

前言

本刊主要收录Web of Science核心合集数据库有关体教融合、体医融合、奥林匹克教育、冰雪运动、体育工程、反兴奋剂、文化与新闻传播领域的最新研究成果。

Web of Science核心合集包括Science Citation Index Expanded (SCIE)、社会科学引文索引(SSCI)、艺术和人文引文索引(A&HCI)、Emerging Sources Citation Index (ESCI)、Conference Proceedings Citation Index (CPCI)、Book Citation Index (BKCI)等,是科学及学术研究的全球原创引证索引。其涵盖超过250个自然科学、社会科学、艺术和人文学科。

本刊旨在利用Web of Science核心合集平台为广大师生提供有关目前热点的最新研究内容。检索出的数据采用书目共现分析系统(Bicomb V2021)对文献信息进行提取,包括期刊、关键词、标题、发文年份等,相同含义的字段去重且批量合并,同时去除没有实质意义的字段,对所提取的字段进行频次统计,形成高频矩阵,并使用社会网络分析软件Ucinet绘制成知识图谱,进行共词聚类分析。

本期选录体教融合方面的文献13篇,体医融合方面的文献12篇,冰雪运动方面的文献13篇,体育工程方面的文献12篇,反兴奋剂方面的文献10篇。

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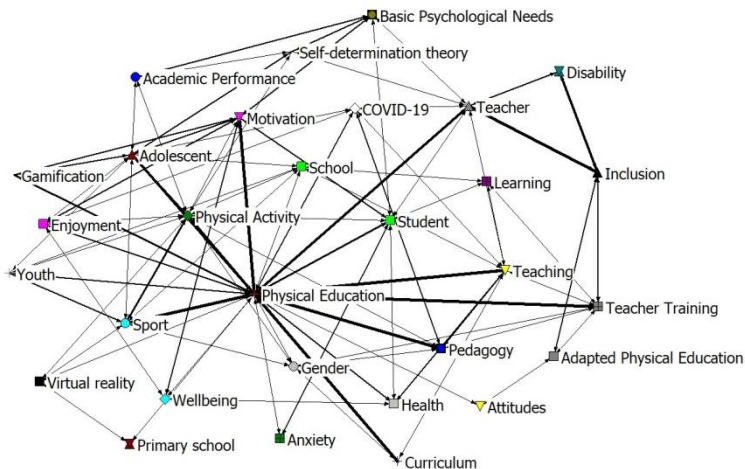
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体教融合

本期体教融合学术研究共检索到英文相关文献207篇，研究热点主要集中在中小学体育教师全纳教育能力、运动相关的生活技能和个人发展、体育对儿童身心发展的影响、体育对学生自我认知的影响等。检索结果如下：1) 关键词共词分析。提取关键词809个，经过数据清洗后关键词有550个，词频为10及以上的关键词有8个，累计百分比为18.5%，高频关键词有体育教育、教育学、认同感、教师、动力等，生成可视化知识图谱（见下图）。2) 来源期刊分析。涉及期刊188种，其中载文7篇及以上的期刊有6种，所载文献累计百分比为42.6%，刊载体教融合前三位的期刊分别为：Retos-nuevas tendencias en educacion fisica deporte y recreacion（JCR学科分区Q4），Journal of physical education recreation and dance（JCR学科分区Q3），Sustainability（JCR学科分区Q2、Q3、Q4）。3) 学科交叉分析。引用文献总计12篇，最多的频次为3次，分别为Mask RCNN-based single shot multibox detector for gesture recognition in physical education 和 The expectancy-value theory: A meta-analysis of its application in physical educations。4) 学术关注度分析。文献级别用量最多的是22次，排名前三位的文献分别为：Analysis of the factors influencing inclusive education competency of primary and secondary physical education teachers in China、Effects of the policy of physical education entrance examination for senior high school on health in middle school students、Boosting student's motivation through Gamification in physical education。



Xue, R., Chai, H., Zhu, D., Yao, L., Yan, W., & Fu, W. (2023). Analysis of the Factors Influencing Inclusive Education Competency of Primary and Secondary Physical Education Teachers in China. *Sustainability*, 15(1), 308.

ABSTRACT

Teachers' inclusive education competency is an important factor influencing the realization of high-quality inclusive education. This study investigated the current situation of the inclusive education competency of primary and secondary school physical education teachers and analyzed its influencing factors. There were 286 physical education teachers who participated in the study, including 228 males and 58 females by answering Questionnaire on the Professional Competency of Teachers in Compulsory Education. We found the professional attitude dimension score regarding the inclusive education competency of physical education teachers was significantly higher than that of professional knowledge, professional skills and capacity of acquiring support, whereas the score of professional knowledge dimension was significantly lower than that of professional skills and capacity of acquiring support, and the score of professional skills dimension was higher than that of the capacity of acquiring support dimension. There was no significant difference in the inclusive education competency of physical education teachers in terms of gender, school district and study section, whereas there were significant differences in terms of teaching age, whether children with or without disabilities were taught, and the cumulative length of training related to inclusive education. The inclusive education competency of physical education teachers needed to be further improved.

Sotos-Martínez, V. J., Tortosa-Martínez, J., Baena-Morales, S., & Ferriz-Valero, A. (2023). Boosting Student's Motivation through Gamification in Physical Education. Behavioral Sciences, 13(2), 165.

ABSTRACT

Students are becoming less motivated towards current education. For this reason, teachers are investigating several innovative methodologies to learn how they affect student motivation, such as gamification. The purpose of this study was to analyze the effects of gamification on the motivation of elementary physical education students. A total of 72 elementary school students from two different Spanish elementary schools participated (38 boys and 34 girls), separated into a gamified group ($n = 35$) and a control group ($n = 37$). Ten gamification sessions were performed using a technological app called ClassDojo. The gamified proposal was based on both a PBL model and an MDA model. A questionnaire, "Motivation Questionnaire in Physical Education" (CMEF-EP) was used to measure the motivation of the students before and after the intervention. An increase was observed in all the variables for the gamified group: intrinsic motivation ($p < 0.001$), identified regulation ($p < 0.001$), introjected regulation ($p = 0.001$), and external regulation ($p = 0.002$), except for the amotivation ($p = 0.120$). No changes were observed in the control group. A significant interaction effect over time was seen only for intrinsic motivation for the gamified group versus the control group ($F(1) = 5.263$; $p = 0.025$; $\eta^2(2) = 0.070$). The results show the efficacy of gamification to increase the motivation of elementary physical education students. However, it does not decrease amotivation. This will enable the subject to contribute to achieving the United Nations' proposed Sustainable Development Goal 4, which is to 'Improve Quality Education'.

Gould, D., Pierce, S., & Wright, E. (2023). An autoethnographic account and interpretation of sport related life skills and personal development. *International Journal of Sport and Exercise Psychology*, 1-21.

ABSTRACT

An autoethnographic case study of the first author's personal experience of psychosocial development and life skills transfer across his high school sport experience and over his four-decade career as a sport psychology researcher and consultant is presented. Adopting a story-analytic and teller-mode approach, the first author (Dan) conveys and interprets his own story of personal and life skill development via sport and integrates his experiences with findings from qualitative interviews he conducted with nine classmates who were also varsity athletes in 1969 at the same high school [Gould et al., under review. Former scholastic athletes views of sport-based life skills learning: A 50 year retrospective study. Manuscript Submitted for Review]. The interviews were designed to describe and systematically analyse how Dan and his former classmates' experiences resonate with the sport-based life skills development literature. Dan's sport-related personal and life skill development story centred on six overarching themes. These included: (1) openness to personal development because of his drive to excel and need to feel worthy; (2) "not a Tabula Rasa athlete"; (3) coaches as mentors but his mother was his greatest influence; (4) high school sport helping make him who he is; (5) high school sport serving as an incubator for self-regulation and personal growth; and (6) depositing and withdrawing from his "experience bank" to help himself and help others over the course of his life. Dan's experiences are interpreted relative to the existing personal and life skill sport-based development research and theory.

Zurita-Ortega, F., Alonso-Vargas, J. M., Puertas-Molero, P., González-Valero, G., Ubago-Jiménez, J. L., & Melguizo-Ibáñez, E. (2023). Levels of Physical Activity, Family Functioning and Self-Concept in Elementary and High School Education Students: A Structural Equation Model. *Children*, 10(1), 163.

ABSTRACT

In the adolescent population there is great concern about low levels of physical activity and low levels of family awareness of the benefits of physical exercise on physical and mental health. This study aims to determine the influence of physical activity levels, family functioning and self-concept in primary and secondary school students, as well as to develop a structural equation model as a function of weekly physical activity time. A descriptive, cross-sectional, comparative study was conducted on whether students engage in more than three hours of physical activity per week. To collect the data, instruments validated by the scientific community were used, such as the Adaptability, Partnership, Growth, Affection, and Resolve family questionnaire (APGAR) and the self-concept questionnaire form 5. The results show that those students who engage in more than 3 h of physical activity per week have higher levels of family functioning than those who do not meet this sport criterion. In addition, physically active students show higher scores on all dimensions of self-concept than those who practice less than 3 h of physical activity per week. Finally, as a conclusion, it can be affirmed that the amount of physical activity practice brings benefits to student's mental health.

Mercader-Rubio, I., Ángel, N. G., Silva, S., Moisés, A., & Brito-Costa, S. (2022). Relationships between somatic anxiety, cognitive anxiety, self-efficacy, and emotional intelligence levels in university physical education students. *Frontiers in Psychology*, 13.

ABSTRACT

One of the most studied topics nowadays, from psychology in general, and from sport

psychology, is anxiety. In fact, research on anxiety has been approached from various theoretical perspectives ranging from psychoanalysis, behaviorism, or more recently, those theories that take into consideration the importance of affective, rational, and emotional processes. The aim of this study is to analyze the levels of anxiety and emotional intelligence, and their relationship. The sample is composed of 165 university physical education students with a mean age of 20.33 years ($SD = 3.44$), (70.9% male and 27.9% female). We used the CSAI-2 questionnaire (to measure cognitive anxiety, somatic anxiety, and self-confidence), and the TMMS-24 (to measure emotional intelligence). The main findings of this research highlighted the presence of significant correlations between emotional clarity and emotional regulation, self-confidence, cognitive anxiety, and somatic anxiety. Therefore, we conclude that sporting performance is influenced by various variables of different kinds, including emotions, and highlight the importance of the incorporation of the emotional component in the field of sport.

Wang, N., Wang, Q., Liu, X., Mahfooz, M., & Savila, Z. (2023). Examining the impact of physical education and physical skills development on preschoolers' physical and mental health. *Frontiers in psychology*, 13, 1000653.

ABSTRACT

With greater socio-economic development and the popularization of scientific child-rearing methods, education has become of primary importance in contemporary society. This study attempts to promote the physical and mental health of preschoolers and improve their comprehensive learning ability. To understand the impact of sports skills and Physical Education (PE) on preschoolers' physical and mental health, we utilized the Questionnaire Survey (QS) and expert evaluation. First, the development of sports skills and the basic connotation of sports were expounded. Second, the characteristics of preschoolers and the importance of preschool education were discussed. Finally, the physical and mental health of 60 preschoolers was evaluated

based on physical skill development and sports. The results revealed that the respondent preschoolers were grouped reasonably, and the research results had high reference values. In the control group, the physical conditions of four preschoolers changed significantly in the best case. By comparison, in the experimental group, preschoolers with significant physical changes had reached nine at best. In addition, as high as nine respondents showed obvious improvement in their mental state in the best case. Therefore, this study demonstrates that physical skill development and PE significantly impact preschoolers' physical and mental health, which has an important impact on preschoolers' learning. This finding provides a reference for preschoolers' sports skills development and contributes to their comprehensive PE teaching.

Corti, J. F., Raimundi, M. J., Celsi, I., Alvarez, O., & Castillo, I. (2023). The Moderating Effect of Athletes' Personal Values on the Relationship between Coaches' Leadership Behaviors and the Personal and Social Skills of Young Basketball Players. *Sustainability*, 15(5), 4554.

ABSTRACT

Transformational coaching has been shown to increase the personal and social skills of adolescent athletes. Nevertheless, the latter's dispositional characteristics, such as personal values, could have a moderating effect on this relationship. The main objective of this work was to examine perceptions of coaches' transformational behaviors and the modulation of athletes' personal values in their relationship with personal and social skills development. Adolescents ($n = 309$) of both genders (81.9% male) aged 13-19 years ($M = 16.10$; $SD = 1.70$) from 16 different basketball clubs participated in the study. All participants completed a socio-demographic questionnaire, the Transformational Coaching Questionnaire, the Portrait Values Questionnaire-Revised, and the Youth Experiences Survey for Sport. Results showed that, controlling for age and gender, transformational behaviors that highlight individual differences within the team, especially through fostering autonomy and creative thinking (i.e., intellectual

stimulation), create contexts in which their athletes can develop personal and social skills to their fullest. However, in players with high self-transcendence and low self-enhancement, the increase in intellectual stimulation was not associated with higher personal and social skills, but social focus transformational behaviors (i.e., idealized influence and inspirational motivation) were. This study contributes to the field of positive adolescent development by showing evidence of both the individual and the social focus of transformational leadership behaviors to maximize personal and social skills, depending on which values their athletes consider important.

