running smoothness was quantified with peak acceleration and jerk magnitudes from the foot, sacrum, and head; and running economy was determined with oxygen consumption data. As hypothesised, the anterior midsole shear was greater in the 3D-Shear condition compared to the TPU-Control. The 3D-Shear did not improve running economy. Runners exhibited significantly lower peak accelerations at the sacrum, along with lower magnitudes of jerk at the foot, sacrum, and head in the 3D-Shear condition, indicating smoother running patterns.	Détecteur science technologies
2022-01	2022-Hutchinson-The Iliotibial Band: A Complex Structure with Versatile Functions	The development of a pronounced iliotibial band (ITB) is an anatomically distinct evolution of humans. The mechanical behaviour of this "new" structure is still poorly understood and hotly debated in current literature. Iliotibial band syndrome (ITBS) is one of the leading causes of lateral knee pain injuries in runners. We currently lack a comprehensive understanding of the healthy behaviour of the ITB, and this is necessary prior to further investigating the aetiology of pathologies like ITBS. Therefore, the purpose of this narrative review was to collate the anatomical, biomechanical and clinical literature to understand how the mechanical function of the ITB is influenced by anatomical variation, posture and muscle activation. The complexity of understanding the mechanical function of the ITB is due, in part, to the presence of its two in-series muscles: gluteus maximus (GMAX) and tensor fascia latae (TFL). At present, we lack a fundamental understanding of how GMAX and TFL transmit force through the ITB and what mechanical role the ITB plays for movements like walking or running. While there is a range of proposed ITBS treatment strategies, robust evidence for effective treatments is still lacking. Interventions that directly target the running biomechanics suspected to increase either ITB strain or compression of lateral knee structures may have promise, but clinical randomised controlled trials are still required.	ITBS
2022-01	2022-Malisoux-Lower impact forces but greater burden for the musculoskeletal system in running shoes with greater cushioning stiffness	In a recent randomized trial investigating running shoe cushioning, injury risk was greater in recreational runners who trained in the shoe version with greater cushioning stiffness (Stiff) compared to those using the Soft version. However, vertical impact peak force (VIPF) was lower in the Stiff version. To investigate further the mechanisms involved in the protective effect of greater cushioning, the present study used an intra-subject design and analysed the differences in running kinematics and kinetics between the Stiff and Soft shoe versions on a subsample of 41 runners from the previous trial. Data were recorded in the two shoe conditions using an instrumented treadmill at 10 km.h-1. VIPF was confirmed to be lower in the Stiff version compared to the Soft version (1.39 ± 0.25 vs. 1.50 ± 0.25 BW, respectively; p = 0.009, d = 0.42), but not difference was observed in vertical loading rate (p = 0.255 and 0.897 for vertical average and instantaneous loading rate, respectively). Ankle eversion maximal velocity was not different (p = 0.099), but the Stiff version induced greater ankle negative work (-0.55 ± 0.09 vs. -0.52 ± 0.10 J.kg-1; p = 0.009, d = 0.32), maximal ankle negative power (-7.21 ± 1.90 vs. -6.96 ± 1.92 W.kg-1; p = 0.037, d = 0.13) and maximal hip extension moment (1.25 ± 0.32 vs.1.18 ± 0.30 N.m.kg-1; p = 0.009, d = 0.22). Our results suggest that the Stiff shoe version is related to increased mechanical burden for the musculoskeletal system, especially around the ankle joint.	Technologies et biomécanique

2022-01	2022-Viljoen-Trail running injury risk factors: a living systematic review	Objective: To review and frequently update the available evidence on injury risk factors and epidemiology of injury in trail running. Design: Living systematic review. Updated searches will be done every 6 months for a minimum period of 5 years. Data sources: Eight electronic databases were searched from inception to 18 March 2021. Eligibility criteria: Studies that investigated injury risk factors and/or reported the epidemiology of injury in trail running. Results: Nineteen eligible studies were included, of which 10 studies investigated injury risk factors among 2 785 participants. Significant intrinsic factors associated with injury are: more running experience, level A runner and higher total propensity to sports accident questionnaire (PAD-22) score. Previous history of cramping and postrace biomarkers of muscle damage is associated with cramping. Younger age and low skin phototypes are associated with sunburn. Significant extrinsic factors associated with injury are neglecting warm-up, no specialised running plan, training on asphalt, double training sessions per day and physical labour occupations. A slower race finishing time is associated with cramping, while more than 3 hours of training per day, shade as the primary mode of sun protection and being single are associated with sunburn. An injury incidence range 0.7-61.2 injuries/1000 hours of running and prevalence range 1.3% to 90% were reported. The lower limb was the most reported region of injury, specifically involving blisters of the foot/toe. Conclusion: Limited studies investigated injury risk factors in trail running. Our review found eight intrinsic and nine extrinsic injury risk factors. This review highlighted areas for future research that may aid in designing injury risk management strategies for safer trail running participation.	Facteurs risque blessures
2022-01	2022-Patoz-There Is No Global Running Pattern More Economic Than Another at Endurance Running Speeds	Purpose: The subjective Volodalen® score (V®score) and the objective duty factor metric can both assess global running patterns. The authors aimed to investigate the relation between running economy (RE) at endurance running speeds and the global running pattern quantified using both subjective and objective measures. Methods: RE and 3-dimensional whole-body kinematics were acquired by indirect calorimetry and an optoelectronic system, respectively, for 52 trained runners during treadmill runs at 10, 12, and 14 km/h. Results: Correlations between RE and V®score and RE and duty factor were negligible and nonsignificant across speeds tested ($P \geq .20$), except for a low and significant correlation between RE and V®score at 10 km/h. Conclusions: These findings suggest there is no global running pattern more economic than another at endurance running speeds. Therefore, there is no advantage of choosing, favoring, or prescribing one specific global running pattern along a continuum based on V®score or duty factor metrics, and coaches should not try to modify the spontaneous running pattern of runners at endurance running speed to improve RE.	Patron de course et économie
2022-01	2021-Curtis-Daily activity in minimal footwear increases foot strength	The human foot is uniquely adapted to bipedal locomotion and has a deformable arch of variable stiffness. Intrinsic foot muscles regulate arch deformation, making them important for foot function. In this study we explore the hypothesis that normal daily activity in minimal footwear, which provides little or no support, increases foot muscle strength. Western adults wore minimal footwear for a six-month period (the "intervention" group). Foot strength, i.e., maximum isometric plantarflexion strength at the metatarsophalangeal joints, and foot biometrics were measured before and after the intervention. An additional group was investigated to add further insight on the long-term effects of footwear, consisting of Western adults with an average 2.5 years of experience in minimal footwear (the "experienced" group). This study shows that foot strength increases by, on average, 57.4% ($p < 0.001$) after six months of daily activity in minimal footwear. The experienced group had similar foot strength as the post intervention group, suggesting that six months of regular minimal footwear use is sufficient to gain full strength, which may aid healthy balance and gait.	Chaussure minimaliste et force du pied
2021-12	2022-Weakley-Putting the Squeeze on Compression Garments: Current Evidence and Recommendations for Future Research: A Systematic Scoping Review	Background: Compression garments are regularly worn during exercise to improve physical performance, mitigate fatigue responses, and enhance recovery. However, evidence for their efficacy is varied and the methodological approaches and outcome measures used within the scientific literature are diverse. Objectives: The aim of this scoping review is to provide a comprehensive overview of the effects of compression garments on commonly assessed outcome measures in response to exercise, including: performance, biomechanical, neuromuscular, cardiovascular, cardiorespiratory, muscle damage, thermoregulatory, and perceptual responses. Methods: A systematic search of electronic databases (PubMed, SPORTDiscus, Web of Science and CINAHL Complete) was performed from the earliest record to 27 December, 2020. Results: In total, 183 studies were identified for qualitative analysis with the following breakdown: performance and muscle function outcomes: 115 studies (63%), biomechanical and neuromuscular: 59 (32%), blood and saliva markers: 85 (46%), cardiovascular: 76 (42%), cardiorespiratory: 39 (21%), thermoregulatory: 19 (10%) and perceptual: 98 (54%). Approximately 85% (n = 156) of studies were published between 2010 and 2020. Conclusions: Evidence is equivocal as to whether garments improve physical performance, with little evidence supporting improvements in kinetic or kinematic outcomes. Compression likely reduces muscle oscillatory properties and has a positive effect on sensorimotor systems. Findings suggest potential increases in arterial blood flow; however, it is unlikely that compression garments meaningfully change metabolic responses, blood pressure, heart rate, and cardiorespiratory measures. Compression garments increase localised skin temperature and may reduce perceptions of muscle soreness and pain following exercise; however, rating of perceived exertion during exercise is likely unchanged. It is unlikely that compression garments negatively influence exercise-related outcomes. Future research should assess wearer belief in compression garments, report pressure ranges at multiple sites as well as garment material, and finally examine individual responses and varying compression coverage areas.	Bas compressifs

2021-12	2021-Au-Impact Sound Across Rearfoot, Midfoot, and Forefoot Strike During Overground Running	Context: Three foot-strike techniques are common in runners. If these techniques generate different sounds at the point of impact with the ground, lower limb kinetics may be influenced. No previous authors have determined whether such relationships exist. Objectives: To determine foot-ground impact sound characteristics and compare the impact-sound characteristics across foot-strike techniques and the relationships between impact-sound characteristics and vertical loading rates. Design: Cross-sectional study. Setting: Gait analysis laboratory. Patients or other participants: A total of 30 runners (15 women, 15 men; age = 23.5 ± 4.0 years, height = 1.67 ± 0.1 m, mass = 58.1 ± 8.2 kg) completed overground running trials with rearfoot-strike, midfoot-strike (MFS), and forefoot-strike (FFS) techniques in a gait analysis laboratory. Main outcome measure(s): Impact sound was measured using a shotgun microphone, and the peak sound amplitude, median frequency, and sound duration were analyzed. Separate linear regressions, clustering participants due to repeated measures, were used to compare the sound characteristics across foot-strike techniques. Kinetic data were collected from a force plate, and the vertical loading rates were calculated. Pearson correlation was used to determine the relationship between sound characteristics and kinetics. Results: Landing with an MFS or FFS resulted in greater peak sound amplitude ($P < .001$) and shorter sound duration ($P < .001$) than a rearfoot strike. The MFS exhibited the highest median frequency among the 3 foot-strike patterns, followed by the FFS ($P < .001$). We did not find a significant relationship between vertical loading rates and any impact sound characteristics ($P > .115$). Conclusions: The results suggest that impact-sound characteristics may be used to differentiate foot-strike patterns in runners. However, these did not relate to lower limb kinetics. Therefore, clinicians should not solely rely on impact sound to infer impact loading.	Évaluation course
2021-12	2022-Garcia-Quantification method influences training load change in high school cross-country runners across a competitive season	Context: Running programs traditionally monitor external loads (e.g., time, distance). There has been a recent movement to encompass a more comprehensive approach to also monitor training loads that account for internal loads (e.g., intensity, measured as session rating of perceived exertion [sRPE]). The combination of an external and internal load accounts for the potential interaction between these loads. While differences in weekly change in training loads have been reported between external loads and the combination of an external and internal load during 2- and 4-week training cycles, there are no reports whether these differences are apparent during an entire cross-country season in high school runners. Objective: To compare change in training loads, as measured by external loads and combinations of an external and internal load, in high school runners during an interscholastic cross-country season. Design: Case-series. Setting: Community-based with daily online surveys. Participants: Twenty-four high school cross-country runners (female=14, male=10, age=15.9±1.1 years, running experience=9.9±3.2 years). Main outcome measure(s): Week-to-week percent change in training load when measured by external loads (time, distance) and the combination of an external and internal load (timeRPE, distanceRPE). Results: Overall, the average weekly change was 7.1% greater for distanceRPE compared to distance (p=.04, d=0.18). When decreasing weekly running duration, the average weekly change was 5.2% greater for distanceRPE compared to timeRPE (p=.03, d=0.24). When maintaining or increasing weekly running duration, the average weekly change was 10-15% greater when an external load was combined with an internal load compared to external loads alone, but these differences were non- significant (p=.11-.22, d=0.19-0.34). Conclusions: Our results demonstrate that progression in training load may be underestimated when relying solely on external loads. The interaction between internal loads (sRPE) and external loads (distance or time) appears to provide a different measure of training stresses experienced by runners than external loads alone.	Load/Capacity
2021-12	2022-Bartley-Effects of cold water immersion on circulating inflammatory markers at the Kona Ironman World Championship	Cold water immersion (CWI) purportedly reduces inflammation and improves muscle recovery after exercise, yet its effectiveness in specific contexts (ultraendurance) remains unclear. Thus, our aim was to study hematological profiles, systemic inflammation, and muscle damage responses to a specific post-race CWI (vs. control) during recovery after the Ironman World Championship, a culmination of ~100 000 athletes competing in global qualifying Ironman events each year. Twenty-nine competitors were randomized into either a CWI or control (CON) group. Physiological parameters and blood samples were taken at pre-race, after intervention (POST), and 24 (+1DAY) and 48 hours (+2DAY) following the race. Muscle damage markers (plasma myoglobin, serum creatine kinase) were elevated at POST, +1DAY, and +2DAY, while inflammatory cytokines interleukin (IL)-6, IL-8, and IL-10 and total leukocyte counts were increased only at POST. CWI had no effect on these markers. Numbers of the most abundant circulating cell type, neutrophils, were elevated at POST more so in CWI ($p < 0.05$, vs. CON). Despite that neutrophil counts may be a sensitive marker to detect subtle effects, CWI does not affect recovery markers 24- and 48-hours post-race (vs. CON). Overall, we determined that our short CWI protocol was not sufficient to improve recovery. Novelty: Ironman World Championship event increased circulating muscle damage markers, inflammatory markers, and hematological parameters, including circulating immune cell sub-populations that recover 24-48 hours after the race. 12-min CWI post-ultraendurance event affects the absolute numbers of neutrophils acutely, post-race (vs. CON), but does not impact recovery 24- and 48-hours post-race.	CWI

2021-12	2021-Jafarnezhadgero-Long-term training on sand changes lower limb muscle activities during running in runners with over-pronated feet	Background: Running on sand could be a promising exercise intervention for the treatment of over-pronated feet. However, there is a lack of knowledge about the effects of running on sand on muscle activities. Therefore, this study aims to evaluate the long-term effects of running on sand on the activities of selected lower limb muscles in individuals with OPF compared with healthy controls. Methods: Sixty recreational adult male runners with over-pronated feet (foot posture index > 10) were divided into two equal groups (intervention and control). Participants ran barefoot at a pre-defined speed (~3.3 m/s) over level stable ground both before and after long-term training on the sand. Muscle activities were recorded using a surface bipolar electromyography system. Results: For the intervention group, we found a reduced foot posture index ($p < 0.001$; $d = 2.00$) and significant group-by-time interactions for gluteus medius activity during the mid-stance phase ($p < 0.028$; $d = 0.59$). Significantly higher gluteus medius activity ($p = 0.028$, $d = 0.569$) was found during the post-test. We also observed significant group-by-time interactions for medial gastrocnemius activity during the push-off phase ($p < 0.041$; $d = 0.54$). Significantly larger medial gastrocnemius activity ($p = 0.041$; $d = 0.636$) was found during the post-test compared to the pre-test. Conclusions: Long-term running on sand resulted in reduced pronation, increased medial gastrocnemius activity, and improved frontal plane pelvic stability due to higher gluteus medius activity.	Surfaces
2021-12	2021-Jiang-Running speed does not influence the asymmetry of kinematic variables of the lower limb joints in novice runners	Purpose: The purpose of this study was to evaluate kinematic variables at 5 running speeds (8 to 12 km/h), for the asymmetry between lower limbs. We also investigated the effects of running speed on the bilateral asymmetry of the lower limb joints kinematic variables among novice runners. Methods: Kinematic (200 Hz) running data were collected bilaterally for 17 healthy male novice runners (age: 23.1 ± 1.3 years, height: 1.77 ± 0.04 m, mass: 72.3 ± 4.57 kg, BMI: 23.1 ± 1.0 kg/m2) running on a treadmill at 5 fixed speeds (8, 9, 10, 11 and 12 km/h) in a randomized order. Symmetry angles (SA) were calculated to quantify gait asymmetry magnitude at each running speed. Results: Overall, SPM analysis using paired t-tests revealed significant joints kinematic differences between the left lower limb and the right lower limb at each running speed. Significant differences between limbs were found for all joint kinematic variables in the ankle and hip, regardless of running speed. As for the knee angle, significant differences between legs were only found during the running speed of 11 km/h. For knee angle velocity, significant differences between legs were found in all running speeds except for 8 km/h. However, there was no noticeable difference in asymmetry values across running speeds. Conclusions: The findings of the current study indicate that gait asymmetry of joint kinematics variables between lower limbs during running is apparent in healthy novice runners. Meanwhile, running speed does not influence lower limb joints kinematic asymmetry among novice runners.	Symétrie
2021-11	2021-Suda-Predictive Effect of Well-Known Risk Factors and Foot-Core Training in Lower Limb Running-Related Injuries in Recreational Runners: A Secondary Analysis of a Randomized Controlled Trial	Background: Running carries the risk of several types of running-related injuries (RRIs), especially in the lower limbs. The variety of risk factors and the lack of strong evidence for several of these injury risks hinder the ability to draw assertive conclusions about them, hampering the implementation of effective preventive strategies. Because the etiology of RRIs seems to be multifactorial, the presence of RRI risk factors might influence the outcome of therapeutic strategies in different ways. Thus, further investigations on how risk and protective factors influence the incidence and prevention of RRIs should be conducted. Purpose: To investigate the predictive effect of well-known risk factors and 1 protective factor-foot-core training-on the incidence of lower limb RRIs in recreational runners. Study design: Cohort study; Level of evidence, 2. Methods: Middle- and long-distance recreational runners (N = 118) were assessed at baseline and randomly allocated to either an intervention group (n = 57) or a control group (n = 61). The intervention group underwent an 8-week (3 times/wk) foot-core training program. Participants were followed for a year after baseline assessment for the occurrence of RRIs. Logistic regression with backward elimination of variables was used to develop a model for prediction of RRI in recreational runners. Candidate predictor variables included age, sex, body mass index, years of running practice, number of races, training volume, training frequency, previous RRI, and the foot-core exercise training. Results: The final logistic regression model included 3 variables. As previously shown, the foot-core exercise program is a protective factor for RRIs (odds ratio, 0.40; 95% CI, 0.15-0.98). In addition, older age (odds ratio, 1.07; 95% CI, 1.00-1.14) and higher training volume (odds ratio, 1.02; 95% CI, 1.00-1.03) were risk factors for RRIs. Conclusion: The foot-core training was identified as a protective effect against lower limb RRI, which can be negatively influenced by older age and higher weekly training volume. The predictive model showed that RRIs should be considered a multivariate entity owing to the interaction among several factors.	Renforcement pied
2021-11	2021-Trowell-Effect of concurrent strength and endurance training on run performance and biomechanics: a randomised controlled trial	This parallel-groups randomised controlled trial investigated the effect of concurrent strength and endurance (CSE) training on running performance, biomechanics, and muscle activity during overground running. Thirty moderately-trained distance runners were randomly assigned to 10-weeks CSE training (n = 15; 33.1 ± 7.5 years) or a control group (n = 15; 34.2 ± 8.2 years). Participants ran ≥ 30 km per week and had no experience with strength training. The primary outcome measure was two-kilometre run time. Secondary outcome measures included lower limb sagittal plane biomechanics and muscle activity during running (3.89 m·s-1 and maximal sprinting); maximal aerobic capacity ($\dot{V}O_2$ max); running economy; and, body composition. CSE training improved two-kilometre run time (mean difference (MD): -11.3 s [95% CI -3.7, -19.0]; p = 0.006) and time to exhaustion during the $\dot{V}O_2$ max running test (MD 59.1 s [95% CI 8.58, 109.62]; p = 0.024). The CSE training group also reduced total body fat (MD: -1.05 kg [95% CI -0.21, -1.88]; p = 0.016) while total body mass and lean body mass were unchanged. Hip joint angular velocity during the early swing phase of running at 3.89 m·s-1 was the only biomechanical or muscle activity variable that significantly changed following CSE training. CSE training is beneficial for running performance, but changes in running biomechanics and muscle activity may not be contributing factors to the performance improvement. Future research should consider other possible mechanisms and the effect of CSE training on biomechanics and muscle activity during prolonged running under fatigued conditions.	Renforcement et performance

2021-11	2021-Lafferty-Clinical Indoor Running Gait Analysis May Not Approximate Outdoor Running Gait Based on Novel Drone Technology	Background: Traditional running gait analysis is limited to artificial environments, but whether treadmill running approximates overground running is debated. This study aimed to compare treadmill gait analysis using fixed video with outdoor gait analysis using drone video capture. Hypothesis: Measured kinematics would be similar between natural outdoor running and traditional treadmill gait analysis. Study design: Crossover study. Level of evidence: Level 2. Methods: The study population included cross-country, track and field, and recreational athletes with current running mileage of at least 15 km per week. Participants completed segments in indoor and outdoor environments. Indoor running was completed on a treadmill with static video capture, and outdoor segments were obtained via drone on an outdoor track. Three reviewers independently performed clinical gait analysis on footage for 32 runners using kinematic measurements with published acceptable intra- and interrater reliability. Results: Of the 8 kinematic variables measured, 2 were found to have moderate agreement indoor versus outdoor, while 6 had fair to poor agreement. Foot strike at initial contact and rearfoot position at midstance had moderate agreement indoor versus outdoor, with a kappa of 0.54 and 0.49, respectively. The remaining variables: tibial inclination at initial contact, knee flexion angle initial contact, forward trunk lean full gait cycle, knee center position midstance, knee separation midstance, and lateral pelvic drop at midstance were found to have fair to poor agreement, ranging from 0.21 to 0.36. Conclusion: This study suggests that kinematics may differ between natural outdoor running and traditional treadmill gait analysis. Clinical relevance: Providing recommendations for altering gait based on treadmill gait analysis may prove to be harmful if treadmill analysis does not approximate natural running environments. Drone technology could provide advancement in clinical running recommendations by capturing runners in natural environments.	Overground vs treadmill
2021-11	2021-Bovalino-Foot Strike Patterns During Overground Distance Running: A Systematic Review and Meta-Analysis	Background: Investigations of foot strike patterns during overground distance running have foci on prevalence, performance and change in foot strike pattern with increased distance. To date, synthesised analyses of these findings are scarce. Objective: The key objectives of this review were to quantify the prevalence of foot strike patterns, assess the impact of increased running distance on foot strike pattern change and investigate the potential impact of foot strike pattern on performance. Methods: Relevant peer-reviewed literature was obtained by searching EBSCOhost CINAHL, Ovid Medline, EMBASE and SPORTDiscus (inception-2021) for studies investigating foot strike patterns in overground distance running settings (> 10 km). Random effects meta-analyses of prevalence data were performed where possible. Results: The initial search identified 2210 unique articles. After removal of duplicates and excluded articles, 12 articles were included in the review. Meta-analysis of prevalence data revealed that 79% of long-distance overground runners rearfoot strike early, with prevalence rising to 86% with increased distance. In total, 11% of runners changed foot strike pattern with increased distance and of those, the vast majority (84%) do so in one direction, being non-rearfoot strike to rearfoot strike. Analysis of the relationship between foot strike pattern and performance revealed that 5 studies reported a performance benefit to non-rearfoot strike, 1 study reported a performance benefit to non-rearfoot strike in women but not men, 4 studies reported no benefit to non-rearfoot strike or rearfoot strike, and no studies reported a performance benefit of rearfoot strike over non-rearfoot strike. Conclusion: Most overground distance runners rearfoot strike early, and the prevalence of this pattern increases with distance. Of those that do change foot strike pattern, the majority transition from non-rearfoot to rearfoot. The current literature provides inconclusive evidence of a competitive advantage being associated with long-distance runners who use a non-rearfoot strike pattern in favour of a rearfoot strike pattern.	Prevalence FSP
2021-11	2021-Urbaczka-Effect of training volume on footstrike patterns over an exhaustive run	Background: Although footstrike pattern (FP) may not be a factor influencing running performance, 11-75% of world-class distance runners use a non-rearfoot FP. However, little attention has been paid to describe the effect of running volume on FP changes when a runner is fatigued. Research question: Does the training volume provide an adequate stimulus to mitigate FP changes during an exhaustive run in non-rearfoot, habitual minimalist footwear runners? Methods: The objective of this study was to compare FP between non-rearfoot, habitual minimalist footwear runners with a moderate training volume (MT) and a high training volume (HT) during an exhaustive run on a motorized treadmill. Based on their weekly training volume (distance), twenty-eight runners were arranged into two groups paired by height and age. At the first visit, runners underwent a VO2max test to acquire their velocity for the exhaustive run. During the second visit, biomechanical and physiological analysis of the beginning and the end phase of the exhaustive run was done. Results: The frontal plane foot angle, the sagittal plane ankle angle at the initial contact (IC), and the foot eversion ROM showed a significant interaction effect ($P < 0.05$). Additionally, the sagittal plane footstrike angle, the frontal plane foot angle, the sagittal plane ankle angle, knee flexion angle at IC and foot eversion ROM showed a significant effect of fatigue ($P < 0.05$). Finally, the frontal plane foot angle, the sagittal plane footstrike angle, the sagittal plane ankle angle, and the knee flexion angle showed significant group effects ($P < 0.05$). Significance: The training volume affects the footstrike pattern of non-rearfoot, habitual minimalist footwear runners when they are fatigued. The highly trained runners maintained their ankle angle throughout the exhaustive running protocol, whereas the moderately trained group changed the frontal and sagittal plane characteristics of their footstrike pattern.	Cinématique et chaussures

