

# 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、文化与新闻传播等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 (AHCI)、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。检索导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 12 篇, 体医融合方面的文献 11 篇, 冰雪运动方面的文献 9 篇, 体育工程方面的文献 11 篇, 反兴奋剂方面的文献 13 篇。

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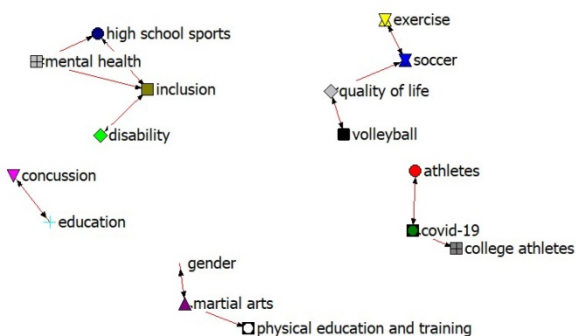
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## 体教融合

本期体教融合学术研究共检索到英文相关文献 112 篇，研究热点主要集中在高校三大球训练教学行为评价及混合教学模式、机器学习和数字信息技术在体育教学中应用、体育参与运动员的超越二元论等方面。检索结果：1) 关键词共词分析。提取关键词 363 个，经过数据清洗后关键词有 354 个，词频为 2 及以上的关键词有 22 个，累计百分比为 13.28%，高频关键词有体育教育、Covid-19、传统武术、大学运动员、心理健康、性别、青少年等，生成可视化知识图谱（见下图）。2) 来源期刊分析。涉及期刊 42 种，其中载文 2 篇及以上的期刊有 8 种，累计百分比为 41.67%，刊载体教融合相关内容前三位的期刊分别为：International journal of environmental research and public health (JCR 学科分区 Q2、Q1)，International journal of performance analysis in sport (JCR 学科分区 Q3)，Sustainability (JCR 学科分区 Q2、Q3、Q4)。3) 交叉学科分析。引用文献总计 4064 篇，最多的频次为 3 次，排名前三位的文献分别为 *Consensus statement on concussion in sport-the 5th international conference on concussion in sport held in Berlin, October 2016*、*Served Well? A Pilot Field Study on the Effects of Conveying Self-Control Strategies on Volleyball Service Performance*、*‘Why can't girls play football?’ Gender dynamics and the playground*。4) 学术关注度分析。文献级别用量最多的是 26 次，排名前三位的文献分别为 *Where is Safeguarding in Sport Psychology Research and Practice*、*Weight loss in combat sports: physiological, psychological and performance effects*、*Factors related to rapid weight loss practices among international-style wrestlers*。



**Danut Mocanu, G., Murariu, G., & Onu, I. (2022). The Influence of BMI Levels on the Values of Static and Dynamic Balance for Students (Men) of the Faculty of Physical Education and Sports. Journal of Mens Health, 18(7), Article 156.**

#### **ABSTRACT**

Background: Postural stability is a factor that conditions the motor performance of athletes and of different categories of the population involved in activities that require physical effort. The aim of the study is to highlight the differences that appear in terms of balance performance for students, depending on their classification on BMI levels. Methods: A group of 109 students from the Faculty of Physical Education and Sports (1st year undergraduate) participated in this study at the end of the academic year (May, 2019), being divided following the anthropometric assessment into 3 groups related to BMI levels (7 cases of underweight, BMI =  $17.21 \pm 1.11$ ; 83 cases of normal weight, BMI =  $22.29 \pm 1.56$ ; 19 cases of overweight, BMI =  $27.97 \pm 2.89$ ). The research is cross-sectional, using the MANOVA statistical calculation procedure (multivariate and univariate test—with Bonferroni Post Hoc Test and comparison of significance between the mean values of the 3 defined groups, for the 7 applied balance tests). Results: Univariate test results indicate values of F associated with statistically insignificant thresholds ( $p \gg 0.05$ ) for most of the tests used, with weak and very weak values of size effect ( $\eta^2$ ). This aspect is also reinforced by the differences between the averages of the analyzed pairs, where only the statistically significant superiority ( $p < 0.05$ ) of the underweight over the overweight for the Stork test is noticed. The underweight group achieves slightly superior performance in the assessments for Standing balance test, Stork test, Flamingo test, Walk and turn field sobriety test, and that of the normal weight for Functional reach test and Bass test, the overweight having the poorest results in most tests; the differences between the 3 BMI levels analyzed are insignificant ( $p \gg 0.05$ ). Conclusions: Even if underweight and normal weight have

better average scores than overweight, the lack of statistical significance of these differences can be explained by student specialization, constant involvement in physical performance, curricular or leisure activities improving performance on balance tests for the overweight category. These results reflect the particularities of the studied group and cannot be generalized for the university population, especially due to the numerically reduced group of underweight people.

**Danut Mocanu, G., Murariu, G., Onu, I., & Badicu, G. (2022). The Influence of Gender and the Specificity of Sports Activities on the Performance of Body Balance for Students of the Faculty of Physical Education and Sports. International Journal of Environmental Research and Public Health, 19(13), Article 7672.**

#### **ABSTRACT**

A sense of balance is required in sports activities, conditioning the quality of movements and physical performance. (1) The purpose of the study is to investigate the influence of gender and the specificity of sports activities on body balance. The investigated participants are 157 students of the Faculty of Physical Education and Sports/Bachelor's degree: 109 men (age =  $20.49 \pm 2.03$ , body mass index, BMI =  $22.96 \pm 3.20$ ), and 48 women (age =  $20.21 \pm 1.51$ , BMI =  $21.05 \pm 2.78$ ). (2) Design: Cross-sectional study, with the definition of the variables gender and sport activity with three stages (non-athletes/NA, team sports games/TSG, and individual sports/IS). The evaluation was based on four dynamic balance tests (Bass test/points, Functional reach test/cm, Fukuda test/degrees of rotation, and Walk and turn field sobriety test/errors) and three static balance tests (Flamingo test/falls, Stork test, and One-leg standing test with eyes closed/s). (3) Results: The variance analysis (multivariate and univariate tests) indicates the superiority of women in most tests applied, but with significantly better values ( $p < 0.05$ ) only for the Flamingo test and Bass test. Men have



superior results only for vestibular stability (Fukuda test) and One-leg standing test, but it is statistically insignificant ( $p > 0.05$ ). The TSG group has slightly better values than the IS group for the whole set of tests conducted, but these are not statistically significant ( $p > 0.05$ ), so we cannot highlight the certain superiority of TSG practitioners over those involved in IS. Both the TSG and the IS group outperformed all tests compared to the NA group, with significant differences ( $p < 0.05$ ), especially for the TSG. Conclusion: Women have better values than men on most tests, and performance sports students have higher average scores than those in the NA group, which demonstrates the beneficial influence of specific training on static and dynamic postural stability.