Blake, M., & Solberg, V. S. H. (2023). Designing elite football programmes that produce quality athletes and future ready adults: incorporating social emotional learning and career development. Soccer & Society, 1-16.

ABSTRACT

This article uses a positive youth development (PYD) perspective to recommend a number of programme design strategies for improving the mental health and wellbeing, future readiness, and performance of elite youth footballers in the academy system. Elite youth footballers refers to the estimated 12,000 boys (aged 8-21) who are contracted to professional academies at any one time, with many of these youth experiencing negative outcomes during their time within the academy system and beyond (e.g. psychological distress, inferior academic outcomes, academic disengagement, foreclosed identities, impaired social and emotional development). The recommendations are framed around key PYD competencies with the primary goal being to increase resilience, proactivity, and adaptability amongst these youth.

Phillips, M., Tsuda, E., & Wyant, J. (2023). Promoting Motor Skill Development and Social-Emotional Learning among Preschoolers in Physical Education. Journal of Physical Education, Recreation & Dance, 94(3), 29-34.

ABSTRACT

The preschool years are essential for developing physically active lifestyles and social-emotional well-being. This article introduces the PASS (Physical Activity and Social Skills) physical education program, which identifies specific ways to develop fundamental motor skills, provide physical activity opportunities, and promote social-emotional learning among preschoolers. The program aims to meet the guidelines of SHAPE America's Active Start (2020) and Head Start's Program (i.e., perceptual, motor, and physical development and social and emotional development). Teachers must be intentional with the content they prioritize in their curriculum, and the PASS Program activities can be readily used to provide children with quality and meaningful learning opportunities.

Hollett, N., & Brock, S. J. (2023). 'What makes you the boss?' Understanding student perceptions of social status in sport education. Sport, Education and Society, 1-13.

ABSTRACT

Student's social status within the context of physical education group work can influence engagement and behaviour during group tasks (Cohen [1994]. Restructuring the classroom: Conditions for productive small groups. Review of Educational Research, 64(1), 1-35.). According to Bourdieu ([1985]. The forms of capital. In J. G. Richard (Ed.), Handbook of theory and research for the sociology of education (pp. 241-258)), this phenomenon is due to the group creating a doxa, or hierarchy, of social capital brought forth by each group member. Research shows social status can influence the experiences of students within group tasks, indicating the potential for unequal

participation and interactions during group work (Brock et al. [2009]. The influence of student status on student interactions and experiences during a sport education unit. *Physical Education and Sport Pedagogy*, 14(4), 355-375. ; Cohen & Lotan [2014]. *Designing group work: Strategies for the heterogeneous classroom* (3rd ed.). Teachers College Press). In the sport education model, students experience affiliation with their teammates to build their sense of belonging and investment (Garcia Lopez & Kirk [2022]. Empowering children from socially vulnerable backgrounds through the use of roles in sport education. *Sport, Education and Society*, 27(6), 676-688. ; MacPhail et al. [2004]. Sport education: Promoting team affiliation through physical education. *Journal of Teaching in Physical Education*, 23(2), 106-122.). Therefore, the purpose of this study was to explore students' perceptions of status, roles, and team dynamics while participating in a sport education unit. Participants were eight fifth grade students representing two teams participating in a 20-lesson sport education floor hockey unit. Data collection included individual semi-structured interviews based on critical incidents as stimulated recall from GoPro recorded lessons. Results indicated students perceived their status to be based on their skill ability, used a more passive approach to group discussions to avoid conflict, and expressed frustrations with lack of contributions by teammates. Through transcendental phenomenology, this article reveals the perceptions of students' experiences related to their group identities and socialisation as they participate in physical education group work.

León, B., Fernandez-Rio, J., Rivera-Pérez, S., & Iglesias, D. (2023). Cooperative Learning, Emotions, and Academic Performance in Physical Education: A Serial Multiple Mediation Model. *Educational Psychology*, 29(1), 75-82.

ABSTRACT

Based on the control-value theory, this study examined connections between the perceived in-class degree of cooperation and academic performance mediated through the students' negative and positive emotions in physical education. Students (N = 620,

55.5% girls; M (age) = 13.01, SD = 2.10) reported on their perceptions of the degree of cooperation and the negative (shame, hopelessness, anxiety, boredom) and positive (confidence, pride, enjoyment, calmness) emotions in physical education classes. Academic performance was obtained from their school's administrators. Results from the multiple lineal regression analyses, considering the in-class degree of cooperation and the negative and positive emotions as predictor variables, showed a significantly positive link between the in-class degree of cooperation and the dependent variable academic performance, and between positive emotions and academic performance. These findings elucidate the impact of cooperative learning contexts and emotions on academic performance. Educational implications and future research are discussed.

Oh, D., & Lee, K. (2023). Humanities-Oriented Physical Education for Social and Emotional Learning. *Journal of Physical Education, Recreation & Dance*, 94(3), 17-23.

ABSTRACT

Children and adolescents face increased mental health issues and social isolation, especially within the COVID-19 environment. In response to the current situation, the concept of social and emotional learning (SEL) has shown positive influences on children and adolescents. This paper will provide a brief definition and values of SEL. Then, the authors will suggest the concept of Humanities-Oriented Physical Education (HOPE) as a vehicle for SEL. Following this, under the umbrella of HOPE, this paper will introduce one specific pedagogical model that has the potential for creating successful learning environments for SEL within physical education settings.

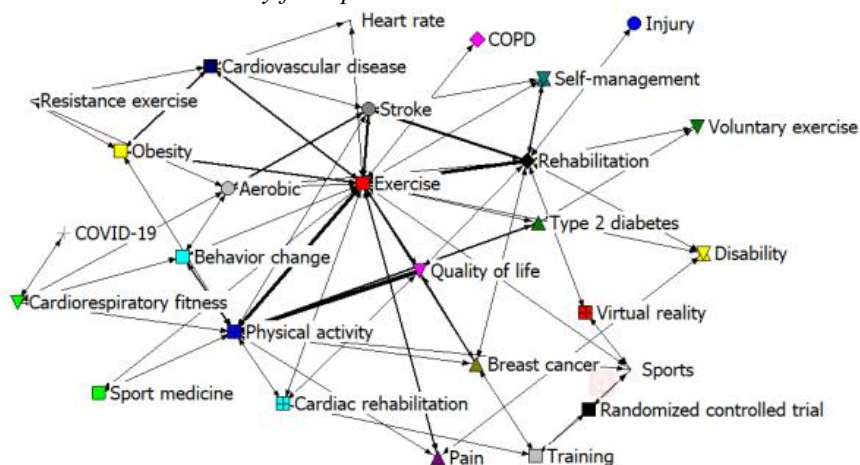
Whalen JM, Nelson DJ, Whalen RJ, Provencher MT. (2023). Coaching, Mentorship, and Leadership Lessons Learned from Professional Football. Clin Sports Med, 42(2):291-299.

ABSTRACT

Coaching, mentorship, and leadership are all paramount for the creation of a championship-winning football team. Looking back and studying the great coaches of professional football provides valuable insight into the qualities and the characteristics they possessed and how that impacted their leadership. Many of the great coaches from this game have instilled team standards and a culture that led to unprecedented success and sprouted into many other great coaches and leaders. Leadership at all levels of an organization is essential to consistently achieve a championship-caliber team.

体医融合

本期体医融合学术研究共检索到英文相关文献152篇，研究热点主要集中在对新冠康复期运动的指导，III期结肠癌的身体活动，不同运动对心衰患者身体功能、慢阻肺、中风患者康复方面的影响、运动时机和身体代谢的关系、多病患者和多囊卵巢综合征患者的运动疗法和生活方式管理等方面。检索结果如下：1) 关键词共词分析。提取关键词747个，经过数据清洗后关键词有739个，词频为3及以上的关键词有28个，累计百分比为24.22%，高频关键词有锻炼、中风、康复、糖尿病、脑震荡等，生成可视化知识图谱（见下图）。2) 来源期刊分析。涉及期刊137种，其中载文3篇及以上的期刊有4种，累计百分比为12.4%，刊载体医融合前三位的期刊分别为：International journal of environmental research and public health（JCR学科分区Q2、Q2、Q2），Bmc sports science medicine and rehabilitation（JCR学科分区Q2、Q2），PM&R（JCR学科分区Q2、Q3）。3) 交叉学科分析。引用文献总计21篇，最多的频次为3次，这两篇文献分别是：*Exercise for the prevention of Anthracycline-induced functional disability and cardiac dysfunction: The BREXIT study*、*Physical activity in stage III colon cancer: CALGB/SWOG 80702 (Alliance)*。4) 学术关注度分析。文献级别用量最多的是11次，排名前两位的文献分别为：*Stimulation of functional recovery via neurorepair mechanisms by the traditional Japanese Kampo medicine, Ninjin?yoeito, and physical exercise in a rat ischemic stroke model*、*Effects of a concurrent training, respiratory muscle exercise, and self- management recommendations on recovery from post-COVID-19 conditions: the RECOVE trial*。



Jimeno-Almazán, A., Buendía-Romero, Á., Martínez-Cava, A., Franco-López, F., Sánchez-Alcaraz, B. J., Courel-Ibáñez, J., & Pallarés, J. G. (2023). Effects of a concurrent training, respiratory muscle exercise, and self-management recommendations on recovery from post-COVID-19 conditions: the RECOVE trial. *Journal of Applied Physiology*, 134(1), 95-104.

ABSTRACT

The aim of this study was to determine the effectiveness of physical exercise, respiratory muscle training, and the self-management World Health Organization (WHO) recommendations leaflet on the recovery of physical fitness, quality of life, and symptom status in people with post-COVID-19 conditions. Eighty nonhospitalized adults with a post-COVID-19 condition were randomly assigned to one of four 8-wk parallel intervention groups: 1) multicomponent exercise program based on concurrent training (CT, number of subjects (n) = 20; 3 resistance and endurance supervised sessions per week at low-moderate intensity); 2) inspiratory muscle training (RM, n = 17; 2 standardized daily sessions); 3) a combination of both of the above (CTRM, n = 23); and 4) control group (CON, n = 20; following the WHO guidelines for post-COVID-19-related illness rehabilitation). No significant differences between groups were detected at baseline. Although no significant differences between interventions were detected in the V_{O2max} , significant individual improvements were identified in the CT (7.5%; effect size, ES = 0.28) and CTRM (7.8%; ES = 0.36) groups. Lower body muscle strength significantly improved in the CT and CTRM (14.5%-32.6%; ES = 0.27-1.13) groups compared with RM and CON (-0.3% to 11.3%; ES = 0.10-0.19). The CT and CTRM groups improved significantly for dyspnea and fatigue, as did the health status. In addition, significant differences between interventions were described in fatigue and depression scales favoring CT and CTRM interventions. An individualized and supervised concurrent training with or without inspiratory muscle training was safe and more effective than self-care recommendations and inspiratory muscle training alone, to regain cardiovascular and muscular fitness, improve symptom severity, and health

status in outpatients with post-COVID-19 conditions. NEW & NOTEWORTHY Eight weeks of concurrent training, with or without inspiratory muscle exercise, was better than WHO "Support for Rehabilitation: Self-Management after COVID-19-Related Illness" recommendations or inspiratory muscle training alone to improve cardiopulmonary fitness, strength, and symptom severity, in a safe and effective manner. The RECOVE trial proved the benefits and utility of a supervised exercise program in people with post-COVID-19 conditions after mild COVID-19 in an ambulatory setting.

Nelson, M. B., Shiroma, E. J., Kitzman, D. W., Duncan, P. W., Reeves, G. R., Whellan, D. J., ... & Pastva, A. M. (2023). Physical activity and relationship to physical function, quality of life, and cognitive function in older patients with acute decompensated heart failure. *American Heart Journal*, 256, 85-94.

ABSTRACT

Background : Volitional physical activity level is predictive of a variety of health outcomes, but has not been examined in patients recently hospitalized for acute decompensated HF (ADHF).
Methods Ten to 14 days after index hospitalization for ADHF, 93 participants wore a wrist-mounted triaxial accelerometer (ActiGraph GT3X+) to objectively quantify sedentary behavior, light physical activity, and moderate-to-vigorous physical activity. Levels were compared to 2 groups of age-matched NHANES participants: healthy and chronic, stable HF. The relationship between physical activity levels and physical function [Short Physical Performance Battery (SPPB)], HF-specific quality-of-life (QOL) [Kansas City Cardiomyopathy Questionnaire (KCCQ)], and cognition [Montreal Cognitive Assessment (MOCA)] were examined.
Results ADHF participants accumulated a median 1,008 (IQR 896, 1,109) minutes of sedentary time, 88 (57, 139) minutes of light physical activity, and 10 (6, 25) minutes of moderate-to-vigorous physical activity per day. Sedentary time, light physical activity, or moderate-to-vigorous activity did not differ by sex or EF subtype. ADHF participants spent only 9% of awake time nonsedentary, compared to 34% and

27% for healthy adults and adults with chronic, stable HF, respectively. Among ADHF participants, SPPB, KCCQ, and MOCA scores did not differ among quartiles of total physical activity. Conclusions Older patients recently hospitalized for ADHF have very low levels of physical activity and high levels of sedentary time, both of which may be potential targets for interventions in this high-risk population. Physical activity level was not significantly associated with objectively measured physical function, QOL, or cognition, suggesting that this measure provides independent information regarding the patient experience of living with HF. Trial Registration NCT02196038, <https://clinicaltrials.gov/ct2/show/NCT02196038> (Am Heart J 2023;256:85-94.)