2021-11	2021-Campos-Training-intensity Distribution on Middle- and Long-distance Runners: A Systematic Review	Training-intensity distribution (TID) is considered the key factor to optimize performance in endurance sports. This systematic review aimed to: I) characterize the TID typically used by middle-and long-distance runners; II) compare the effect of different types of TID on endurance performance and its physiological determinants; III) determine the extent to which different TID quantification methods can calculate same TID outcomes from a given training program. The keywords and search strategy identified 20 articles in the research databases. These articles demonstrated differences in the quantification of the different training-intensity zones among quantification methods (i. e. session-rating of perceived exertion, heart rate, blood lactate, race pace, and running speed). The studies that used greater volumes of low-intensity training such as those characterized by pyramidal and polarized TID approaches, reported greater improvements in endurance performance than those which used a threshold TID. Thus, it seems that the combination of high-volume at low-intensity (≥ 70% of overall training volume) and low-volume at threshold and high-intensity interval training (≤ 30%) is necessary to optimize endurance training adaptations in middle-and long-distance runners. Moreover, monitoring training via multiple mechanisms that systematically encompasses objective and subjective TID quantification methods can help coaches/researches to make better decisions.	Periodisation
2021-11	2021-Whiting-Metabolic cost of level, uphill, and downhill running in highly cushioned shoes with carbon-fiber plates	Background: Compared to conventional racing shoes, Nike Vaporfly 4% running shoes reduce the metabolic cost of level treadmill running by 4%. The reduction is attributed to their lightweight, highly compliant, and resilient midsole foam and a midsole-embedded curved carbon fiber plate. We investigated whether these shoes also reduce the metabolic cost of moderate uphill (+3°) and downhill (-3°) grades. We tested the null hypothesis that, compared to conventional racing shoes, highly cushioned shoes with carbon-fiber plates would impart the same ~4% metabolic power (W/kg) savings during uphill and downhill running as they do during level running. Methods: After familiarization, 16 competitive male runners performed 6 5-min trials (2 shoes × 3 grades) in 2 Nike marathon racing-shoe models (Streak 6 and Vaporfly 4%) on a level, uphill (+ 3°), and downhill (-3°) treadmill at 13 km/h (3.61 m/s). We measured submaximal oxygen uptake and carbon dioxide production during Minutes 4-5 and calculated metabolic power (W/kg) for each shoe model and grade combination. Results: Compared to the conventional shoes (Streak 6), the metabolic power in the Vaporfly 4% shoes was 3.83% (level), 2.82% (uphill), and 2.70% (downhill) less (all $p < 0.001$). The percent of change in metabolic power for uphill running was less compared to level running ($p = 0.04$, effect size, ES = 0.561) but was not statistically different between downhill and level running ($p = 0.17$, ES = 0.356). Conclusion: On a running course with uphill and downhill sections, the metabolic savings and hence performance enhancement provided by Vaporfly 4% shoes would likely be slightly less overall, compared to the savings on a perfectly level race course.	Chaussures et Performance
2021-11	2021-Van Alsenoy-Increased footwear comfort is associated with improved running economy - a systematic review and meta-analysis	Footwear with or without custom foot orthotics have the potential to improve comfort, but the link with running performance needs further investigation. We systematically reviewed the association of footwear comfort on running economy in recreational runners. Nine electronic databases were searched from inception to March 2020. Eligible studies investigated both direct outcome measures of running performance (e.g. running speed) and/or physiological measures (e.g. running economy (RE)) alongside comfort for each footwear condition tested. Methodological quality was assessed using the 'Effective Public Health Practice Project' (EPHPP). RE during submaximal running was the most common physiological outcome reported in 4 of the 6 eligible studies. The absolute difference in RE between the most and least comfortable footwear condition was computed, and meta-analysis was conducted using a random effect model. The most comfortable footwear is associated with a reduction in oxygen consumption (MD: -2.06 mL.kg-1.min-1, 95%CI: -3.71, -0.42, P = 0.01) while running at a set submaximal speed. There was no significant heterogeneity ($I2=0\%$, $P=0.82$). EPHPP quality assessment demonstrated weak quality of the studies, due to reporting bias and failing to disclose the psychometric properties of the outcome measures. It can be concluded with moderate certainty that improved RE in recreational athletes is associated with wearing more comfortable footwear compared to less comfortable footwear.	Chaussures et performance
2021-11	2021-Namineni-Marathon Runners' Knowledge and Strategies for Hydration	Objective: To study hydration plans and understanding of exercise-associated hyponatremia (EAH) among current marathon runners. Design: Cross-sectional study. Setting: Southern California 2018 summer marathon. Participants: Two hundred ten marathon runners. Interventions: Survey administered 1 to 2 days before the race. Race times were obtained from public race website. Main outcome measures: Planned frequency of hydration; awareness of, understanding of, and preventative strategies for dehydration and EAH; resources used to create hydration plans; drink preferences. Results: When the participants were split into 3 equal groups by racing speed, the slower tertile intended to drink at every mile/station (60%), whereas the faster tertile preferred to drink every other mile or less often (60%), although not statistically significant. Most runners (84%) claimed awareness of EAH, but only 32% could list a symptom of the condition. Both experienced marathoners and the faster tertile significantly had greater understanding of hyponatremia compared with first-time marathoners and the slower tertile, respectively. Less than 5% of marathoners offered "drink to thirst" as a prevention strategy for dehydration or EAH. Conclusion: Slower runners plan to drink larger volumes compared with their faster counterparts. Both slower and first-time marathoners significantly lacked understanding of EAH. These groups have plans and knowledge that may put them at higher risk for developing EAH. Most marathon runners did not know of the guidelines to "drink to thirst," suggesting the 2015 EAH Consensus statement may not have had the desired impact.	Hydratation

2021-11	2021-Molina-Molina-The effect of two retraining programs, barefoot running vs increasing cadence, on kinematic parameters: A randomized controlled trial	The aim of this study was to compare the effects of two 10-week non-laboratory-based running retraining programs on foot kinematics and spatiotemporal parameters in recreational runners. One hundred and three recreational runners (30 ± 7.2 years old, 39% females) were randomly assigned to either: a barefoot retraining group (BAR) with 3 sessions/week over 10 weeks, a cadence retraining group (CAD) who increased cadence by 10% again with 3 sessions/week over 10 weeks and a control group (CON) who did not perform any retraining. The footstrike pattern, footstrike angle (FSA), and spatial-temporal variables at comfortable and high speeds were measured using 2D/3D photogrammetry and a floor-based photocell system. A 3 × 2 ANOVA was used to compare between the groups and 2 time points. The FSA significantly reduced at the comfortable speed by 5.81° for BAR ($p < 0.001$; Cohen's $d = 0.749$) and 4.81° for CAD ($p = 0.002$; Cohen's $d = 0.638$), and at high speed by 6.54° for BAR ($p < 0.001$; Cohen's $d = 0.753$) and by 4.71° for CAD ($p = 0.001$; Cohen's $d = 0.623$). The cadence significantly increased by 2% in the CAD group ($p = 0.015$; Cohen's $d = 0.344$) at comfortable speed and the BAR group showed a 1.7% increase at high speed. BAR and CAD retraining programs showed a moderate effect for reducing FSA and rearfoot prevalence, and a small effect for increasing cadence. Both offer low-cost and feasible tools for gait modification within recreational runners in clinical scenarios.	Pieds nus / cadence + cinématique, gait retraining	
2021-11	2021-Stellingwerff-Overtraining Syndrome (OTS) and Relative Energy Deficiency in Sport (RED-S): Shared Pathways, Symptoms and Complexities	The symptom similarities between training-overload (with or without an Overtraining Syndrome (OTS) diagnosis) and Relative Energy Deficiency in Sport (RED-S) are significant, with both initiating from a hypothalamic-pituitary origin, that can be influenced by low carbohydrate (CHO) and energy availability (EA). In this narrative review we wish to showcase that many of the negative outcomes of training-overload (with, or without an OTS diagnosis) may be primarily due to misdiagnosed under-fueling, or RED-S, via low EA and/or low CHO availability. Accordingly, we undertook an analysis of training-overload/OTS type studies that have also collected and analyzed for energy intake (EI), CHO, exercise energy expenditure (EEE) and/or EA. Eighteen of the 21 studies (86%) that met our criteria showed indications of an EA decrease or difference between two cohorts within a given study (n = 14 studies) or CHO availability decrease (n = 4 studies) during the training-overload/OTS period, resulting in both training-overload/OTS and RED-S symptom outcomes compared to control conditions. Furthermore, we demonstrate significantly similar symptom overlaps across much of the OTS (n = 57 studies) and RED-S/Female Athlete Triad (n = 88 studies) literature. It is important to note that the prevention of under-recovery is multi-factorial, but many aspects are based around EA and CHO availability. Herein we have demonstrated that OTS and RED-S have many shared pathways, symptoms, and diagnostic complexities. Substantial attention is required to increase the knowledge and awareness of RED-S, and to enhance the diagnostic accuracy of both OTS and RED-S, to allow clinicians to more accurately exclude LEA/RED-S from OTS diagnoses.	RED-S	
2021-10	2021-Hansen-Factors correlated with running economy among elite middle- and long-distance runners	Running economy (RE) at a given submaximal running velocity is defined as oxygen consumption per minute per kg body mass. We investigated RE in a group of 12 male elite runners of national class. In addition to RE at 14 and 18 km h-1 we measured the maximal oxygen consumption (VO2max) and anthropometric measures including the moment arm of the Achilles tendon (LAch), shank and foot volumes, and muscular fascicle lengths. A 3-D biomechanical movement analysis of treadmill running was also conducted. RE was on average 47.8 and 62.3 ml O2 min-1 kg-1 at 14 and 18 km h-1 . Maximal difference between the individual athletes was 21% at 18 km h-1 . Mechanical work rate was significantly correlated with VO2 measured in L min-1 at both running velocities. However, RE and relative work rate were not significantly correlated. LAch was significantly correlated with RE at 18 km h-1 implying that a short moment arm is advantageous regarding RE. Neither foot volume nor shank volume were significantly correlated to RE. Relative muscle fascicle length of m. soleus was significantly correlated with RE at 18 km h-1 . Whole body stiffness and leg stiffness were significantly correlated with LAch indicating that a short moment arm coincided with high stiffness. It is concluded that a short LAch is correlated with RE. Probably, a short LAch allows for storage of a larger amount of elastic energy in the tendon and influences the force-velocity relation toward a lower contraction velocity.	Économie de course	
2021-10	2021-Zhang-Effects of 12-week transition training with minimalist shoes on Achilles tendon loading in habitual rearfoot strike runners	Minimalist shod runners have reported greater material and mechanical properties of the Achilles tendon (AT) due to increased loading than runners who wear more cushioned running shoes. This study aimed to investigate the effects of 12-week transition training from conventional shoes to minimalist shoes on AT loading in habitual rearfoot strike runners. Seventeen healthy male habitual rearfoot strikers completed 12-week transition training. They were instructed either to run in minimalist shoes with a forefoot strike pattern (MIN + FFS, n = 9) or run in minimalist shoes but were free to develop their strike pattern (MIN, n = 8). Ultrasound images were captured to determine the cross-sectional area of the AT. Sagittal plane ankle kinematics and ground reaction forces were recorded simultaneously to quantify ankle joint mechanics and AT loading. The strike angle significantly decreased in MIN + FFS after the transition training, indicating a flatter foot at initial contact, whereas no changes were observed in MIN. After training, a significant increase in peak plantarflexion moment was observed for MIN + FFS (15.4%) and MIN (7.6%). Significantly increased peak AT force, peak loading rate and peak stress were observed after training in both groups. Specifically, MIN + FFS had a greater increase in peak AT force (20.3% versus 10.1%), peak loading rate (37.2% versus 25.4%) and peak AT stress (13.7% versus 8.1%) than MIN. Furthermore, for both groups, there were no significant differences in the moment arm and cross-sectional area of the AT observed before and after 12 weeks of training. The results of this study suggested that it was insufficient to promote the morphological adaptation of the AT, but the mechanical loading of the AT was adapted during running after 12-week transition training with minimalist shoes in MIN + FFS and MIN. Preliminary evidence showed that a gradual transition to minimalist shoes with a forefoot strike pattern may be beneficial to the mechanical loading of the AT.	Transition chaussures MINI	
2021-10	2021-Carvalho-Effects of 24 h Compression Interventions with Different Garments on Recovery Markers during Running	Compression and temperature manipulation are discussed as strategies to improve performance markers and recovery in sports. Here, we investigate the effects of compression stockings made with fabric, either combined or not with heating and cooling substances, on variables related to running performance and recovery. Ten trained runners (mean ± standard deviation age 45 ± 9 years old, body mass 69 ± 7 kg, height 166 ± 4 cm) with no experience of using compression garments performed an intense running session of 10 km, then wore a stocking for 24 h (randomized; without compression, compression, compression with camphor, and compression with menthol), and were evaluated on the following day, after running 5 km. The different types of compression stockings used 24 h before exercise did not affect running kinematics ($p > 0.14$), skin temperature ($p > 0.05$), heart rate ($p > 0.12$; mean value of maximal heart rate 156 bpm), comfort perception ($p = 0.13$; mean value of 7/10 points), or perception of recovery ($p = 0.13$; mean value of 7/10 points). In general, there were no effects of 24 h pre-exercise lower leg compression, including those treated with menthol and camphor applications on running kinematics, skin temperature, heart rate, or recovery perception in athletes undertaking consecutive running exercises.	Bas compressifs	
2021-10	2021-Ueno-Relationship between Step Characteristics and Race Performance during 5000-m Race	This study examined the relationship between step characteristics and race time in a 5000-m race. Twenty-one male Japanese endurance runners performed a 5000-m race. Step length, step frequency, contact time, and flight time of two gait cycles (i.e., four consecutive ground contacts) were measured every 400-m by using high-speed video image. Moreover, step length was normalized to body height to minimize the effect of body size. In addition to step characteristics on each lap, the averages of all laps and the per cent change from the first half to the second half were calculated. The average step frequency and step length normalized to body height correlated significantly with the 5000-m race time ($r = -0.611$, $r = -0.575$, respectively, $p < 0.05$ for both). Per cent changes in contact time and step length correlated significantly with the 5000-m race time ($r = 0.514$, $r = -0.486$, respectively, $p < 0.05$ for both). These findings suggest that, in addition to higher step frequency and step length normalized to body height, smaller changes in step length during a given race may be an important step characteristic to achieving superior race performance in endurance runners.	Cadence & performance	MDPI - 21 sujets

2021-09	2021-Joubert-A Comparison of Running Economy Across Seven Carbon-Plated Racing Shoes	Background: Advancements in running shoe technology, particularly in the Nike Vaporfly, have been shown to improve running economy. Other brands have now also developed new, advanced shoes with a carbon-fiber plate and thicker, new midsole foams. However, none of these new shoes have been compared to the Vaporfly. Therefore, we compared the effects of 7 different carbon-plated shoes and 1 traditional racing shoe on running economy. Methods: Seven carbon-plated shoes: Hoka-RocketX (HRX), Saucony-Endorphin Pro (SEP), Nike-Alphafly (NAF), Asics-Metaspeed Sky (AMS), Nike-Vaporfly2 (NVF2), New Balance-RC Elite (NBRC), Brooks-Hyperion Elite2 (BHE2), and one traditional shoe: Asics-Hyperspeed (AHS) were tested in 12 male runners (5k best: 16.0±0.7 min) on two visits. Shoes were tested in a random sequence over 8x5-minute trials (16 km·hr-1; 5-minute rest between trials) on visit 1, and in the reverse/mirrored order for visit 2. Metabolic and running mechanics data were collected and averaged across visits. Results: VO2 (ml·kg-1·min-1; % change from AHS) was significantly different across shoes. HRX (51.67±2.07) and BHE2 (51.42±1.72) did not differ from AHS (51.71±2.02). While SEP (50.93±1.82; -1.48±0.72%) and NBRC (50.99±1.83; -1.37±0.78%) were statistically better than AHS, they were inferior to NAF (50.13±1.86; -3.03±1.48%), NVF2 (50.29±1.72; -2.72±1.02%), and AMS (50.39±1.71; -2.52±1.08%). Conclusions: While some of the shoes tested performed better than the traditional racing shoe, only NAF and AMS matched the NVF2. From these data, it appears the running shoe market as a whole has not caught up to the advantages conferred by the NVF2.	Chaussures carbone
2021-09	2021-Ramskov-Interactions between running volume and running pace on injury occurrence in recreational runners: A secondary analysis	Context The combination of an excessive increase in running pace and volume is essential to consider when investigating associations between running and running-related injury. Objectives The purpose of the present study was to complete a secondary analysis on a dataset from a randomized trial, to investigate the interactions between relative or absolute weekly changes in running volume and running pace on running injury occurrence among a cohort of injury-free recreational runners in Denmark. Design Prospective cohort study Setting Running volume and pace were collected during a 24-week follow-up using global positioning systems (GPS) data. Training data was used to calculate relative and absolute weekly changes in running volume and pace. Patients or Other Participants A total of 586 recreational runners were included in the analysis. All participants were injury-free at inclusion. Main Outcome Measure(s) Running-related injury was the outcome. Injury data were collected weekly using a modified version of the OSTRC questionnaire. Risk difference (RD) was the measure of injury risk. Results A total of 133 runners sustained a running-related injury. A relative weekly change of progression >10% in running volume and progression in running pace (RD=8.1%, 95%CI: - 9.3;25.6%) and an absolute weekly change of progression >5km in running volume and progression in running pace (RD=5.2%, 95%CI: -12.0;22.5%), were not associated with a statistically significant positive interaction. Conclusions As coaches, clinicians and athletes may agree that excessive increase in running pace and excessive increase in running volume are important contributors to injury development, we analyzed the interaction between them. Although a statistically significant positive interaction on an additive scale in runners who progressed both running pace and running volume were not identified in the present study, readers of scientific articles should be aware that interaction is an important analytical approach that could be applied to other datasets in future publications.	Progression course
2021-09	2021-Knapik-Update on Minimalist Running Shoes	This article provides updated information comparing minimalist running shoes (MRS) to conventional running shoes (CRS). Our previous review found that, compared with running in CRS, transitioning to MRS resulted in lower energy cost and less ground contact occurring at the forefoot, resulting in lower impact forces. There was some increased risk of injury with MRS, although data were conflicting. A more recent 26-week study involved 30 trained runners using CRS and 31 using MRS. The proportion of training time in the assigned shoes increased by 5% each week. After the first 6 weeks of transition (35% of training time in the assigned shoe), energy cost was lower and 5-km running time faster in MRS compared with CRS. No further improvement occurred from weeks 6 to 26. There were no significant differences in injury incidence in the two groups (CRS = 37%, MRS = 52%; p = .24). Running-related pain was higher in the MRS group in the knee, shin, calf, and ankle and increased at these locations as running mileage increased. Risk of injury in MRS increased as participant body weight increased. These more recent data suggest that MRS can improve performance, but most runners should limit running in MRS to 35% of training time and in situations where optimal performance is desired (e.g., races, fitness tests).	Chaussures minimalistes
2021-09	2021-Moltubakk-Altered Triceps Surae Muscle-Tendon Unit Properties after 6 Months of Static Stretching	Introduction: This study examined the effects of 24 wk of daily static stretching of the plantarflexors (unilateral 4 × 60-s stretching, whereas the contralateral leg served as a control; n = 26) on joint range of motion (ROM), muscle-tendon unit morphological and mechanical properties, neural activation, and contractile function. Methods: Torque-angle/velocity was obtained in passive and active conditions using isokinetic dynamometry, whereas muscle-tendon morphology and mechanical properties were examined using ultrasonography. Results: After the intervention, ROM increased (stretching, +11° ± 7°; control, 4° ± 8°), and passive torque (stretching, -10 ± 11 N·m; control, -7 ± 10 N·m) and normalized EMG amplitude (stretching, -3% ± 6%; control, -3% ± 4%) at a standardized dorsiflexion angle decreased. Increases were seen in passive tendon elongation at a standardized force (stretching, +1.3 ± 1.6 mm; control, +1.4 ± 2.1 mm) and in maximal passive muscle and tendon elongation. Angle of peak torque shifted toward dorsiflexion. No changes were seen in tendon stiffness, resting tendon length, or gastrocnemius medialis fascicle length. Conformable changes in ROM, passive dorsiflexion variables, tendon elongation, and angle of peak torque were observed in the nonstretched leg. Conclusions: The present findings indicate that habitual stretching increases ROM and decreases passive torque, altering muscle-tendon behavior with the potential to modify contractile function.	Stretching

2021-09	2021-Burke-Risk Factors for Injuries in Runners: A Systematic Review of Foot Strike Technique and Its Classification at Impact	Background: It has been suggested that foot strike technique (FST) at initial contact is related to running-related injuries (RRIs). Purpose: To explore the relationship between FST and RRIs. Study Design: Systematic review; Level of evidence, 3. Methods: A systematic electronic search was performed using MEDLINE, PubMed, SPORTDiscus, Scopus, and Web of Science databases. Included were studies published in the English language that explored the relationship between FST and RRIs between January 1960 and November 2020. Results were extracted and collated. The Grading of Recommendations, Assessment, Development and Evaluation approach was applied to synthesize the quality of evidence. Results: We reviewed 13 studies exploring the relationship between FST and RRIs. Of these, 6 studies reported FST categorically (foot strike pattern [FSP]), and 7 reported continuous measures (foot contact angle, ankle flexion angle, and strike index). Three of the 6 studies looking at categorical FSP found rearfoot strikers have a significantly greater retrospective injury rate than do non– rearfoot strikers, with 1 other study noting a greater risk associated with midfoot and forefoot strike. Regarding the continuous measures of FST, only 1 of the 7 studies reported a significant relationship with RRIs. Conclusion: There was low evidence to suggest a relationship between FST (or its subcategories of categorical FSP and continuous measures) and RRIs. While two-thirds of the categorical studies found a relationship between FSP and RRIs, these studies were very low quality, with limitations such as retrospective study design, low participant numbers, and poor FSP assessment methods. More large-scale prospective studies are required.	FSP et blessures
2021-08	2021-Reeves-No change in foot soft tissue morphology and skin sensitivity after three months of using foot orthoses that alter plantar pressure	Altering plantar load using foot orthoses (FOs) may alter the mechanical work required of internal structures and change the size of muscle and connective tissues. Skin sensitivity might also change as a result of altering mechanoreceptor stimulation. This study investigated the effects of FOs on foot soft tissue morphology and skin sensitivity over three months of use. Forty-one healthy participants wore prefabricated FOs (n = 23) or no insert (n = 18) for three months. The FOs were prescribed specific to each participant, using criteria of a change in peak pressure of 8% in the medial arch (pressure increase) and medial heel (pressure decrease). Ultrasound images were recorded pre- and post-FOs use to derive cross-sectional area and thickness of: abductor hallucis, flexor hallucis brevis, flexor digitorum brevis and the Achilles tendon at the insertion and mid-portion. Plantar fascia thickness was measured at the insertion and midfoot. The minimal detectable difference was established in piloting (n = 7). Skin sensitivity was measured with monofilaments at the dorsum (between the hallux and second toe), medial and lateral heel, medial and lateral arch and the 1st metatarsal head. The FOs increased peak pressure by 15% in the medial arch and reduced it by 21% in the medial heel. None of the changes in soft tissue measurements was greater than the minimal detectable difference and there were no effects of group and time. Skin sensitivity decreased over time at the 1st metatarsal head for both groups, but there was no group effect. Using FOs over three months did not change the foot tissues nor skin sensitivity. This study challenges the notion that FOs make muscles smaller.	Orthèses
2021-08	2021-Faelli-The Effect of Static and Dynamic Stretching during Warm-Up on Running Economy and Perception of Effort in Recreational Endurance Runners	This randomized crossover counterbalanced study investigated, in recreational runners, the acute effects of pre-exercise stretching on physiological and metabolic responses, endurance performance, and perception of effort. Eight male endurance runners (age 36 ± 11 years) performed three running-until-exhaustion tests, preceded by three warm-ups, including the following different stretching protocols: static (SS), dynamic (DS), and no-stretching (NS). During the SS and DS sessions, the warm-up consisted of 10 min of running plus 5 min of SS or DS, respectively, while during the NS session, the warm-up consisted of 15 min of running. Physiological and metabolic responses, and endurance running performance parameters, were evaluated. The perception of effort was derived from the rating of perceived exertion (RPE). Running economy significantly improved after SS ($p < 0.05$) and DS ($p < 0.01$), and RPE values were significantly lower in SS ($p < 0.05$) and DS ($p < 0.01$), compared to NS. No differences in physiological and metabolic responses among the sessions were found. This study showed that including SS and DS within the warm-up ameliorated running economy and decreased the perception of effort during a running-until-exhaustion test, highlighting the benefits of stretching on endurance performance. These results should encourage recreational runners to insert stretching during warm-up, to optimize the running energy costs, reducing the perception of effort and making the training sessions more enjoyable.	Stretching
2021-08	2021-Rodrigo-Carranza-The effects of footwear midsole longitudinal bending stiffness on running economy and ground contact biomechanics A systematic review and meta-analysis	This study aimed to address the effects of increased longitudinal bending stiffness (LBS) on running economy (RE) and running biomechanics. A systematic search on four electronic databases (Pubmed, WOS, Medline and Scopus) was conducted on 26 May 2021. Twelve studies met the inclusion criteria and were included. Standardised mean difference with 95% confidence intervals (CI) between footwear with increased LBS vs. non-increased LBS conditions and effect sizes were calculated. To assess the potential effects of moderator variables (type and length plate, increased LBS, shoe mass and running speed) on the main outcome variable (i.e. RE), subgroup analyses were performed. Increased LBS improved RE (SMD = -0.43 [95% CI -0.58, -0.28], $Z = 5.60$, $p < 0.001$) compared to non-increased LBS. Significant increases of stride length (SMD = 0.29 [95% CI 0.10, 0.49], $Z = 2.93$, $p = 0.003$) and contact time (SMD = 0.17 [95% CI 0.03, 0.31], $Z = 2.32$, $p = 0.02$) were found when LBS was increased. RE improved to a greater degree at higher running speeds with footwear with increased LBS. RE improved 3.45% with curve plate compared to no-plate condition without improvements with flat plate shoes. When shoe mass was matched between footwear with increased LBS vs. non-increased LBS conditions, RE improved (3.15%). However, when shoe mass was not controlled (experimental condition with ~35 grams extra), a significant small improvement was found. These RE improvements appear along with an increase of stride length and contact time. Shoe mass, type of plate (flat or curve) and running speed should be taken into consideration when designing a shoe aimed at improving long-distance running performance.	Chaussure et performance