**Feng, Y., & Wang, Y. (2022). Evaluation Model of Football Players' Training and Teaching Actions Based on Artificial Intelligence. International Transactions on Electrical Energy Systems, 2022, Article 7427967.**

#### **ABSTRACT**

Football is a sport that needs to combine the physical stamina and physical characteristics of athletes. It needs to pay attention to the differences in different individuals and then conduct targeted training. In this regard, this article introduces artificial intelligence technology into the teaching actions of football player training and analyzes the teaching elements according to the characteristics of the football player's body. Through the analysis of fog computing under artificial intelligence, this article aimed to study the related effects of combining intelligent technology on the basis of athletes' original training. This article proposes the establishment of a system model and quantitative analysis of different frames of football players' movements. According to the combination of two-phase analysis, it can be concluded that after the introduction of artificial intelligence technology, the ability of football players in various indexes has

increased by 20%.

**Garcia-Ceberino, J. M., Feu, S., Gamero, M. G., & Ibanez, S. J. (2022).  
Determinant Factors of Achievement Motivation in School Physical Education.  
Children-Basel, 9(9), Article 1366.**

#### **ABSTRACT**

Today, it is important for physical education teachers to know students' motivation profiles for learning. Therefore, this study aimed to analyze achievement motivation according to four variables: students' sex, the taught sport modality, students' experience and teaching methodology. Likewise, the effects of students' sex and experience on the methodologies applied were analyzed. A total of 108 primary education students ( $10.95 \pm 0.48$  years), 54 boys and 54 girls, from three state schools participated in the study. The students answered the Achievement Motivation in Physical Education test (Spanish version) after participating in soccer and basketball programs based on different methodologies. Each class-group received a different educational program (soccer or basketball). The differences between the categories of the variables analyzed were calculated for each dimension of the motivational test through the Mann–Whitney U and Kruskal–Wallis H tests. The effects of students' sex and experience on the teaching methodologies applied were analyzed using the univariate General Linear Model test. In soccer and basketball, boys perceived being more motor competent ( $U = 732.00$ ;  $p < 0.05$ ;  $r = 0.43$ ) than girls. In addition, experienced students in both sports perceived being more motor competent ( $U = 695.50$ ;  $p < 0.05$ ;  $r = 0.27$ ) than inexperienced students. In turn, they indicated feeling less failure anxiety and stress ( $U = 780.00$ ;  $p < 0.05$ ;  $r = 0.22$ ). All of the students who played soccer reported more commitment (learning dedication) ( $U = 1051.50$ ;  $p < 0.05$ ;  $r = 0.20$ ) and perceived motor competence ( $U = 972.00$ ;  $p < 0.05$ ;  $r = 0.24$ ) than students who played basketball. Considering the

effects of students' sex and experience on the methodologies (perceived motor competence dimension), there were significant differences ( $F = 7.68$ ;  $p < 0.05$ ;  $\eta^2 = 0.07$ ) in favor of experienced boys who played soccer and basketball using the Tactical Games Approach methodology. Soccer was practiced more in school and out of school. This made students feel greater commitment (learning dedication) and perceived motor competence towards this invasion sport in physical education. In addition, it was shown that teachers should take into account students' sex and experience because they are two factors that influence the teaching of sports and achievement motivation.

**Jang, H. S., Dai, Y., Strunk, K. K., & Salisbury-Glennon, J. (2022). Investigating mastery-avoidance goals using the achievement goal questionnaire for sports (AGQ-S): a meta-analytic confirmatory factor analysis (MA-CFA). *Current Psychology*.**

#### **ABSTRACT**

Objectives: The phenomenon of doping is rarely researched in Paralympic sport, especially from the coach perspective. This study responds directly to this gap in research by exploring coaches' doping-related perceptions, knowledge, and opinions of the current anti-doping system in order to inform future interventions specific to disabled elite sport contexts. Method: Eleven coaches from Germany ( $n = 6$ ) and the UK ( $n = 5$ ) working across physiological ( $n = 7$ ) and skill-based ( $n = 4$ ) sport disciplines at an elite level (Paralympic,  $n = 10$  and World Championship,  $n = 1$ ) took part in semi-structured interviews. Data were analysed using abductive reflexive thematic analysis (Braun & Clarke, 2019a). Findings: Four themes were developed to capture the coaches' perspectives. The first represents coaches' perception that doping is an issue in Paralympic sport. The second theme shows that risk factors to dope are typically multiple and intertwined, stemming especially from financial incentives and pressure to

win. Theme three captures coaches' opinion of differences in testing and education across countries due to budget, resource, or infrastructure issues. Finally, data showed that coaches prefer to refer responsibility for doping prevention to their national anti-doping organisation, rather than taking on personal responsibility for anti-doping efforts. Conclusions: According to the interviewed coaches, doping has the potential to be a big issue in disabled elite sport. The main risk factors of money and pressure to win (earn prize money or funding/sponsorship) are knitted together and can be additionally impacted (negatively) by a nation's sporting system. These factors should be addressed by thinking both on an individual level (e.g., support dual careers) and a structural/policy level (e.g., aim to have minimum standards to level the global inconsistent anti-doping systems, including anti-doping education/testing). Furthermore, coaches should take their role and be proactively made aware of their responsibility in doping prevention to coach clean and protect their athletes properly.