Lai, Y. T., Huang, H. L., Hsieh, C. C., Lin, C. H., Yang, J. C., Tsou, H. H., ... & Liu, W. S. (2023). The Effects of Yoga Exercise on Blood Pressure and Hand Grip Strength in Chronic Stroke Patients: A Pilot Controlled Study. International Journal of Environmental Research and Public Health, 20(2), 1108.

ABSTRACT

Background: We investigated the beneficial effect of add-on yoga with rehabilitation on blood pressure (BP) and hand grip strength in patients with chronic stroke (more than 90 days). Methods: The study included patients 30-80 years of age who could stand independently for 1 min. Patients with psychiatric diseases or undergoing other therapies (like acupuncture) were excluded. The yoga group received training (1 h session twice weekly) with standard rehabilitation for 8 weeks. The control group received standard rehabilitation only. There were no differences in age, gender, hand grip strength, or BP between the two groups (16 subjects in each group) at baseline. Results: The systolic BP ($p = 0.01$) decreased significantly, and the diastolic BP also decreased but not significantly in the yoga group ($p = 0.11$). For hand grip strength, both the unaffected hand ($p = 0.00025$) and the affected hand ($p = 0.027$) improved significantly. The control group showed no significant change in systolic or diastolic BP, nor did the grip strength change in both hands. Gender and age also affected the results of overall rehabilitation in

that women benefited more from a decrease in BP, while men and young people (lower than the mean age of 60) benefited from hand grip strength improvement. Conclusions: Combining yoga with rehabilitation in chronic stroke patients can improve hand grip strength and decrease systolic BP.

Bennett, S., & Sato, S. (2023). Enhancing the metabolic benefits of exercise: Is timing the key?. *Frontiers in Endocrinology*, 14.

ABSTRACT

Physical activity represents a potent, non-pharmacological intervention delaying the onset of over 40 chronic metabolic and cardiovascular diseases, including type 2 diabetes, coronary heart disease, and reducing all-cause mortality. Acute exercise improves glucose homeostasis, with regular participation in physical activity promoting long-term improvements in insulin sensitivity spanning healthy and disease population groups. At the skeletal muscle level, exercise promotes significant cellular reprogramming of metabolic pathways through the activation of mechano- and metabolic sensors, which coordinate downstream activation of transcription factors, augmenting target gene transcription associated with substrate metabolism and mitochondrial biogenesis. It is well established that frequency, intensity, duration, and modality of exercise play a critical role in the type and magnitude of adaptation; albeit, exercise is increasingly considered a vital lifestyle factor with a critical role in the entrainment of the biological clock. Recent research efforts revealed the time-of-day-dependent impact of exercise on metabolism, adaptation, performance, and subsequent health outcomes. The synchrony between external environmental and behavioural cues with internal molecular circadian clock activity is a crucial regulator of circadian homeostasis in physiology and metabolism, defining distinct metabolic and physiological responses to exercise unique to the time of day. Optimising exercise outcomes following when to exercise would be essential to establishing personalised exercise medicine depending on exercise objectives linked to disease states. We aim to

provide an overview of the bimodal impact of exercise timing, i.e. the role of exercise as a time-giver (zeitgeber) to improve circadian clock alignment and the underpinning clock control of metabolism and the temporal impact of exercise timing on the metabolic and functional outcomes associated with exercise. We will propose research opportunities that may further our understanding of the metabolic rewiring induced by specific exercise timing.

Volterrani, M., Caminiti, G., Perrone, M. A., Cerrito, A., Franchini, A., Manzi, V., & Iellamo, F. (2023). Effects of Concurrent, Within-Session, Aerobic and Resistance Exercise Training on Functional Capacity and Muscle Performance in Elderly Male Patients with Chronic Heart Failure. *Journal of Clinical Medicine*, 12(3), 750.

ABSTRACT

Background: The best format of exercise training (ET) in the setting of cardiac rehabilitation in patients with chronic heart failure (CHF) is still to be defined. Current guidelines recommend aerobic exercises, such as running and cycling, including some sessions per week of resistance exercise. Aim: The aim of this study was to address the effectiveness of a concurrent exercise training program utilizing a circuit of sequential endurance and resistance exercises on functional capacity and muscular strength in patients with CHF. Methods: Ninety-five consecutive male patients (age 63.1 +/- 6 years) with CHF (EF < 40%) in NYHA functional class II/III, were randomly assigned on 1:1 basis to a 12-week aerobic continuous training (AT) or concurrent CT), aerobic + resistance, training (CT), three times a week, with each session lasting 80 min. We used high quality, specifically designed ergometers, connected with each other and governed by a central console, and managed by a single physiotherapist. Before and after training all patients performed a symptoms-limited exercise test on a treadmill and a 6-min walking test (6MWT). Patients in the CT group also performed resistance exercises of upper and lower body. Results: The 6MWT and exercise duration at ergometric test

increased significantly in both AT and CT groups, with the increase being greater in CT group ($p < 0.001$; ES = 0.13; $p < 0.01$; ES = 0.07). Muscular strength increased significantly in the CT group, particularly in the lower body muscular districts ($p < 0.001$). Quality of life improved in both groups, with a significantly greater improvement in the CT group ($p < 0.05$). No side effects leading to discontinuation of training were observed. Conclusions: These findings indicate that concurrent, within-session training results in larger improvements in functional capacity, in addition to muscle performance, in patients with CHF, in comparison to single-mode aerobic training.

Jing, Y., Ma, Y., Zhang, H., Wu, Z., Li, Y., Li, H., ... & Xu, Y. (2023). Pulmonary rehabilitation integrated coached exercise training for patients with COPD: a study protocol for a randomized controlled trial. *Trials*, 24(1), 69.

ABSTRACT

Background: Chronic obstructive pulmonary disease (COPD) is the most common chronic lung disease creating an immense burden on social health care systems. Pulmonary rehabilitation (PR) has proven to be effective in patients with COPD. However, exercise training as the basis of PR becomes extremely tedious, occasionally causing a loss of perseverance in patients. Therefore, we considered an approach that makes this technique interesting and easier to persist. The aim of this project was to explore an exercise training approach based on PR-integrated coached exercise training to promote the new exercise training approach as a form of group rehabilitation activity in the future.

Methods: Participants will be randomly divided into the trial and control groups. The trial group will be treated with PR-integrated coached exercise training (plus usual care). All exercise programs will be guided by sports coaches with a physical education background. Meanwhile, the control group will receive traditional PR and home exercises, including walking and swimming. The study will last for 12 weeks. The

primary outcome measure is exercise tolerance using the 6-min walking test and secondary outcomes are the peak oxygen uptake of cardiopulmonary exercise tests, the COPD Assessment Test, and the St. Georges Respiratory Questionnaire. Other evaluated outcomes include changes in postbronchodilator forced expiratory volume at 1(st) second, forced vital capacity, body fat and muscle composition, and mental status measured using the Hamilton Anxiety and Depression Scales.

Discussion: This study provides a simple, feasible, repeatable, and fun exercise training approach. To the best of our knowledge, there are no randomized controlled trials in the existing literature on PR-integrated coached exercise. The protocol shared in our study can be used as a reference for exercise training in patients with COPD.

Torres-Nunes, L., da Costa-Borges, P. P., Paineiras-Domingos, L. L., Bachur, J. A., Coelho-Oliveira, A. C., da Cunha de Sá-Caputo, D., & Bernardo-Filho, M. (2023). Effects of the whole-body vibration exercise on sleep disorders, body temperature, body composition, tone, and clinical parameters in a child with Down syndrome who underwent total atrioventricular septal defect surgery: A case-report. *Children*, 10(2), 213.

ABSTRACT

Background: The health and developmental issues of people with Down syndrome (DS) are complex and are associated with many medical, psychological, and social problems from childhood through into adulthood. DS children have an increased risk of multiorgan comorbidities, including congenital heart disease. Atrioventricular septal defect (AVSD) is a congenital heart malformation that often occurs in DS people. Aim: Physical activity and exercise are recommended for patients with cardiovascular disease and are considered to be the gold standard of cardiac rehabilitation. Whole-body vibration exercise (WBVE) is considered a form of exercises. The aim of this case report is to show the effects of WBVE on sleep disturbances, body temperature, body composition, tone, and clinical parameters in a child with DS with corrected total AVSD. The subject is a 10-year-old girl, with free-type DS, who underwent surgery to correct a

total AVSD at 6 months. She underwent periodic cardiological monitoring and was released to perform any type of physical exercise, including WBVE. WBVE improved sleep quality and body composition. Conclusion: WBVE leads to physiological effects that benefit the DS child.

Glaviano, N. R., Mangum, L. C., Bazett-Jones, D. M., DiStefano, L. J., Toland, M. D., & Boling, M. (2023). Strength Training Rehabilitation Incorporating Power Exercises (STRIPE) for individuals with patellofemoral pain: a randomised controlled trial protocol. *BMJ Open Sport & Exercise Medicine*, 9(1), e001482.

ABSTRACT

Patellofemoral pain (PFP) is a chronic condition that presents with patellar pain during various daily and recreational activities. Individuals with PFP have a wide range of impairments that result in long-term disability and reduced quality of life. Current interventions target hip muscle weakness with strength-based exercises, but recurrence rates are as high as 90%. A single feasibility study demonstrated success with power-based exercises; however, there is limited evidence evaluating pain or self-reported function in larger cohorts, and no study has assessed recurrence rates. This protocol details a study evaluating a strength-based rehabilitation programme compared with a strength-based programme incorporating power-based exercises in individuals with PFP. This single-blinded randomised controlled trial will evaluate 88 participants with PFP, aged 18-40 years old. Participants will be recruited from three universities, the surrounding community and sports medicine clinics. Participants will receive three telemedicine rehabilitation sessions a week for 6 weeks. The rehabilitation programme will consist of either strength-based exercises or a combination of power and strength-based exercises. Pain, subjective function and recurrence rates will be assessed at baseline, immediately after the intervention and at four follow-up time points: 6-month, 12-month, 18-month and 24-month postintervention. We will also assess neuromuscular function of the hips and global rating of change at each postintervention time point.

Skou, S. T., Brødsgaard, R. H., Nyberg, M., Dideriksen, M., Bodtger, U., Bricca, A., & Jäger, M. (2023). Personalised exercise therapy and self-management support for people with multimorbidity: feasibility of the MOBILIZE intervention. *Pilot and Feasibility Studies*, 9(1), 1-14.

ABSTRACT

Background: Exercise therapy is safe and effective in people with single conditions, but the feasibility in people with two or more conditions is unclear. Therefore, the aim was to evaluate the feasibility of exercise therapy and self-management in people with multimorbidity prior to a randomised, controlled trial (RCT). Methods: This was a mixed-methods feasibility study performed in two general hospitals and one psychiatric hospital. 20 adult patients (8 females; mean age (SD) 67 (6.9)) with at least two long-term conditions and a score of ≥ 3 on Disease Burden Impact Scale for at least one condition (at least moderate limitations of daily activities) and of ≥ 2 for at least one other condition. Patients with unstable health conditions, at risk of serious adverse events (SAE) or with terminal conditions were excluded. Participants received 12 weeks of exercise (18 60-min group-based and 6 home-based sessions) and self-management support (6 90-min group-based sessions) supervised by physiotherapists. Pre-defined progression to RCT criteria were the primary outcomes and included recruitment rate (acceptable 20 participants in 3 months), retention through follow-up (75% retention), compliance (75% complete > 9 of exercise and > 3 self-management sessions), outcome burden (80% do not find outcomes too burdensome), improvement in quality of life (EQ-5D-5L) and function (6-min walk test; $\geq 50\%$ experience clinically relevant improvements) and intervention-related SAEs (No SAEs). Furthermore, a purposeful sample including eleven participants and two facilitators were interviewed about their experiences of participating/facilitating. Qualitative data was analysed using thematic analysis. Results: Recruitment rate (20 in 49 days), retention (85%), outcome burden (95%), and SAEs (0 related to intervention) were acceptable, while compliance (70%) and improvements (35% in quality of life, 46% in function) were not (amendment

needed before proceeding to RCT). The intervention was found acceptable by both participants and physiotherapists with some barriers among participants relating to managing multiple chronic conditions while caring for others or maintaining a job. Physiotherapists expressed a need for additional training. Conclusions: Exercise therapy and self-management are feasible in people with multimorbidity. The subsequent RCT, amending the intervention according to progression criteria and feedback, will determine whether the intervention is superior to usual care alone.

Cowan, S., Lim, S., Alycia, C., Pirotta, S., Thomson, R., Gibson-Helm, M., ... & Moran, L. (2023). Lifestyle management in polycystic ovary syndrome—beyond diet and physical activity. *BMC Endocrine Disorders*, 23(1), 14.