2021-07	2021-Musgjerd-Effect of Increasing Running Cadence on Peak Impact Force in an Outdoor Environment	Background An estimated 56% of recreational runners sustain a running-related injury related to the high impact forces in running. Increasing step frequency (cadence) while maintaining a consistent speed has been shown to be an effective way to lower impact forces which may reduce injury risk. Purpose To examine effects of increased cadence on peak impact force during running in an outdoor setting. It was hypothesized that as cadence increases, peak force would decrease. Study Design Repeated measures, quasi-experimental Methods Peak force and cadence measurements were collected from 15 recreational runners (8 females, 7 males) during two 2.4-mile outdoor runs. Peak force was measured using an insole-based load measuring device. Baseline session run was completed at participant's naturally preferred cadence and cadence session run was completed at a cadence targeted to be 10% greater than baseline. Pace was monitored with a GPS watch. Cadence was cued by an auditory metronome and measured with both GPS watch and insoles. Repeated-measures ANOVA's examined the differences in average peak force, GPS-reported cadence, and insole-reported cadence between mile 1 and mile 2, and across the two cadence conditions. Results Cadence differences of 7.3% were observed between baseline and cadence sessions ($p<0.001$). A concurrent decrease in average peak force of 5.6% was demonstrated during the cadence run ($p<0.05$). Average cadences measured by GPS watch and insoles were found to be the same at both baseline ($p=0.096$) and during cadence ($p=0.352$) sessions. Conclusion Increasing cadence by an average of 7% in an outdoor setting resulted in a decrease in peak force at two different time points during a 2.4-mile run. Furthermore, using a metronome for in-field cadence manipulation led to a change in cadence. This suggests that a metronome may be an effective tool to manipulate cadence for the purpose of decreasing peak impact force in an outdoor setting.	Cadence et biomec
2021-07	2021-Gruber-Leg and Joint Stiffness Adaptations to Minimalist and Maximalist Running Shoes	The running footwear literature reports a conceptual disconnect between shoe cushioning and external impact loading: footwear or surfaces with greater cushioning tend to result in greater impact force characteristics during running. Increased impact loading with maximalist footwear may reflect an altered lower-extremity gait strategy to adjust for running in compliant footwear. The authors hypothesized that ankle and knee joint stiffness would change to maintain the effective vertical stiffness, as cushioning changed with minimalist, traditional, and maximalist footwear. Eleven participants ran on an instrumental treadmill (3.5 m·s-1) for a 5-minute familiarization in each footwear, plus an additional 110 seconds before data collection. Vertical, leg, ankle, and knee joint stiffness and vertical impact force characteristics were calculated. Mixed model with repeated measures tested differences between footwear conditions. Compared with traditional and maximalist, the minimalist shoes were associated with greater average instantaneous and average vertical loading rates ($P < .050$), greater vertical stiffness ($P \leq .010$), and less change in leg length between initial contact and peak resultant ground reaction force ($P < .050$). No other differences in stiffness or impact variables were observed. The shoe cushioning paradox did not hold in this study due to a similar musculoskeletal strategy for running in traditional and maximalist footwear and running with a more rigid limb in minimalist footwear.	Chaussures et biomécanique
2021-07	2022-Healey-Longitudinal bending stiffness does not affect running economy in Nike Vaporfly Shoes	Objective: To determine the independent effect of the curved carbon-fiber plate in the Nike Vaporfly 4% shoe on running economy and running biomechanics. Methods: Fifteen healthy male runners completed a metabolic protocol and a biomechanics protocol. In both protocols participants wore 2 different shoes, an intact Nike Vaporfly 4% (VFintact) and a cut Nike Vaporfly 4% (VFcut). The VFcut had 6 medio-lateral cuts through the carbon-fiber plate in the forefoot to reduce the effectiveness of the plate. In the metabolic protocol, participants ran at 14 km/h for 5 min, twice with each shoe, on a force-measuring treadmill while we measured metabolic rate. In the biomechanics protocol, participants ran across a runway with embedded force plates at 14 km/h. We calculated running economy, kinetics, and lower limb joint mechanics. Results: Running economy did not significantly differ between shoe conditions (on average, 0.55% ± 1.77% (mean ± SD) worse in the VFcut compared to the VFintact; 95% confidence interval: (-1.44% to 0.40%)). Biomechanical differences were only found in the metatarsophalangeal joint (MTP) with increased MTP dorsiflexion angle, angular velocity, and negative power in the VFcut. Contact time was 1% longer in the VFintact. Conclusion: Cutting the carbon-fiber plate and reducing the longitudinal bending stiffness did not have a significant effect on the energy savings in the Nike Vaporfly 4%. This suggests that the plate's stiffening effect on the MTP joint plays a limited role in the reported energy savings, and instead savings are likely from a combination and interaction of the foam, geometry, and plate.	Chaussures & performance

x	2021-07	2021-Sundstrom-Runners Adapt Different Lower-Limb Movement Patterns With Respect to Different Speeds and Downhill Slopes	The aim of this study was to investigate the influence of slope and speed on lower-limb kinematics and energy cost of running. Six well-trained runners (VO2max 72 ± 6 mL·kg-1·min-1) were recruited for the study and performed (1) VO2max and energy cost tests and (2) an experimental running protocol at two speeds, 12 km·h-1 and a speed corresponding to 80% of VO2max (V80, 15.8 ± 1.3 km·h-1) on three different slopes (0°, -5°, and -10°), totaling six 5-min workload conditions. The workload conditions were randomly ordered and performed continuously. The tests lasted 30 min in total. All testing was performed on a large treadmill (3 × 5 m) that offered control over both speed and slope. Three-dimensional kinematic data of the right lower limb were captured during the experimental running protocol using eight infrared cameras with a sampling frequency of 150 Hz. Running kinematics were calculated using a lower body model and inverse kinematics approach. The generic model contained three, one, and two degrees of freedom at the hip, knee, and ankle joints, respectively. Oxygen uptake was measured throughout the experimental protocol. Maximum hip extension and flexion during the stance phase increased due to higher speed ($p < 0.01$ and $p < 0.01$, respectively). Knee extension at the touchdown and maximal knee flexion in the stance phase both increased on steeper downhill slopes (both $p < 0.05$). Ground contact time (GCT) decreased as the speed increased ($p < 0.01$) but was unaffected by slope ($p = 0.73$). Runners modified their hip movement pattern in the sagittal plane in response to changes in speed, whereas they altered their knee movement pattern during the touchdown and stance phases in response to changes in slope. While energy cost of running was unaffected by speed alone ($p = 0.379$), a shift in energy cost was observed for different speeds as the downhill gradient increased ($p < 0.001$). Energy cost was lower at V80 than 12 km·h-1 on a -5° slope but worse on a -10° slope. This indicates that higher speeds are more efficient on moderate downhill slopes (-5°), while lower speeds are more efficient on steeper downhill slopes (-10°).	Biomécanique Pentes
x	2021-07	2021-Plesek-Running Footstrike Patterns and Footwear in Habitually Shod Preschool Children	Introduction: Running skill develops during the preschool age. There is little research evidence as to how footstrike patterns are affected by footwear during this important developmental period. Purpose: The aim of this study was to compare footstrike patterns among different age groups of preschool children running in different footwear conditions. Methods: Three-dimensional kinetics and kinematics were collected while 48 typically developing children age 3 to 6 yr ran overground at self-selected speed in a barefoot condition and in minimalist and standard running shoes. Children were divided into four age groups (n = 12 per group). The key dependent variables for this study included strike index and sagittal plane ankle angle at footstrike. A two-way mixed ANOVA (3 × 4) was performed to determine possible footwear and age differences in footstrike patterns. Results: An interaction between footwear condition and age group was found in the ankle angle at footstrike ($P = 0.030$, $\eta 2 = 0.145$). There was a main effect within the footwear condition across all age groups for strike index ($P = 0.001$, $\eta 2 = 0.337$). The ankle was more plantar flexed in the barefoot and minimalist conditions compared with standard running shoes only in 6-yr-old children ($P < 0.05$, $d > 0.8$). In addition, 6-yr-old children had a more plantar flexed ankle than did 3-yr-old children when they ran barefoot ($P = 0.008$, $d = 1.24$). Conclusions: Footstrike pattern is affected by footwear in preschool children. As children get older, their footstrike pattern becomes more non-rearfoot with a more plantar flexed ankle in barefoot and minimalist shoes. On the contrary, the rearfoot-midfoot strike pattern did not change over preschool age when they wore standard running shoes.	Chaussure enfants
x	2021-07	2021-Sahabuddin-The effects of hip- and ankle-focused exercise intervention on dynamic knee valgus: a systematic review	Background: A range of non-contact injuries such as anterior cruciate ligament tear, and patellofemoral pain syndrome are caused by disordered knee joint loading from excessive dynamic knee valgus (DKV). Previous systematic reviews showed that DKV could be modified through the influence of hip strength and ankle range of motion. Therefore, the purpose of this systematic review was to examine the effects of exercise intervention which involved either top-down or bottom-up kinetic chains on minimizing DKV in male and female adults and adolescents, with and without existing knee pain. Methodology: Electronic searches were conducted in SAGE, Science Direct, SCOPUS, and Pubmed. The search strategy consisted of medical subject headings and free-text search keywords, synonyms and variations of 'exercise intervention,' 'knee alignment,' 'dynamic knee valgus', 'knee abduction' that were merged via the Boolean operator 'AND' and 'OR'. The search was conducted on full-text journals that documented the impact of the exercise intervention program involving either the bottom-up or top-down DKV mechanism on the knee kinematics. Furthermore, exercise intervention in this review should last at least one week which included two or three sessions per week. This review also considered both men and women of all ages with a healthy or symptomatic knee problem. The risk of bias of the included studies was assessed by Cochrane risk assessment tool. The protocol of this review was registered at PROSPERO (registration number: CRD42021219121). Results: Ten studies with a total of 423 participants (male = 22.7%, female = 77.3%; adults = 249, adolescents = 123; pre-adolescent = 51) met the inclusion criteria of this review. Seven studies showed the significant effects of the exercise intervention program (range from two weeks to ten weeks) on reducing DKV. The exercise training in these seven studies focused on muscle groups directly attached to the knee joint such as hamstrings and gastrocnemius. The remaining three studies did not show significant improvement in DKV after the exercise intervention (range between eight weeks to twelve weeks) probably because they focused on trunk and back muscles instead of muscles crossing the knee joint. Conclusion: Exercises targeting specific knee-joint muscles, either from top-down or bottom-up kinetic chain, are likely to reduce DKV formation. These results may assist athletes and coaches to develop effective exercise program that could minimize DKV and ultimately prevent lower limb injuries.	Correction du valgus genou
x	2021-07	2021-Miller-An Evidence-Based Review of the Pathophysiology, Treatment, and Prevention of Exercise Associated Muscle Cramps	Exercise-associated muscle cramps (EAMC) are common and frustrating for athletes and the physically active. We critically-appraised the EAMC literature to provide evidence-based treatment and prevention recommendations. While the pathophysiology of EAMC appears controversial, recent evidence suggests EAMC are due to a confluence of unique intrinsic and extrinsic factors rather than a singular etiology. The treatment of acute EAMC continues to include self-application or clinician-guided gentle static stretching until EAMC abatement. Once the painful EAMC are alleviated, clinicians can continue treatment on the sidelines by focusing on patient-specific risk factors that the clinician believes may have contributed to the genesis of EAMC. For EAMC prevention, clinicians should first perform a thorough medical history followed by identification of the patients' unique risk factors that could have coalesced to elicit EAMC. Individualizing EAMC prevention strategies will likely be more effective than generalized advice (e.g., drink more fluids).	Hydratation vs. crampes

x	2021-06	2021-Vannatta-The Effect of Strength Training on Running Kinematics: A Narrative Review	Running kinematics have been related to injury and therefore may provide a therapeutic avenue for injury prevention and rehabilitation. The effect of strengthening exercise on running kinematics has not been systematically reviewed. The objective of this study was to determine the effect of strengthening exercise programs on 3D running kinematics in experienced runners. A systematic literature review was completed of PubMed/MEDLINE, CINAHL, and SPORTDiscus from inception to April 2020. Articles investigating strengthening exercise programs and completing 3D kinematic analysis during running on experienced runners were included. Twenty-two full text articles were reviewed. Eight met the inclusion criteria. The modified Downs and Black criteria were used to assess article quality and risk of bias. Due to the heterogeneity of methodology, data synthesis was not possible. Therefore, a narrative review is presented. There was inconsistent evidence for the role of strengthening programs on hip adduction, knee internal rotation, and metatarsophalangeal range of motion which may be influenced by the type of strengthening exercise employed or by differences in the sample populations investigated. Most variables showed no change following the completion of a strengthening program. However, some studies indicated that specific strengthening programs may increase trunk rotation excursion, decrease peak hip adduction, increase hip adduction excursion, decrease peak knee internal rotation, increase plantarflexion excursion, or decrease eversion excursion. There is inconclusive evidence for how strengthening exercise may affect running kinematics. The type, frequency, intensity, and duration of strengthening exercise and mode of feedback on movement performance needed to change running kinematics is unknown.	Renforcement et patron de course
x	2021-06	2021-Au-Comparison of foot strike sound between rearfoot, midfoot and forefoot strike runners	Context: There are three common foot strike techniques in runners. Whether these techniques generate different sounds at the point of impact with the ground may influence lower limb kinetics. No previous studies have determined whether such relationships exist. Objectives: To determine foot-ground impact sound characteristics and to compare the impact sound characteristics across foot strike techniques and the relationships between impact sound characteristics and vertical loading rates. Design: Cross-sectional study Setting: Gait analysis laboratory Patients or Other Participants: Thirty runners (50% female, age=23.5±4.0 yrs, mass=58.1±8.2kg, height=1.67±0.1m) completed overground running trials with rearfoot strike (RFS), midfoot strike (MFS) and forefoot strike (FFS) techniques in a gait analysis laboratory. Main outcome measure(s): Impact sound was measured by a shotgun microphone and the peak sound amplitude, median frequency and sound duration were analysed. Separate linear regression, clustering participants repeated measures were used to compare the sound parameters across foot strike techniques. Kinetic data was collected from a force plate and the vertical loading rates were calculated. Pearson's correlation was used to determine relationship between sound characteristic and kinetics. Results: Landing with a MFS or FFS resulted in greater peak sound amplitude (ps<0.001) and shorter sound duration (ps<0.001) than RFS. MFS exhibited the highest median frequency among the three foot strike patterns, followed by FFS (ps<0.001). We did not find a significant relationship between vertical loading rates and any impact sound parameters (ps>0.115). Conclusions: The results suggest that impact sound characteristics may be used to differentiate foot strike patterns in runners. However, this did not relate to lower limb kinetics. Therefore, clinicians should not solely rely on impact sound to infer impact loading.	Évaluation course
x	2021-06	2021-Xia-Self-selected running gait modifications reduce acute impact loading, awkwardness, and effort	Impact loading has been associated with running-related injuries, and gait retraining has been suggested as a means of reducing impact loading and lowering the risk of injury. However, gait retraining can lead to increased perceived awkwardness and effort. The influence of specifically trained and self-selected running gait modifications on acute impact loading, perceived awkwardness and effort is currently unclear. Sixteen habitual rearfoot/midfoot runners performed forefoot strike pattern, increased step rate, anterior trunk lean and self-selected running gait modifications on an instrumented treadmill based on real-time biofeedback. Impact loading, perceived awkwardness and effort scores were compared among the four gait retraining conditions. Self-selected gait modification reduced vertical average loading rate (VALR) by 25.3%, vertical instantaneous loading rate (VILR) by 27.0%, vertical impact peak (VIP) by 16.8% as compared with baseline. Forefoot strike pattern reduced VALR, VILR and peak tibial acceleration. Increased step rate reduced VALR. Anterior trunk lean did not reduce any impact loading. Self-selected gait modification was perceived as less awkward and require less effort than the specifically trained gait modification ($p < 0.05$). These findings suggest that self-selected gait modification could be a more natural and less effortful strategy than specifically trained gait modification to reduce acute impact loading, while the clinical significance remains unknown.	Gait retraining effets sur VLR / Intégration

x	2021-06	2021-Wu-Running-related Injuries in Middle School Cross Country Runners: Prevalence and characteristics of common injuries	Introduction: Understanding the prevalence and factors associated with running-related injuries in middle school runners may guide injury prevention. Objective: To determine the prevalence of running-related injuries and describe factors related to a history of injury. Design: Retrospective cross-sectional study. Setting: Survey distributed online to middle school runners. Methods: Participants completed a web-based survey regarding prior running-related injuries, training, sleep, diet, and sport participation. Main outcome measurements: Prevalence and characteristics differentiating girls and boys with and without running-related injury history adjusted for age. Participants: 2,113 youth runners (average age=13.2 years, boys: n=1,255, girls: n=858). Results: Running-related injuries were more prevalent in girls (56% vs 50%, p=0.01). Ankle sprain was the most common injury (girls: 22.5%, boys: 21.6%), followed by patellofemoral pain (20.4% vs 7.8%) and shin splints (13.6% vs 5.9%); both were more prevalent in girls (p<0.0001). Boys more frequently reported plantar fasciitis (5.6% vs 3.3%, p=0.01), iliotibial band syndrome (4.1% vs 1.4%, p=0.0007) and Osgood-Schlatter Disease (3.8% vs 1.2%, p=0.0007). Runners with history of running-related injuries were older, ran greater average weekly mileage, ran faster, had fewer average hours of sleep on weekends, skipped more meals, missed breakfast, and consumed less milk (all p<0.05). Girls with history of running-related injuries reported higher dietary restraint scores, later age of menarche, more menstrual cycle disturbances, and higher likelihood of following vegetarian diets and an eating disorder diagnosis (all p<0.05). Runners with no history of running-related injuries were more likely to have participated in ≥2 years of soccer or basketball (p<0.0001). Conclusion: Most middle school runners reported a history of running-related injuries, with certain injuries differed by sex. Modifiable factors with the greatest association with running-related injuries included training volume, dietary restraint, skipping meals, and less sleep. Sport sampling, including participation in ball sports may reduce running-related injury risk in this population.	Facteurs risque blessures
x	2021-05	2021-Afonso-The Effectiveness of Post-exercise Stretching in Short-Term and Delayed Recovery of Strength, Range of Motion and Delayed Onset Muscle Soreness: A Systematic Review and Meta-Analysis of Randomized Controlled Trials	Background: Post-exercise (i.e., cool-down) stretching is commonly prescribed for improving recovery of strength and range of motion (ROM) and diminishing delayed onset muscular soreness (DOMS) after physical exertion. However, the question remains if post-exercise stretching is better for recovery than other post-exercise modalities. Objective: To provide a systematic review and meta-analysis of supervised randomized-controlled trials (RCTs) on the effects of post-exercise stretching on short-term (≤1 h after exercise) and delayed (e.g., ≥24 h) recovery makers (i.e., DOMS, strength, ROM) in comparison with passive recovery or alternative recovery methods (e.g., low-intensity cycling). Methods: This systematic review followed PRISMA guidelines (PROSPERO CRD42020222091). RCTs published in any language or date were eligible, according to P.I.C.O.S. criteria. Searches were performed in eight databases. Risk of bias was assessed using Cochrane RoB 2. Meta-analyses used the inverse variance random-effects model. GRADE was used to assess the methodological quality of the studies. Results: From 17,050 records retrieved, 11 RCTs were included for qualitative analyses and 10 for meta-analysis (n = 229 participants; 17-38 years, mostly males). The exercise protocols varied between studies (e.g., cycling, strength training). Post-exercise stretching included static stretching, passive stretching, and proprioceptive neuromuscular facilitation. Passive recovery (i.e., rest) was used as comparator in eight studies, with additional recovery protocols including low intensity cycling or running, massage, and cold-water immersion. Risk of bias was high in ~70% of the studies. Between-group comparisons showed no effect of post-exercise stretching on strength recovery (ES = -0.08; 95% CI = -0.54-0.39; p = 0.750; I 2 = 0.0%; Egger's test p = 0.531) when compared to passive recovery. In addition, no effect of post-exercise stretching on 24, 48, or 72-h post-exercise DOMS was noted when compared to passive recovery (ES = -0.09 to -0.24; 95% CI = -0.70-0.28; p = 0.187-629; I 2 = 0.0%; Egger's test p = 0.165-0.880). Conclusion: There wasn't sufficient statistical evidence to reject the null hypothesis that stretching and passive recovery have equivalent influence on recovery. Data is scarce, heterogeneous, and confidence in cumulative evidence is very low. Future research should address the limitations highlighted in our review, to allow for more informed recommendations. For now, evidence-based recommendations on whether post-exercise stretching should be applied for the purposes of recovery should be avoided, as the (insufficient) data that is available does not support related claims.	Stretching
x	2021-05	2021-Nakaoka-The Association Between the Acute:Chronic Workload Ratio and Running-Related Injuries in Dutch Runners: A Prospective Cohort Study	Objective: To investigate the association between the acute:chronic workload ratio (ACWR) and running-related injuries (RRI). Methods: This is a secondary analysis using a database composed of data from three studies conducted with the same RRI surveillance system. Longitudinal data comprising running exposure (workload) and RRI were collected biweekly during the respective cohorts' follow-up (18-65 weeks). ACWR was calculated as the most recent (i.e., acute) external workload (last 2 weeks) divided by the average external (i.e., chronic) workload of the last 4, 6, 8, 10 and 12 weeks. Three methods were used to calculate the ACWR: uncoupled, coupled and exponentially weighted moving averages (EWMA). Bayesian logistic mixed models were used to analyse the data. Results: The sample was composed of 435 runners. Runners whose ACWR was under 0.70 had about 10% predicted probability of sustaining RRI (9.6%; 95% credible interval [CrI] 7.5-12.4), while those whose ACWR was higher than 1.38 had about 1% predicted probability of sustaining RRI (1.3%; 95% CrI 0.7-1.7). The association between the ACWR and RRI was significant, varying from a small to a moderate association (1-10%). The higher the ACWR, the lower the RRI risk. Conclusions: The ACWR showed an inversely proportional association with RRI risk that can be represented by a smooth L-shaped, second-order, polynomial decay curve. The ACWR using hours or kilometres yielded similar results. The coupled and uncoupled methods revealed similar associations with RRIs. The uncoupled method presented the best discrimination for ACWR strata. The EWMA method yielded sparse and non-significant results.	Entraînement et blessures