**Leng, S., & Shao, M. (2022). A Study on the Effect of the Club Model on the Effectiveness of College Volleyball Teaching Based on a Random Matrix Model. *Mathematical Problems in Engineering*, 2022, Article 5681412.**

#### **ABSTRACT**

This paper constructs a random matrix-based teaching evaluation model for college volleyball clubs and deeply investigates the impact of a random matrix-based teaching evaluation model for college volleyball clubs on the effectiveness of college volleyball teaching. Based on random matrix theory (RMT), we analyze the data characteristics according to the single ring law. By introducing matrix Stein pairs, combined with the Laplace transform method, some concentration inequalities of random matrices are proved, and these inequalities play a very important role in the study of eigenvalues of random matrices. The random matrix model was used to analyze the changes brought by

the club-based curriculum teaching to students' physical quality, and a random matrix-based assessment model of college volleyball club teaching was proposed. The model fit test and independence test were conducted using IBM SPSS Statistics 20 software, and an online survey in the form of Questionnaire Star platform was used to map the correlation between college volleyball education and club-based teaching reform with X college physical education students as the research subjects, to provide more scientific theoretical guidance for the influence of club-based teaching mode of physical education courses on the physical quality of college students.

**Li, H.-c., & Shen, S.-f. (2022). The Reform of Basketball Curriculum Model for Students' Physical Development under the National Fitness Environment. Journal of Environmental and Public Health, 2022, Article 2869323.**

#### **ABSTRACT**

College sports serving national fitness are a complex system. College sports are an important part of national fitness. Basketball curriculum, as a subsystem of college sports, has always been loved by college students. The reform of college basketball curriculum mode is an important way to explore the coordinated evolution of college sports subsystem. Through the methods of questionnaire, interview, and mathematical statistics, aiming at the problems existing in the planning and design of basketball curriculum objectives and contents in colleges and universities, this study puts forward that it is necessary to establish a scientific and reasonable basketball special curriculum objective system and then combine the basketball curriculum teaching theory with the basketball training teaching mode, to cultivate students' practical application ability, and adopt a variety of teaching methods to cultivate students' practical ability. Finally, the teaching mode of basketball is improved. Through an example, the application effect of the basketball curriculum model under the background of national fitness proposed in

this study is tested. The results show that the basketball curriculum teaching model proposed in this study has certain feasibility and effectiveness.

**Mountain, A., & Lucchini Butcher, K. (2022). Challenging the Badger Brand: The Ethics of Conducting Oral History Interviews with College-Athletes. Oral History Review, 49(2), 309-327.**

**ABSTRACT**

This article examines three ethical problems that arose during our attempts to document the experiences of college athletes at the University of Wisconsin-Madison. First: how do we, as white women employed by an institution responsible for oppression and marginalization, speak to community members that were harmed and neglected? Second, there are specific challenges associated with the collection of NCAA athletes' oral histories. How can we gather meaningful and truthful oral histories from former and current college athletes when speaking out can have serious consequences for our narrators? Finally, we were concerned with the ethics of using a large, lower-level university course, comprised primarily of inexperienced white students, as a means to collect these oral histories. We offer a transparent examination of our own work in the hope that being upfront about our successes and failures can encourage a greater discussion concerning the ethics of conducting oral histories at universities.

**Oldham, J. R., Lanois, C. J., Caccese, J. B., Crenshaw, J. R., Knight, C. A., Berkstresser, B., Buckley, T. A. (2022). Association Between Collision Sport Career Duration and Gait Performance in Male Collegiate Student-Athletes. American Journal of Sports Medicine, 50(9), 03635465221104685-Article No.: 03635465221104685.**

**ABSTRACT**

Background: Investigations of estimated age of first exposure to repetitive head impacts from collision and contact sports have shown no associations with neurocognitive or neurobehavioral function at the collegiate level, but the effect of career duration may be a more comprehensive factor. Understanding whether longer career duration influences gait performance would provide insights into potential neurological impairment. Purpose: To examine the relationship between career duration of collision sports and single/dual-task gait performance in collegiate student-athletes. Study Design: Cross-sectional study; Level of evidence, 3. Methods: We recruited 168 male student-athletes from collision sports: football, lacrosse, ice hockey, and wrestling (mean  $\pm$  SD age,  $19.2 \pm 1.3$  years; height,  $184.5 \pm 7.2$  cm; mass,  $94.3 \pm 15.9$  kg; estimated age of first exposure,  $8.6 \pm 3.1$  years; career duration,  $10.6 \pm 3.0$  years). All participants completed a baseline single- and dual-task gait assessment before the start of their athletic season. Inertial measurement units were used to measure gait speed and stride length. During the dual task, participants were asked to perform working memory cognitive tasks while walking. The dependent variables were single/dual-task gait speed and stride length, cognitive accuracy, and dual-task cost. The relationship between career duration, analyzed as a continuous variable, and the dependent variables was analyzed using a linear regression. Results: There were no significant associations between career duration and single-task gait speed ( $1.16 \pm 0.16$  m/s;  $\beta = -0.004$ ;  $P = .35$ ; 95% CI =  $-0.012$  to  $0.004$ ;  $\eta^2 = 0.005$ ) or dual-task gait speed ( $1.02 \pm 0.17$  m/s;  $\beta = -0.003$ ;  $P = .57$ ; 95% CI =  $-0.011$  to  $0.006$ ;  $\eta^2 = 0.002$ ). There were also no significant associations between career duration and single/dual-task stride length, cognitive accuracy, or dual-task cost. Conclusion: Career duration among collegiate collision sport athletes was not associated with single- or dual-task gait performance, suggesting that a greater exposure to repetitive head impacts is not detrimental to dynamic postural control at the college level. However, the effects of diminished gait

performance over the lifetime remain to be elucidated.

**Rodrigues, D. d. C., de Siqueira, V. S., da Costa, R. M., & Barbosa, R. M. (2022). Artificial Intelligence applied to smart interfaces for children's educational games. Displays, 74, Article 102217.**

#### **ABSTRACT**

Games for entertainment and fun are consolidated on the market. In this sense, using games to develop teaching material can help in the early childhood education teaching process. Students can learn content in a practical and fun way. A common problem in educational games is the way the game interface is presented to the player. Some developers do not give much attention to the adaptive details of children's game interfaces. Each child has a different motor evolution to play and the game interface shown on the mobile device screen should adapt to this. This factor can help or hinder the student's learning process when applying teaching methodology through an educational game. This paper describes an experimental study on artificial intelligence techniques used to customize educational game interfaces according to the player's profile. Thus, the game components are adapted in real-time for a better player experience. The empirical results indicate that children who used the proposed approach achieved superior performance compared with those who did not use the approach. Aspects related to the number of correct answers by the child were evaluated with regard to visual aspects, soundtrack, positioning of objects on the screen, and mobile device rotation. Other points evaluated were the patterns related to where the child made mistakes and the automatic adjustments made to improve the number of correct answers of the players participating in the study.