ABSTRACT

Polycystic ovary syndrome (PCOS) is a common condition affecting reproductive-aged women with reproductive, metabolic and psychological consequences. Weight and lifestyle (diet, physical activity and behavioural) management are first-line therapy in international evidence-based guidelines for PCOS. While these recommend following population-level diet and physical activity guidelines, there is ongoing interest and research in the potential benefit of including psychological and sleep interventions, as well as a range of traditional, complimentary and integrative medicine (TCIM) approaches, for optimal management of PCOS. There is limited evidence to recommend a specific diet composition for PCOS with approaches including modifying protein, carbohydrate or fat quality or quantity generally having similar effects on the presentations of PCOS. With regards to physical activity, promising evidence supports the provision of vigorous aerobic exercise, which has been shown to improve body composition, cardiorespiratory fitness and insulin resistance. Psychological and sleep interventions are also important considerations, with women displaying poor emotional wellbeing and higher rates of clinical and subclinical sleep disturbance, potentially limiting their ability to make positive lifestyle change. While optimising sleep and

emotional wellbeing may aid symptom management in PCOS, research exploring the efficacy of clinical interventions is lacking. Uptake of TCIM approaches, in particular supplement and herbal medicine use, by women with PCOS is growing. However, there is currently insufficient evidence to support integration into routine clinical practice. Research investigating inositol supplementation have produced the most promising findings, showing improved metabolic profiles and reduced hyperandrogenism. Findings for other supplements, herbal medicines, acupuncture and yoga is so far inconsistent, and to reduce heterogeneity more research in specific PCOS populations, (e.g. defined age and BMI ranges) and consistent approaches to intervention delivery, duration and comparators are needed. While there are a range of lifestyle components in addition to population-recommendations for diet and physical activity of potential benefit in PCOS, robust clinical trials are warranted to expand the relatively limited evidence-base regarding holistic lifestyle management. With consumer interest in holistic healthcare rising, healthcare providers will be required to broaden their knowledge pertaining to how these therapies can be safely and appropriately utilised as adjuncts to conventional medical management.

Gonçalves, C., Parraca, J. A., Bravo, J., Abreu, A., Pais, J., Raimundo, A., & Clemente-Suárez, V. J. (2023). Influence of Two Exercise Programs on Heart Rate Variability, Body Temperature, Central Nervous System Fatigue, and Cortical Arousal after a Heart Attack. *International Journal of Environmental Research and Public Health*, 20(1), 199.

ABSTRACT

Cardiovascular diseases (CVD) are the leading cause of death globally. Cardiac rehabilitation (CR) programs' benefits are overall consensual; however, during exercise, progressive physiological effects have not been studied yet in cardiac patients. Our study aims to analyze physiological parameters of thermography, heart rate variability (HRV), blood pressure, central nervous system (CNS) fatigue, and cortical arousal in heart

attack patients (HAP) who belong to CR programs of High-Intensity Interval Training (HIIT) and Moderate-intensity Continuous Training (MICT) compared to healthy participants. In this case control study, two HAP patients (both male, age 35 and 48, respectively) and two healthy people (both male, age 38 and 46, respectively) were randomly assigned in a 1:1:1:1 allocation ratio to one of four groups: cardiac MICT, cardiac HIIT, control MICT, and control HIIT. The HIIT at approximate to 85-95% of peak heart rate (HR) was followed by a one-minute recovery interval at 40% peakHR, and MICT at approximate to 70-75% of peakHR. Outcome measurements included thermography, HRV, blood pressure, CNS fatigue, and cortical arousal; The HAP presents more than twice the CNS fatigue in MICT than control participants, but HIIT has almost the same CNS fatigue in HAP and control. In addition, both of the HAP groups presented higher temperatures in the chest. The HIIT protocol showed better physiological responses during exercise, compared to MICT in HAP.

Brown, J. C., Ma, C., Shi, Q., Fuchs, C. S., Meyer, J., Niedzwiecki, D., ... & Meyerhardt, J. A. (2023). Physical activity in stage III colon cancer: CALGB/SWOG 80702 (Alliance). *Journal of Clinical Oncology*, 41(2), 243-254.

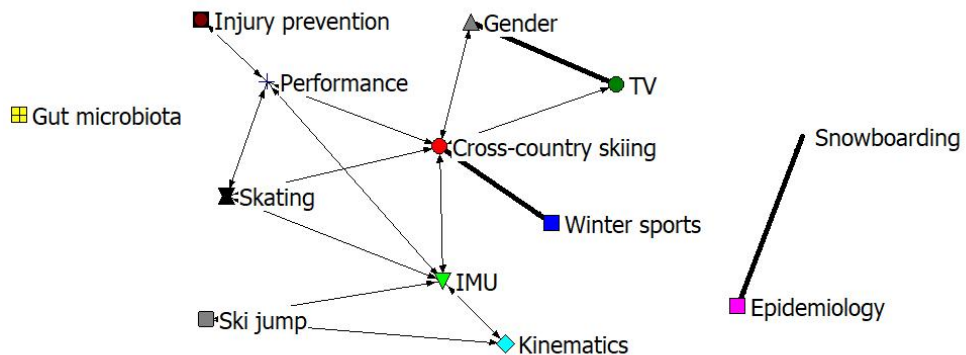
ABSTRACT

Purpose: To determine the specific types, durations, and intensities of recreational physical activity associated with the greatest improvements in disease-free survival (DFS) of patients with colon cancer. **Methods:** We conducted a prospective cohort study nested within a randomized multicenter trial of stage III colon cancer that compared 3 versus 6 months of fluorouracil, leucovorin, and oxaliplatin with or without celecoxib. We measured recreational physical activity in the first 3 months of chemotherapy and again 6 months after completion of chemotherapy. The primary end point was DFS. **Results:** During a median follow-up of 5.9 years, 457 of 1,696 patients experienced disease recurrence or death. For total recreational physical activity volume, the 3-year DFS was 76.5% with < 3.0 metabolic equivalent task hours per week (MET-h/wk) and

87.1% with ≥ 18.0 MET-h/wk (risk difference [RD], 10.6%; 95% CI, 4.7 to 19.4; $P < .001$). For light-intensity to moderate-intensity activities, the 3-year DFS was 65.7% with 0.0 h/wk and 87.1% with ≥ 1.5 h/wk (RD, 21.4%; 95% CI, 9.2 to 37.1; $P < .001$). For vigorous-intensity activity, the 3-year DFS was 76.0% with 0.0 h/wk and 86.0% with ≥ 1.0 h/wk (RD, 10.0%; 95% CI, 4.5 to 18.9; $P < .001$). For brisk walking, the 3-year DFS was 81.7% with < 1.0 h/wk and 88.4% with ≥ 3.0 h/wk (RD, 6.7%; 95% CI, 3.0 to 13.8; $P < .001$). For muscle strengthening activity, the 3-year DFS was 81.8% with 0.0 h/wk and 88.8% for ≥ 0.5 h/wk (RD, 7.0%; 95% CI, 3.1 to 14.2; $P = .003$). Conclusion: Among patients with stage III colon cancer enrolled in a trial of postoperative treatment, larger volumes of recreational physical activity, longer durations of light- to moderate-intensity aerobic physical activity, or any vigorous-intensity aerobic physical activity were associated with the greatest improvements in DFS.

冰雪运动

本期冰雪运动学术研究共检索到英文相关文献209篇，研究热点主要集中在滑雪运动装备对滑行中表面接触面积、负载分区以及滑雪期间装备分布的影响、雪道优化设计与面积计算、冰雪运动损伤与康复、滑雪设施开放对疫情的影响等方面。检索结果如下：1）关键词共词分析。提取关键词257个，经过数据清洗后关键词有739个，词频为3及以上的关键词有28个，累计百分比为24.22%，高频关键词有锻炼、中风、康复、糖尿病、脑震荡等，生成可视化知识图谱（见下图）。2）来源期刊分析。涉及期刊50种，其中载文3篇及以上的期刊有1种，累计百分比为6%，排名第一的期刊是Wilderness & Environmental medicine（JCR学科分区Q3、Q3）。3）交叉学科分析。引用文献总计22篇，最多的频次为5次，该文献是：*Self-healing hydrogel with multiple adhesion as sensors for winter sports*。4）学术关注度分析。文献级别用量最多的是157次，排名前三位的文献分别为：*A self-adhesive and low-temperature-tolerant strain sensor based on organohydrogel for extreme ice and snow motion monitoring*、*Self-healing hydrogel with multiple adhesion as sensors for winter sports*、*Microplastics: What happens in the human digestive tract? First evidences in adults using in vitro gut models*。



Kalliorinne, K., Hindér, G., Sandberg, J., Larsson, R., Holmberg, H. C., & Almqvist, A. (2023). The impact of cross-country skiers' tucking position on ski-camber profile, apparent contact area and load partitioning. Proceedings of the Institution of Mechanical Engineers, Part P: Journal of Sports Engineering and Technology, 17543371221141748.

ABSTRACT

In cross-country skiing races, the difference between the fastest and the second fastest time can be minuscule. As in all endurance sports, cross-country skiing requires the use of energy to overcome resistive forces, in this case primarily aerodynamic drag and friction between the skis and snow. Even a slight reduction in either of these can determine the outcome of a race. The geometry of the ski exerts a profound influence on the friction between the skis and snow. As a result of the flexible modern cross-country skis, the camber profile and gliding properties to be influenced by the skiers' position. Here, based on the location of the normal force corresponding to the plantar pressure, we characterize the ski camber while performing three variations of the downhill tucking position. We found that when gliding on a classic ski, the risk of contact between the kick wax and snow can be reduced by tucking in a leaning backwards position (i.e. by moving the skier's center of mass backwards). With the tucking position, the percentage of the skier's body weight that is distributed onto the friction interface at the rear of the skis varies between 63.5% in Gear 7 (leaning forward) on a skating ski and 93.0% in Gear 7 (leaning backwards) on a classic ski.

Mössner, M., Schindelwig, K., Heinrich, D., Hasler, M., & Nachbauer, W. (2023). Effect of load, ski and snow properties on apparent contact area and pressure distribution in straight gliding. Cold Regions Science and Technology, 208, 103799.

ABSTRACT

Modeling of ski friction requires an in-depth understanding of the ski-snow contact. For

this aim, we implemented the Euler-Bernoulli beam equations for an embedded cross-country skating ski. Apparent contact area and pressure distribution were calculated from the ski's penetration depth using a hypoplastic force-penetration relation of snow. In a static validation experiment on an elastomer foundation, the difference between measured and calculated pressure of a loaded ski was below 5.1 kPa. For cross-country skis gliding on snow, the apparent contact area increased for increased normal load, softer snow, and decreased ski stiffness and camber. The pressure along the ski showed separated parts. The maximum pressure increased for increased normal load and harder snow. Overall, we observed an apparent contact area between 23.6 and 57.8% and a maximum pressure between 27.4 and 110.7 kPa. Concluding, a model for the ski-snow contact in straight gliding ski was developed. Apparent contact area and pressure distribution was affected by normal load, snow hardness, and ski stiffness and camber. Effects on the pressure should be considered in applications like ski construction, waxing, and modeling friction along the ski.

Wu, Y., & Wu, X. (2023). Optimal Design of Ski Tracks in Construction Projects: Taking the Warm-Up and Training Ski Track of the South Area in the Yanqing Competition Zone of the Beijing 2022 Winter Olympic Games as an Example. Buildings, 13(3), 659.

ABSTRACT

Mature civil engineering software and platforms can provide a dynamic correlated situation of the road design, generate a quick and accurate grading design in terrain model making, and, most importantly, improve the design efficiency and calculation accuracy and reduce the workload of designers in the construction project. However, the application of existing platforms in complex site engineering for the design of ski tracks has not been well developed. The design process of ski tracks requires consideration of elaborate requirements in complex environmental conditions. In this study, we aim to simplify digital elevation model (DEM) data, optimize ski track contour lines, and

localize the design expression of the ski track designs based on the experience of the construction of the National Alpine Ski Center in the Yanqing Competition Zone for the Beijing 2022 Winter Olympic Games. This study examines the feasibility of the optimal digital approach combining mathematics and computer science based on the case study of the warm-up and training ski track of the south area in the Yanqing Competition Zone. This study will contribute to the optimal design of skiing tracks in construction projects and help to improve designers' workload efficiency for the design and construction of ski tracks in the future.

Jonsson Kårström, M., Staunton, C., McGawley, K., Björklund, G., & Laaksonen, M. S. (2023). Rifle carriage affects gear distribution during on-snow skiing in female and male biathletes. *Journal of Sports Sciences*, 1-10.

ABSTRACT

The aim was to investigate whether rifle carriage affects gear distribution during on-snow skiing in highly-trained biathletes, and whether there were any associated sex differences. Twenty-eight biathletes (11 women, 17 men) skied a 2230-m lap at competition speed twice, one lap with the rifle (WR) and the other lap without the rifle (NR). The biathletes wore a portable 3D-motion analysis system while skiing, which enabled characterisation of distance and time in different gears. Skiing WR increased lap time compared to NR (412 (90) vs. 395 (91) s, $p < 0.001$). The biathletes used gear 2 to a greater extent WR compared to NR (distance: 413 +/- 139 vs. 365 +/- 142 m; time: 133 (95) vs. 113 (86) s; both $p < 0.001$) and gear 3 less (distance: 713 +/- 166 vs. 769 +/- 182 m, $p < 0.001$; time: 141 +/- 33 vs. 149 +/- 37 s, $p = 0.008$), with similar patterns for women and men. Differences between WR and NR in the use of gears 3 and 2 were more extensive for moderate compared to steeper uphill terrain. Rifle carriage increased the use of gear 2, which was negatively associated with performance. Therefore, preparing biathletes to be able to cover more distance in gear 3 WR, especially in moderate uphill terrain, may improve biathlon skiing performance.