x	2021-05	2021-Kemler-Performance goals of runners are associated with the occurrence of running-related injuries	Objective: The aim of this study was to evaluate the relationship between running performance goals and running-related injuries (RRIs). Design: Retrospective cross-sectional study. Setting: A total of 970 recreational runners filled in an online questionnaire to collect data on personal characteristics, their running activities, RRIs, and running goals. Participants: 970 recreational runners, 1) without a running performance goal, who 2) trained to complete a certain distance, and who 3) trained to complete a certain distance and to participate in a specific running event. Main outcome measures: RRI, defined as any physical complaint developed during running in the previous 12 months. Results: A statistically significant relationship was found between runners who trained for a specific running event and who also wanted to run a certain distance (OR 2.0, 95%CI 1.23-2.98) compared with runners without a running goal. (Hinder from a) Previous injury (OR 3.9, 95%CI 2.79-5.42), overweight (OR 1.6, 95%CI 1.10-2.21), and training for more than 22.5 h/year (OR 1.7, 95%CI 1.04-2.72 and OR 2.3, 95%CI 1.42-3.81) were also associated with RRIs. Conclusion: Running to achieve running goals, specifically running to complete a certain distance and to participate in an event, is associated with the occurrence of an RRI.	Examen subjectif
x	2021-05	2021-Mazzone-Clinical application of foot strike run retraining for military service members with chronic knee pain	Introduction: Military training is associated with a high incidence of knee pain. Conversion from a rearfoot to non-rearfoot strike during running is effective at reducing knee pain in research environments. The purpose of this report was to demonstrate run retraining as a clinical intervention for service members with knee pain. Methods: Sixteen service members with running-related chronic knee pain underwent run retraining that converted foot strike from a rearfoot to a non-rearfoot strike using real-time visual feedback. The Lower Extremity Functional Scale (LEFS) and Numerical Pain Rating Scale (NPRS) for knee pain during running were assessed pretraining, at the final training session and at a 1-month follow-up. During running, foot inclination angle and vertical ground reaction force (VGRF) average loading rate were measured pretraining and at 1 month of follow-up. Results: Service members underwent 7.4±1.0 training sessions over the course of 15.8±4.6 days. LEFS improved by 8±6 points immediately after retraining, with an overall improvement of 10±6 points from pretraining to 1-month follow-up ($p<0.01$). NPRS improved by 2.0±0.4 points immediately after retraining, with an overall improvement of 2.0±0.4 points from pretraining to 1-month follow-up ($p<0.01$). Conversion to a non-rearfoot strike pattern was apparent at follow-up for all but two patients. VGRF average loading rate decreased by 56%±17% ($p<0.01$) from pretraining to 1-month follow-up. Conclusions: Knee pain and function improved as a result of non-rearfoot strike run retraining, which supports the clinical use of this evidence-based intervention.	Gait retraining
x	2021-05	2021-Napier-The Effect of Footwear, Running Speed, and Location on the Validity of Two Commercially Available Inertial Measurement Units During Running	Introduction: Most running-related injuries are believed to be caused by abrupt changes in training load, compounded by biomechanical movement patterns. Wearable technology has made it possible for runners to quantify biomechanical loads (e.g., peak positive acceleration; PPA) using commercially available inertial measurement units (IMUs). However, few devices have established criterion validity. The aim of this study was to assess the validity of two commercially available IMUs during running. Secondary aims were to determine the effect of footwear, running speed, and IMU location on PPA. Materials and Methods: Healthy runners underwent a biomechanical running analysis on an instrumented treadmill. Participants ran at their preferred speed in three footwear conditions (neutral, minimalist, and maximalist), and at three speeds (preferred, +10%, -10%) in the neutral running shoes. Four IMUs were affixed at the distal tibia (IMeasureU-Tibia), shoelaces (RunScribe and IMeasureU-Shoe), and insole (Plantiga) of the right shoe. Pearson correlations were calculated for average vertical loading rate (AVLR) and PPA at each IMU location. Results: The AVLR had a high positive association with PPA (IMeasureU-Tibia) in the neutral and maximalist ($r = 0.70$-0.72; $p \leq 0.001$) shoes and in all running speed conditions ($r = 0.71$-0.83; $p \leq 0.001$), but low positive association in the minimalist ($r = 0.47$; $p < 0.05$) footwear condition. Conversely, the relationship between AVLR and PPA (Plantiga) was high in the minimalist ($r = 0.75$; $p \leq 0.001$) condition and moderate in the neutral ($r = 0.50$; $p < 0.05$) and maximalist ($r = 0.57$; $p < 0.01$) footwear. The RunScribe metrics demonstrated low to moderate positive associations ($r = 0.40$-0.62; $p < 0.05$) with AVLR across most footwear and speed conditions. Discussion: Our findings indicate that the commercially available Plantiga IMU is comparable to a tibia-mounted IMU when acting as a surrogate for AVLR. However, these results vary between different levels of footwear and running speeds. The shoe-mounted RunScribe IMU exhibited slightly lower positive associations with AVLR. In general, the relationship with AVLR improved for the RunScribe sensor at slower speeds and improved for the Plantiga and tibia-mounted IMeasureU sensors at faster speeds.	Effet chaussures sur biomécanique
x	2021-05	2021-Bermon-Effect of Advanced Shoe Technology on the Evolution of Road Race Times in Male and Female Elite Runners	The influence of advanced footwear technology (thickness of light midsole foam and rigid plate) on distance running performances was analyzed during an 8-year period. Analysis of variance was used to measure effects of time, gender, shoe technology, and East African origin on male and female top 20 or top 100 seasonal best times in 10-kilometer races, half-marathons, and marathons. In both genders and three distance-running events, seasonal best times significantly decreased from 2017, which coincided with the introduction of the advanced footwear technology in distance running. This performance improvement was of similar magnitude in both East African and non-East African elite runners. In female elite athletes, the magnitudes (from 1.7 to 2.3%) of the decrease in seasonal best times between 2016 and 2019 were significantly higher than in their male counterparts (from 0.6 to 1.5%). Analyses of variance confirmed that the adoption of the advanced footwear technology significantly improved the top 20 seasonal best times in female half marathons and marathons and male marathons, with the improvements being more pronounced in females and in long-distance running events. The adoption of this new shoe technology improved female marathon time by ~2 min and 10 s, which represents a significant increase in performance (1.7%).	Chaussures / Performance

x	2021-05	2021-Warden-Optimal Load for Managing Low-Risk Tibial and Metatarsal Bone Stress Injuries in Runners: The Science Behind the Clinical Reasoning	Background: Low-risk bone stress injuries (BSIs) of the tibia and metatarsal diaphysis account for >50% of BSIs in runners. They interrupt training and are managed using non-invasive approaches. The desire by all involved is for a speedy, but safe return to running. Clinical question: What is the optimal load to manage low-risk tibial and metatarsal BSIs and safely return to running? Key results: Optimal load can be guided by knowledge of the BSI healing process and is symptom driven. At all stages, the optimal load does not produce symptoms during, after, or the day following loading. Clinical application: A period of initial load reduction, via partial- or non-weightbearing, is typically needed to alleviate presenting symptoms. Analgesics or NSAIDs may be used short-term (<7 days), but only in the presence of resting and/or night pain. Healing supplements (e.g. low-intensity pulsed ultrasound and/or recombinant parathyroid hormone therapy) may be attempted to influence tissue healing. Athletes can maintain cardiopulmonary fitness via cross-training, while simultaneously addressing musculoskeletal fitness. A return-to-run program can be initiated once an athlete is pain-free with daily activities for 5 consecutive days. Progress is directed by symptom provocation and initially focuses on increasing running volume before speed. Continue optimal loading following return to running and consider including jump training and/or gait retraining to reduce subsequent BSI risk. The optimal loading approach to managing low-risk tibial and metatarsal BSIs is clinically successful, but requires further scientific validation	Fx stress
x	2021-05	2021-Rogers-Chronic Plantar Heel Pain is Principally Associated With Waist Girth (Systemic) and Pain (Central) Factors, Not Foot Factors: A Case-Control Study	Objectives: To determine the independent associations of potential clinical, symptom, physical activity, and psychological factors with chronic plantar heel pain. Design: Case-control. Methods: We investigated associations by comparing 220 participants with chronic plantar heel pain (>3 months) and 100 age- and sex-matched controls recruited randomly from the electoral roll. Exposures measured were waist girth, BMI, body composition, clinical measures of foot and leg function, physical activity by accelerometry, depression and pain catastrophising, symptoms of prolonged morning stiffness anywhere in the body, and multisite pain. Data were analysed using multivariable conditional logistic regression. Results: Waist girth (cm) (OR 1.06; 95% CI 1.03 to 1.09), ankle plantarflexor strength (kg) (OR 0.98; 95% CI 0.97 to 0.99), pain at multiple sites (OR 2.76; 95% CI 1.29 to 5.91 (pain at 1 other site), to OR 10.45; 95% CI 3.66 to 29.81 (pain at 4 or more other sites)) and pain catastrophising status (none, some or catastrophiser) (OR 2.91; 95% CI 1.33 to 6.37 (some), OR 6.79; 95% CI 1.91 to 24.11 (catastrophising)) were independently associated with chronic plantar heel pain. There were univariable but not independent associations with morning stiffness, first metatarsophalangeal joint extension ROM, depression and BMI, and no significant associations with physical activity or body composition by bioimpedance analysis. Conclusion: Waist girth, ankle plantarflexor strength, multisite pain and pain catastrophising, but not foot-specific factors, were independently associated with chronic plantar heel pain. Three of four of these factors reflect central or systemic associations.	Lien Anatomie/blessures
x	2021-05	2021-Mousavi-Factors Associated With Lower Limb Injuries in Recreational Runners: A Cross-Sectional Survey Including Mental Aspects and Sleep Quality	Knowledge about prevalence and etiology of running-related injuries (RRIs) is important to design effective RRI prevention programs. Mental aspects and sleep quality seem to be important potential risk factors, yet their association with RRIs needs to be elucidated. The aims of this study are to investigate the epidemiology of RRIs in recreational runners and the association of mental aspects, sleep, and other potential factors with RRIs. An internet-based questionnaire was sent to recreational runners recruited through social media, asking for personal and training characteristics, mental aspects (obsessive passion, motivation to exercise), sleep quality, perceived health, quality of life, foot arch type, and RRIs over the past six months. Data were analyzed descriptively and using logistic regression. Self-reported data from 804 questionnaires were analyzed. Twenty-five potential risk factors for RRIs were investigated. 54% of runners reported at least one RRI. The knee was the most-affected location (45%), followed by the lower leg (19%). Patellofemoral pain syndrome was the most-reported injury (20%), followed by medial tibial stress syndrome (17%). Obsessive passionate attitude (odds ratio (OR):1.35; 95% confidence interval (CI):1.18-1.54), motivation to exercise (OR:1.09; CI:1.03-1.15), and sleep quality (OR:1.23; CI:1.15-1.31) were associated with RRIs, as were perceived health (OR:0.96; CI:0.94-0.97), running over 20 km/week (OR:1.58; CI:1.04-2.42), overweight (OR:2.17; CI:1.41-3.34), pes planus (OR:1.80; CI:1.12-2.88), hard-surface running (OR:1.37; CI:1.17-1.59), running company (OR:1.65; CI:1.16-2.35), and following a training program (OR:1.51; CI:1.09-2.10). These factors together explained 30% of the variance in RRIs. A separate regression analysis showed that mental aspects and sleep quality explain 15% of the variance in RRIs. The association of mental aspects and sleep quality with RRIs adds new insights into the multifactorial etiology of RRIs. We therefore recommend that besides common risk factors for RRI, mental aspects and sleep be incorporated into the advice on prevention and management of RRIs.	Facteurs risque blessures

x	2021-05	2021-Thorpe-Analgesic practices and predictors of use in South Africa-based runners	Background: The use of analgesics is prevalent in runners, with an associated potential for serious harm. More information is needed regarding runners' practices and the factors that may influence their use of analgesics, to identify potential sources of misuse or abuse. Objectives: To describe South Africa (SA)-based runners' practices regarding use of analgesics, focusing on the types used, sources of information, and factors predicting use. Methods: This study had a descriptive, cross-sectional design. SA-based runners aged ≥18 years, who had run at least one race during the year preceding the study, were included. Participants were recruited via social media and SA running clubs. They completed an online survey that included demographic information, training and competition history, and analgesic usage practices. Results: Data from 332 participants (196 females, 136 males) were analysed. There was a high rate of analgesic use (64%), with 17% of users reporting concomitant use of more than one type of analgesic. The highest rate of analgesic use was after a run (80%). Non-steroidal anti-inflammatory drugs (NSAIDs) were the most frequently used analgesics before (71%), during (50%) and after a run (74%). Importantly, NSAIDs and a combination NSAID-containing analgesic were the most common analgesics used concomitantly (19%). Most participants (90%) used over-the-counter analgesics, 41% of them receiving no input from any health professional. Sustaining a running-related injury increased the likelihood of analgesic use almost three-fold (Exp(B)=2.6; 95% confidence interval 1.59 - 2.41; p=0.0001). Conclusions: A large percentage of runners in our study displayed unsafe practices regarding analgesic use during training and competition, predominantly for perceived injury management. Importantly, the lack of education and recommendations regarding analgesics from health professionals is very concerning, as there is a risk of potentially life-threatening analgesic-induced adverse effects, especially as a high percentage were using two NSAIDs concomitantly. Knowledge of these practices, gained through this study, could allow for the development and implementation of corrective strategies to promote education and safe practice of analgesic use in runners.	AINS vs. blessures intro
x	2021-05	2021-Swinnen-Changing Stride Frequency Alters Average Joint Power and Power Distributions during Ground Contact and Leg Swing in Running	Purpose: Runners naturally adopt a stride frequency closely corresponding with the stride frequency that minimizes energy consumption. While the concept of self-optimization is well recognized, we lack mechanistic insight in the association between stride frequency and energy consumption. Altering stride frequency affects lower extremity joint power, however these alterations are different between joints, possibly with counteracting effects on the energy consumption during ground contact and swing. Here, we investigated the effects of changing stride frequency from a joint level perspective. Methods: 17 experienced runners performed six running trials at five different stride frequencies (preferred stride frequency (PSF) twice, PSF ± 8%, PSF ± 15%) at 12 km/h. During each trial, we measured metabolic energy consumption and muscle activation, and collected kinematic and kinetic data which allowed us to calculate average positive joint power using inverse dynamics. Results: With decreasing stride frequency, average positive ankle and knee power during ground contact increased ($p < 0.01$) while average positive hip power during leg swing decreased ($p < 0.01$). Average soleus muscle activation during ground contact also decreased with increasing stride frequency ($p < 0.01$). In addition, the relative contribution of positive ankle power to the total positive joint power during ground contact decreased ($p = 0.01$) with decreasing stride frequency whereas the relative contribution of the hip during the full stride increased ($p < 0.01$) with increasing stride frequency. Conclusion: Our results provide evidence for the hypothesis that the optimal stride frequency represents a trade-off between minimizing the energy consumption during ground contact, associated with higher stride frequencies, without excessively increasing the cost of leg swing or reducing the time available to produce the necessary forces.	Gait retraining
x	2021-05	2021-Dillon-Do Injury-Resistant Runners Have Distinct Differences in Clinical Measures Compared to Recently Injured Runners?	Introduction: Although lower extremity muscle strength, joint motion and functional foot alignment are commonly used, time-efficient clinical measures that have been proposed as risk factors for running related injuries (RRIs), it is unclear if these factors can distinguish injury-resistance in runners. Purpose: This study compares clinical measures, with consideration of sex, between recently injured runners (3 months to 1 year prior), those with a high level of injury resistance who have been uninjured for at least 2 years, and never-injured runners. Methods: Averaged bilateral values and between-limb symmetry angles of lower limb isometric muscle strength, joint motion, navicular drop and Foot Posture Index (FPI) were assessed in a cohort of recreational runners and their injury history was recorded. Differences in clinical measures between injury groupings were examined, with consideration of sex. Results: Of the 223 runners tested, 116 had been recently injured, 61 had been injured >2 years ago and were deemed to have acquired re-injury resistance, and 46 were never injured. Plantar flexion was greater in both recently injured ($P = .001$) and acquired re-injury resistance runners ($P = .001$). compared to never-injured runners. Recently injured runners displayed higher hip abduction strength compared to never-injured runners ($P = .019$, $n2 = .038$, small effect size). There were no statistically significant differences in the remaining measures between the injury groupings. With the exception of FPI, there was no interaction between sex and injury grouping for any of the measures. Conclusion: Commonly employed clinical measures of strength, joint motion and functional foot alignment were not superior in injury-resistant runners compared to recently injured runners, questioning their relevance in identifying future injury resistance of runners.	Lien anatomie/blessures

x	2021-04	2021-Scheer-Musculoskeletal Injuries in Ultra-Endurance Running: A Scoping Review	Ultra-endurance running (UER) has seen an important increase in participation over the last few decades. Long hours of UER can lead to excessive stress on the body, resulting in musculoskeletal injuries (MSKI). UER is not a uniform sport and events can differ considerably in distance (over 42.195 km), time (e.g., events over 6 h) and multi-day or multi-stage events on various surfaces (e.g., track, on-road, off-road). The aims of this scoping review were therefore: (1) to examine the current evidence of MSKI, providing a synthesis of the most common MSKI by anatomical region and specific diagnosis; (2) categorize MSKI by type of UER activity (competition: time-limited; multi-stage; continuous UER events and training); (3) describe knowledge gaps in the literature and provide advice on potential further research. Our electronic literature search (PubMed, SPORTDiscus, Web of Science) identified a total of 13 studies (9 in competition, and 4 in training). Anatomical site, diagnosis and rate of injuries differ between competition and training as well as between different UER types. MSKI are observed in 18% of multi-stage events (0.7-1.8 injuries/runner and 7.2 injuries/1000 h). Most MSKI involve the lower leg (35.0%), ankle (16.8%), knee (13.1%) and foot (12.6%), with main diagnosis of medial tibial stress syndrome (30.1%) and patella femoral pain syndrome (PFPS; 7.2%). Single, continuous UER events differ between a 1005 km road race with almost all of the injuries due to overuse, with the main anatomical site of the knee (31%), ankle (28%) and lower leg (14%) and main diagnosis of PFPS (15.6%), compared to a 65 km trail race, with 32.8% of MSKI, mainly on the foot [plantar fasciitis (28.6%)], ankle [sprain (28.6%)] and knee. Timed-UER events (injury rate of 2.1 injuries/athlete) observed most injuries on the ankle (36%) and knee (19%), with the main diagnosis of tendinitis of the foot dorsiflexors (30%). Injuries during training most commonly affect, the back (42%), and knee (40%) and bone stress injuries (22%). Main diagnoses include ankle sprain (18%), iliotibial band injury (16%) and Achilles tendinopathy (11%). Future considerations include examining MSKI in different UER events, environments and surfaces, and on larger study populations. Establishing risk factors, examining sex differences and using a standard reporting system of MSKI in UER are also important.	Incidence blessures
x	2021-04	2021-Kakouris-A systematic review of running-related musculoskeletal injuries in runners	Running-related musculoskeletal injuries (RRMIs), especially stemming from overuse, frequently occur in runners. This study aimed to systematically review the literature and determine the incidence and prevalence proportion of RRMIs by anatomical location and specific pathology. An electronic database search with no date beginning restrictions was performed in SPORTDiscus, PubMed, and MEDLINE up to June 2020. Prospective studies were used to find the anatomical location and the incidence proportion of each RRMI, whereas retrospective or cross-sectional studies were used to find the prevalence proportion of each RRMI. A separate analysis for ultramarathon runners was performed. The overall injury incidence and prevalence were 40.2% ± 18.8% and 44.6% ± 18.4%, respectively. The knee, ankle, and lower leg accounted for the highest proportion of injury incidence, whereas the knee, lower leg, and foot/toes had the highest proportion of injury prevalence. Achilles tendinopathy (10.3%), medial tibial stress syndrome (9.4%), patellofemoral pain syndrome (6.3%), plantar fasciitis (6.1%), and ankle sprains (5.8%) accounted for the highest proportion of injury incidence, whereas patellofemoral pain syndrome (16.7%), medial tibial stress syndrome (9.1%), plantar fasciitis (7.9%), iliotibial band syndrome (7.9%) and Achilles tendinopathy (6.6%) had the highest proportion of injury prevalence. The ankle (34.5%), knee (28.1%), and lower leg (12.9%) were the 3 most frequently injured sites among ultramarathoners. The injury incidence proportions by anatomical location between ultramarathoners and non-ultramarathoners were not significantly different ($p = 0.798$). The pathologies with the highest incidence proportion of injuries were anterior compartment tendinopathy (19.4%), patellofemoral pain syndrome (15.8%), and Achilles tendinopathy (13.7%). The interpretation of epidemiological data in RRMIs is limited due to several methodological issues encountered.	Incidence blessures
x	2021-04	2021-Nasser-Proximal Hamstring Tendinopathy: A Systematic Review of Interventions	Background: Proximal hamstring tendinopathy affects athletic and non-athletic populations and is associated with longstanding buttock pain. The condition is common in track and field, long distance running and field-based sports. Management options need to be evaluated to direct appropriate clinical management. Purpose/hypothesis: To evaluate surgical and non-surgical interventions used in managing proximal hamstring tendinopathy. Study design: Systematic review. Methods: Electronic databases were searched to January 2019. Studies (all designs) investigating interventions for people with proximal hamstring tendinopathy were eligible. Outcomes included symptoms, physical function, quality of life and adverse events. Studies were screened for risk of bias. Reporting quality was assessed using the Cochrane Risk of Bias Tool (Randomized Controlled Trials [RCT]) and the Joanna Briggs Institute Checklist (Case Series). Effect sizes (Standard mean difference or Standard paired difference) of 0.2, 0.5 and 0.8 were considered as small, medium and large respectively. Overall quality of evidence was rated according to GRADE guidelines. Results: Twelve studies (2 RCTs and 10 case series) were included (n=424; males 229). RCTs examined the following interventions: platelet-rich plasma injection (n=1), autologous whole-blood injection (n=1), shockwave therapy (n=1) and multi-modal intervention (n=1). Case series included evaluation of the following interventions: platelet-rich plasma injection (n=3), surgery (n=4), corticosteroid injection (n=2), multi-modal intervention + platelet-rich plasma injection (n=1). Very low-level evidence found shockwave therapy was more effective than a multi-modal intervention, by a large effect on improving symptoms (-3.22 SMD; 95% CI -4.28, -2.16) and physical function (-2.42 SMD; 95% CI-3.33, -1.50) in the long-term. There was very low-level evidence of no difference between autologous whole-blood injection and platelet-rich plasma injection on physical function (0.17 SMD; 95% CI -0.86, 1.21) to (0.24 SMD; 95% CI -0.76, 1.24) and quality of life (-0.04 SMD; 95%CI -1.05, 0.97) in the medium-term. There was very low-quality evidence that surgery resulted in a large reduction in symptoms (-1.89 SPD; 95% CI -2.36, -1.41) to (-6.02 SPD; 95% CI -8.10, -3.94) and physical function (-4.08 SPD; 95%CI -5.53, -2.63) in the long-term. Conclusions: There is insufficient evidence to recommend any one intervention over another. A pragmatic approach would be to initially trial approaches proven successful in other tendinopathies.	Traitement tendinopathie ischios
x	2021-04	2020-Moran-influence of gait retraining on running economy: a review and potential implications	Running gait retraining has been reported to reduce lower-extremity loads and the risk for some running-related injuries. This has provided evidence that distance running gait can safely be modified in runners. Optimal running gait at a given speed is the product of anthropometric, neuromuscular, fatigue, and external factors. Because running biomechanics are integrally linked with economy, a major determinant of endurance running performance, it is conceivable that gait retraining could improve performance. The evidence investigating the influence of gait retraining on running economy will be evaluated and potential applications discussed.	Gait retraining