**Shen, Y., & Shao, W. (2022). Influence of Hybrid Pedagogical Models on Learning Outcomes in Physical Education: A Systematic Literature Review. *International Journal of Environmental Research and Public Health*, 19(15), Article 9673.**

**ABSTRACT**

Hybrid implementation of pedagogical models (PMs) helps to overcome the limitations of a single pedagogical model (PM) when it comes to improving student learning outcomes in physical education (PE). Empirical research on hybridizations has grown substantially in recent years, so the purpose of this study was to conduct a systematic review on the effects and mechanisms of different hybridizations on students' learning outcomes (i.e., motor, cognitive, affective, and social) in PE. Electronic databases, including ERIC, SCOPUS, EBSCO host, and Web of Science, were used to select intervention studies. After inclusion and exclusion criteria were applied, 17 high-quality studies, published in English peer-reviewed journals, were assessed. Results show that there were seven different hybrid models having impacts on students' learning outcomes, which could be divided into four categories: (1) game performance and technical skills; (2) understanding of tactics and decision-making abilities; (3) motivation, autonomy, and confidence; (4) interpersonal skills, cooperative learning ability, and responsibility. Length of implementation and teachers' familiarity were the main factors that limit the implementation on hybridizations. Future research should consider quasi-experiments with control groups of hybrids versus single models to figure out the advantages of the hybrid model over the single model; including more evidence from different schools, regions, and countries is necessary.

**Su, Z. (2022). Artificial Intelligence in the Auxiliary Guidance Function of Athletes' Movement Standard Training in Physical Education. Journal of Circuits Systems and Computers, 31(11), Article 2240001.**

**ABSTRACT**

Artificial Intelligence (AI) is a new technical science that studies and develops theories, methods, techniques and application systems for simulating, extending and expanding human intelligence. This paper is based on the research of AI in the auxiliary guidance function of athletes' standard training in physical education. It aims to conduct data mining from different aspects such as different joint angular speeds, motion injury screening and different parts of sports injuries and then integrate these aspects. Create a way to reduce athletes' injuries and scientific training. In order to improve the recognition efficiency of athletes' movement patterns, nonlinear auto regressive neural networks are used to recognize the movement patterns of athletes' limb surface signals. Through this research work, it can provide a certain reference basis and practice platform for the research on the auxiliary guidance role of AI in the sports standard training of athletes in physical education. Performance design and implementation include four modules: Image acquisition, preprocessing, motion detection and human motion recognition. Between them, the image acquisition module uses a memory mapping path to determine the format of the camera frame image, and the image format conversion is completed through channel conversion. Experimental data shows that athletes' strength quality, speed of action response, technical continuity, psychological stability and physical control ability have all been greatly improved. Among them, the most obvious is that with the assistance of AI technology, the psychological stability has reached 9.2; the strength quality has reached 9.1.

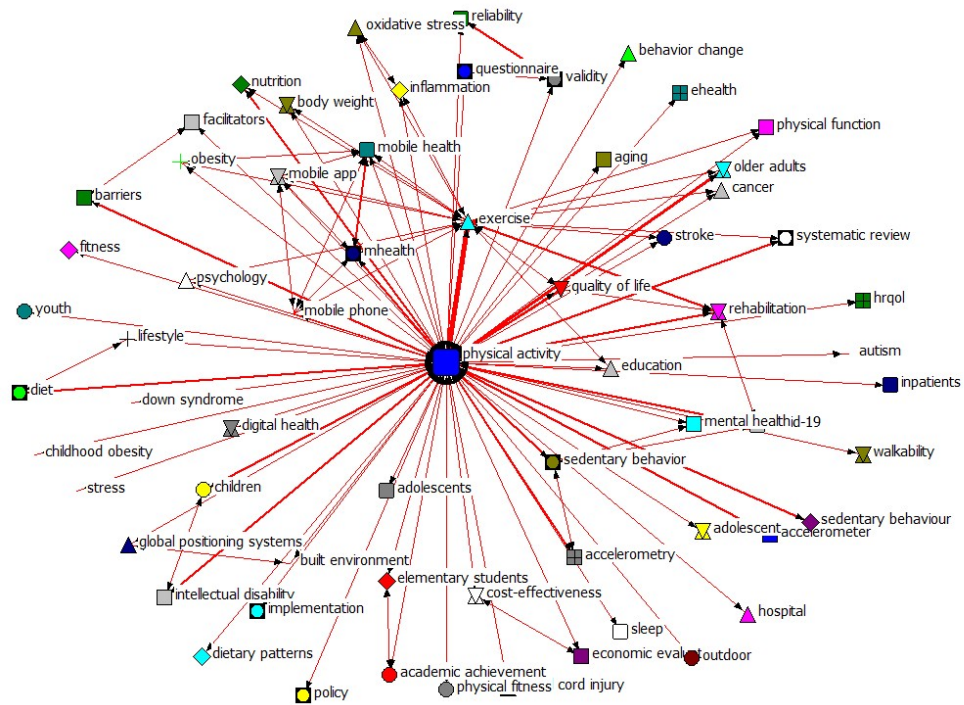
**Wei, W., & Liu, W. (2022). Sleep Pattern Is Related to Mental Health among Chinese Collegiate Student Athletes. *International Journal of Environmental Research and Public Health*, 19(15), Article 8961.**

**ABSTRACT**

Regarding the association between sleep and napping duration and mental health in young and older adults, some studies indicated a positive association, while others indicated a negative, or no, association between them. Moreover, collegiate student athletes have different mental health stressors, such as training pressure, improving sports performance, and relationships with coaches. Therefore, sleep is important for athletes. Whether sleep duration is related to their mental health is unclear. Thus, this study aimed to examine the association between nighttime sleep duration, daytime napping duration, and mental health among collegiate student athletes. This cross-sectional study included 700 college athletes. Sleep and daytime napping durations were assessed using a self-reported questionnaire. The Zung Self-rating Depression Scale and Generalized Anxiety Disorder-7 assessed mental health. A multivariate logistic regression analysis was conducted to examine the adjusted association between sleep duration and mental health. In this study, the odds ratios for depression and anxiety symptoms were significantly higher for short sleep duration (<7 h). Additionally, a significant positive association was found between daytime napping duration and the prevalence of depression. This study indicates that short nighttime sleep and long daytime napping duration may be risk factors for collegiate student athletes' mental health, having important implications for educators and coaches.