Wang, W., Zhao, C., & Zhang, H. (2023). Research on the Calculation and Analysis of Ski-Track Areas Based on Laser Point Clouds. Applied Sciences, 13(3), 1632.

ABSTRACT

To address the long-term statistical problem of ski-track area in the construction and operation of ski resorts, we propose a new ski-track point cloud boundary extraction method that improves the accuracy of boundary extraction and minimizes the offset of the area error. In this method, all point clouds are first projected onto the fitting plane using the random sample consensus (RANSAC) method. An improved point cloud boundary extraction algorithm is used to triangulate and extract the high-precision ski-track boundary. A discrete Green formula is then used to calculate and count the ski track's exact area. It is demonstrated through five sets of test experiments that the error offset of the method proposed in this paper is smaller than that of other classical methods, which confirms its benefits and feasibility.

Ruedl, G., Posch, M., Tecklenburg, K., Schranz, A., Faulhaber, M., & Burtcher, M. (2023). Skill-Specific Differences in Equipment-Related Risk Factors for ACL Injury in Male and Female Recreational Skiers. Orthopaedic Journal of Sports Medicine, 11(3), 23259671231155841.

ABSTRACT

Background: In recreational alpine skiing, the anterior cruciate ligament (ACL) is affected in approximately 50% of serious knee injuries. There are established sex-based and skill-based differences in ACL injury risk, but the potential impact of equipment used (eg, skis, bindings, and boots) has not been evaluated. Purpose: To evaluate individual and equipment-related risk factors for an ACL injury depending on sex and skill level. Study Design: Case-control study; Level of evidence, 3. Methods: This was a retrospective questionnaire-based, case-control study of female and male skiers with and without ACL injuries during 6 winter seasons (from 2014-2015 to 2019-2020).

Demographic data, skill level, equipment specifications, risk-taking behavior, and ownership of ski equipment were recorded. Ski geometry (ski length; sidecut radius; and widths of the tip, waist, and tail) was taken from each participant's ski. The standing heights of the front and back part of the ski binding were measured using a digital sliding caliper, and the standing height ratio was calculated. Abrasion of the ski boot sole was also measured at the toe and heel. Participants were divided by sex into less and more skilled skiers. Results: A total of 1817 recreational skiers participated in this study, of whom 392 (21.6%) sustained an ACL injury. A greater standing height ratio and more abrasion at the toe of the boot sole were associated with increased ACL injury risk in both sexes, independent of the skill level. Riskier behavior increased the injury risk only in male skiers, independent of the skill level, and longer skis increased the injury risk only in less skilled female skiers. Older age, the use of rented/borrowed skis, and more abrasion at the heel of the boot sole were independent risk factors for ACL injury in the more skilled skiers of both sexes. Conclusion: Individual and equipment-related risk factors for an ACL injury partly differed according to skill level and sex. Consideration of the demonstrated equipment-related factors should be implemented in order to reduce ACL injuries in recreational skiers.

Schlemmer, P., & Schnitzer, M. (2021). Research note: Ski touring on groomed slopes and the COVID-19 pandemic as a potential trigger for motivational changes. *Journal of Outdoor Recreation and Tourism*, 41, 100413 - 100413.

ABSTRACT

Ski touring on groomed slopes is a relatively new outdoor sport that has steadily been gaining interest. So far, little scientific attention has been given to this outdoor activity. Thus, few questions have been asked about the motivation for practising this sport, and even fewer about whether the current COVID-19 pandemic has had an impact on the frequency of and motivation for ski touring. For this reason, we conducted a large-scale study (n = 6802) in the Austrian Alps. Results revealed that the COVID-19 pandemic

has not changed the motive structure for ski touring; however, the findings showed that many people have even started to practice this sport. This research note contributes to the existing knowledge by (a) documenting ski tourers' motives using a large sample, (b) giving insights into the effects of the COVID-19 pandemic on this specific outdoor sport, and (c) showing COVID-19-related impacts on practicing ski touring. Management implications: center dot No changes in motivational reasons for ski touring due to COVID-19 pandemic. center dot Trend towards outdoor sports, especially ski tours on groomed slopes in the alpine region of central Europe. Amplification of the trend due to the pandemic and the associated restrictions. center dot As an outdoor sport, ski touring on groomed slopes offers versatile added value for ski tourers, but also huge potential for ropeway operators. center dot This soft slope tourism can also show alternatives to temporary ropeway closures in times of the COVID-19 pandemic and could also promote tourism (especially day tourism) in small circles at the regional level. center dot The increase in beginners naturally raises the question of whether this group needs special offers or how to deal with beginners on the slopes. On the other hand, this also raises the question of how to deal with the increase in ski slope users in general.

Zaremba, K. (2023). Opening of hotels and ski facilities: Impact on mobility, spending, and Covid - 19 outcomes. Health Economics.

ABSTRACT

This paper investigates how reopening hotels and ski facilities in Poland impacted tourism spending, mobility, and COVID-19 outcomes. We used administrative data from a government program that subsidizes travel to show that the policy increased the consumption of tourism services in ski resorts. By leveraging geolocation data from Facebook, we showed that ski resorts experienced a significant influx of tourists, increasing the number of local users by up to 50%. Furthermore, we confirmed an increase in the probability of meetings between pairs of users from distanced locations and users from tourist and non-tourist areas. As the policy impacted travel and

gatherings, we then analyzed its effect on the diffusion of COVID-19. We found that counties with ski facilities experienced more infections after the reopening. Moreover, counties strongly connected to the ski resorts during the reopening had more subsequent cases than weakly connected counties.

Zhao, S., Lindinger, S., Ohtonen, O., & Linnamo, V. (2023). Contribution and effectiveness of ski and pole forces in selected roller skiing techniques on treadmill at moderate inclines. *Frontiers in Sports and Active Living*, 5.

ABSTRACT

Background: Most of the studies about the effects of incline on cross-country skiing are related to the metabolic efficiency. The effective skiing biomechanics has also been indicated to be among the key factors that may promote good performance. The aims of this study were to provide biomechanical characteristics and investigate the relative contribution and effectiveness of ski and pole forces in overcoming the total external resistance with double poling (DP) and Gear 3 (G3) techniques at varying moderate uphill inclines. Methods: 10 male cross-country skiers participated in this study. Custom-made force measurement bindings, pole force sensors, and an 8-camera Vicon system were used to collect force data and ski and pole kinematics at 3 degrees, 4 degrees and 5 degrees with 10 km/h skiing speed. Results: The cycle length (CL) decreased by 10% and 7% with DP and G3 technique from 3 degrees to 5 degrees ($p < 0.001$, $p < 0.001$). The cycle rate (CR) increased by 13% and 9% from 3 degrees to 5 degrees with DP and G3 technique respectively. From 3 degrees to 5 degrees, the peak pole force increased by 25% ($p < 0.001$) and 32% ($p < 0.001$) with DP and G3 technique. With DP technique, the average cycle propulsive force (ACPF) increased by 46% ($p < 0.001$) from 3 degrees to 5 degrees and with G3 technique, the enhancement for ACPF was 50% ($p < 0.001$). In G3 technique, around 85% was contributed by poles in each incline. Conclusion: The higher power output in overcoming the total resistance was required to ski at a greater incline. With DP technique, the upper body demands, and

technical effectiveness were increasing with incline. With G3 technique, the role of external pole work for propulsion is crucial over different terrains while role of legs may stay more in supporting the body against gravity and repositioning body segments.

Yang, Y., Sun, H., Shi, C., Liu, Y., Zhu, Y., & Song, Y. (2023). Self-healing hydrogel with multiple adhesion as sensors for winter sports. *Journal of colloid and interface science*, 629(Pt A), 1021–1031.

ABSTRACT

Hydrogels are widely used as sensors in the field of wearable devices. However, the hydrogels were rarely designed to endure the harsh outdoor environment in winter, including extremely low temperature, ultraviolet (UV) radiation and variable humidity. In addition, physical damage is also a challenge for hydrogels. In this study, a self-healing hydrogel with adhesion was prepared as a sensor for winter sports using a one-pot method. Polyvinyl alcohol was used as the hydrogel matrix, providing the hydrogel preferable self-healing properties and adhesion to various surfaces such as porcine skin, metal, glass, and plastic. Lithium chloride was used for the chain entanglement of polyvinyl alcohol, forming a hydrogel with excellent ionic conductivity (24.29 S m⁻¹ at room temperature, 13.45 S m⁻¹ under -18 °C) to detect human motion and temperature changes. Together with ethylene glycol, lithium chloride also provided successful water retention ability and frost resistance. The hydrogel remained stable after 30 d of storage at room temperature and -18 °C. Sodium lignosulfonate was introduced to improve the mechanical properties and ultraviolet (UV) resistance of hydrogel, created nearly 100% UV shielding with a thickness of 0.5 mm. These advantages provide great potential to the hydrogel for application in flexible wearable devices for winter sports.

Radovanović, S., Bohanec, M., & Delibasic, B. (2023). Extracting decision models for ski injury prediction from data. *International Transactions in Operational Research*.

ABSTRACT

Creating decision models for risk assessment of ski injuries is a challenging task. Ski injuries are rare events, but they carry a high cost, that is, can cause working or movement disabilities. Usually, ski risk assessment is performed on small-scale, case-controlled studies where the effect of a single factor is evaluated. Recently, data mining and machine learning algorithms are being employed for ski risk assessment and injury prediction. However, these models do not generally satisfy the need for interpretation of the decision model, do not provide explanations for the predictions, and in general do not ensure the completeness and consistency of decision rules. To make data mining and machine learning models useful, one needs to implement the aforementioned properties. Decision support systems are expected to have these properties; however, the process of building such decision support systems is still tedious: it has to consider human biases, assumptions, and subjective values, as well as focus on the decision problem being solved. We propose a method for extraction of decision models from data at hand. Our method DIDEX, Data Induced DEcision eXpert, builds models that have desirable properties for inclusion in decision support systems. The proposed method is used to build a decision model for ski injury prediction based on data from Mt. Kopaonik ski resort, Serbia. The results show that DIDEX generates up to a five times simpler model compared to the existing domain expert DEX models while having a 6% better predictive accuracy. Additionally, its predictive accuracy is comparable to similar machine learning algorithms, such as decision tree classifiers, random forest, and logistic regression.

Schöffl, Volker R. MD, PhD, MHBA; Zimmermann, Paul MD; Küpper, Thomas MD, PhD; Lutter, Christoph MD, PhD, MHBA, Msc. (2023) Ski Mountaineering—Scientific Knowledge of This New Olympic Sport: A Narrative Review. *Current Sports Medicine Reports* 22(2):p 61-66.

ABSTRACT

Ski mountaineering (skimo) has been accepted as a new sport for the 2026 Milan-Cortina Olympics. The equipment used in this competitive ski mountaineering varies from leisure ski mountaineering equipment mainly in one point: the minimal weight. At the elite athlete level, skimo demands both maximal endurance performance and a high-intensity anaerobic capacity for the sprint and vertical races. Race time significantly correlates to $\dot{V}O_2\text{max}$, body mass index and racing gear mass. Available literature only rarely comments on competitive skimo injuries. Injuries are not only due to falls in downhill skiing but also can result from external hazards, such as avalanches and cold. The high training load of athletes in combination with a low body weight, low body fat, and exposure to cold cause high rates of respiratory infections in athletes. The inclusion of skimo into the Olympic program is expected to result in certain changes, such as higher training loads for the athletes and increased scientific interest into training methods.

Lixăndroiu R, Lupşa-Tătaru D. (2023) Switzerland? The Best Choice for Accommodation in Europe for Skiing in the 2023 Season. *Sustainability*. 15(5):4032.