x	2021-03	2021-van Oeveren-The biomechanics of running and running styles: a synthesis	Running movements are parametrised using a wide variety of devices. Misleading interpretations can be avoided if the interdependencies and redundancies between biomechanical parameters are taken into account. In this synthetic review, commonly measured running parameters are discussed in relation to each other, culminating in a concise, yet comprehensive description of the full spectrum of running styles. Since the goal of running movements is to transport the body centre of mass (BCoM), and the BCoM trajectory can be derived from spatiotemporal parameters, we anticipate that different running styles are reflected in those spatiotemporal parameters. To this end, this review focuses on spatiotemporal parameters and their relationships with speed, ground reaction force and whole-body kinematics. Based on this evaluation, we submit that the full spectrum of running styles can be described by only two parameters, namely the step frequency and the duty factor (the ratio of stance time and stride time) as assessed at a given speed. These key parameters led to the conceptualisation of a so-called Dual-axis framework. This framework allows categorisation of distinctive running styles (coined 'Stick', 'Bounce', 'Push', 'Hop', and 'Sit') and provides a practical overview to guide future measurement and interpretation of running biomechanics.	Biomécanique course (écoles de pensées)
x	2021-03	2021-Zhou-Effects of overground surfaces on running kinematics and kinetics in habitual non-rearfoot strikers	This study aimed to investigate the effects of different overground surfaces on running biomechanics of non-rearfoot strikers. Thirty-one male habitual non-rearfoot strikers were required to run at 3.3 ± 0.2 m/s on a customized runway with artificial grass, concrete, or synthetic rubber surfaces in a random order. Vertical loading rates, three-dimensional ground reaction forces (GRFs), and lower-limb joint angles and moments were compared among surfaces. Regarding kinematics, significances were only detected in maximum knee flexion angle, with greater values when running on artificial grass compared to synthetic rubber or concrete. Regarding kinetics, changes were demonstrated in GRF peaks and lower-limb joint moments. GRF peaks were significantly greater when running on synthetic rubber or artificial grass compared to concrete; lower-limb joint moments were significantly lower when running on synthetic rubber compared to concrete; these changes were inconsistent when running on artificial grass compared to concrete. Significant differences were demonstrated in running kinetics when habitual non-rearfoot strikers ran on different overground surfaces. Running on artificial grass or synthetic rubber caused greater GRFs than running on concrete. However, only synthetic rubber could reduce joint loads.	Surfaces
x	2021-03	2021-Walsh-Sleep and the athlete: narrative review and 2021 expert consensus recommendations	Elite athletes are particularly susceptible to sleep inadequacies, characterised by habitual short sleep (<7 hours/night) and poor sleep quality (eg, sleep fragmentation). Athletic performance is reduced by a night or more without sleep, but the influence on performance of partial sleep restriction over 1-3 nights, a more real-world scenario, remains unclear. Studies investigating sleep in athletes often suffer from inadequate experimental control, a lack of females and questions concerning the validity of the chosen sleep assessment tools. Research only scratches the surface on how sleep influences athlete health. Studies in the wider population show that habitually sleeping <7 hours/night increases susceptibility to respiratory infection. Fortunately, much is known about the salient risk factors for sleep inadequacy in athletes, enabling targeted interventions. For example, athlete sleep is influenced by sport-specific factors (relating to training, travel and competition) and non-sport factors (eg, female gender, stress and anxiety). This expert consensus culminates with a sleep toolbox for practitioners (eg, covering sleep education and screening) to mitigate these risk factors and optimise athlete sleep. A one-size-fits-all approach to athlete sleep recommendations (eg, 7-9 hours/night) is unlikely ideal for health and performance. We recommend an individualised approach that should consider the athlete's perceived sleep needs. Research is needed into the benefits of napping and sleep extension (eg, banking sleep).	Section risque de blessures intro vs. intégré à QSM
x	2021-03	2021-Garcia-Tibial acceleration and shock attenuation while running over different surfaces in a trail environment	Objectives Increased tibial axial acceleration and reduced shock attenuation are associated with running injuries and are believed to be influenced by surface type. Trail running has increased in popularity and is thought to have softer surface properties than paved surface, but it is unclear if trail surfaces influence tibial acceleration and shock attenuation. The purpose of this study was to investigate peak triaxial and resultant tibial acceleration as well as axial and resultant shock attenuation among dirt, gravel, and paved surfaces. Design Fifteen recreational runners (12 females, 3 males, age = 27.7 ± 9.1 years) ran over dirt, gravel, and paved surfaces in a trail environment while instrumented with triaxial tibial and head accelerometers. Methods Differences between tri-planar peak tibial accelerations (braking, propulsion, axial, medial, lateral, and resultant) and shock attenuations (axial and resultant) among surface types were assessed with one-way ANOVAs with Bonferroni post-hoc tests. Results No significant differences were found for tibial accelerations or shock attenuations among surface types ($p > 0.05$). Conclusions Dirt and gravel trail running surfaces do not have lower tibial accelerations or greater shock attenuation than paved surfaces. While runners are encouraged to enjoy the psychological benefits of trail running, trail surfaces do not appear to reduce loading forces associated with RRIs.	Surfaces
x	2021-03	2021-Goss-Wearable Technology May Assist in Retraining Foot Strike Patterns in Previously Injured Military Service Members: A Prospective Case Series	A rearfoot strike (RFS) pattern with increased average vertical loading rates (AVLR) while running has been associated with injury. This study evaluated the ability of an instrumented sock, which provides real-time foot strike and cadence audio biofeedback, to transition previously injured military service members from a RFS to a non-rearfoot strike (NRFS) running pattern. Nineteen RFS runners (10 males, 9 females) were instructed to wear the instrumented socks to facilitate a change in foot strike while completing an independent walk-to-run progression and lower extremity exercise program. Kinetic data were collected during treadmill running while foot strike was determined using video analysis at initial (T1), post-intervention (T2), and follow-up (T3) data collections. Nearly all runners (18/19) transitioned to a NRFS pattern following intervention (8 ± 2.4 weeks after the initial visit). Most participants (16/18) maintained the transition at follow-up (5 ± 0.8 weeks after the post-intervention visit). AVLR of the involved and uninvolved limb decreased 29% from initial [54.7 ± 13.2 bodyweights per sec (BW/s) and 55.1 ± 12.7 BW/s] to post-intervention (38.7 ± 10.1 BW/s and 38.9 ± 10.0 BW/s), respectively. This effect persisted 5-weeks later at follow-up, representing an overall 30% reduction on the involved limb and 24% reduction on the uninvolved limb. Cadence increased from the initial to the post-intervention time-point ($p = 0.045$); however, this effect did not persist at follow-up ($p = 0.08$). With technology provided feedback from instrumented socks, approximately 90% of participants transitioned to a NRFS pattern, decreased AVLR, reduced stance time and maintained these running adaptations 5-weeks later	Gait retraining

x	2021-02	2021-Wallis-A Systematic Review of Clinical Practice Guidelines for Physical Therapist Management of Patellofemoral Pain	Objective: The purpose of this study was to conduct a systematic review to evaluate clinical practice guidelines (CPGs) for the physical therapist management of patellofemoral pain. Methods: Five electronic databases (CINAHL, Embase, Medline, Psychinfo, Cochrane Library) were searched from January 2013 to October 2019. Additional search methods included searching websites that publish CPGs containing recommendations for physical therapist management of patellofemoral pain. Characteristics of the guidelines were extracted, including recommendations for examination, interventions, and evaluation applicable to physical therapist practice. Quality assessment was conducted using the Appraisal of Guidelines for Research and Evaluation (AGREE) II instrument, applicability of recommendations to physical therapist practice was examined using the AGREE Recommendation Excellence (AGREE REX) instrument, and convergence of recommendations across guidelines was assessed. Results: Four CPGs were included. One guideline evaluated as higher quality provided the most clinically applicable set of recommendations for examination, interventions, and evaluation processes to assess the effectiveness of interventions. Guideline-recommended interventions were consistent for exercise therapy, foot orthoses, patellar taping, patient education, and combined interventions and did not recommend the use of electrotherapeutic modalities. Two guidelines evaluated as higher quality did not recommend using manual therapy (in isolation), dry needling, and patellar bracing. Conclusion: Recommendations from higher-quality CPGs may conflict with routine physical therapist management of patellofemoral pain. This review provides guidance for clinicians to deliver high-value physical therapist management of patellofemoral pain.	Traitement SFP
x	2021-02	2021-Viljoen-Epidemiology of Injury and Illness Among Trail Runners: A Systematic Review	Background: Trail running is characterised by large elevation gains/losses and uneven varying running surfaces. Limited information is available on injury and illness among trail runners to help guide injury and illness prevention strategies. Objective: The primary aim of this review was to describe the epidemiology of injury and illness among trail runners. Methods: Eight electronic databases were systematically searched (MEDLINE Ovid, PubMed, Scopus, SportsDiscus, CINAHL, Health Source: Nursing/Academic, Health Source: Consumer Ed., and Cochrane) from inception to November 2020. The search was conducted according to the PRISMA statement and the study was registered on PROSPERO international prospective register of systematic reviews (CRD42019135933). Full-text English and French studies that investigated injury and/or illness among trail runners participating in training/racing were included. The main outcome measurements included: trail running injury (incidence, prevalence, anatomical site, tissue type, pathology-type/specific diagnosis, severity), and illness (incidence, prevalence, symptoms, specific diagnosis, organ system, severity). The methodological quality of the included studies was assessed using an adapted Downs and Black assessment tool. Results: Sixteen studies with 8644 participants were included. Thirteen studies investigated race-related injury and/or illness and three studies included training-related injuries. The overall incidence range was 1.6-4285.0 injuries per 1000 h of running and 65.0-6676.6 illnesses per 1000 h of running. The foot was the most common anatomical site of trail running injury followed by the knee, lower leg, thigh, and ankle. Skin lacerations/abrasions were the most common injury diagnoses followed by skin blisters, muscle strains, muscle cramping, and ligament sprains. The most common trail running illnesses reported related to the gastro-intestinal tract (GIT), followed by the metabolic, and cardiovascular systems. Symptoms of nausea and vomiting related to GIT distress and dehydration were commonly reported. Conclusion: Current trail running literature consists mainly of injury and illness outcomes specifically in relation to single-day race participation events. Limited evidence is available on training-related injury and illness in trail running. Our review showed that injury and illness are common among trail runners, but certain studies included in this review only focused on dermatological injuries (e.g. large number of feet blisters) and GIT symptoms. Specific areas for future research were identified that could improve the management of trail running injury and illness.	Intro / Stats sur blessures selon type de coureur
x	2021-02	2021-Kim-Reduced joint reaction and muscle forces with barefoot running	Barefoot running has been associated with lowered joint loading, but it remains unclear whether the biomechanical benefits are evident after mid-distance running. A musculoskeletal model was adopted for estimating lower limb joint loading for barefoot (n = 10) versus shod (n = 10) 5 km running. The barefoot group reduced peak joint reaction force at the hip and knee, and presented muscle force reductions compared to shod controls with significant group effects and interaction effects ($p < .05$). These changes were primarily group effects as time point effects were not significant. These findings should be considered when designing barefoot running shoes, running programmes, and injury prevention programmes.	Course pieds nus
x	2021-02	2021-Konrad-The Impact of a Single Stretching Session on Running Performance and Running Economy: A Scoping Review	One determining factor for running performance is running economy (RE), which can be quantified as the steady-state oxygen consumption at a given running speed. Stretching is frequently applied in sports practice and has been widely investigated in recent years. However, the effect of stretching on RE and performance is not clear. Thus, the purpose of this scoping review is to investigate the effects of a single bout of stretching on RE and running performance in athletes (e.g., recreational and elites) and non-athletes. The online search was performed in PubMed, Scopus, and Web of Science databases. Only studies that explored the acute effects of stretching on RE (or similar variables) and/or running performance variables with healthy and adult participants, independent of activity level, were included in this review. Eleven studies met the inclusion criteria with a total of 44 parameters (14 performance-related/30 metabolic parameters) and 111 participants. Regardless of the stretching technique, there was an improvement both in performance variables (21.4%) and metabolic variables (13.3%) following an acute bout of stretching. However, detrimental effects in performance variables (28.5%) and metabolic variables (6.6%) were also reported, though the results were influenced by the stretching duration and technique. Although it was observed that a single static stretching exercise with a duration of up to 90 s per muscle group can lead to small improvements in RE (1.0%; 95% CI: -1.04 to 2.22), negative effects were reported in running performance (-1.4%; 95% CI: -3.07 to -0.17). It was also observed that a single bout of dynamic stretching only resulted in a negligible change in RE -0.79% (95% CI: -0.95 to 4.18) but a large increase in running performance (9.8%; 95% CI: -3.28 to 16.78), with an overall stretch duration (including all muscles) between 217 and 900 s. Therefore, if stretching is applied without additional warm-up, the results suggest applying dynamic stretching (for a short overall stretching duration of ≤220 s) rather than static stretching if the goal is to increase running performance. In general, only short static stretching durations of ≤60 s per muscle-tendon unit are advisable. One study reported that less flexible runners have greater benefits from stretching than athletes with normal flexibility. In addition, it can be suggested that less flexible runners should aim for an optimum amount of flexibility, which would likely result in a more economical run.	Stretching

x	2021-02	2021-Hanley-Footstrike patterns and race performance in the 2017 IAAF World Championship men's 10,000 m final	Midfoot- (MFS) and forefoot-striking (FFS) runners usually switch to rearfoot-striking (RFS) during marathons. However, world-class runners might resist modifications during shorter races. The purpose of this study was to analyse footstrike patterns, ground contact times and running speeds in a World Championship men's 10,000 m final. Footstrike patterns and contact times of the top 12 finishing men (24 ± 5 years) were recorded (150 Hz) during laps 1, 5, 11, 15, 20 and 25. Split times for each 100-m segment were obtained. No RFS patterns were observed; there was no difference between the number of FFS and MFS athletes at any distance ($p \geq 0.581$) and no change in the proportions of FFS and MFS occurred ($p = 0.383$). No link between race performance and footstrike pattern appeared given the similar number who used FFS or MFS and their similar finishing times. Despite slower running speeds and longer contact times in the middle of the race ($p \leq 0.024$), no effect on footstrike patterns occurred. The prevalence of anterior footstrike patterns in this world-class race reflects the capability of maintaining fast paces (>22 km/h). Changes in footstrike pattern might accompany the physiological and neuromuscular effects of fatigue over longer distances.	FSP et performance
x	2021-02	2021-Luedke-Factors Associated With Self-Selected Step Rates Between Collegiate and High School Cross Country Runners	Introduction: Cross country is a popular high school and collegiate sport with a high rate of running-related injuries (RRI). Among high school runners, higher step rates have been associated with greater running experience and decreased body height, and lower step rates have been prospectively associated with increased risk of shin RRI. These associations have not been reported in collegiate cross country runners. The purpose of this study was to compare step rates between collegiate and high school cross country runners. Secondary objectives included determining if step rates in collegiate runners were related to experience and anthropometric variables, and whether their self-selected step rates were prospectively related to lower extremity RRI. Materials and methods: Twenty-nine NCAA Division III collegiate cross country runners (13 females, mean ± SD age 19.7 ± 1.3 years) completed a survey and ran at their self-selected speed. Step rate was assessed with Polar RCX5 wristwatches and S3+ Stride Sensors™ on the first day of the season. Runners were followed during the season for occurrence of time-loss lower extremity RRI. A cohort of 68 high school runners was used for comparison of step rates at their self-selected speeds. Results: Collegiate runners' self-selected step rates (177.1 ± 7.2 spm [steps per minute]) were higher than high school runners' (171.3 ± 8.3 spm) ($p = 0.01$). Collegiate runners ran at higher self-selected speeds (4.6 ± 0.5 m/s) than the high school runners (3.8 ± 0.5 m/s) ($p < 0.001$). A lower percentage of collegiate runners ran at ≤166 spm than high school runners. Body mass was negatively correlated with step rate in collegiate runners. During the season, 41.3% of collegiate runners experienced lower extremity RRI. Step rates for collegiate runners who did not experience RRI (178.9 ± 7.7 spm) were not significantly higher than runners who did experience RRI (174.5 ± 5.7 spm) ($p = 0.10$). Discussion: Higher step rates were found in collegiate than high school runners, but the difference was partially explained by higher self-selected running speeds. Thus, variations in step rate between high school and collegiate runners may be expected based on experience, speed, and body mass.	Cadence et blessures
x	2021-02	2021-Van den Berghe-Music-based biofeedback to reduce tibial shock in over-ground running: a proof-of-concept study	Methods to reduce impact in distance runners have been proposed based on real-time auditory feedback of tibial acceleration. These methods were developed using treadmill running. In this study, we extend these methods to a more natural environment with a proof-of-concept. We selected ten runners with high tibial shock. They used a music-based biofeedback system with headphones in a running session on an athletic track. The feedback consisted of music superimposed with noise coupled to tibial shock. The music was automatically synchronized to the running cadence. The level of noise could be reduced by reducing the momentary level of tibial shock, thereby providing a more pleasant listening experience. The running speed was controlled between the condition without biofeedback and the condition of biofeedback. The results show that tibial shock decreased by 27% or 2.96 g without guided instructions on gait modification in the biofeedback condition. The reduction in tibial shock did not result in a clear increase in the running cadence. The results indicate that a wearable biofeedback system aids in shock reduction during over-ground running. This paves the way to evaluate and retrain runners in over-ground running programs that target running with less impact through instantaneous auditory feedback on tibial shock.	Gait retraining
x	2021-02	2021-Dobrosielski-The Association Between Poor Sleep and the Incidence of Sport and Physical Training-Related Injuries in Adult Athletic Populations: A Systematic Review	Background: The importance of achieving an adequate amount of sleep to optimize health and athletic performance is well recognized. Yet, a systematic evidence compilation of the risk for sport-related injury in adult athletic populations due to poor sleep does not exist. Objective: To examine the association between poor sleep and sport and physical training-related injuries in adult athletic populations. Data sources: Electronic databases were searched using keywords relevant to sleep quantity and quality, and musculoskeletal injury and sport-related concussion (SRC). Eligibility criteria for selecting studies: Studies were included in this systematic review if they were comprised of adult athletic populations, reported measures of sleep quantity or quality, followed participants prospectively for injury, and reported an association between sleep and incidence of sport or physical training-related injury. Study appraisal: The methodological quality of each study was assessed using the Newcastle-Ottawa Scale for Cohort Studies. Results: From our review of 12 prospective cohort studies, we found limited evidence supporting an association between poor sleep and injury in adult athletic populations. Specifically, there is (a) insufficient evidence supporting the associations between poor sleep and increased risk of injury in specific groups of athletic adults, including professional or elite athletes, collegiate athletes, elite or collegiate dancers, and endurance sport athletes; and (b) limited evidence of an association between poor sleep and increased risk of SRC in collegiate athletes. Conclusions: The current evidence does not support poor sleep as an independent risk factor for increased risk of sport or physical training-related injuries in adult athletic populations. Given the methodological heterogeneity and limitations across previous studies, more prospective studies are required to determine the association between sleep and injury in this population.	Section risque de blessures intro vs. intégré à QSM

x	2021-02	2021-Sandbakk-The Influence of Exercise Modality on Training Load Management	To provide novel insight regarding the influence of exercise modality on training load management by (1) providing a theoretical framework for the impact of physiological and biomechanical mechanisms associated with different exercise modalities on training load management in endurance exercise and (2) comparing effort-matched low-intensity training sessions performed by top-level athletes in endurance sports with similar energy demands. Practical Applications and Conclusions: The ability to perform endurance training with manageable muscular loads and low injury risks in different exercise modalities is influenced both by mechanical factors and by muscular state and coordination, which interrelate in optimizing power production while reducing friction and/or drag. Consequently, the choice of exercise modality in endurance training influences effort beyond commonly used external and internal load measurements and should be considered alongside duration, frequency, and intensity when managing training load. By comparing effort-matched low- to moderate-intensity sessions performed by top-level athletes in endurance sports, this study exemplifies how endurance exercise with varying modalities leads to different tolerable volumes. For example, the weight-bearing exercise and high-impact forces in long-distance running put high loads on muscles and tendons, leading to relatively low training volume tolerance. In speed skating, the flexed knee and hip position required for effective speed skating leads to occlusion of thighs and low volume tolerance. In contrast, the non-weight-bearing, low-contraction exercises in cycling or swimming allow for large volumes in the specific exercise modalities. Overall, these differences have major implications on training load management in sports.	Cross-training
x	2021-01	2021-Hollander-Sex-Specific Differences in Running Injuries: A Systematic Review with Meta-Analysis and Meta-Regression	Background: Running is a popular sport with high injury rates. Although risk factors have intensively been investigated, synthesized knowledge about the differences in injury rates of female and male runners is scarce. Objective: To systematically investigate the differences in injury rates and characteristics between female and male runners. Methods: Database searches (PubMed, Web of Science, PEDro, SPORTDiscus) were conducted according to PRISMA guidelines using the keywords "running AND injur*". Prospective studies reporting running related injury rates for both sexes were included. A random-effects meta-analysis was used to pool the risk ratios (RR) for the occurrence of injuries in female vs. male runners. Potential moderators (effect modifiers) were analysed using meta-regression. Results: After removal of duplicates, 12,215 articles were screened. Thirty-eight studies were included and the OR of 31 could be pooled in the quantitative analysis. The overall injury rate was 20.8 (95% CI 19.9-21.7) injuries per 100 female runners and 20.4 (95% CI 19.7-21.1) injuries per 100 male runners. Meta-analysis revealed no differences between sexes for overall injuries reported per 100 runners (RR 0.99, 95% CI 0.90-1.10, n = 24) and per hours or athlete exposure (RR 0.94, 95% CI 0.69-1.27, n = 6). Female sex was associated with a more frequent occurrence of bone stress injury (RR (for males) 0.52, 95% CI 0.36-0.76, n = 5) while male runners had higher risk for Achilles tendinopathies (RR 1. 86, 95% CI 1.25-2.79, n = 2). Meta-regression showed an association between a higher injury risk and competition distances of 10 km and shorter in female runners (RR 1.08, 95% CI 1.00-1.69). Conclusion: Differences between female and male runners in specific injury diagnoses should be considered in the development of individualised and sex-specific prevention and rehabilitation strategies to manage running-related injuries.	Incidence blessures
x	2020-12	2021-Dong-The effect of running on knee joint cartilage: A systematic review and meta-analysis	Objective: Although running causes inevitable stress to the joints, data regarding its effect on the cartilage of the knee are conflicting. This systematic review and meta-analysis aimed to evaluate the effect of running on knee joint cartilage. Methods: PubMed, EMBASE, SportDiscus, and Cochrane Library databases were searched to identify randomized controlled trials (RCTs) and cohort studies. The outcome indicators were cartilage oligomeric matrix protein (COMP), cartilage volume and thickness, and T2. Results: A total of two RCTs and 13 cohort studies were included. There was no significant difference in cartilage volume between the running and control groups (MD, -115.88 U/l; 95% CI, -320.03 to 88.27; p = 0.27). However, running would decrease cartilage thickness (MD, -0.09 mm; 95%CI, -0.18 to -0.01; p = 0.03) and T2 (MD, -2.78 ms; 95% CI, -4.12 to -1.45; p < 0.001). Subgroup analysis demonstrated that COMP immediately or at 0.5 h after running was significantly increased, but there were no significant changes at 1 h or 2 h. Conclusions: Running has advantages in promoting nutrition penetrating into the cartilage as well as squeezing out the metabolic substance, such as water. Our study found that running had a short-term adverse effect on COMP and did not affect cartilage volume or thickness.	Running & OA
x	2020-12	2020-Debugne-Foot Loading Associated with Barefoot, Shod, and Minimalist Running in Male Rearfoot Strikers	Background: We aimed to determine the center of pressure (COP) trajectories and regional pressure differences in natural rearfoot strikers while running barefoot, running with a minimalist shoe, and running with a traditional shoe. Methods: Twenty-two male natural rearfoot strikers ran at an imposed speed along an instrumented runway in three conditions: barefoot, with a traditional shoe, and with a minimalist shoe. Metrics associated to the COP and regional plantar force distribution, captured with a pressure platform, were compared using one-way repeated-measures analysis of variance. Results: The forefoot contact phase was found to be significantly shorter in the barefoot running trials compared with the shod conditions (P = .003). The initial contact of the COP was located more anteriorly in the barefoot running trials. The mediolateral position of the COP at initial contact was found to be significantly different in the three conditions, whereas the final mediolateral position of the COP during the forefoot contact phase was found to be more lateral in the barefoot condition compared with both shod conditions (P = .0001). The metrics associated with the regional plantar force distribution supported the clinical reasoning with respect to the COP findings. Conclusions: The minimalist shoe seems to provide a compromise between barefoot running and running with a traditional shoe.	Charges selon type chaussures

x	2020-12	2021-Pieters-Acute Effects of Warming Up on Achilles Tendon Blood Flow and Stiffness	The aim of this study was to investigate the acute effect of frequently used warm-up exercises on the Achilles tendon blood flow and stiffness. In doing so, we want to explore which exercises are suitable to properly prepare the athlete's Achilles tendon in withstanding high amounts of loading during sport activities. This knowledge could help sport physicians and physiotherapists when recommending warm-up exercises that are able to improve sport performance while reducing the injury susceptibility. Achilles tendon blood flow and stiffness measurements of 40 healthy subjects (20 men and 20 women) aged between 18 and 25 years were obtained before and immediately after 4 different warm-up exercises: running, plyometrics, eccentric heel drops, and static stretching. The effect of these warm-up exercises and possible covariates (sex, age, body mass index, rate of perceived exertion, and sports participation) on the Achilles tendon blood flow and stiffness was investigated with linear mixed models. The level of significance was set at $\alpha = 0.05$. The results of this study showed a significant increase in Achilles tendon blood flow and stiffness after 10 minutes of running ($p < 0.001$ and $p < 0.001$) and plyometrics ($p < 0.001$ and $p = 0.039$). Static stretching and eccentric exercises elicited no significant changes. From these results, it could be suggested that warm-up exercises should be intensive enough to properly prepare the Achilles tendon for subsequent sport activities. When looking at Achilles tendon blood flow and stiffness, we advise the incorporation of highly intensive exercises such as running and plyometrics within warm-up programs.	Échauffement
x	2020-12	2020-Hanley-Men's and Women's World Championship Marathon Performances and Changes With Fatigue Are Not Explained by Kinematic Differences Between Footstrike Patterns	World-class marathon runners make initial contact with the rearfoot, midfoot or forefoot. This novel study analyzed kinematic similarities and differences between rearfoot and non-rearfoot strikers within the men's and women's 2017 IAAF World Championship marathons across the last two laps. Twenty-eight men and 28 women, equally divided by footstrike pattern, were recorded at 29.5 and 40 km (laps 3 and 4, respectively) using two high-definition cameras (50 Hz). The videos were digitized to derive spatiotemporal and joint kinematic data, with additional footage (120 Hz) used to identify footstrike patterns. There was no difference in running speed, step length or cadence between rearfoot and non-rearfoot strikers during either lap in both races, and these three key variables decreased in athletes of either footstrike pattern to a similar extent between laps. Men slowed more than women between laps, and overall had greater reductions in step length and cadence. Rearfoot strikers landed with their foot farther in front of the center of mass (by 0.02-0.04 m), with non-rearfoot strikers relying more on flight distance for overall step length. Male rearfoot strikers had more extended knees, dorsiflexed ankles and hyperextended shoulders at initial contact than non-rearfoot strikers, whereas female rearfoot strikers had more flexed hips and extended knees at initial contact. Very few differences were found at midstance and toe-off. Rearfoot and non-rearfoot striking techniques were therefore mostly indistinguishable except at initial contact, and any differences that did occur were very small. The spatiotemporal variables that differed between footstrike patterns were not associated with faster running speeds and, ultimately, neither footstrike pattern prevented reductions in running speeds. The only joint angle measured at a specific gait event to change with fatigue was midswing knee flexion angle in men. Coaches should thus note that encouraging marathon runners to convert from rearfoot to non-rearfoot striking is unlikely to provide any performance benefits, and that training the fatigue resistance of key lower limb muscle-tendon units to avoid decreases in step length and cadence are more useful in preventing reductions in speed during the later stages of the race.	Lien FSP et performance
x	2020-12	2021-Breda-Effectiveness of progressive tendon-loading exercise therapy in patients with patellar tendinopathy: a randomised clinical trial	Objective: To compare the effectiveness of progressive tendon-loading exercises (PTLE) with eccentric exercise therapy (EET) in patients with patellar tendinopathy (PT). Methods: In a stratified, investigator-blinded, block-randomised trial, 76 patients with clinically diagnosed and ultrasound-confirmed PT were randomly assigned in a 1:1 ratio to receive either PTLE or EET. The primary end point was clinical outcome after 24 weeks following an intention-to-treat analysis, as assessed with the validated Victorian Institute of Sports Assessment for patellar tendons (VISA-P) questionnaire measuring pain, function and ability to play sports. Secondary outcomes included the return to sports rate, subjective patient satisfaction and exercise adherence. Results: Patients were randomised between January 2017 and July 2019. The intention-to-treat population (mean age, 24 years, SD 4); 58 (76%) male) consisted of patients with mostly chronic PT (median symptom duration 2 years). Most patients (82%) underwent prior treatment for PT but failed to recover fully. 38 patients were randomised to the PTLE group and 38 patients to the EET group. The improvement in VISA-P score was significantly better for PTLE than for EET after 24 weeks (28 vs 18 points, adjusted mean between-group difference, 9 (95% CI 1 to 16); p=0.023). There was a trend towards a higher return to sports rate in the PTLE group (43% vs 27%, p=0.13). No significant between-group difference was found for subjective patient satisfaction (81% vs 83%, p=0.54) and exercise adherence between the PTLE group and EET group after 24 weeks (40% vs 49%, p=0.33). Conclusions: In patients with PT, PTLE resulted in a significantly better clinical outcome after 24 weeks than EET. PTLE are superior to EET and are therefore recommended as initial conservative treatment for PT.	Tendinopathie patellaire
x	2020-11	2020-Taddei-Foot Core Training to Prevent Running-Related Injuries- A Survival Analysis of a Single-Blind, Randomized Controlled Trial	Background: Running-related injuries (RRIs) are a pervasive menace that can interrupt or end the participation of recreational runners in this healthy physical activity. To date, no satisfactory treatment has been developed to prevent RRIs. Purpose: To investigate the efficacy of a novel foot core strengthening protocol based on a ground-up approach to reduce the incidence of RRIs in recreational long-distance runners over the course of a 1-year follow-up. Study design: Randomized controlled trial; Level of evidence, 1. Methods: The participants, 118 runners, were assessed at baseline and randomly allocated to either an intervention group (n = 57) or a control group (n = 61). The intervention group received an 8-week training course focused on the foot-ankle muscles, followed by remotely supervised training thereafter. Assessments consisted of 3 separate biomechanical evaluations of foot strength and foot posture and a weekly report on each participant's running distance, pace, and injury incidence over 12 months. Results: The control group participants were 2.42 times (95% CI, 1.98-3.62) more likely to experience an RRI within the 12-month study period than participants in the intervention group (P = .035). Time to injury was significantly correlated with Foot Posture Index (P = .031; r = 0.41) and foot strength gain (P = .044; r = 0.45) scores. This foot exercise program showed evidence of effective RRI risk reduction in recreational runners at 4 to 8 months of training. Conclusion: Recreational runners randomized to the new foot core strengthening protocol had a 2.42-fold lower rate of RRIs compared with the control group. Further studies are recommended to better understand the underlying biomechanical mechanisms of injury, types of injuries, and subgroups of runners who might benefit maximally.	Force du pied / prévention blessures