## 体医融合

本期体育教育学术研究供检索到英文相关文献 431 篇, 研究热点主要集中在不同患者身体活动方式、运动促进健康对慢性病干预治疗、远程康复治疗膝骨关节炎患者的运动管理等方面。检索结果: 1) 关键词共词分析。提取关键词 2003 个, 经过数据清洗后关键词为 1986 个, 词频为 2 以上的关键词有 232 个, 累计百分比 48.58%, 高频关键词有身体活动、肥胖、老年人、康复、节食、机能健康、有氧运动、营养等, 生成可视化知识图谱(见下图)。2) 来源期刊分析。涉及期刊 119 种, 其中载文 3 篇以上的期刊有 39 种, 累计百分比为 74.48%, 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 Q1、Q2), NUTRIENTS (JCR 学科分区 Q1), BMJ OPEN (JCR 学科分区 Q2)。3) 交叉学科分析。引用文献总计 19980 篇, 被引频次最高的达 22 次, 排名前三位的文献分别为 *World Health Organization 2020 guidelines on physical activity and sedentary behaviour*、*Exercise Guidelines for Cancer Survivors: Consensus Statement from International Multidisciplinary Roundtable*、*The Physical Activity Guidelines for Americans*。4) 学术关注度分析。文献级别用量最多的是 26 次, 排名前三位的文献分别为 *Impact of Clinical Pilates Exercise on Pain, Cardiorespiratory Fitness, Functional Ability, and Quality of Life in Children with Polyarticular Juvenile Idiopathic Arthritis*、*Is the Combination of Aerobic Exercise with Mat Pilates Better than Mat Pilates Training Alone on Autonomic Modulation Related to Functional Outcomes in Hypertensive Women? Secondary Analysis of a Randomized Controlled Trial*、*Effect of aerobic exercise as a treatment on type 2 diabetes mellitus with depression-like behavior zebra fish*。



**Carlos Venegas-Sanabria, L., Cavero-Redondo, I., Martinez-Vizcaino, V., Alberto Cano-Gutierrez, C., & Alvarez-Bueno, C. (2022). Effect of multicomponent exercise in cognitive impairment: a systematic review and meta-analysis. *Bmc Geriatrics*, 22(1), Article 617.**

**ABSTRACT**

Background: Multicomponent physical exercise is the most recommended type of physical intervention in older adults. Experimental data suggest the relevance of the muscle-brain axis and the relationship between muscle contraction and release of brain-derived neurotropic factor, however, the impact of this relationship on cognition remains unclear, especially in people with diagnosis of cognitive impairment. This study assesses the effect of multicomponent physical exercise on global cognition in people with mild cognitive impairment or dementia. Methods: Randomized controlled trials

published until January 2021 were searched across three electronic databases (PubMed, Scopus, and Cochrane Database). Data about exercises included in the multicomponent intervention (endurance, strength, balance, or flexibility), the inclusion of aerobic exercise, and the change in global cognition were extracted. The effect size was represented as a standardized mean difference. Risk of bias was assessed by the RoB2 tool. Results: A total of 8 studies were included. The overall effect size suggested an effect of multicomponent exercise on global cognition. However, the subgroup analysis showed an effect only when aerobic exercise was included in the intervention. No effect when mild cognitive impairment and dementia were assessed separately was found. Conclusion: This study suggests that multicomponent physical exercise could have an effect on global cognition in people with mild cognitive impairment or dementia only when aerobic exercise is included in the intervention. Our results support the inclusion of structured physical exercise programs in the management of people with cognitive impairment.

**Cena, H., Vandoni, M., Magenes, V. C., Di Napoli, I., Marin, L., Baldassarre, P., Calcaterra, V. (2022). Benefits of Exercise in Multidisciplinary Treatment of Binge Eating Disorder in Adolescents with Obesity. International Journal of Environmental Research and Public Health, 19(14), Article 8300.**

#### **ABSTRACT**

Obesity in childhood and adolescence represents a serious health problem worldwide. Similarly, eating disorders (EDs) are complex diseases that affect adolescents with an increasing prevalence and are an alarming health concern to both physical and mental health. Traditionally, obesity and EDs, particularly binge eating disorder (BED), have been considered separate conditions, but there is emerging evidence such as etiology,

comorbidities, risk factors, psychosocial impairment, and prevention approaches, highlighting important overlaps among these conditions. In youth, the two conditions share risk factors and consequences at both the physical and psychological levels, requiring special care. Exercise, useful as strategy to prevent and treat overweight conditions, may have beneficial effects on BED symptoms, suggesting that it may be considered as one of the key factors in the treatment of individuals affected by obesity with BED. The purpose of this narrative review is to examine the bidirectional impact of obesity and BED in adolescents, in terms of risk factors, etiology and comorbid conditions. Specifically, we focused on the benefits of physical activity (PA) in the multidisciplinary treatment of subjects affected by obesity with BED. Even though additional research is needed to reach conclusions about the role of exercise in the treatment of obesity and comorbid BED, especially in adolescents, promising results have already suggested that closely monitored exercise is safe and, paired with cognitive behavioral therapy, may provide multiple benefits on both the physical and psychological levels. Tailored and integrated treatments for weight management and eating disorders are important to promptly and effectively treat obese subjects that have BED.

**Cheng, Y., Mou, L., & Li, Z. (2022). Trends in adherence to recommended physical activity and its association with cardiovascular risk factors in US adults with cardiovascular disease: a cross-sectional study. *Bmc Cardiovascular Disorders*, 22(1), Article 413.**

#### **ABSTRACT**

Background: Being physically active is important for cardiovascular health. This study aimed to examine the trend in adherence to the physical activity guidelines (PAG) for

aerobic activity among US adults with a history of cardiovascular disease (CVD) and evaluated its association with cardiovascular risk factors. Methods: We studied participants from the national health and nutrition examination survey 2007–08 to 2017–18. Regression models were used to evaluate the significance of the trend and the association between adherences to the PAG with cardiovascular risk factors. Results: A total of 3638 participants were reported to have a history of CVD. The proportion of adherence to PAG significantly increased from 41.5% in 2007–08 to 54.3% in 2017–18. Males had a higher proportion of adherence compared to the females, while the trend in adherence was only significant in females. Adherence to the PAG was significantly associated with decreased levels of waist circumference, body mass index, hemoglobin A1c, and triglycerides. Conclusions: There is a significant increase in the proportion of adherence to the PAG among US adults with a history of CVD from 2007–08 to 2017–18, and adherence to the PAG was associated with improvement in cardiovascular risk factors.