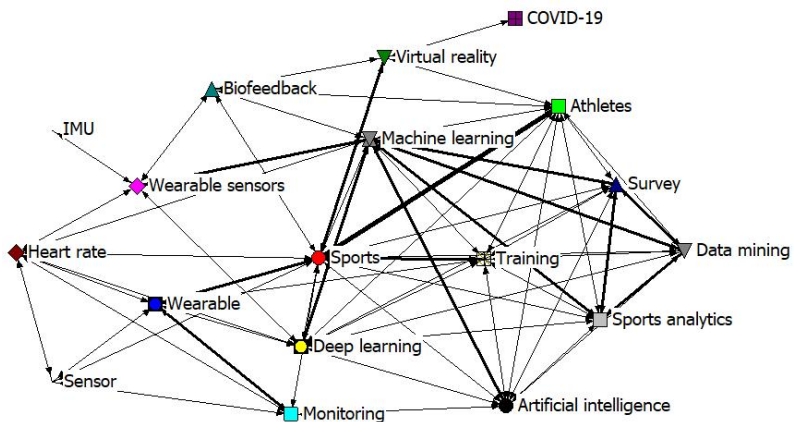
ABSTRACT

The study investigates the connections between tourists' hotel preferences and distance from resort expressed in meters, distance from ski lift expressed in meters, booking score, number of reviews, room type, feature of free cancellation, price expressed in Euro, type (private host/hotel), destination (ski-to-door access/travel sustainable

property) from 10 highly appreciated European ski locations offered in from February 2023 by Booking, using a sustainable, electronic instrument for collecting and analyzing a large amount of data, Octoparse 8 and a multi-attribute decision model. Previous studies concerning tourist preferences and online behavior used traditional methods, such as questionnaires and surveys, being limited to a certain number of questions and respondents; thus, this study covers a research gap in the literature with regard to the use of a large amount of data, electronic instruments and multi-attribute models to rank the hotel locations, which derives from the difficulty in obtaining the necessary data to carry out an in-depth analysis. The results show that when selecting a hotel location from an exclusive ski resort, the tourists are interested in the number of reviews, the price and the distances from the resorts to the ski slopes, while the booking score is less important. This is translated into practical implications for marketers and hotel managers, presented at the end of the paper.

体育工程

本期体育工程学术研究共检索到英文相关文献179篇，研究热点主要集中在人工智能的应用、虚拟现实视频游戏、可穿戴传感器、计算机智能算法等在体育方面的应用。检索结果如下：1) 关键词共词分析。提取关键词276个，经过数据清洗后关键词有492个，词频为2及以上的关键词有21个，累计百分比为10.8%，高频关键词有体育、体育装备、游戏理论、生物力学、人工智能等，生成可视化知识图谱（见下图）。2) 来源期刊分析。涉及期刊50种，其中载文2篇及以上的期刊有5种，累计百分比为38%，刊载体育工程前两位的期刊分别为：Sensors（JCR学科分区Q2、Q2、Q2），Revisia brasileira de medicina do esports（JCR学科分区Q4、Q4）。3) 交叉学科分析。引用文献总计25篇，最多的频次为6次，频次排名前两位的文献分别为 *Ultrasensitive wearable strain sensor for promising application in cardiac rehabilitation*、*Smart data processing for energy harvesting systems using artificial intelligence*、*Ready or not, here I come: A scoping review of methods used to assess player readiness via indicators of neuromuscular function in football code athletes*、*New group-based generalized interval-valued q-rung orthopair fuzzy soft aggregation operators and their applications in sports decision-making problems*。4) 学术关注度分析。文献级别用量最多的是59次，排名前三位的文献分别为： *Smart data processing for energy harvesting systems using artificial intelligence*、*Ultrasensitive wearable strain sensor for promising application in cardiac rehabilitation*、*Wearable Organic Electrochemical Transistor Array for Skin-Surface Electrocardiogram Mapping Above a Human Heart*。



Ghosh, I., Ramasamy Ramamurthy, S., Chakma, A., & Roy, N. (2023). Sports analytics review: Artificial intelligence applications, emerging technologies, and algorithmic perspective. Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery, e1496.

ABSTRACT

The rapid and impromptu interest in the coupling of machine learning (ML) algorithms with wearable and contactless sensors aimed at tackling real-world problems warrants a pedagogical study to understand all the aspects of this research direction. Considering this aspect, this survey aims to review the state-of-the-art literature on ML algorithms, methodologies, and hypotheses adopted to solve the research problems and challenges in the domain of sports. First, we categorize this study into three main research fields: sensors, computer vision, and wireless and mobile-based applications. Then, for each of these fields, we thoroughly analyze the systems that are deployable for real-time sports analytics. Next, we meticulously discuss the learning algorithms (e.g., statistical learning, deep learning, reinforcement learning) that power those deployable systems while also comparing and contrasting the benefits of those learning methodologies. Finally, we highlight the possible future open-research opportunities and emerging technologies that could contribute to the domain of sports analytics.

Contreras, M. M., Garcia, A. I. P., Ramos-Jimenez, A., Torres, R. P. H., & Chavez-Guevara, I. A. (2023). Applications of Maximum Fat Oxidation and FATmax in the evaluation of sports performance in endurance-athletes: a narrative review [Review]. Retos-Nuevas Tendencias En Educacion Fisica Deporte Y Recreacion(47), 806-816.

ABSTRACT

The differential use of energy substrates (lipids and carbohydrates) during sports competitions has been proposed to de-termine sports performance. Therefore, this

review has the objectives: (i) describe the association of maximum oxidation of fats (MFO) and its corresponding intensity (Fatmax) with indicators of sports performance in resistance athletes, (ii) report the Metabolic athlete phenotype belonging to different sports disciplines. Both FATmax and MFO have been studied in a few sports disciplines. Results: Fatmax and MFO are directly associated with each other; however, only the MFO was positively associated with the career time in triathlon athletes, professional skiers with a mischievous field, and ultramarathon runners. In these populations, the maximum oxygen consumption (VO₂max) positively correlates with the MFO, while age is inversely associated with MFO. Although the MFO reported in handball, volleyball, and basketball athletes (0.59 +/- 0.24 g.min⁻¹), as well as in professional players (0.69 +/- 0.15 g.min⁻¹), MFO is superior to the values observed in long-distance corridors and elite skiers. On the other hand, the MFO differs between athletes from different sports disciplines, being superior in long-distance corridors and professional skiers vs. cyclists (0.55 +/- 0.09 vs. 0.48 +/- 0.05 g.min⁻¹), despite similarities in the VO₂max and fat-free mass. Conclusion: The relationship of the MFO and the Fatmax with sports performance varies according to age, sports discipline, and the sex of athletes, observing a particular metabolic phenotype for each sports discipline. Therefore, in addition to measuring the VO₂max and the work intensity corresponding to the lactate threshold or second ventilatory threshold, it is recommended to incorporate the MFO and Fatmax in the physiological evaluations of the athletes to optimize their physical performance.

Télez, A. M., Castro, L. A., & Tentori, M. (2023). Developing and Evaluating a Virtual Reality Videogame Using Biofeedback for Stress Management in Sports. Interacting with Computers, iwad025.

ABSTRACT

Stress is a reaction of the body to external challenges, whether physical or psychological. In sports, there are stress factors that affect the athlete's performance, especially in team

sports that involve short, high-intensity exercise cycles followed by short recovery periods, such as American football. The lack of stress regulation mechanisms can be detrimental to the individual and collective performance of athletes. Biofeedback systems have shown promising clinical results in regulating stress for sports competitions. However, there is a lack of scientific evidence to support their efficacy, and technologies, such as virtual reality videogames, have not been extensively explored. In this article, we present the development and pilot testing of Virtual Autonomic Nervous System (VANS), a virtual reality videogame using biofeedback that supports stress management training in athletes. VANS uses an optical heart rate sensor and aims at keeping the heart rate below a given threshold to control features within the game. We evaluated the usability and user experience of VANS through a 1-week deployment study with 10 American footballers. Our results show that VANS outperformed a commercial videogame used for biofeedback training and considerably reduced stress in our participants. Therefore, VANS could provide stress management training for future matches and competitions. Finally, we reflect on aspects of our design and discuss future directions of our work.

De Fazio, R., Mastronardi, V. M., De Vittorio, M., & Visconti, P. (2023). Wearable Sensors and Smart Devices to Monitor Rehabilitation Parameters and Sports Performance: An Overview. *Sensors*, 23(4), 1856.

ABSTRACT

A quantitative evaluation of kinetic parameters, the joint's range of motion, heart rate, and breathing rate, can be employed in sports performance tracking and rehabilitation monitoring following injuries or surgical operations. However, many of the current detection systems are expensive and designed for clinical use, requiring the presence of a physician and medical staff to assist users in the device's positioning and measurements. The goal of wearable sensors is to overcome the limitations of current

devices, enabling the acquisition of a user's vital signs directly from the body in an accurate and non-invasive way. In sports activities, wearable sensors allow athletes to monitor performance and body movements objectively, going beyond the coach's subjective evaluation limits. The main goal of this review paper is to provide a comprehensive overview of wearable technologies and sensing systems to detect and monitor the physiological parameters of patients during post-operative rehabilitation and athletes' training, and to present evidence that supports the efficacy of this technology for healthcare applications. First, a classification of the human physiological parameters acquired from the human body by sensors attached to sensitive skin locations or worn as a part of garments is introduced, carrying important feedback on the user's health status. Then, a detailed description of the electromechanical transduction mechanisms allows a comparison of the technologies used in wearable applications to monitor sports and rehabilitation activities. This paves the way for an analysis of wearable technologies, providing a comprehensive comparison of the current state of the art of available sensors and systems. Comparative and statistical analyses are provided to point out useful insights for defining the best technologies and solutions for monitoring body movements. Lastly, the presented review is compared with similar ones reported in the literature to highlight its strengths and novelties.

Pavilionis, P., Adhanom, I. B., Moran, R., Taylor, M. R., & Murray, N. G. (2023). Virtual Reality Application for Vestibular/Ocular Motor Screening: Current Clinical Protocol Versus a Novel Prototype. *Sports Health*, 19417381231163158.

ABSTRACT

Background: Virtual reality (VR) has been explored to improve baseline and postinjury assessments in sport-related concussion (SRC). Some experience symptoms related to VR, unrelated to concussion. This may deter use of vestibular/ocular motor screening (VOMS) using VR. Baseline VR VOMS symptomatology differentiates baseline from overall symptomatology. Hypothesis: There will be no difference between current

clinical manual VOMS (MAN), a clinical prototype (PRO), and VR for symptom provocation change score (SPCS) and near point of convergence (NPC) average score in a healthy population and sex differences among the 3 modes of administration. Study Design: Cohort study. Methods: A total of 688 National Collegiate Athletic Association Division I student-athletes completed VOMS using 3 methods (MAN, N = 111; female athletes, N = 47; male athletes, N = 64; average age, 21 years; PRO, N = 365; female athletes, N = 154; male athletes, N = 211; average age, 21 years; VR, N = 212; female athletes, N = 78; male athletes, N = 134; average age = 20 years) over a 3-year period (2019-2021) during annual baseline testing. Exclusion criteria were as follows: self-reported motion sickness in the past 6 months, existing or previous neurological insult, attention deficit hyperactivity disorder, learning disabilities, or noncorrected vision impairment. Administration of MAN followed the current clinical protocols, PRO used a novel prototype, and VR used an HTC Vive Pro Eye head mounted display. Symptom provocation was compared using Mann-Whitney U tests across each VOMS subtest with total SPCS and NPC average by each method. Results: MAN had significantly ($P < 0.01$) more baseline SPCS (MAN = 0.466 +/- 1.165, PRO = 0.163 +/- 0.644, VR = 0.161 +/- 0.933) and significantly ($P < 0.01$) and more SPCS (MAN = 0.396 +/- 1.081, PRO = 0.128 +/- 0.427, VR = 0.48 +/- 0.845) when compared with PRO and VR. NPC average measurements for VR (average, 2.99 +/- 0.684 cm) were significantly greater than MAN (average, 2.91 +/- 3.35 cm; $P < 0.01$; Cohen's $d = 0.03$) and PRO (average, 2.21 +/- 1.81 cm; $P < 0.01$; Cohen's $d = 0.57$). For sex differences, female athletes reported greater SPCS with PRO (female athletes, 0.29 +/- 0.87; male athletes, 0.06 +/- 0.29; $P < 0.01$) but not in VR or MAN. Conclusion: Using a VR system to administer the VOMS may not elicit additional symptoms, resulting in fewer false positives and is somewhat stable between sexes.

Dindorf C, Bartaguiz E, Gassmann F, Fröhlich M. Conceptual Structure and Current Trends in Artificial Intelligence, Machine Learning, and Deep Learning Research in Sports: A Bibliometric Review. *International Journal of Environmental Research and Public Health*. 2023; 20(1):173.

ABSTRACT

Artificial intelligence and its subcategories of machine learning and deep learning are gaining increasing importance and attention in the context of sports research. This has also meant that the number of corresponding publications has become complex and unmanageably large in human terms. In the current state of the research field, there is a lack of bibliometric analysis, which would prove useful for obtaining insights into the large amounts of available literature. Therefore, the present work aims to identify important research issues, elucidate the conceptual structure of the research field, and unpack the evolutionary trends and the direction of hot topics regarding key themes in the research field of artificial intelligence in sports. Using the Scopus database, 1215 documents (reviews and articles) were selected. Bibliometric analysis was performed using VOSviewer and bibliometrix R package. The main findings are as follows: (a) the literature and research interest concerning AI and its subcategories is growing exponentially; (b) the top 20 most cited works comprise 32.52% of the total citations; (c) the top 10 journals are responsible for 28.64% of all published documents; (d) strong collaborative relationships are present, along with small, isolated collaboration networks of individual institutions; (e) the three most productive countries are China, the USA, and Germany; (f) different research themes can be characterized using author keywords with current trend topics, e.g., in the fields of biomechanics, injury prevention or prediction, new algorithms, and learning approaches. AI research activities in the fields of sports pedagogy, sports sociology, and sports economics seem to have played a subordinate role thus far. Overall, the findings of this study expand knowledge on the research situation as well as the development of research topics regarding the use of

artificial intelligence in sports, and may guide researchers to identify currently relevant topics and gaps in the research.