x	2020-11	2021-Stiffler-Joachim-Lower Extremity Kinematic and Kinetic Asymmetries during Running	Between-limb asymmetries during running are often evaluated to assess injury risk or recovery. Asymmetries less than 10% are generally considered normal, but it is unknown if asymmetries vary depending on the metric of interest, the athlete's sex, or running speed. Purpose: The primary aim of this investigation was to describe the magnitude of asymmetries of common variables during running among healthy athletes and to determine if sex and speed influence magnitudes of asymmetry. Methods: This study analyzed routinely collected running gait data on healthy Division I collegiate athletes. All athletes had no history of lower-extremity (LE) surgery, no LE injuries for 3 months before testing, and had running data available at 2.68, 2.95, 3.35, 3.80, and 4.47m·s. Asymmetries were calculated for ground reaction forces, spatiotemporal metrics, joint kinematics, and joint kinetics. Separate linear mixed effects models assessed the influence of sex, speed, and the interaction on asymmetries of interest. Z-scores were calculated for significant effects to further assess magnitude of differences. Results: Results from 204 athletes were included. The magnitude of asymmetry varied depending on the variable of interest, with asymmetries ≤ 3 observed for joint kinematics and greater asymmetries observed among joint work asymmetries ranged from 10-40%. No significant interactions between sex and speed were observed. Differences in sex and speed were noted; however, the effect sizes were very small based on z-score comparison (-0.17 ≤ z ≤ 0.36) and were unlikely to be meaningful. Conclusions: The magnitude of asymmetry varies considerably depending on the running gait variable. Interpretation of between-limb asymmetry in running mechanics needs to be specific to the variable of interest, while sex or running speed appear to be minor factors.	Symétrie
x	2020-11	2020-Esculier-A Contemporary Approach to Patellofemoral Pain in Runners	Patellofemoral pain (PFP) is among the most common injuries in recreational runners. Current evidence does not identify alignment, muscle weakness, and patellar maltracking or a combination of these as causes of PFP. Rather than solely investigating biomechanics, we suggest a holistic approach to address the causes of PFP. Both external loads, such as changes in training parameters and biomechanics, and internal loads, such as sleep and psychological stress, should be considered. As for the management of runners with PFP, recent research suggested that various interventions can be considered to help symptoms, even if these interventions target biomechanical factors that may not have caused the injury in the first place. In this Current Concepts article, we describe how the latest evidence on education about training modifications, strengthening exercises, gait and footwear modifications, and psychosocial factors can be applied when treating runners with PFP. The importance of maintaining relative homeostasis between load and capacity will be emphasized. Recommendations for temporary or longer-term interventions will be discussed. A holistic, evidence-based approach should consist of a graded exposure to load, including movement, exercise, and running, while considering the capacity of the individual, including sleep and psychosocial factors. Cost, accessibility, and the personal preferences of patients should also be considered.	Traitement SFP
x	2020-10	2021-Rabusin-Efficacy of heel lifts versus calf muscle eccentric exercise for mid-portion Achilles tendinopathy (HEALTHY): a randomised trial	Objectives: To compare the efficacy of in-shoe heel lifts to calf muscle eccentric exercise in reducing pain and improving function in mid-portion Achilles tendinopathy. Methods: This was a parallel-group randomised superiority trial at a single centre (La Trobe University Health Sciences Clinic, Discipline of Podiatry, Melbourne, Victoria, Australia). One hundred participants (52 women and 48 men, mean age 45.9, SD 9.4 years) with clinically diagnosed and ultrasonographically confirmed mid-portion Achilles tendinopathy were randomly allocated to either a (1) heel lifts (n=50) or (2) eccentric exercise (n=50) group. The primary outcome measure was the Victorian Institute of Sport Assessment-Achilles (VISA-A) questionnaire at 12 weeks. Differences between groups were analysed using intention to treat with analysis of covariance. Results: There was 80% follow-up of participants (n=40 per group) at 12 weeks. The mean VISA-A score improved by 26.0 points (95% CI 19.6 to 32.4) in the heel lifts group and by 17.4 points (95% CI 9.5 to 25.3) in the eccentric exercise group. On average, there was a between-group difference in favour of the heel lifts for the VISA-A (adjusted mean difference 9.6, 95% CI 1.8 to 17.4, p=0.016), which approximated, but did not meet our predetermined minimum important difference of 10 points. Conclusion: In adults with mid-portion Achilles tendinopathy, heel lifts were more effective than calf muscle eccentric exercise in reducing pain and improving function at 12 weeks. However, there is uncertainty in the estimate of effect for this outcome and patients may not experience a clinically worthwhile difference between interventions.	
x	2020-10	2020-Waite-Effect of Grade and Surface Type on Peak Tibial Acceleration in Trained Distance Runners	Runners experience repeated impact forces during training, and the culmination of these forces can contribute to overuse injuries. The purpose of this study was to compare peak vertical tibial acceleration (TA) in trained distance runners on 3 surface types (grass, asphalt, and concrete) and 3 grades (incline, decline, and level). During visit 1, subjects completed a 1-mile time trial to determine their pace for all running trials: 80% (5%) of the average time trial velocity. During visit 2, subjects were outfitted with a skin-mounted accelerometer and performed 18 separate running trials during which peak TA was assessed during the stance phase. Each subject ran 2 trials for each condition with 2 minutes of rest between trials. Peak TA was different between decline (8.04 [0.12] g) and incline running (7.31 [0.35] g; P = .020). On the level grade, peak TA was greater during grass (8.22 [1.22] g) compared with concrete (7.47 [1.65] g; P = .017). On the incline grade, grass (7.68 [1.44] g) resulted in higher peak TA than asphalt (6.99 [1.69] g; P = .030). These results suggest that under certain grade conditions grass may result in higher TA compared with either concrete or asphalt.	Surfaces

x	2020-10	2020-Zhang-Acute shoe effects on Achilles tendon loading in runners with habitual rearfoot strike pattern	Objectives: Although the overuse injury rate of the Achilles tendon (AT) for running is high, the effect of shoe conditions on AT loading remains unclear. Hence, this study aims to determine the mechanical properties of AT during running under different shoe conditions (minimalist vs. conventional shoes). Design: This work is a controlled laboratory study. Methods: Sixteen healthy male rearfoot strike runners were recruited to complete over ground running trials at 3.33 m/s (±5%) under two shoe conditions (minimalist shoes: INOV-8 Bare-XF 210; conventional shoes: NIKE AIR ZOOM PEGASUS 34). Sagittal plane ankle kinematics and ground reaction forces were simultaneously recorded. Ankle joint mechanics (ankle joint angle and moment) and the mechanical properties (peak force, impulse, stress, strain, and their corresponding peak rate) of the AT were calculated. Results: In comparison with conventional shoes, wearing minimalist shoes showed significant changes ($p < 0.05$): (1) decreased strike angle (48.92 ± 9.01 vs. 41.04 ± 8.69°); (2) increased ankle moment (2.34 ± 0.44 vs. 2.55 ± 0.46 Nm/kg); (3) increased peak AT force (5.85 ± 1.22 vs. 6.24 ± 1.13 BW), AT force impulse (0.65 ± 0.13 vs. 0.70 ± 0.13 BW·s), peak AT loading rate (109.94 ± 9.33 vs. 118.84 ± 26.62 BW/s), and average loading rate (48.42 ± 15.64 vs. 54.90 ± 17.47 BW/s); (4) decreased time to peak AT force (126.31 ± 20.68 vs. 117.77 ± 17.62 ms); (5) increased AT stress (66.96 ± 14.59 vs. 71.89 ± 14.74 MPa), strain (8.19 ± 1.77 vs. 8.78 ± 1.80 %), peak AT stress rate (66.96 ± 14.59 vs. 71.89 ± 14.74 MPa/s), and strain rate (148.71 ± 48.52 vs. 167.28 ± 42.82 %/s). Conclusion: Increased AT force, loading rate, and stress were observed in runners who habitually wear conventional shoes with rearfoot strike patterns when they wore minimalist shoes. Hence, we recommend a gradual transition to minimalist shoes for runners who habitually wear conventional shoes with rearfoot strike patterns.	Effets chaussures sur forces
x	2020-10	2020-Rodrigo-Carranza-Influence of Shoe Mass on Performance and Running Economy in Trained Runners	Purpose: The aim of this study was to assess the effects of adding shoe mass on running economy (RE), gait characteristics, neuromuscular variables and performance in a group of trained runners. Methods: Eleven trained runners (6 men and 5 women) completed four evaluation sessions separated by at least 7 days. The first session consisted of a maximal incremental test where the second ventilatory threshold (VT2) and the speed associated to the VO2max (vVO2max) were calculated. In the next sessions, RE at 75, 85, and 95% of the VT2 and the time to exhaustion (TTE) at vVO2max were assessed in three different shoe mass conditions (control, +50 g and +100 g) in a randomized, counterbalanced crossover design. Biomechanical and neuromuscular variables, blood lactate and energy expenditure were measured during the TTE test. Results: RE worsened with the increment of shoe mass (Control vs. 100 g) at 85% (7.40%, 4.409 ± 0.29 and 4.735 ± 0.27 kJ·kg-1·km-1, $p = 0.021$) and 95% (10.21%, 4.298 ± 0.24 and 4.737 ± 0.45 kJ·kg-1·km-1, $p = 0.005$) of VT2. HR significantly increased with the addition of mass (50 g) at 75% of VT2 ($p = 0.01$) and at 75, 85, and 95% of VT2 ($p = 0.035$, 0.03, and 0.03, respectively) with the addition of 100 g. TTE was significantly longer (∼22%, ∼42 s, $p = 0.002$, ES = 0.149) in the Control condition vs. 100 g condition, but not between Control vs. 50 g (∼24 s, $p = 0.094$, ES = 0.068). Conclusion: Overall, our findings suggest that adding 100 g per shoe impairs running economy and performance in trained runners without changes in gait characteristics or neuromuscular variables. These findings further support the use of light footwear to optimize running performance.	Shoes & performance
x	2020-10	2020-Winters-Comparative effectiveness of treatments for patellofemoral pain: a living systematic review with network meta-analysis	Objective: To investigate the comparative effectiveness of all treatments for patellofemoral pain (PFP). Design: Living systematic review with network meta-analysis (NMA). Data sources: Sensitive search in seven databases, three grey literature resources and four trial registers. Eligibility criteria: Randomised controlled trials evaluating any treatment for PFP with outcomes 'any improvement', and pain intensity. Data extraction: Two reviewers independently extracted data and assessed risk of bias with Risk of Bias Tool V.2. We used Grading of Recommendations, Assessment, Development and Evaluation to appraise the strength of the evidence. Primary outcome measure: 'Any improvement' measured with a Global Rating of Change Scale. Results: Twenty-two trials (with forty-eight treatment arms) were included, of which approximately 10 (45%) were at high risk of bias for the primary outcome. Most comparisons had a low to very low strength of the evidence. All treatments were better than wait and see for any improvement at 3 months (education (OR 9.6, 95% credible interval (CrI): 2.2 to 48.8); exercise (OR 13.0, 95% CrI: 2.4 to 83.5); education+orthosis (OR 16.5, 95% CrI: 4.9 to 65.8); education+exercise+patellar taping/mobilisations (OR 25.2, 95% CrI: 5.7 to 130.3) and education+exercise+patellar taping/mobilisations+orthosis (OR 38.8, 95% CrI: 7.3 to 236.9)). Education+exercise+patellar taping/mobilisations, with (OR 4.0, 95% CrI: 1.5 to 11.8) or without orthosis (OR 2.6, 95% CrI: 1.7 to 4.2), were superior to education alone. At 12 months, education or education+any combination yielded similar improvement rates. Summary/conclusion: Education combined with a physical treatment (exercise, orthoses or patellar taping/mobilisation) is most likely to be effective at 3 months. At 12 months, education appears comparable to education with a physical treatment. There was insufficient evidence to recommend a specific type of physical treatment over another. All treatments in our NMA were superior to wait and see at 3 months, and we recommend avoiding a wait-and-see approach.	SFP

x	2020-09	2020-Mallol-Physiological Response Differences between Run and Cycle High Intensity Interval Training Program in Recreational Middle Age Female Runners	The aim of this investigation was to compare the changes in endurance running performance and physiological variables after a four-week period of high intensity interval training (HIIT) in either running or cycling in female athletes. Fourteen recreational female runners (age = 42 10 yr, height = 1.67 0.06 m, body mass = 61.6 10.4 kg, body mass index (BMI) = 22.2 3.4 kg.m-2) were randomly allocated to one of two HIIT training groups: running (HIITrun) or cycling (HIITbike). Each group performed two HIIT sessions per week for 4 weeks, which consisted of 6 x 2 min at 95% of maximal heart rate (HRmax) and 4 x 1 min all out efforts. Maximal oxygen consumption (VO2max) in treadmill running increased significantly after the HIITrun ($p < 0.01$, ES = 0.6) but remained unchanged in HIITbike. However, HIITbike improved average velocity in a 10 km running time trial (TTrun) ($p < 0.05$, ES = -0.4), whereas, no changes were found for the HIITrun group. Analysing the first and last HIIT sessions, for HIITrun only the average rate of perceived exertion (RPEav) increased significantly, whereas, performance variables such as average heart rate (HRav) and average pace (paceav) remained unchanged. HIITbike enhanced significantly the average speed of HIIT sets (speedav) and the peak power output (PPO) of the session, as well as, the RPEav and delayed onset muscle soreness immediately after HIIT session (DOMSpost) were increased significantly. A regime of HIIT in cycling may evoke increases in female recreational runners' power, which may be related with improvements in a 10 km TTrun independent of changes in aerobic capacity. This may be advantageous in order to avoid overuse running related injuries.	Cross-training
x	2020-09	2020-Wang-Effects of 12-week cadence retraining on impact peak, load rates and lower extremity biomechanics in running	Background: Excessive impact peak forces and vertical load rates are associated with running injuries and have been targeted in gait retraining studies. This study aimed to determine the effects of 12-week cadence retraining on impact peak, vertical load rates and lower extremity biomechanics during running. Methods: Twenty-four healthy male recreational runners were randomised into either a 12-week cadence retraining group (n = 12), which included those who ran with a 7.5% increase in preferred cadence, or a control group (n = 12), which included those who ran without any changes in cadence. Kinematics and ground reaction forces were recorded simultaneously to quantify impact force variables and lower extremity kinematics and kinetics. Results: Significantly decreased impact peak (1.86 ± 0.30 BW vs. 1.67 ± 0.27 BW, P = 0.003), vertical average load rates (91.59 ± 18.91 BW/s vs. 77.31 ± 15.12 BW/s, P = 0.001) and vertical instantaneous load rates (108.8 ± 24.5 BW/s vs. 92.8 ± 18.5 BW/s, P = 0.001) were observed in the cadence retraining group, while no significant differences were observed in the control group. Foot angles (18.27° ± 5.59° vs. 13.74° ± 2.82°, P = 0.003) and vertical velocities of the centre of gravity (CoG) (0.706 ± 0.115 m/s vs. 0.652 ± 0.091 m/s, P = 0.002) significantly decreased in the cadence retraining group at initial contact, but not in the control group. In addition, vertical excursions of the CoG (0.077 ± 0.01 m vs. 0.069 ± 0.008 m, P = 0.002) and peak knee flexion angles (38.6° ± 5.0° vs. 36.5° ± 5.5°, P < 0.001) significantly decreased whilst lower extremity stiffness significantly increased (34.34 ± 7.08 kN/m vs. 38.61 ± 6.51 kN/m, P = 0.048) in the cadence retraining group. However, no significant differences were observed for those variables in the control group. Conclusion: Twelve-week cadence retraining significantly increased the cadence of the cadence retraining group by 5.7%. This increased cadence effectively reduced impact peak and vertical average/instantaneous load rates. Given the close relationship between impact force variables and running injuries, increasing the cadence as a retraining method may potentially reduce the risk of impact-related running injuries.	Gait retraining
x	2020-09	2020-Pirscoveanu-The use of multi-directional footfall sound recordings to describe running vertical impact properties	This study investigated whether the use of multi-directional sound recordings could provide sound amplitudes of superior quality for the assessment of vertical impact properties during running. Thirty-four young adults performed overground running at the preferred speed (HS) and while intentionally reducing volume of footfalls (LS). Ground reaction forces and sounds from four microphones surrounding the force platform were recorded. Vertical loading rate, foot strike pattern and peak sound amplitudes from anterior, posterior, medial, and lateral recordings were analysed. Peak vertical force(a), peak propulsion force(b) and running speed(c) showed significant correlations with peak sounds from anterior microphones during HS (ra = 0.35, rb = -0.49, rc = 0.61). Conversely, these variables were correlated with peak sounds from posterior microphones during LS (ra = 0.39, rb = -0.50, rc = 0.70). Moreover, the sensitivity in determining changes in peak sounds vary across microphone locations, as reductions in peak sounds during LS varied from 31% and 49% across locations. Therefore, the relationships between running sounds and force parameters can be highly influenced by the number and location of microphones. Furthermore, anterior and posterior sound perspectives reveal the most significant interactions between sound and force parameters.	Analyse patron de course
x	2020-09	2020-Protopapas-The effect of a 12-week custom foot orthotic intervention on muscle size and muscle activity of the intrinsic foot muscle of young adults during gait termination	Background: The tissue stress theory is commonly used to prescribe foot orthoses, however the mechanisms of foot orthoses are not understood well. The effect foot orthotics have on the plantar intrinsic muscles remains unclear. The study was designed to assess changes in muscle size and activity of the intrinsic muscles of individuals with pes planus after wearing custom-made foot orthotics for 12-weeks. Methods: Eighteen young adults with pes planus were allocated by stratified sampling into the orthotic group (n = 9) or control group (n = 9). Ultrasonography measured the cross-sectional area of the flexor digitorum brevis, abductor digiti minimi, and abductor hallucis at baseline, 6 and 12-weeks. Subsequently, participants completed an unexpected gait termination protocol (12 of 50 trials unexpected) and average electromyography magnitude was recorded. Findings: After 12-weeks the orthotic group cross-sectional area significantly decreased by 9.6% (P < .001) for the flexor digitorum brevis, 17.1% for abductor digiti minimi (P < .001) and 17.4% for abductor hallucis (P < .001). There were no significant differences of muscle activity magnitude for the intrinsic muscles. Interpretation: The short-term use of custom-made foot orthoses created a decrease in muscle size of the flexor digitorium brevis, abductor digiti minimi and abductor hallucis plantar intrinsic muscles but had no effect on muscle activity. Clinically, these results help to understand the adaptations that are created when foot orthoses are supporting a pes planus foot structure when reducing plantar pressures. These findings may help enhance the prescription of foot orthoses by adding a strength program to prevent disuse atrophy of these muscles.	Effets de la protection sur muscles pied

x	2020-09	2020-Cochrum-Visual Classification of Running Economy by Distance Running Coaches	Objectives: This study assessed the ability of coaches to rank-order distance runners on running economy (RE) through visual assessment. Methods: Running economy was measured in five trained recreational distance runners at a speed of 3.57 m·s-1, with a minimum VO2 difference of 2-mL.kg-1.min-1 between adjacent runners. Following measurement of RE, participants were filmed from the front, side, and rear while running on a treadmill. Endurance coaches from high school to international level (N = 121) viewed each video and ranked the runners on a scale from 1 (most economical) to 5 (least economical). Coaches also completed a demographic questionnaire and listed running style biomechanical observations they used in determining each ranking. A cumulative odds ordinal logistic regression with proportional odds was run to determine the effect of coaching level, years of coaching experience, years of training experience, competition level, certification status, and education level, on the ability of distance running coaching to accurately rank RE among a group of runners. Results: No coaching characteristic was a significant predictor of ranking accuracy, $\chi2 = 3.566$, $p = .735$. Conclusions: Visual assessment of effort, based on RE, is a difficult task, even for the trained eye and could be related to difficulty in understanding the interaction effect of various RE factors or the translation of scientific-based knowledge to the field of play. Practically, coaches should be cautious when recommending biomechanical adjustments without considering the interconnected factors related to such changes.	Biomécanique course et performance
x	2020-09	2020-Blagrove-Inter-limb strength asymmetry in adolescent distance runners- Test-retest reliability and relationships with performance and running economy	The purpose of this investigation was, firstly, to quantify the test-retest reliability of strength measures in adolescent distance runners; and secondly, to explore the relationships between inter-limb strength asymmetry and performance and running economy (RE) in a similar cohort of young runners. For the reliability study, twelve (n = 6 female) post-pubertal adolescent distance runners performed an isometric quarter-squat on a dual force plate and unilateral isometric hip extension and hip abduction tests on two occasions. For the correlation study, participants (n = 31) performed the strength tests plus a submaximal incremental running assessment and a maximal running test. Running economy was expressed as the average energy cost of running for all speeds below lactate turnpoint and was scaled for body mass using a previously calculated power exponent. Allometrically scaled peak force during the quarter-squat and peak torque in the hip strength tasks showed acceptable levels of reproducibility (typical error ≤6.3%). Relationships between strength asymmetry and performance and RE were low or negligible ($r < 0.47$, $p > 0.05$), except for hip abduction strength asymmetry and RE in the female participants ($r = 0.85$, $p < 0.001$, $n = 16$). Practitioners should consider inter-limb hip abduction strength asymmetry on an individual level, and attempting to reduce this asymmetry in females may positively impact RE.	Symétrie
x	2020-09	2020-Hoitz-The effects of systematically altered footwear features on biomechanics, injury, performance, and preference in runners of different skill level- a systematic review	Matching running footwear features to the functional needs of specific groups of runners stratified according to their training status or running experience has the potential to improve footwear preference, enhance running performance, and reduce the risk of running-related injuries. The complexity of modern running shoes in combination with the various functional needs of specific groups of runners, however, introduces many confounding factors, disguising what an appropriate shoe design should entail. As a result, it is crucial to identify and synthesise the effects of systematically modified running footwear features on lower extremity biomechanics, performance, injury risk, and footwear preference in runners of different skill levels to advance the knowledge of running biomechanics and footwear. The databases Scopus and PubMed were searched for related studies and 895 articles were identified. After the application of exclusion criteria, 68 articles remained and were arranged in a matrix that highlighted the investigated footwear feature and runner level. The effects of 20 footwear features on lower extremity biomechanics, injury, performance, and preference in novice, recreational, and high calibre runners were synthesised. Laced uppers with harder midsole materials in the forefoot/lateral regions of the shoe and softer materials in the rearfoot/medial regions increased comfort and thus likely preference. To increase performance, footwear should be constructed as lightweight as possible, and implement a range of different bending stiffness for individual needs. Injury risks at the knee joint were reduced in footwear with thinner midsoles. For high calibre runners, specifically, insoles should be custom moulded to the shape of the foot, and special attention needs to be payed to the elasticity of the upper, in order to avoid detrimental shifts in running patterns.	Shoes
x	2020-08	2020-Xu-Effects of Foot Strike Techniques on Running Biomechanics- A Systematic Review and Meta-analysis	Content: Distance running is one of the most popular physical activities, and running-related injuries (RRIs) are also common. Foot strike patterns have been suggested to affect biomechanical variables related to RRI risks. Objective: To determine the effects of foot strike techniques on running biomechanics. Data sources: The databases of Web of Science, PubMed, EMBASE, and EBSCO were searched from database inception through November 2018. Study selection: The initial electronic search found 723 studies. Of these, 26 studies with a total of 472 participants were eligible for inclusion in this meta-analysis. Study design: Systematic review and meta-analysis. Level of evidence: Level 4. Data extraction: Means, standard deviations, and sample sizes were extracted from the eligible studies, and the standard mean differences (SMDs) were obtained for biomechanical variables between forefoot strike (FFS) and rearfoot strike (RFS) groups using a random-effects model. Results: FFS showed significantly smaller magnitude (SMD, -1.84; 95% CI, -2.29 to -1.38; P < 0.001) and loading rate (mean: SMD, -2.1; 95% CI, -3.18 to -1.01; P < 0.001; peak: SMD, -1.77; 95% CI, -2.21 to -1.33; P < 0.001) of impact force, ankle stiffness (SMD, -1.69; 95% CI, -2.46 to -0.92; P < 0.001), knee extension moment (SMD, -0.64; 95% CI, -0.98 to -0.3; P < 0.001), knee eccentric power (SMD, -2.03; 95% CI, -2.51 to -1.54; P < 0.001), knee negative work (SMD, -1.56; 95% CI, -2.11 to -1.00; P < 0.001), and patellofemoral joint stress (peak: SMD, -0.71; 95% CI, -1.28 to -0.14; P = 0.01; integral: SMD, -0.63; 95% CI, -1.11 to -0.15; P = 0.01) compared with RFS. However, FFS significantly increased ankle plantarflexion moment (SMD, 1.31; 95% CI, 0.66 to 1.96; P < 0.001), eccentric power (SMD, 1.63; 95% CI, 1.18 to 2.08;P < 0.001), negative work (SMD, 2.60; 95% CI, 1.02 to 4.18; P = 0.001), and axial contact force (SMD, 1.26; 95% CI, 0.93 to 1.6; P < 0.001) compared with RFS. Conclusion: Running with RFS imposed higher biomechanical loads on overall ground impact and knee and patellofemoral joints, whereas FFS imposed higher biomechanical loads on the ankle joint and Achilles tendon. The modification of strike techniques may affect the specific biomechanical loads experienced on relevant structures or tissues during running.	Biomechanics