**Elliott, J., Munford, L., Ahmed, S., Littlewood, A., & Todd, C. (2022). The impact of COVID-19 lockdowns on physical activity amongst older adults: evidence from longitudinal data in the UK. *Bmc Public Health*, 22(1), Article 1802.**

#### **ABSTRACT**

Background: A sedentary lifestyle increases the risk of adverse health outcomes and frailty, particularly for older adults. To reduce transmission during the COVID-19 pandemic, people were instructed to stay at home, group sports were suspended, and gyms were closed, thereby limiting opportunities for physical activity. Whilst evidence suggests that physical activity levels reduced during the pandemic, it is unclear whether the proportion of older adults realizing the recommended minimum level of physical



activity changed throughout the various stages of lockdown. Methods: We used a large sample of 3,660 older adults (aged  $\geq 65$ ) who took part in the UK Household Longitudinal Study's annual and COVID-19 studies. We examined changes in the proportion of older adults who were realizing the UK Chief Medical Officers' physical activity recommendations for health maintenance at several time points before and after COVID-19 lockdowns were imposed. We stratified these trends by the presence of health conditions, age, neighborhood deprivation, and pre-pandemic activity levels. Results: There was a marked decline in older adults' physical activity levels during the third national lockdown in January 2021. The proportion realizing the Chief Medical Officers' physical activity recommendations decreased from 43% in September 2020 to 33% in January 2021. This decrease in physical activity occurred regardless of health condition, age, neighbourhood deprivation, or pre-pandemic activity levels. Those doing the least activity pre-lockdown increased their activity during lockdowns and those doing the most decreased their activity levels. Conclusions: Reductions in older adults' physical activity levels during COVID-19 lockdowns have put them at risk of becoming deconditioned and developing adverse health outcomes. Resources should be allocated to promote the uptake of physical activity in older adults to reverse the effects of deconditioning.

**Fernandez-Rodriguez, R., Alvarez-Bueno, C., Cavero-Redondo, I., Torres-Costoso, A., Pozuelo-Carrascosa, D. P., Reina-Gutierrez, S., Martinez-Vizcaino, V. (2022). Best Exercise Options for Reducing Pain and Disability in Adults with Chronic Low Back Pain: Pilates, Strength, Core-Based, and Mind-Body. A Network Meta-analysis. Journal of Orthopaedic & Sports Physical Therapy, 52(8), 505-521.**

**ABSTRACT**

Objective: To determine which type of exercise is best for reducing pain and disability in adults with chronic low back pain (LBP). Design: Systematic review with a network meta-analysis (NMA) of randomized controlled trials (RCTs). Literature Search: Six electronic databases were systematically searched from inception to July 2021. Study Selection Criteria: RCTs testing the effects of exercise on reducing self-perceived pain or disability in adults (aged 18–65 years) with chronic LBP. Data Synthesis: We followed the PRISMA-NMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses, incorporating NMAs of health care interventions) statement when reporting our NMA. A frequentist NMA was conducted. The probability of each intervention being the most effective was conducted according to surface under the cumulative ranking curve (SUCRA) values. Results: We included 118 trials (9710 participants). There were 28 head-to-head comparisons, 7 indirect comparisons for pain, and 8 indirect comparisons for disability. Compared with control, all types of physical exercises were effective for improving pain and disability, except for stretching exercises (for reducing pain) and the McKenzie method (for reducing disability). The most effective interventions for reducing pain were Pilates, mind-body, and core-based exercises. The most effective interventions for reducing disability were Pilates, strength, and core-based exercises. On SUCRA analysis, Pilates had the highest likelihood for reducing pain (93%) and disability (98%). Conclusion: Although most exercise interventions had benefits for managing pain and disability in chronic LBP, the most beneficial programs were those that included (1) at least 1 to 2 sessions per week of Pilates or strength exercises; (2) sessions of less than 60 minutes of core-based, strength, or mind-body exercises; and (3) training programs from 3 to 9 weeks of Pilates and core-based exercises.

**Grooten, W. J. A., Bostrom, C., Dederling, A., Halvorsen, M., Kuster, R. P., Nilsson-Wikmar, L., . . . Rasmussen-Barr, E. (2022). Summarizing the effects of different exercise types in chronic low back pain - a systematic review of systematic reviews. *Bmc Musculoskeletal Disorders*, 23(1), Article 801.**

## **ABSTRACT**

Background: In chronic LBP (CLBP), guideline-endorsed treatment is to stay active, return to normal activity, and to exercise. Several reviews on various exercise types used in CLBP have been published. We aimed to identify systematic reviews of common exercise types used in CLBP, to appraise their quality, and to summarize and compare their effect on pain and disability. Methods: We searched the databases OVID MEDLINE, EMBASE, COCHRANE LIBRARY, and WEB OF SCIENCE (Core collection) for systematic reviews and meta-analyses on adults between 18 and 70 years of age suffering from chronic or recurrent LBP for a period of at least 12 weeks, which investigated the effects of exercises on pain and disability. All searches were conducted without language restriction. The search was performed up until 2022-01-26. The included reviews were grouped into nine exercise types: aerobic training, aquatic exercises, motor control exercises (MCE), resistance training, Pilates, sling exercises, traditional Chinese exercises (TCE), walking, and yoga. The study quality was assessed with AMSTAR-2. For each exercise type, a narrative analysis was performed, and the level of evidence for the effects of exercise was assessed through GRADE. Results: Our database search resulted in 3,475 systematic reviews. Out of the 253 full texts that were screened, we included 45 systematic reviews and meta-analyses. The quality of the included reviews ranged from high to critically low. Due to large heterogeneity, no meta-analyses were performed. We found low-to-moderate evidence of mainly short-term and small beneficial effects on pain and disability for MCE, Pilates,

resistance training, TCE, and yoga compared to no or minimal intervention. Conclusions: Our findings show that the effect of various exercise types used in CLBP on pain and disability varies with no major difference between exercise types. Many of the included systematic reviews were of low-to-moderate quality and based on randomized controlled trials with high risk of bias. The conflicting results seen undermine the certainty of the results leading to very-low-to-moderate quality of evidence for our results. Future systematic reviews should be of higher quality to minimize waste of resources.