Brognara, L., Mazzotti, A., Rossi, F., Lamia, F., Artioli, E., Faldini, C., & Traina, F. (2023). Using Wearable Inertial Sensors to Monitor Effectiveness of Different Types of Customized Orthoses during CrossFit® Training. *Sensors*, 23(3), 1636.

ABSTRACT

Background: Dynamic balance plays a key role in high-impact sports, such as CrossFit, where athletes are required to maintain balance in various weightlifting exercises. The loss of balance in these sport-specific movements may not only affect athlete performance, but also increase the risk of injuries. **Objectives:** The aim of the study is to achieve greater insight into the balance and athlete position during the CrossFit training by means of inertial sensors, with a particular focus on the role of different custom foot orthoses (CFOs) in order to detect correlations with the role of the cavus foot. **Methods:** A total of 42 CrossFit((R)) athletes, aged 25 to 42 years, were enrolled in this study. One-way ANOVA tests with post-hoc analysis of variance were used to compare foot posture groups and effects of different types of customized foot orthoses. **Results:** When comparing the effects of CFOs with the respective balance basal level during the pistol squat exercise, we observed a significant ($p = 0.0001$) decrease in the sway area, antero-posterior displacement (APD) and medio-lateral displacement (MLD) compared to the basal using both types of CFOs. **Conclusion:** No significant positive effects of CFOs were observed in some static tests. On the contrary, positive effects of CFOs and, in particular, postural insoles, are relevant to dynamic balance.

Ghosh, I., Ramasamy Ramamurthy, S., Chakma, A., & Roy, N. (2023). Sports analytics review: Artificial intelligence applications, emerging technologies, and algorithmic perspective. Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery, e1496.

ABSTRACT

The rapid and impromptu interest in the coupling of machine learning (ML) algorithms with wearable and contactless sensors aimed at tackling real-world problems warrants a pedagogical study to understand all the aspects of this research direction. Considering this aspect, this survey aims to review the state-of-the-art literature on ML algorithms, methodologies, and hypotheses adopted to solve the research problems and challenges in the domain of sports. First, we categorize this study into three main research fields: sensors, computer vision, and wireless and mobile-based applications. Then, for each of these fields, we thoroughly analyze the systems that are deployable for real-time sports analytics. Next, we meticulously discuss the learning algorithms (e.g., statistical learning, deep learning, reinforcement learning) that power those deployable systems while also comparing and contrasting the benefits of those learning methodologies. Finally, we highlight the possible future open-research opportunities and emerging technologies that could contribute to the domain of sports analytics.

Lerebourg, L., Saboul, D., Clémentçon, M., & Coquart, J. B. (2023). Prediction of marathon performance using artificial intelligence. International Journal of Sports Medicine.

ABSTRACT

Although studies used machine learning algorithms to predict performances in sports activities, none, to the best of our knowledge, have used and validated two artificial intelligence techniques: artificial neural network (ANN) and k-nearest neighbor (KNN) in the running discipline of marathon and compared the accuracy or precision of the

predicted performances. Official French rankings for the 10-km road and marathon events in 2019 were scrutinized over a dataset of 820 athletes (aged 21, having run 10 km and a marathon in the same year that was run slower, etc.). For the KNN and ANN the same inputs (10-km race time, body mass index, age and sex) were used to solve a linear regression problem to estimate the marathon race time. No difference was found between the actual and predicted marathon performances for either method ($p > 0,05$). All predicted performances were significantly correlated with the actual ones, with very high correlation coefficients ($r > 0,90$; $p < 0,001$). KNN outperformed ANN with a mean absolute error of 2,4 vs 5,6%. The study confirms the validity of both algorithms, with better accuracy for KNN in predicting marathon performance. Consequently, the predictions from these artificial intelligence methods may be used in training programs and competitions.

Shan, S., Sun, S., & Dong, P. (2023). Data driven intelligent action recognition and correction in sports training and teaching. *Evolutionary Intelligence*, 1-9.

ABSTRACT

With the development of world economy, sports development has also become a symbol of national strength. Nowadays, sports competition has become an important activity for all countries to show their strength, and also an important bridge to connect all countries and build friendship. In the process of challenging the limit, human beings gradually master the action essentials of various sports, and the action difference of athletes directly affects the grades of the competition. Therefore, in the process of sports training, athletes of various countries will focus on the standard of action of each athlete. In traditional sports training, veteran athletes with rich experience are usually used as coaches to guide athletes empirically. However, the difference of coaches will also lead to the difference of sports effects. At the same time, coaches' grasp of athletes' action standards is more based on subjective observation, which cannot be accurately measured, so there may be large differences and errors in their grasp of action standards. In this

paper, we propose an intelligent action recognition and correction system to assist coaches to measure and evaluate athletes' actions more accurately, and give correction suggestions according to standard actions. Our system uses RGB-D sensors to analyze athletes' skeleton key points in real time. The different between the athlete's action and the standard action is calculated through the connection between the joint key points. In this paper, we also use the timing tracking algorithm to comprehensively evaluate the consistency of the action with the standard. We verified the feasibility of the recognition correction system through the actual movement and measurement of athletes. The experiment shows that our system can accurately measure the movements of athletes, and has more accurate measurement results and correction suggestions than the traditional coach naked eye measurement.

Dindorf, C., Bartaguiz, E., Dully, J., Sprenger, M., Becker, S., Fröhlich, M., & Ludwig, O. (2023). In Vivo Monitoring of Acute and Intermittent Fatigue in Sport Climbing Using Near-Infrared Spectroscopy Wearable Biosensors. *Sports*, 11(2), 37.

ABSTRACT

The objectification of acute fatigue (during isometric muscle contraction) and cumulative fatigue (due to multiple intermittent isometric muscle contractions) plays an important role in sport climbing. The data of 42 participants were used in the study. Climbing performance was operationalized using maximal climbing-specific holding time (CSHT) by performing dead hangs. The test started with an initial measurement of handgrip strength (HGS) followed by three intermittent measurements of CSHT and HGS. During the test, finger flexor muscle oxygen saturation (SmO₂) was measured using a near-infrared spectroscopy wearable biosensor. Significant reductions in CSHT and HGS could be found ($p < 0.001$), which indicates that the consecutive maximal isometric holding introduces cumulative fatigue. The reduction in CSHT did not correlate with a reduction in HGS over multiple consecutive maximal dead hangs ($p > 0.35$). Furthermore, there were no significant differences in initial SmO₂ level, SmO₂

level at termination, SmO₂ recovery, and mean negative slope of the SmO₂ saturation reduction between the different measurements ($p > 0.24$). Significant differences were found between pre-, termination-, and recovery- (10 s after termination) SmO₂ levels ($p < 0.001$). Therefore, monitoring acute fatigue using athletes' termination SmO₂ saturation seems promising. By contrast, the measurement of HGS and muscle oxygen metabolism seems inappropriate for monitoring cumulative fatigue during intermittent isometric climbing-specific muscle contractions.

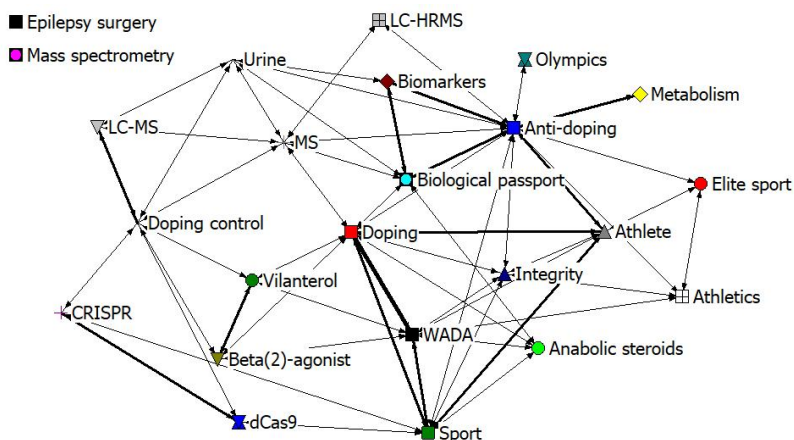
Yu, H., & Mi, Y. (2023). Application Model for Innovative Sports Practice Teaching in Colleges Using Internet of Things and Artificial Intelligence. Electronics, 12(4), 874.

ABSTRACT

The Internet of Things (IoT) and artificial intelligence (AI) have promoted teaching reform while improving people's lives. Under the new teaching environment, the position of physical education (PE) teaching in the teaching work has become increasingly prominent. At present, there are some problems in the PE teaching mode of most colleges and universities, such as poor teaching environment, unstable teaching data, and lack of technical support for the teaching system. This also leads to the low quality of PE teaching and unsatisfactory teaching results. In this paper, IoT and AI are combined to study the application mode of innovative practical teaching in college PE. This paper first constructs a physical education teaching system based on the Internet of Things, then summarizes the necessity of artificial intelligence technology participating in the reform of physical education classroom teaching, and gives a specific teaching application model. Finally, based on the golden sine algorithm-optimization neural network, the application model of college physical education in this paper is evaluated. Through experiments and investigations, the new teaching mode improves the teaching efficiency by 14.7%, improves the teaching quality, and provides reference for the next development of IoT and AI in teaching.

反兴奋剂

本期反兴奋剂学术研究共检索到英文相关文献51篇，研究热点主要集中在兴奋剂的检测、兴奋剂检测标准、兴奋剂相关认知等方面。检索结果如下：1) 关键词共词分析。提取关键词266个，经过数据清洗后关键词有262个，词频为2及以上的关键词有24个，累计百分比为29.77%，高频关键词有兴奋剂、反兴奋剂、运动员、世界反兴奋剂机构、生物护照等，生成可视化知识图谱（见下图）。2) 来源期刊分析。涉及期刊51种，其中载文2篇及以上的期刊有4种，所载文献累计百分比为39.21%，刊载反兴奋剂研究前三位的期刊分别为：Drug testing and analysis (JCR学科分区Q2、Q2、Q2)，Talanta (JCR学科分区Q1)，Frontiers in sports and active living (JCR学科分区Q3)。3) 学科交叉分析。引用文献总计4篇，最多的频次为1次，排名前三位的文献分别为*Assay validation for vilanterol and its metabolites in human urine with application for doping control analysis*、*Urine concentrations of vilanterol and its metabolites, GSK932009 and GW630200, after inhalation of therapeutic and supratherapeutic doses*。4) 学术关注度分析。文献级别用量最多的是15次，排名前三位的文献分别为：*CRISPR/deadCas9-based high-throughput gene doping analysis (HiGDA): A proof of concept for exogenous human erythropoietin gene doping detection*、*Direct coupling in-tube solid-phase microextraction with mass spectrometry using polymer coated open-tubular column for rapid analysis of antiepileptic drugs in biofluids*、*Comparison of different approaches for direct coupling of solid-phase microextraction to mass spectrometry for drugs of abuse analysis in plasma*。



Ayyildiz, E., Kayabesler, H., Gulu, M., Yagin, F. H., Aldhahi, M. I., Garcia-Grimau, E., & Al-Mhanna, S. B. (2023). Examining mindfulness and moral disengagement in doping: Perspective of Turkish wrestlers. *Frontiers in Psychology*, 14, 7.

ABSTRACT

Introduction: Studies related to attitudes toward the use of prohibited substances in Turkish athletes are scarce. The World Anti-Doping Agency (WADA) has implemented anti-doping educational policies emphasizing doping-related education in studies conducted among Turkish wrestlers. However, it is still unclear the extent to which the wrestlers comply and adhere to these anti-doping policies. No research has previously examined the effect of anti-doping education on athletes' mindfulness and moral disengagement in doping (MDD). Therefore, the present study has a two-fold objective: first, to examine whether doping-related education (DRE) and the status of being a national athlete (NA) have an effect on athlete mindfulness and MDD. Second, to analyze the relationship between each sub-dimensions of athlete mindfulness: awareness (ASD), judgment (JSD), and refocus (RSD) with MDD.
Methods: A total of 409 male wrestlers participated in this study. MANOVA analysis showed that NA and DRE alone have no effect on MDD but have a general effect on mindfulness.
Results: The highest effect was on the ASD of being an NA ($F(2, 406) = 0.173, p = 0.173$). When the interaction effect of NA*DRE was examined, significant difference in MDD ($F = 8.218, p = 0.004$), ASD ($F = 8.476, p = 0.004$), JSD ($F = 5.844, p = 0.016$), and RSD ($F = 11.476, p = 0.001$) were found. MDD has a weak negative relationship with ASD ($r = -0.126$) and RSD ($r = -0.041$) and a weak positive relationship with the JSD sub-dimension ($r = 0.140$). Those results suggest that being a NA and having received anti-doping education affect moral disengagement in doping and athletes' mindfulness.
Discussion: As a conclusion, it is recommended to increase awareness and anti-doping education among national-standard Turkish wrestlers to prevent them from engaging in doping behaviors.

Equey, T., Salamin, O., Ponzetto, F., Nicoli, R., Kuuranne, T., Saugy, J., ... & Baume, N. (2023). Longitudinal Profiling of Endogenous Steroids in Blood Using the Athlete Biological Passport Approach. The Journal of Clinical Endocrinology & Metabolism, dgad085.