x	2020-08	2020-Melo-Correlation between running asymmetry, mechanical efficiency, and performance during a 10 km run	Running asymmetry is considered a matter of concern for performance and injury, but the association between asymmetry and performance remain unclear. There are different strategies to address asymmetries and its relationship with performance. Here we investigated the correlation between global symmetry index and mechanical efficiency during 10 km running. Thirteen amateur trained athletes (8 men and 5 women) performed a 10 km running at a fixed pace while a 3D accelerometer attached to the pelvic region recorded position data throughout the course of the run and gas exchanges were monitored breath by breath. Global symmetry index was determined for 3 directions, and mechanical efficiency was calculated as the ratio of external work output to energy expenditure determined from gas analysis. Global Symmetry Index and mechanical efficiency decreased (-55.5% and -44.8%, respectively) during the course of the 10 km run ($p < 0.01$). A positive correlation was observed between global symmetry index and efficiency ($r = 0.66$, $p = 0.01$). Asymmetry in the vertical direction had a relatively higher impact on the global symmetry index. The global symmetry index accounted for 43.1% of the variance in mechanical efficiency ($p = 0.015$). Symmetry, evaluated by the global symmetry index, directly correlates with mechanical efficiency during a 10 km run.	Symétrie
x	2020-08	2020-Deng-Changes in the Plantar Flexion Torque of the Ankle and in the Morphological Characteristics and Mechanical Properties of the Achilles Tendon after 12-Week Gait Retraining	Purpose: Although the Achilles tendon (AT) is the largest and strongest tendon, it remains one of the most vulnerable tendons among elite and recreational runners. The present study aims to explore the effects of 12-week gait retraining (GR) on the plantar flexion torque of the ankle and the morphological and mechanical properties of the AT. Methods: Thirty-four healthy male recreational runners (habitual rearfoot strikers) who never tried to run in minimal shoes were recruited, and the intervention was completed (20 in the GR group vs. 14 in the control (CON) group). The participants in the GR group were asked to run in minimal shoes (INOV-8 BARE-XF 210) provided by the investigators with forefoot strike patterns during the progressive 12-week GR. Meanwhile, the participants in the CON group were instructed to run in their own running shoes, which they were familiar with, with original foot strike patterns and intensities. The morphological properties of the AT, namely, length and cross-sectional area (CSA), were obtained by using an ultrasound device. A dynamometer was utilized simultaneously to measure and calculate the plantar flexion torque of the ankle, the rate of torque development, the peak force of the AT, and the stress and strain of the AT. Results: After 12-week GR, the following results were obtained: (1) A significant time effect in the peak ankle plantarflexion torque was observed ($p = 0.005$), showing a 27.5% increase in the GR group; (2) A significant group effect in the CSA was observed ($p = 0.027$), specifically, the increase in CSA was significantly larger in the GR group than the CON group; (3) A significant time effect in the peak AT force was observed ($p = 0.005$), showing a 27.5% increase in the GR group. Conclusion: The effect of 12 weeks of GR is an increase in AT CSA, plantar flexor muscle strength of the ankle, and peak AT force during a maximal voluntary isometric contraction test. These changes in AT morphology and function could be positive for tendon health and could prevent future AT injury.	Running gait & forces / adaptations
x	2020-08	2020-Lai-Will the Foot Strike Pattern Change at Different Running Speeds with or without Wearing Shoes?	Runners strike their feet with three different patterns during running: forefoot, midfoot, and rearfoot. This study aimed to investigate whether runners maintain consistent patterns while running speed and foot condition change. The foot strike patterns of runners when running on a treadmill at paces ranging from slow to fast were recorded from twenty healthy male regular runners, with and without shoes, in random order. A high-speed camera was used to observe the strike patterns, which were then categorized by an experienced physical therapist. Linear-log and Pearson chi-square analysis with a significance level of $\alpha = 0.05$ was performed to examine the correlation between foot strike pattern, running speed, and shoe conditions. The results suggest that runners strike with different patterns when running with and without shoes ($\chi2 = 99.07$, $p < 0.01$); runners preferred to adopt heel strike regardless of running speeds when running with shoes. While running barefoot, only 23.8% of landing strikes were rearfoot, and the strike pattern distribution did not change significantly with the running speed ($\chi2 = 2.26$, $p = 0.89$). In summary, the foot strike preference of runners is correlated with the foot condition (barefoot or shod) rather than running speed. For runners who intend to change their strike patterns for any reason, we recommend that they consider adjusting their footwear, which may naturally help with the foot strike adjustment. Future studies should attempt to use advanced techniques to observe further foot biomechanics in order to discover if changing strike pattern is directly correlated with lower limb injuries.	Shoes / barefoot and kinematics
x	2020-07	2020-Garofolini-A real-time feedback method to reduce loading rate during running: Effect of combining direct and indirect feedback	Impact loading plays a key role in the pathophysiology of running-related injuries. Providing real-time feedback may be an effective strategy to reduce impact loading; however, it is currently unclear what an effective training method to help runners achieve a habitual low loading rate is. We subjected 20 healthy non-runners to a structured sequence of direct and indirect biofeedback designed to facilitate broader exploration of neuro-mechanical workspace for potential movement solutions (indirect feedback on cadence and foot-strike angle) and to refine and converge upon an optimal sub-set of that space to match the task goal (direct feedback on loading rate). While indirect biofeedback on foot-strike angle yielded a lower impact load than providing direct biofeedback on loading rate, compared to indirect biofeedback on foot-strike angle, providing direct feedback on loading rate statistically increased (+58%, $p = 0.007$) the range of goal-relevant solutions participants used to lower their impact loading. Results showed that structured feedback was effective in increasing the range of input parameters that match the task goal, hence expanding the size of goal-relevant solutions, which may benefit running performance under changing environmental constraints.	Gait retraining
x	2020-07	2020-Dhillon-What are the perceptions of runners and healthcare professionals on footwear and running injury risk?	OBJECTIVES: There is a gap in research exploring perceptions of runners and healthcare professionals (HCPs) about running footwear and injury risk. The objectives of this study were: (1) to document factors considered by runners when selecting footwear; (2) to compare perceptions on footwear and injury risk in runners and HCPs; and (3) to evaluate the perceived usefulness of an online educational module. METHODS: Using an online survey, we collected information on demographics and perceptions about footwear and injury risk. Runners reported their footwear selection strategy, and HCPs their typical recommendations. An evidence-based educational module was presented, and participants rated its usefulness. RESULTS: The survey was completed by 2442 participants, of which 1035 completed the optional postmodule questions. Runners reported relying mostly on comfort and advice from retailers when selecting shoes. Perceptions regarding the effects of specific footwear types (minimalist, maximalist), characteristics (softness, drop) and selection strategy (foot type, transition) on biomechanics and injury risk were different between HCPs and runners. Overall, runners perceived footwear as more important to prevent injury than did HCPs (7.6/10, 99% CI 7.4 to 7.7 vs 6.2/10, 99% CI 6.0 to 6.5; $p<0.001$). Both runners (8.1/10, 99% CI 7.9 to 8.3) and HCPs (8.7/10, 99% CI 8.6 to 8.9) found the educational module useful. A majority of respondents indicated the module changed their perceptions. CONCLUSION: Footwear is perceived as important in reducing running injury risk. This online module was deemed useful in educating about footwear evidence. Future studies should evaluate if changes in perceptions can translate to behaviour change and, ultimately, reduced injury risk.	Shoes

x	2020-07	2020-Simoni-Time-course of running treadmill adaptation in novice treadmill runners.	Studies on running biomechanics and energetics are usually conducted on a treadmill. To ensure that locomotion on a treadmill is comparable to locomotion overground, participants need to be expert in the use of the device. This study aimed to identify the number and duration of sessions needed to obtain stable measurements for spatiotemporal and metabolic parameters in unexperienced treadmill runners. Fourteen male recreational runners performed three 15-min treadmill running trials in different days at a submaximal speed. Spatiotemporal and metabolic parameters were registered at minutes: 5, 10, 15 and their within-trial and between-trial changes were analysed using a two-way repeated measures ANOVA and Bonferroni post-hoc test. Within-trial differences were found in step frequency (decreased over time), Step Length and Contact Time (increased), reaching stability at different time points. Ventilator parameters increased, reaching stability after 5-10 min, while heart rate increased progressively over time. The only between-trial differences were an increase in step length and a decrease in step frequency at min 1, between trials 1 and 3. In conclusion, at least three running trials of 15 min are required to familiarize with the device. The last 5 min of the third trial can be regarded as stable measurements.	Évaluation course
x	2020-07	2020-Rosenbloom-Oral non-steroidal anti-inflammatory drug use in recreational runners participating in Parkrun UK: Prevalence of use and awareness of risk	OBJECTIVE: Non-steroidal anti-inflammatory drugs (NSAIDs) are widely used in endurance running and by elite athletes. We examined the pattern of use of NSAIDs, the purpose of use and knowledge of the adverse effects of NSAID use in a population of recreational runners at Parkrun UK. METHODS: An online observational non-interventional cross-sectional survey of Parkrun UK participants being over the age of 18, on Parkrun UK's mailing list, and residing in the UK. KEY FINDINGS: Runners (n = 806) had a high use of NSAIDs in the past 12 months (87.8%). The average age of respondents was 48.39 years. There was a significant association between those taking an oral NSAID in the last twelve months and those with a sporting injury ($\chi 2$ = 10.89, df = 1, n = 797, P = 0.001). Ibuprofen was the most commonly used NSAID (81.1%). A third of runners had experienced an adverse drug reaction associated with NSAIDs, usually gastrointestinal. Half of runners used NSAIDs with no advice, and patient information leaflets were the most common source for those that had advice. Ninety-four per cent of runners would like more information on the harms and benefits of NSAIDs. CONCLUSIONS: Some recreational runners have a high use of NSAIDs, which is chronic in nature and a potential health risk. Recreational runners want more information on the harms and benefits of NSAIDs. Race event organizers should provide evidence-based advice on the use of NSAIDs.	AINS
x	2020-07	2020-Khassetarash-Biomechanics of graded running: Part II-Joint kinematics and kinetics	Compared to level running (LR), different strategies might be implemented by runners to cope with specific challenges of graded running at different speeds. The changes in joint kinetics and kinematics associated with graded running have been investigated, but their interactions with speed are unknown. Nineteen participants ran on an instrumented treadmill at five grades (0°, ±5° and ± 10°) and three speeds (2.50, 3.33 and 4.17 m/s), while 3D motion and forces were recorded. Three speed × five-grade repeated-measures ANOVA was used to analyze kinetic and kinematic variables. A speed × grade interaction was observed for hip range of motion (ROM). Downhill running (DR) at fastest speed did not reduce ROM at the hip, compared to LR. Compared to LR, it was observed that the hip joint was responsible for a greater contribution of energy generation while running at the fastest speed at +10°. Speed × grade interactions were also observed for the energy absorption, peak moment, and peak power at the knee. Contrary to LR, running faster during UR did not require higher peak power at the knee. Finally, DR at the fastest speed did not increase peak negative power at the knee compared to LR. This study demonstrates that ankle, knee, and hip joint kinetics depend on speed and grade of running, while the effect of grade on joint kinematics was not substantially modulated by speed.	Surfaces
x	2020-07	2020-Vernillo-Biomechanics of graded running: Part I - Stride parameters, external forces, muscle activations.	Biomechanical alterations with graded running have only been partially quantified, and the potential interactions with running speed remain unclear. We measured spatiotemporal parameters, ground reaction forces, and leg muscle activations (EMG) in nineteen adults (10F/9M) running on an instrumented treadmills at 2.50, 3.33, and 4.17 m·s-1 and 0, ±5°, and ±10°. Step frequency illustrated a significant speed × grade interaction (P < .001) and was highest (+3%) at the steepest grade (+10°) and fastest speed (4.17 m·s-1) when compared to level running (LR) at the same speed. Significant interaction was also observed for ground reaction forces (all P ≤ .047). Peak ground reaction forces in the normal direction increased with running speed during downhill running (DR) only (+9% at -10° and 4.17 m·s-1). Impulse in the normal direction decreased at fastest speed and steepest DR (-9%) and uphill running (UR) (-17%) grades. Average normal loading rate increased and decreased at fastest speed and steepest DR (+52%) and UR (-28%) grades, respectively. Negative parallel impulse increased and decreased at fastest speed and steepest DR (+166%) and UR (-90%), respectively. Positive parallel impulse decreased and increased at fastest speed and steepest DR (-75%) and UR (+111%), respectively. EMG showed comparable u-shaped curves across the grades investigated, although only a change in vastus lateralis and tibilias anterior activity was detectable at the steepest grades and fastest speed. Overall, running grade and speed significantly influences spatiotemporal parameters, ground reaction forces, and muscle activations.	Surfaces
x	2020-07	2020-Futrell-Transition to forefoot strike reduces load rates more effectively than altered cadence.	BACKGROUND: Excessive vertical impacts at landing are associated with common running injuries. Two primary gait-retraining interventions aimed at reducing impact forces are transition to forefoot strike and increasing cadence. The objective of this study was to compare the short- and long-term effects of 2 gait-retraining interventions aimed at reducing landing impacts. METHODS: A total of 39 healthy recreational runners using a rearfoot strike and a cadence of ≤170 steps/min were randomized into cadence (CAD) or forefoot strike (FFS) groups. All participants performed 4 weeks of strengthening followed by 8 sessions of gait-retraining using auditory feedback. Vertical average load rates (VALR) and vertical instantaneous load rates (VILR) were calculated from the vertical ground reaction force curve. Both cadence and foot strike angle were measured using 3D motion analysis and an instrumented treadmill at baseline and at 1 week, 1 month, and 6 months post retraining. RESULTS: ANOVA revealed that the FFS group had significant reductions in VALR (49.7%) and VILR (41.7%), and changes were maintained long term. Foot strike angle in the FFS group changed from 14.2° dorsiflexion at baseline to 3.4° plantarflexion, with changes maintained long term. The CAD group exhibited significant reduction only in VALR (16%) and only at 6 months. Both groups had significant and similar increases in cadence at all follow-ups (CAD, +7.2% to 173 steps/min; and FFS, +6.1% to 172 steps/min). CONCLUSION: Forefoot strike gait-retraining resulted in significantly greater reductions in VALR and similar increases in cadence compared to cadence gait-retraining in the short and long term. Cadence gait-retraining resulted in small reductions in VALR at only the 6-month follow-up.	Gait retraining
x	2020-07	2020-Nordin-Footwear and footstrike change loading patterns in running.	Loading rates have been linked to running injuries, revealing persistent impact features that change direction among three-dimensional axes in different footwear and footstrike patterns. Extracting peak loads from ground reaction forces, however, can neglect the time-varying loading patterns experienced by the runner in each footfall. Following footwear and footstrike manipulations during laboratory-based overground running, we examined three-dimensional loading rate-time features in each direction (X, Y, Z) using principal component analysis. Twenty participants (9 M, 11 F, age: 25.3 ± 3.6 y) were analysed during 14 running trials in each of two footwear (cushioned and minimalist) and three footstrike conditions (forefoot, midfoot, rearfoot). Two principal components (PC) captured the primary loading rate-time features (PC1: 42.5% and PC2: 22.8% explained variance) and revealed interaction among axes, footwear, and footstrike conditions (PC1: F (2.1, 40.1) = 5.6, p = 0.007, η 2 = 0.23; PC2: F (2.0, 38.4) = 62.3, p < 0.001, η 2 = 0.77). Rearfoot running in cushioned footwear attenuated impact loads in the vertical direction, and forefoot running in minimalist footwear attenuated impact loads in the anterior-posterior and medial-lateral directions relative to forefoot running in cushioned shoes. Loading patterns depend on footwear and footstrike interactions, which require shoes that match the runner's footstrike pattern.	Charges selon type chaussures et biomécanique

x	2020-07	2020-Szymanek-IS STEP RATE ASSOCIATED WITH RUNNING INJURY INCIDENCE? AN OBSERVATIONAL STUDY WITH 9- MONTH FOLLOW UP.	BACKGROUND: Several strategies have been proposed to reduce loading of the lower extremity while running including step rate manipulation. It is unclear however, whether step rate influences the incidence of lower extremity injuries. PURPOSE: To examine the association between step rate and risk of injury in an adult recreational runner population. STUDY DESIGN: Prospective Cohort. METHODS: A total of 381 runners were prospectively followed for an average of nine months. Two-dimensional video was used to assess preferred step rate during a timed two-mile run or a 5K race. Injury surveillance to record sub-clinical injuries (those for which medical treatment was not sought) was performed via semi-monthly email surveys over the course of one year. Injury surveillance for clinical injuries (those for which medical treatment was sought) was performed via a full medical record review using the Armed Forces Health Longitudinal Technology Application. Clinical, sub-clinical and combined clinical and sub-clinical injury incidence were assessed in separate analyses. Injury was operationally defined as seven or more days of reduced activity due to pain. To assess the predictive validity of running step rate, the step rate of participants who did not develop a musculoskeletal injury during the observation period were compared with the running step rate of participants who did develop an injury during the observation period. RESULTS: Out of 381 runners, 16 sustained a clinical overuse injury for which medical treatment was sought. Mean step rate for clinically un-injured runners was 172 steps/min and mean step rate for clinically injured runners was 173 steps/min which was not statistically significantly different (p = 0.77.) Out of 381 runners, 95 completed all four sub-clinical injury surveys (95/381 = 25%). Out of those 95 runners, 19 sustained a clinical (n=4) or sub-clinical injury (n=15). The step rate of sub-clinically injured and non-injured runners in this sub-sample was also not statistically significantly different (p = 0.08), with a mean of 174 steps/min for the uninjured group and a mean step rate of 170 steps/min for those in the sub-clinical injured group. CONCLUSION: Preferred step rate was not associated with lower extremity injury rates in this sample of DoD runners. Additional research is needed to justify preferred step rate manipulation as a means to reduce lower extremity injury risk.	Prévention et biomécanique
x	2020-07	2020-Wang-Twelve-Week Gait Retraining Reduced Patellofemoral Joint Stress during Running in Male Recreational Runners	PURPOSE: To explore the changes in knee sagittal angle and moment and patellofemoral joint (PFJ) force and stress before and after 12-week gait retraining. METHODS: A total of 30 healthy male recreational runners were randomized into a control group (n = 15) who ran in their original strike pattern using minimalist shoes or experimental group (n = 15) who ran in a forefoot strike pattern using minimalist shoes during the 12-week gait retraining. The kinematic and kinetic data of the dominant leg of the participants during the 12 km/h running were collected by 3D motion capture systems and 3D force platforms. Besides, the biomechanical property of the PFJ was calculated on the basis of the joint force model and the regression equation of the contact area. RESULTS: After the 12-week gait retraining, 78% of the rearfoot strikers turned into forefoot strikers. Peak knee extension moment and peak PFJ stress decreased by 13.8% and 13.3% without altering the running speed, respectively. Meanwhile, no changes in maximum knee flexion angle/extension moment and PFJ force/stress were observed for the control group. CONCLUSION: The 12-week gait retraining effectively reduced the PFJ stress, thereby providing a potential means of reducing the risk of patellofemoral pain syndrome while running.	Gait retraining
x	2020-07	2020-Jungmalm-Associations between biomechanical and clinical/anthropometrical factors and running-related injuries among recreational runners: a 52-week prospective cohort study.	BACKGROUND: The purpose of this exploratory study was to investigate whether runners with certain biomechanical or clinical/anthropometrical characteristics sustain more running-related injuries than runners with other biomechanical or clinical/anthropometrical characteristics. METHODS: The study was designed as a prospective cohort with 52-weeks follow-up. A total of 224 injury-free, recreational runners were recruited from the Gothenburg Half Marathon and tested at baseline. The primary exposure variables were biomechanical and clinical/anthropometrical measures, including strength, lower extremity kinematics, joint range of motion, muscle flexibility, and trigger points. The primary outcome measure was any running-related injury diagnosed by a medical practitioner. Cumulative risk difference was used as measure of association. A shared frailty approach was used with legs as the unit of interest. A total of 448 legs were included in the analyses. RESULTS: The cumulative injury incidence proportion for legs was 29.0% (95%CI = 24.0%; 34.8%). A few biomechanical and clinical/anthropometrical factors influence the number of running-related injuries sustained in recreational runners. Runners with a late timing of maximal eversion sustained 20.7% (95%CI = 1.3; 40.0) more injuries, and runners with weak abductors in relation to adductors sustained 17.3% (95%CI = 0.8; 33.7) more injuries, compared with the corresponding reference group. CONCLUSIONS: More injuries are likely to occur in runners with late timing of maximal eversion or weak hip abductors in relation to hip adductors.	Lien anatomie/force et blessures
x	2020-07	2020-Wei-A Plyometric Warm-Up Protocol Improves Running Economy in Recreational Endurance Athletes	This study explored the impact of two differing warm-up protocols (involving either resistance exercises or plyometric exercises) on running economy (RE) in healthy recreationally active participants. Twelve healthy university students [three males, nine females, age 20 ± 2 years, maximal oxygen uptake (38.4 ± 6.4 ml min-1 kg-1)] who performed less than 5 h per week of endurance exercise volunteered to participant in this study. All participants completed three different warm-up protocols (control, plyometric, and resistance warm-up) in a counterbalanced crossover design with trials separated by 48 h, using a Latin-square arrangement. Dependent variables measured in this study were RE at four running velocities (7, 8, 9, and 10 km h-1), maximal oxygen uptake; heart rate; respiratory exchange rate; expired ventilation; perceived race readiness; rating of perceived exertion, time to exhaustion and leg stiffness. The primary finding of this study was that the plyometric warm-up improved RE compared to the control warm-up (6.2% at 7 km h-1, ES = 0.355, 9.1% at 8 km h-1, ES = 0.513, 4.5% at 9 km h-1, ES = 0.346, and 4.4% at 10 km h-1, ES = 0.463). There was no statistically significant difference in VO2 between control and resistance warm-up conditions at any velocity. There were also no statistically significant differences between conditions in other metabolic and pulmonary gas exchange variables; time to exhaustion; perceived race readiness and maximal oxygen uptake. However, leg stiffness increased by 20% (P = 0.039, ES = 0.90) following the plyometric warm-up and was correlated with the improved RE at a velocity of 8 km h-1 (r = 0.475, P = 0.041). No significant differences in RE were found between the control and resistance warm-up protocols. In comparison with the control warm-up protocol, an acute plyometric warm-up protocol can improve RE in healthy adults.	Warmup
x	2020-07	2020-Vannatta-Biomechanical risk factors for running-related injury differ by sample population: A systematic review and meta-analysis.	BACKGROUND: The role of biomechanical variables of running gait in the development of running related injury has not been clearly elucidated. Several systematic reviews have examined running biomechanics and its association with particular running related injuries. However, due to retrospective designs, inferences into the cause of these injuries are limited. Although prospective studies have been completed, no quantitative analysis pooling these results has been completed. METHODS: A systematic review of MEDLINE, CINAHL, and PubMed was completed. Articles included used prospective study designs, human subjects currently completing a regular running program, and a minimum 12-week follow-up period. Excluded articles had no biomechanical data reported, participants who were beginning runners or military recruits, or had an intervention provided. FINDINGS: Thirteen studies met these criteria. Pooled analyses were completed if two or more studies were available with samples that investigated the same sex and competition level. A qualitative synthesis was completed when pooled analysis was not possible. Five unique running samples were identified and allowed for pooled analyses of variables in mixed-sex collegiate runners and female recreational runners. Moderate evidence exists for increased hip adduction and reduced peak rearfoot eversion as risk factors for running related injury in female recreational runners. Variables differed in other samples of runners. INTERPRETATION: A runner's sex and competition level may affect the relationship between biomechanical factors and the development of running related injury. Hip adduction and rearfoot eversion may be important factors related to running related injury in female recreational runners. Further investigation of biomechanical factors in running injury is warranted	Facteurs risque blessures