**Lee, J. H., Shin, K. H., Han, S.-B., Hwang, K. S., Lee, S. J., & Jang, K.-M. (2022). Prospective comparative study between knee alignment-oriented static and dynamic balance exercise in patellofemoral pain syndrome patients with dynamic knee valgus. *Medicine*, 101(37), Article e30631.**

#### **ABSTRACT**

Exercise therapy has been reported as an effective treatment method for patellofemoral pain syndrome (PFPS). However, there is a lack of studies regarding the effectiveness of balance exercise in the treatment of patients with PFPS. This study aimed to prospectively compare changes in proprioception, neuromuscular control, knee muscle strength, and patient-reported outcomes between patients with PFPS treated with knee alignment-oriented static balance exercise (SBE) and dynamic balance exercise (DBE). The participants were divided into 2 groups: 17 knee alignment-oriented SBE group and 19 knee alignment-oriented DBE group. Proprioception was assessed by dynamic postural stability using postural stabilometry. Neuromuscular control and knee muscle strength were measured for acceleration time and peak torque in quadriceps muscle using an isokinetic device. Patient-reported outcomes were evaluated using a visual analog scale for pain and the Kujala Anterior Knee Pain Scale. There was greater

improvement in dynamic postural stability ( $0.9 \pm 0.3$  vs  $1.2 \pm 0.5$ ; 95% confidence interval [CI]: 0, 0.6; Effect size: 0.72;  $P = .021$ ) and quadriceps AT ( $40.5 \pm 14.3$  vs  $54.1 \pm 16.9$ ; 95% CI: 2.9, 24.2; Effect size: 0.86;  $P = .014$ ) in the DBE group compared to the SBE group. Knee alignment-oriented DBE can be more effective in improving dynamic postural stability and quadriceps muscle reaction time compared with the knee alignment-oriented SBE in PFPS patients with dynamic knee valgus.

**Manuel Jurado-Castro, J., Munoz-Lopez, M., Sanchez-Toledo Ledesma, A., & Ranchal-Sanchez, A. (2022). Effectiveness of Exercise in Patients with Overweight or Obesity Suffering from Knee Osteoarthritis: A Systematic Review and Meta-Analysis. International Journal of Environmental Research and Public Health, 19(17), Article 10510.**

#### **ABSTRACT**

**Objectives:** The main purpose of this study was to review the evidence about the effectiveness of exercise in patients with overweight or obesity suffering from knee osteoarthritis. **Methods:** Randomized clinical trials (RCTs) published between January 2002 and May 2022 were included. **Results:** A total of 64 articles were identified, of which six met the criteria for meta-analysis. The pain scale score was higher in the control group (mean difference 0.95; confidence interval 0.42–1.47;  $p < 0.001$ ;  $I^2 = 44\%$ ). The physical function scale (lower scores indicate lower levels of symptoms or physical disability) presented a higher score in the control group (mean difference 3.74; confidence interval 0.85–6.53;  $p < 0.05$ ;  $I^2 = 56\%$ ). Moreover, the intervention group achieved a greater distance (meters) walking in a 6 min interval (mean difference 38.18; confidence interval 20.01–56.35;  $p < 0.001$ ;  $I^2 = 0\%$ ). **Conclusions:** Exercise interventions seem effective in improving quality of life in people with overweight or

obesity suffering from knee osteoarthritis, reducing pain and improving physical function.

**McKeon, G., Curtis, J., & Rosenbaum, S. (2022). Promoting physical activity for mental health: an updated evidence review and practical guide. *Current Opinion in Psychiatry*, 35(4), 270-276.**

#### **ABSTRACT**

Purpose of review: The aim of this study was to provide psychiatrists with the knowledge, tools and guidance to support physical activity promotion in clinical practice. The review also aims to provide an up-to-date summary of the evidence regarding physical activity in the prevention and treatment of mental disorders in adults.

Recent findings: There is emerging evidence demonstrating that physical activity can protect against incident anxiety and depression. There is robust evidence showing that physical activity is an effective adjunct treatment strategy for depressive disorders and anxiety and stress-related disorders, with emerging evidence for schizophrenia and bipolar disorders. Translation of this evidence into practice is in general ad hoc, and large physical health disparities for people with mental disorders persist. The reasons for this are multifactorial, and include the intersection of social, economic and personal barriers to physical activity. Evidence-based approaches include regular screening of physical activity levels, staff culture change within mental health services and established referral pathways. Summary: Translation of evidence regarding physical activity for mental health into routine programmes is critical. Efforts to move beyond solely targeting individual-level barriers to physical activity and address systemic barriers include lack of access to appropriate exercise services. This requires consideration of training needs, service structure and culture change.

**Patnode, C. D., Redmond, N., Iacocca, M. O., & Henninger, M. (2022). Behavioral Counseling Interventions to Promote a Healthy Diet and Physical Activity for Cardiovascular Disease Prevention in Adults Without Known Cardiovascular Disease Risk Factors Updated Evidence Report and Systematic Review for the US Preventive Services Task Force. *Jama-Journal of the American Medical Association*, 328(4), 375-388.**

## **ABSTRACT**

Importance: Unhealthful dietary patterns, low levels of physical activity, and high sedentary time increase the risk of cardiovascular disease. Objective: To synthesize the evidence on benefits and harms of behavioral counseling interventions to promote a healthy diet and physical activity in adults without known cardiovascular disease (CVD) risk factors to inform a US Preventive Services Task Force recommendation. Data Sources: MEDLINE, PsycINFO, and the Cochrane Central Register of Controlled Trials through February 2021, with ongoing surveillance through February 2022. Study Selection Randomized clinical trials (RCTs) of behavioral counseling interventions targeting improved diet, increased physical activity, or decreased sedentary time among adults without known elevated blood pressure, elevated lipid levels, or impaired fasting glucose. Data Extraction and Synthesis: Independent data abstraction and study quality rating and random effects meta-analysis. Main Outcomes and Measures: CVD events, CVD risk factors, diet and physical activity measures, and harms. Results: One-hundred thirteen RCTs were included (N = 129 993). Three RCTs reported CVD-related outcomes: 1 study (n = 47 179) found no significant differences between groups on any CVD outcome at up to 13.4 years of follow-up; a combined analysis of the other 2 RCTs (n = 1203) found a statistically significant association of the intervention with nonfatal