ABSTRACT

Context Detection of endogenous anabolic androgenic steroids (EAAS), like testosterone (T), as doping agents has been improved with the launch of the Steroidal Module of the Athlete Biological Passport (ABP) in urine samples. Objective To target doping practices with EAAS, particularly in individuals with low level of biomarkers excreted in urine, by including new target compounds measured in blood. Design T and T/androstenedione (T/A4) distributions were obtained from 4 years of anti-doping data and applied as priors to analyze individual profiles from 2 T administration studies in female and male subjects. Setting Anti-doping laboratory. Elite athletes (n = 823) and male and female clinical trials subjects (n = 19 and 14, respectively). Intervention(s) Two open-label administration studies were carried out. One involved a control phase period followed by patch and then oral T administration in male volunteers and the other followed female volunteers during 3 menstrual cycles with 28 days of daily transdermal T application during the second month. Main outcome measure(s) Serum samples were analyzed for T and A4 and the performance of a longitudinal ABP-based approach was evaluated for T and T/A4. Results An ABP-based approach set at a 99% specificity flagged all female subjects during the transdermal T application period and 44% of subjects 3 days after the treatment. T showed the best sensitivity (74%) in response to transdermal T application in males. Conclusions Inclusion of T and T/A4 as markers in the Steroidal Module can improve the performance of the ABP to identify T transdermal application, particularly in females.

Greenbaum, D. H., McLachlan, A. J., Roubin, R. H., Moles, R., & Chaar, B. B. (2023). Examining pharmacists' anti-doping knowledge and skills in assisting athletes to avoid unintentional use of prohibited substances. International Journal of Pharmacy Practice, riad015.

ABSTRACT

Objectives: To explore the knowledge and skills of pharmacists practicing in Sydney, Australia, in preventing the use of prohibited medications by athletes. Methods: Using a simulated-patient study design, the researcher (an athlete and pharmacy student herself) contacted 100 Sydney pharmacies by telephone requesting advice about taking a salbutamol inhaler (a WADA-prohibited substance with conditional requirements), for exercise-induced asthma, following a set interview protocol. Data were assessed for both clinical and anti-doping advice appropriateness. Key findings: Appropriate clinical advice was provided by 66% of pharmacists in the study, appropriate anti-doping advice was provided by 68%, and 52% provided appropriate advice across both aspects. Of the respondents, only 11% provided both clinical and anti-doping advice at a comprehensive level. Identification of accurate resources was made by 47% of pharmacists. Conclusions: Whilst most participating pharmacists had the skills to deliver assistance regarding the use of prohibited substances in sports, many lacked core knowledge and resources to enable them to deliver comprehensive care to prevent harm and protect athlete-patients from anti-doping violations. A gap was identified regarding advising/counselling athletes, indicating the need for additional education in sport-related pharmacy. This education would need to be coupled with the incorporation of sport-related pharmacy into current practice guidelines to enable pharmacists to uphold their duty of care and for athletes to benefit from their medicines-related advice.

Martinelli, L. A., N Thrower, S., Heyes, A., Boardley, I. D., Backhouse, S. H., & Petróczy, A. (2023). The good, the bad, and the ugly: A qualitative secondary analysis into the impact of doping and anti-doping on clean elite athletes in five European countries. *International Journal of Sport Policy and Politics*, 1-20.

ABSTRACT

Protecting clean sport, and the rights of athletes to a clean sport environment, is at the centre of anti-doping policies. To better support and enable clean athletes and sport, an understanding of the clean athlete lifeworld is required. The current study explored the ways that clean athletes are personally affected by others' actual or suspected instances of doping and anti-doping rule violations, and by aspects of the anti-doping system. Qualitative Secondary Analysis (QSA) was used to re-analyse and interpret 13 focus group transcripts generated from the 'Research-Embedded Strategic Plan for Anti-Doping Education Clean Sport Alliance Initiative for Tackling Doping' (RESPECT) project (see Petroczi et al., 2021b). The sample in the parent study included 82 self-declared clean elite athletes, from Germany, Ireland, Netherlands, Slovenia, and the UK. Reflexive thematic analysis generated three overarching themes: The harm done by clean athletes having to coexist with dopers, how clean athletes are undermined by a disingenuous interest in clean sport, and the anxiety experienced by clean athletes over mistakes that could lead to anti-doping rule violations. The impacts of doping on clean athletes - direct or indirect - are experienced by all clean athletes in some way. The results indicate that current approaches to anti-doping rule compliance frequently undermine clean athletes and the perceived legitimacy of the anti-doping system.

Ponzetto, F., Parasiliti-Caprino, M., Gesmundo, I., Marinelli, L., Nonnato, A., Nicoli, R., ... & Settanni, F. (2023). Single-run UHPLC-MS/MS method for simultaneous quantification of endogenous steroids and their phase II metabolites in serum for anti-doping purposes. *Talanta*, 255, 124218.

ABSTRACT

Anti-doping rule violations related to the abuse of endogenous anabolic androgenic steroids can be currently discovered by the urinary steroidal module of Athlete Biological Passport. Since this powerful tool is still subjected to some limitations due to various confounding factors altering the steroid profile, alternative strategies have been constantly proposed. Among these, the measurement of blood concentrations of endogenous steroid hormones by LC-MS is currently of increasing interest in anti-doping, bringing significant advantages for the detection of testosterone abuse in females and in individuals with deletion of UGT2B17 enzyme. Although various research groups have made significant efforts in method development, there is currently no accepted or harmonized anti-doping method for quantitative analysis of the various testosterone doping markers in blood. In this study we present a UHPLC-MS/MS method for the quantification of major circulating steroid hormones together with an extended panel of glucuro- and sulpho-conjugated phase II metabolites of androgens. Chromatographic setup was optimized by comparing the performance of three different C18 stationary phases and by the careful selection of mobile phases with the aim of separating all the target steroids, including numerous isomeric/isobaric compounds. MS parameters were fine-tuned to obtain the sensitivity needed for measuring the target analytes, that show specific serum concentrations ranging from low pg/mL for less abundant compounds to μ g/mL for sulpho-conjugated steroids. Finally, sample preparation protocol was developed for the extraction of steroid hormones from 200 μ L of serum and the performance was evaluated in terms of extraction recovery and matrix effect. The final method was then applied to authentic serum samples collected from healthy volunteers (40 males and 40 females) at the Blood Bank of the City of

Health and Science University Hospital of Turin. The analysis of these samples allowed to obtain results on serum concentrations of the targeted steroids, with particular emphasis on previously undiscovered phase II metabolites, such as the isomers of 5-androstane-3,17-diol glucuronide. This preliminary application also enabled measuring dihydrotestosterone sulphate in male samples, efficiently separating this analyte from its isomer, epiandrosterone sulphate, which circulates in blood at high concentrations. The promising results of this study are encouraging for the measurement of blood steroid profile markers in serum and plasma samples for Athlete Biological Passport purposes.

Handelsman, D. J., Gild, M., Clifton-Bligh, R., Speers, N., Kouzios, D., McMartin, M. C., & Desai, R. (2023). Thyroid hormone abuse among elite athletes. *Journal of the Endocrine Society*, 7(5), bvad027.

ABSTRACT

Context Thyroid hormone (TH) abuse for performance enhancement in sport remains controversial and it is not prohibited in sports under the World Anti-Doping Code. However, the prevalence of TH usage in athletes is not known. **Objective** We investigated TH use among Australian athletes undergoing antidoping tests for competition in World Anti-Doping Agency (WADA)-compliant sports by measuring TH in serum and surveying mandatory doping control form (DCF) declarations by athletes of all drugs used in the week prior to the antidoping test. **Methods** Serum thyroxine (T4), triiodothyronine (T3), and reverse T3 were measured by liquid chromatography-mass spectrometry and serum thyrotropin, free T4, and free T3 by immunoassays in 498 frozen serum samples from antidoping tests together with a separate set of 509 DCFs. **Results** Two athletes had biochemical thyrotoxicosis giving a prevalence of 4 per 1000 athletes (upper 95% confidence limit [CL] 16). Similarly, only 2 of 509 DCFs declared usage of T4 and none for T3, also giving a prevalence of 4 (upper 95% CL 16) per 1000 athletes. These estimates were consistent with DCF analyses from international

competitions and lower than the estimated T4 prescription rates in the age-matched Australian population. Conclusion There is minimal evidence for TH abuse among Australian athletes being tested for competing in WADA-compliant sports.

Wuest, B., Gavrilović, I., Cowan, D., Torre, X. D. L., Botrè, F., & Parr, M. K. (2023). Analysis of doping control samples using supercritical fluid chromatography - tandem mass spectrometry: Ready for routine use. Journal of Separation Science, 2200880.

ABSTRACT

Supercritical fluid chromatography is proving to be a good separation and sample preparation tool for various analytical applications and, as such, has gained the attention of the anti-doping community. Here, the applicability of supercritical fluid chromatography hyphenated to tandem mass spectrometry for routine doping control analysis was tested. A multi-analyte method was developed to cover 197 drugs and metabolites that are prohibited in sport. More than 1000 samples were analyzed by applying a "dilute and inject" approach after hydrolysis of glucuronide metabolites. Additionally, a comparison with routinely used liquid chromatography-mass spectrometry was performed with 250 of the 1000 samples and a number of past positive anti-doping samples. It revealed some features where supercritical fluid chromatography-tandem mass spectrometry was found to be complementary or advantageous to liquid chromatography-mass spectrometry for anti-doping purposes, such as better retention of analytes that are poorly retained in reversed-phase liquid chromatography. Our results suggest that supercritical fluid chromatography-tandem mass spectrometry is sensitive (limit of detection <50% relevant minimum required performance level required by the World Anti-Doping Agency for anti-doping analysis), reproducible, robust, precise (analytes of interest area coefficient of variation <5%; retention time difference coefficient of variation <1%) and complementary to existing techniques currently used for routine analysis in the World Anti-Doping Agency accredited laboratories.

Pavot, D. (2023). Pathways to greater government accountability for breaches of their obligations in relation to doping in sport. *Frontiers in Sports and Active Living*, 5, 33.

ABSTRACT

The State doping scandal in Russia has highlighted a major discrepancy in the fight against doping in sport: on the one hand, the signatories of the World Anti-Doping Code (federations, NADO's, etc.) are subject to a very strict regime and incur serious sanctions, while on the other hand, States, when they massively violate the rules, do not risk very important consequences in international law. For example, high ranking officials as well as the Russian state apparatus have not been affected with a few exceptions such as the Moscow antidoping laboratory. The aim of this opinion paper is to present a reflection on the different avenues that could be envisaged to make governments more accountable, especially as work is underway on the topic. The development of a true government accountability regime would allow the system to be more balanced.

Noguerol, D. F. (2023). Anti-doping policy, press and Francoism: the case of the Tour of England of 1965 [Article]. *Materiales Para La Historia Del Deporte*(23), 86-101.

ABSTRACT

In 1965, the cyclists Luis Pedro Santamarina, Salvador Canet and Jesus Usamentiaga were disqualified from the Tour of Britain after a positive test on amphetamine in anti-doping control. This article aims to analyze the response of the ABC and Mundo Deportivo (MD) journalists to the first case of doping that affected Spanish athletes. Previously, these newspapers had already reported doping cases in cycling. The difference was that, for the first time, the protagonists were athletes of the same nationality as the journalists. The case took place at the beginning of anti-doping policy, shortly after the first European Congress on doping held in the Council of Europe (CE).

Doctors attending the CE, including Spanish physicians like Jesus Fernandez Cabeza, expressed a desire for journalists to bring to their audience the danger of doping. In general, Spanish newspapers contributed to the spread of the hegemonic scientific discourse based on evidence, although, as we will analyze in this research, the defense of the national hero passed over the interests of the spokesmen of anti-doping policy.

Shelley, J., N Thrower, S., & Petróczi, A. (2023). Whose job is it anyway? A qualitative investigation into the influence of agents, race organisers, and sponsors on the risk of doping in elite distance running. *International Journal of Sport Policy and Politics*, 1-22.

ABSTRACT

Agents, race-organisers, and sponsors have a key influence in shaping the world of elite professional distance running. Yet to date this important but hard-to-reach stakeholder group has been omitted from the global research landscape of doping and anti-doping. The purpose of this study is to address this gap in the literature and explore the systematic contributors to doping in elite long-distance running, along with potential solutions to this issue, from this influential perspective. Thirteen in-depth interviews were conducted with agents (n = 8) of world-class long-distance runners, major race organisers (n = 3), and sports marketing managers for global brands (n = 2). The interviews were conducted via the phone, audio-recorded, and transcribed verbatim. Reflexive thematic analysis generated three themes which focused on: 1) The framework of professional distance running and the contextual aspects which may contribute to doping risk, 2) the impact of various recruitment strategies on doping and anti-doping, and 3) the lessons that can be learnt from the participants' first-hand experiences with doping cases and/or managing anti-doping requirements. Reflecting on the sector rather than the sample, the results highlighted that not all commercial stakeholders feel responsible for anti-doping. Collective responsibility from all stakeholders, which is currently borne by some and not others, is necessary to minimise doping in distance running. The challenge is how to convince all stakeholders of their share of the responsibility.