x	2020-07	2020-Sheerin-The effectiveness of real-time haptic feedback gait retraining for reducing resultant tibial acceleration with runners.	OBJECTIVES: To examine the effectiveness of real-time haptic feedback gait retraining for reducing resultant tibial acceleration (TA-R) with runners, the retention of changes over four weeks, and the transfer of learning to overground running. DESIGN: Case control. SETTING: Biomechanical laboratory treadmill, and track-based overground, running. PARTICIPANTS: 18 experienced uninjured high tibial acceleration runners. MAIN OUTCOME MEASURES: TA-R measured while treadmill and overground running assessed at pre-, post- and 4-weeks post-intervention. RESULTS: Across the group, a 50% reduction in TA-R was measured post-intervention (ES: 0.9, z = -18.2, p < .001), and 41% reduction at 4-weeks (ES: 0.8, z = -12.9, p < .001) with treadmill running. A 28% reduction (ES: 0.7, z = -13.2, p < .001), and a 17% reduction in TA-R were measured at these same time points when runners ran overground (ES: 0.7, z = -11.2, p < .001). All but two runners responded positively to the intervention at the post-intervention assessment. Eleven runners were categorised as positive responders to the intervention at the 4-week post-intervention. CONCLUSIONS: Haptic feedback based on TA-R appears to be as effective, but less invasive and expensive, compared to other more established modalities, such as visual feedback. This new approach to movement retraining has the potential to revolutionise the way runners engage in gait retraining.	Gait retraining
x	2020-07	2020-Mo-Bilateral asymmetry of running gait in competitive, recreational and novice runners at different speeds.	The mechanisms and underlying causes of bilateral asymmetry among healthy runners of different levels remain unclear. This cross-sectional laboratory study aimed to investigate the effects of running speed and running experience or competitive level on bilateral symmetry during running. Eleven competitive runners, 9 recreational runners and 11 novice runners were recruited in this study. They ran on an instrumented treadmill for 3 min at each of 5 fixed speeds (8, 9, 10, 11 and 12 km/h) in a randomized order. Bilateral asymmetry was evaluated and quantified using symmetry index (SI) of temporal and kinetic parameters. Overall, SI ranged between 0.8% for stride time and 21.4% for vertical average loading rate. Significant speed effects were observed on SI of flight time (p = .012), which was significantly higher at 8 km/h than that of the other 4 speeds (p = .023, 0.005, 0.023 and 0.028, respectively). Group-by-speed interactions were detected on SI in time to peak vertical ground reaction force (p = .032) and vertical average loading rate (p = .002). The competitive runners presented linear reduction in the SI with increasing speed from 8 to 12 km/h (R2 > 0.94); for the recreational runners, SI changed nonlinearly and presented a roughly U-shaped trend across speeds (R2 > 0.88); and for the novice runners, changes of SI across speed were inconsistent and dependent on parameters of interest (R2 > 0.64). Bilateral asymmetry was affected by both running speed and runners' running experience or competitive level. The competitive runners were found to run with a more symmetrical manner with a greater running speed, the recreational runners demonstrated the most symmetrical pattern at the critical speed, whereas the novice runners showed inconsistent trends.	Symétrie
x	2020-07	2020-Davis-Gait Retraining as an Intervention for Patellofemoral Pain.	PURPOSE OF REVIEW: Movement retraining in rehabilitation is the process by which a motor program is changed with the overall goal of reducing pain or injury risk. Movement retraining is an important component of interventions to address patellofemoral pain. The purpose of this paper is to review the methods and results of current retraining studies that are aimed at reducing symptoms of patellofemoral pain. RECENT FINDINGS: The majority of studies reviewed demonstrated some improvement in patellofemoral pain symptoms and overall function. However, the degree of improvement as well as the persistence of improvement over time varied between studies. The greatest pain reduction and persistent changes were noted in those studies that incorporated a faded feedback design including between 8 and 18 sessions over 2-6 weeks, typically 3-4 sessions per week. Additionally, dosage in these studies increased to 30-45 min during later sessions, resulting in 177-196 total minutes of retraining. In contrast, pain reductions and persistence of changes were the least in studies where overall retraining volume was low and feedback was either absent or continual. Faulty movement patterns have been associated with patellofemoral pain. Studies have shown that strengthening alone does not alter these patterns, and that addressing the motor program is needed to effect these changes. Based upon the studies reviewed here, retraining faulty patterns, when present, appears to play a significant role in addressing patellofemoral pain. Therefore, movement retraining, while adhering to basic motor control principles, should be part of a therapist's intervention skillset when treating patients with PFP.	Gait retraining
x	2020-07	2020-Mota-Effects of Wearing Compression Stockings on Exercise Performance and Associated Indicators: A Systematic Review.	This systematic review investigated the effects of wearing below-knee compression stockings (CS) on exercise performance (or sports activity) and associated physiological and perceived indicators. We searched articles on PubMed using the following terms: "graduated compression stockings"; "compression stockings"; "graduated compression socks"; "compression socks" combined with "performance", "athletes", "exercise", "exercise performance", "fatigue", "sports" and "recovery", resulting in 1067 papers. After checking for inclusion criteria (e.g., original studies, healthy subjects, performance analysis), 21 studies were selected and analyzed. We conclude that wearing CS during exercise improved performance in a small number of studies. However, wearing CS could benefit muscle function indicators and perceived muscle soreness during the recovery period. Future research should investigate the chronic effect of CS on Sports Medicine and athletic performance.	Bas compression
x	2020-07	2020-Letafatkar-Effect of neuromuscular training augmented with knee valgus control instructions on lower limb biomechanics of male runners.	OBJECTIVE: To examine if combining neuromuscular training (NMT) with knee valgus control instructions (VCIs) can affect lower limb biomechanics and injury incidence in male novice runners and assess over 1-year follow-up. DESIGN: Controlled laboratory Study. SETTING: University research laboratory. PARTICIPANTS: 60 male novice runners randomly assigned into NMT (n = 20), NMT plus VCIs (n = 20), and sham (n = 20). MAIN OUTCOME MEASURES: Kinematic and kinetic were measured at pre- and post-test and 1-year follow-up. Injury incidence assessed at pre-test and 1-year follow up. RESULTS: There were significant between-group differences in kinetics after 6 weeks in NMT plus VCIs group. No significant differences were observed between NMT and NMT plus VCIs in kinematic variables. No significant change was seen in the sham in all variables. At 1-year follow-up, the minimal changes were seen in kinetic variables. Reduction reported running-related injuries were 31.58% in the NMT alone group, 65.52% in NMT plus VCIs group. In sham, it increased to 13.46%. CONCLUSIONS: NMT plus VCIs was effective to reduce kinetics and improve kinematics in novice runners. Also, it could reduce injury incidence. This protocol may be an option for both athletic trainers and coaches for preventing of lower limbs' injury in male runners.	Gait retraining
x	2020-07	2020-Sun-Systematic Review of the Role of Footwear Constructions in Running Biomechanics: Implications for Running-Related Injury and Performance.	Although the role of shoe constructions on running injury and performance has been widely investigated, systematic reviews on the shoe construction effects on running biomechanics were rarely reported. Therefore, this review focuses on the relevant research studies examining the biomechanical effect of running shoe constructions on reducing running-related injury and optimising performance. Searches of five databases and Footwear Science from January 1994 to September 2018 for related biomechanical studies which investigated running footwear constructions yielded a total of 1260 articles. After duplications were removed and exclusion criteria applied to the titles, abstracts and full text, 63 studies remained and categorised into following constructions: (a) shoe lace, (b) midsole, (c) heel flare, (d) heel-toe drop, (e) minimalist shoes, (f) Masai Barefoot Technologies, (g) heel cup, (h) upper, and (i) bending stiffness. Some running shoe constructions positively affect athletic performance-related and injury-related variables: 1) increasing the stiffness of running shoes at the optimal range can benefit performance-related variables; 2) softer midsoles can reduce impact forces and loading rates; 3) thicker midsoles can provide better cushioning effects and attenuate shock during impacts but may also decrease plantar sensations of a foot; 4) minimalist shoes can improve running economy and increase the cross-sectional area and stiffness of Achilles tendon but it would increase the metatarsophalangeal and ankle joint loading compared to the conventional shoes. While shoe constructions can effectively influence running biomechanics, research on some constructions including shoe lace, heel flare, heel-toe drop, Masai Barefoot Technologies, heel cup, and upper requires further investigation before a viable scientific guideline can be made. Future research is also needed to develop standard testing protocols to determine the optimal stiffness, thickness, and heel-toe drop of running shoes to optimise performance-related variables and prevent running-related injuries.	Effets type chaussure

x	2020-07	2020-Milner-Tibial Acceleration during Running Is Higher in Field Testing Than Indoor Testing.	Tibial acceleration is frequently measured in runners, and recent advances in wireless technology have led to field studies measuring tibial acceleration outside the laboratory. However, it is unknown whether laboratory and field measures of tibial acceleration differ within runners. In addition, the relationship between peak axial acceleration and the more recent measure peak resultant tibial acceleration has not been determined. PURPOSE: This study aimed to determine whether laboratory and field measures of tibial acceleration are comparable, and whether peak axial and peak resultant tibial acceleration are interchangeable. METHODS: Nineteen healthy rearfoot striking runners between 18 and 45 yr of age participated. A precision accelerometer was aligned with the vertical axis of the distal tibia and firmly attached. Data were collected in the following conditions during running at 3.0 m·s ± 5%: traditional overground laboratory gait analysis contacting force plates, treadmill, outdoor grass, and outdoor sidewalk. Acceleration data were filtered and normalized to gravity. Peaks for variables of interest were extracted from the first 40% of stride for 10 trials per condition. Differences among conditions were determined. RESULTS: Peak positive acceleration was lower in laboratory and treadmill compared with grass and sidewalk conditions. However, laboratory and treadmill were similar in magnitude, as were grass and sidewalk. Peak resultant acceleration was consistently higher than peak axial acceleration, with the same pattern among conditions. Laboratory acceleration measures explained at best only half of the variance in the field conditions and did not explain the variance for grass. CONCLUSION: Tibial impact acceleration magnitude is influenced by testing procedures in runners. These findings support measuring tibial impact acceleration in the field to determine new metrics associated with injury.	Biomécanique tapis vs. dehors
x	2020-02	2020-Vincent-Impact of Body Mass Index on Biomechanics of Recreational Runners	Objective: Some recreational runners with obesity successfully train or compete without musculoskeletal injury. Insight into the key kinetic strategies of injury-free heavier runners is necessary to appropriately guide development of safe training programs for this population. This study determined key biomechanical strategies of running in individuals with body mass index (BMI) values above and below 30kg/m2. Design: This was a case control study of runners with obesity (n=18; 42.7 years, 38.9% women) who were matched by sex, age, footstrike type, footwear characteristics, and running speed with healthy runners (n=77; 41.7 years, 32.5% women). Setting: Research laboratory affiliated with an academic medical center. Main Outcome Measures: A seven-camera optical motion analysis system was used to capture running kinematics and an instrumented treadmill captured kinetic data. Main outcomes were temporal spatial parameters, joint excursions, peak ground reaction forces (GRF), joint moments, vertical average loading rate (VALR), impulses and vertical stiffness (Kvert). Results: Runners with obesity demonstrated 15% less vertical excursion of the center of mass, 18% wider strides and 3% longer stance times than non-obese runners ($p<0.05$). Normalized peak GRFs and VALRs were higher in the non-obese group. Absolute GRF impulse was higher in the group with obesity compared to the non-obese group (339.6 ± 55.2 Ns versus 255.0 ± 45.8 Ns; $p=0.0001$). Kvert was higher in the obese group compared to the non-obese group (238.6 ± 50.3 N/cm versus 183.1 ± 29.4 N/cm; $p=0.0001$). Peak hip moments were higher in runners with obesity in sagittal and frontal planes ($p<0.05$) Conclusion: Runners with obesity dampened impact forces and controlled loading rate more than non-obese runners by increasing lower body stiffness and constraining vertical displacement.	Biomécanique et poids
x	2020-02	2020-Colino-Mechanical Properties of Treadmill Surfaces and Their Effects on Endurance Running	PURPOSE: To characterize, for the first time, the mechanical properties of treadmill surfaces along with a practical interpretation of their influence on physiological and perceived demands during endurance running compared with other widely used surfaces such as asphalt and tartan tracks. METHODS: Ten experienced male endurance runners performed a 40-minute running bout at a preferred constant speed on 3 different surfaces (after a randomized, counterbalanced order with a 7-d interval between trials): asphalt, tartan, or treadmill. Shock absorption, vertical deformation, and energy restitution were measured for the 3 surfaces. Intensity (based on heart rate data) and rating of perceived exertion were monitored. RESULTS: The values of shock absorption averaged 0.0% (asphalt), 37.4% (tartan), and 71.3% (treadmill), while those of vertical deformation and energy restitution averaged 0.3, 2.2, and 6.5 mm and 90.8%, 62.6%, and 37.0%, respectively. Running intensity (as determined by heart rate data) was higher overall on the treadmill than tartan but not asphalt running. Except for the first 10 minutes, all mean rating of perceived exertion values were significantly higher in asphalt and treadmill than in tartan. No significant differences were identified between treadmill and asphalt. CONCLUSIONS: The considerably higher shock absorption of the treadmill than the tartan surface leads to a reduction in the amount of energy returned to the athlete, which in turn increases physiological stress and rating of perceived exertion during endurance running.	Biomécanique tapis vs. dehors
x	2020-02	2020-Bovalino-Change in foot strike patterns and performance in recreational runners during a road race: A cross-sectional study	Objectives: To characterise foot strike and observe change in foot strike patterns with increasing distance during a 15 km recreational running road race. To assess the impact of foot strike on running performance. Design: Observational cross-sectional study. Methods: Foot strike patterns were determined at the 3 km and 13 km checkpoints for 459 participants during the 2017 Melbourne City to Sea recreational running event. Foot strike patterns were categorised as either rearfoot strike (RFS) or non-rearfoot strike (NRFS) at both checkpoints and analyses were conducted on intra-individual change in foot strike as well as relationship to finishing time. Results: The most prevalent foot strike pattern at 3 km and 13 km was RFS with 76.9% (95%CI: 73.2%-80.5%) and 91.0% (95%CI: 88.7%-93.1%) using this pattern, respectively. Of the 105 participants who ran with a NRFS at 3 km, 61% changed to RFS at 13 km. Race completion time differed by foot strike pattern, where mean time for consistent NRFS (62.64 ± 11.20 min) was significantly faster than consistent RFS (72.58 ± 10.84 min; $p<0.001$) and those who changed from NRFS to RFS between checkpoints (67.93 ± 10.60 min; $p=0.040$). Conclusions: While the majority of recreational distance runners RFS within race settings, the fastest runners were those who consistently ran with a NRFS. In runners that use a NRFS early, a large proportion change to RFS as distance increases. Further research is warranted to determine whether interventions aimed at reducing muscular fatigue can attenuate this change and enhance running performance.	Prévalence FSP

x	2020-02	2020-Yang-Alterations in running biomechanics after 12 week gait retraining with minimalist shoes	Purpose: The intervention of 12 week gait retraining with minimalist shoes was established to examine its effect on impact forces, joint mechanics, and vertical stiffness during running. Methods: Thirty male recreational runners were randomly assigned to the gait retraining + minimalist shoe (n = 15, GR) and minimalist shoe (n = 15, MIN) groups. The ground reaction force and marker trajectories were collected before and after intervention at a speed of 3.33 ± 5% m/s. Results: A total of 17 participants (9 in the GR group and 8 in the MIN group) completed the training. After training, (1) the loading rate of both groups decreased significantly, and the loading rate of the GR group was lower than that of the MIN group. (2) The foot strike angle of the GR group decreased significantly after training, and the plantarflexion angle and hip joint angular extension velocity increased in both groups. (3) The moment of ankle joint increased in the GR group, and the stiffness of lower limbs was significantly improved in both groups. Conclusion: The 12 week gait retraining with minimalist shoes converted rearfoot strikers into forefoot strikers with a rate of 78% (7/9). More importantly, such a combined program, compared to the training with only minimalist shoes, can avoid the peak impact force and decrease the loading rate more effectively, thus providing a potential means of reducing risk of running injury caused by impact forces. Moreover, the increased vertical stiffness of lower extremity after gait retraining may improve running economy and corresponding energy utilization. However, these observations also suggest that the sole use of minimalist footwear may have limited effects on reducing running-related impacts.	Gait retraining
x	2020-02	2020-Gil-Does the inclusion of ballistic exercises during warm-up enhance short distance running performance?	BACKGROUND: Warm-up is considered essential to optimize running performance, but little is known about the effect of specific warm-up tasks, specifically in the real competitive context. The current study aimed to verify the acute effects of a warm-up including ballistic exercises in 30m running performance. In addition, a second 30m trial was assessed to better understand the warm-up effects in training/competition. METHODS: Twenty-two men (19.32±1.43 years-old) randomly completed the time- trials on separate days and after a typical warm-up (WU), a WU complemented with ballistic exercises (post-activation potentiation - PAP) or no warm-up (NWU). Biomechanical, physiological and psychophysiological variables were assessed. RESULTS: The participants were 1.9% faster in the first 30m sprint after WU compared with NWU, mainly increased performance in the first 15m (p=0.03, ES=0.48). WU resulted in greater stride length in the last 15m of the first sprint. PAP did not differ from NWU and WU, despite eight participants performed better after this warm-up. CONCLUSIONS: These results highlight the positive effects of warm-up for sprinting, despite failed to evidence positive effects when ballistic exercises are included. In addition, the influence of warm-up in the running technique was highlighted by the changes in the running kinematics and a need for individualization of warm-up procedures.	Warmup
x	2020-01	2019-Mohseni-Factors Associated With Half- and Full-Marathon Race-Related Injuries: A 3-Year Review	Objective: To better evaluate the relationships between training, demographics, and injury, this study sought to define race-related injury risk factors for half- and full-marathon runners. Design: This 3-year, observational cross-sectional study included adults who participated in a half or full marathon. Prerace and 2-week postrace surveys collected data on demographics, training factors, and injuries. Setting: This study took place during a nationally recognized marathon affiliated with a local hospital. Participants: Runners were recruited during the Expo in the days before the race. Postrace surveys were returned by 1043 half marathoners and 624 full marathoners (response rate, 83%). Interventions: This was an observational study; independent variables included demographic data and race year. Main outcome measure: The primary outcome was race-related injury that occurred during the race or within 2 weeks after the race. Results: Race-related injuries were reported by 24% of half marathoners and 30% of full marathoners. For half and full marathoners, respectively, significant factors for injuries were previous injury, lower peak weekly training mileage, and lower weekly mileage before race training. Factors significant for only half-marathon injuries were younger age, female sex, shorter distance of longest training run, and no formal training program. Factors significant for only full-marathon injuries were higher body mass index, fewer days running per week, and fewer years of running experience. Conclusions: Previous running injuries, undertraining, and inexperience increased race-related injury risk; women had higher risk than men. Decreased risk of injury was associated with training loads of greater than 23 miles/week for half marathoners and 40 miles/week for full marathoners.	Facteurs risque blessures
x	2020-01	2020-Malisoux-Shoe Cushioning Influences the Running Injury Risk According to Body Mass: A Randomized Controlled Trial Involving 848 Recreational Runners	Background: Shoe cushioning is expected to protect runners against repetitive loading of the musculoskeletal system and there- fore running-related injuries. Also, it is a common belief that heavier runners should use footwear with increased shock absorption properties to prevent injuries. Purpose: The aim of this study was to determine if shoe cushioning influences the injury risk in recreational runners and whether the association depends on the runner's body mass. Study Design: Randomized controlled trial; Level of evidence, 1. Methods: Healthy runners (n = 848) randomly received 1 of 2 shoe prototypes that only differed in their cushioning properties. Global stiffness was 61.3 6 2.7 and 94.9 6 5.9 N/mm in the soft and hard versions, respectively. Participants were classified as light or heavy according to their body mass using the median as a cut-off (78.2 and 62.8 kg in male and female runners, respec- tively). They were followed over 6 months regarding running activity and injury (any physical complaint reducing/interrupting run- ning activity for at least 7 days). Data were analyzed through time-to-event models with the subhazard rate ratio (SHR) and their 95% confidence interval (CI) as measures of association. A stratified analysis was conducted to investigate the effect of shoe cushioning on the injury risk in lighter and heavier runners. Results: The runners who had received the hard shoes had a higher injury risk (SHR, 1.52 [95% CI, 1.07-2.16]), while body mass was not associated with the injury risk (SHR, 1.00 [95% CI, 0.99-1.01]). However, after stratification according to body mass, re- sults showed that lighter runners had a higher injury risk in hard shoes (SHR, 1.80 [95% CI, 1.09-2.98]) while heavier runners did not (SHR, 1.23 [95% CI, 0.75-2.03]). Conclusion: The injury risk was higher in participants running in the hard shoes compared with those using the soft shoes. How- ever, the relative protective effect of greater shoe cushioning was found only in lighter runners.	Technologies et blessures
x	2020-01	2020-Morris-Using real-time biofeedback to alter running biomechanics: A randomized controlled trial	In this study, we assessed the effectiveness of a mobile feedback system on transitioning runners to a non-rearfoot strike (NRFS) pattern and prospectively compared injury incidence rates at one year between rearfoot strike (RFS) and NRFS runners. 128 RFS runners participated in a 2-hour training session to learn a NRFS pattern with 114 completing the 1-year follow-up. Participants were randomized into a control group (CON) with no additional training and a biofeedback group (BFG) where they received equipment to provide real-time biofeedback to augment the transition to a NRFS pattern. Foot strike patterns (FSP) were assessed at baseline, post-training, 6-months, and 1-year. Injury data were collected through weekly email surveys over one year. Eighty percent of runners demonstrated a NRFS pattern following the training session (91/114, P < .001). The percentage of NRFS runners remaining at the one-year follow-up decreased slightly in both groups, but was not significantly different between groups (CON = 69%, P = .29; BFG = 75%, P = .36). Injury rates were similar between RFS runners (37% injured) and NRFS runners (30% injured) after one year (P = .47). The relative risk for knee injury in RFS runners was 5.64 (95% CI: 1.90-16.8; P = .02). In conclusion, both groups had a significant number of participants transition to a NRFS immediately after training and maintain NRFS at the 1-year follow-up. However, compliance with the sensor in the BFG group was very poor due to limitations of the sensor. Regardless of FSP, runners experienced 1-year injury incidence rates between 30%-37%. RFS runners had nearly a six times greater risk for developing a knee injury than NRFS runners.	Gait retraining

x	2020-01	2020-Chan-The effects of midfoot strike gait retraining on impact loading and joint stiffness	Objective: To assess the biomechanical changes following a systematic gait retraining to modify footstrike patterns from rearfoot strike (RFS) to midfoot strike (MFS). Design: Pre-post interventional study. All participants underwent a gait retraining program designed to modify footstrike pattern to MFS. Setting: Research laboratory. Participants: Twenty habitual RFS male runners participated. Main Outcome Measures: Gait evaluations were conducted before and after the training. Footstrike pattern, loading rate (LR), ankle and knee joint stiffness were compared. Results: Participants' footstrike angle was reduced ($p<0.001$, Cohen's $d=1.65$) and knee joint stiffness was increased ($p=0.003$, Cohen's $d=0.69$). No significant difference was found in the vertical loading rates ($p>0.155$). Further subgroup analyses were conducted on the respondents (n=8, 40% of participants) who exhibited MFS for over 80% of their footfalls during the post-training evaluation. Apart from the increased knee joint stiffness ($p=0.005$, Cohen's $d=1.14$), respondents exhibited a significant reduction in the ankle joint stiffness ($p=0.019$, Cohen's $d=1.17$) when running with MFS. Conclusions: Gait retraining to promote MFS was effective in reducing runners' footstrike angle, but only 40% of participants responded to this training program. The inconsistent training effect on impact loading suggests a need to develop new training protocols in an effort to prevent running injuries.	Gait retraining