CVD events (hazard ratio, 0.27 [95% CI, 0.08 to 0.88]) and fatal CVD events (hazard ratio, 0.31 [95% CI, 0.11 to 0.93]) at 4 years. Diet and physical activity behavioral counseling interventions were associated with small, statistically significant reductions in continuous measures of blood pressure (systolic mean difference,  $-0.8$  [95% CI,  $-1.3$  to  $-0.3$ ]; 23 RCTs [n = 57 079]; diastolic mean difference,  $-0.4$  [95% CI,  $-0.8$  to  $-0.0$ ]; 24 RCTs [n = 57 148]), low-density lipoprotein cholesterol level (mean difference,  $2.2$  mg/dL [95% CI,  $-3.8$  to  $-0.6$ ]; 15 RCTs [n = 6350]), adiposity-related outcomes (body mass index mean difference,  $-0.3$  [95% CI,  $-0.5$  to  $-0.1$ ]; 27 RCTs [n = 59 239]), dietary outcomes, and physical activity at 6 months to 1.5 years of follow-up vs control conditions. There was no evidence of greater harm among intervention vs control groups. Conclusions and Relevance: Healthy diet and physical activity behavioral counseling interventions for persons without a known risk of CVD were associated with small but statistically significant benefits across a variety of important intermediate health outcomes and small to moderate effects on dietary and physical activity behaviors. There was limited evidence regarding the long-term health outcomes or harmful effects of these interventions.

**Yang, W., Liang, X., & Sit, C. H.-P. (2022). Physical activity and mental health in children and adolescents with intellectual disabilities: a meta-analysis using the RE-AIM framework. *International Journal of Behavioral Nutrition and Physical Activity*, 19(1), Article 80.**

#### **ABSTRACT**

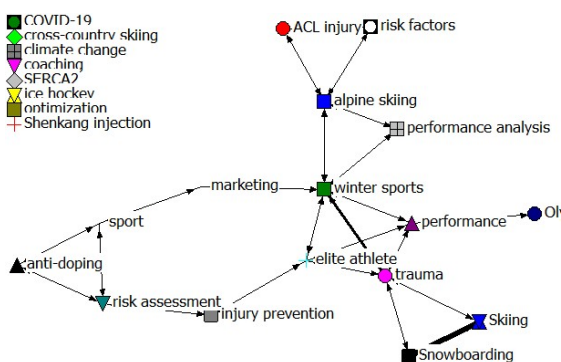
Background: Children and adolescents with intellectual disabilities (IDs) tend to have lower levels of physical activity and poorer mental health than their typically developing peers. Studies on the effects of physical activity on the mental health of children with



IDs using the Reach, Effectiveness, Adoption, Implementation, and Maintenance (RE-AIM) framework are scarce. Methods: A systematic literature review using six databases (CINAHL, Eric, PsycINFO, PubMed, SPORTDiscus, and Web of Science) was conducted from January 2000 to September 2021. Studies reporting at least one physical activity intervention and mental health outcome in children and adolescents with IDs aged between 5 and 17 years were included in the meta-analysis. Preferred Reporting Items for Systematic Review and Meta-Analysis guideline, Comprehensive Meta-Analysis, and the RE-AIM framework were utilized. Results: A total of 15 studies that met the inclusion criteria were included in the meta-analysis. The effects of physical activity on mental health in children and adolescents with IDs were significant and large (Hedges'  $g = 0.897$ ,  $p < 0.01$ ), with medium effects on psychological health (Hedges'  $g = 0.542$ ,  $p < 0.01$ ) and large effects on cognitive function (Hedges'  $g = 1.236$ ,  $p < 0.01$ ). Randomized controlled trial (RCT) design and intervention components ( $> 120$  minutes per week, therapeutic, and aerobic exercise) demonstrated the strongest effects. Moreover, study background (publication year, study location, and sample size), participant characteristics (age and sex), and Maintenance (RE-AIM framework) moderated the effects of physical activity on mental health. Based on the RE-AIM framework, there were higher proportions in the dimensions of Reach and Effectiveness than Adoption, Implementation, and Maintenance. Conclusions: Physical activity appears to have positive effects on mental health, including psychological health and cognitive function, in children and adolescents with IDs. Physical activity interventions using the RE-AIM framework are recommended to assess short- and long-term impacts and translate scientific evidence into practice.

## 冰雪运动

本期冰雪运动学术研究供检索到英文相关文献 174 篇，研究热点主要集中在滑雪运动损伤及其预防、滑雪场空间格局及综合评估、冬季项目运动成绩表现等领域。检索结果：1) 关键词共词分析。提取关键词 660 个，经过数据清洗后关键词为 645 个，词频为 2 以上的关键词有 26 个，累计百分比 8.78%，高频关键词有滑雪、冬季运动、高山滑雪、损伤预防、气候变化、成绩表现、风险评估等，生成可视化知识图谱（见下图）。2) 来源期刊分析。涉及期刊 71 种，其中载文 3 篇以上的期刊有 6 种，累计百分比为 52.82%，刊载冰雪运动前三位的期刊分别为：INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH（JCR 学科分区 Q1、Q2），JOURNAL OF STRENGTH AND CONDITIONING RESEARCH（JCR 学科分区 Q1），METABOLITES（JCR 学科分区 Q2）。3) 交叉学科分析。引用文献总计 6925 篇，最多的频次为 5 次，排名前三位的文献分别为：*Alpine Skiing Injuries*、*Risk factors for injuries in alpine skiing, telemark skiing and snowboarding - case-control study*、*Extinction risk and conservation of the world's sharks and rays*。4) 学术关注度分析。文献级别用量最高的是 29 次，排名前三位的文献分别为 *Framing the Games: US Media Coverage of the Beijing 2022 Winter Olympics*、*The Deep Integration of China's Regional Ice-Snow Industry and Ecocultural Tourism under the Background of Beijing Winter Olympic Games: Taking Hunan as an Example*、*Sustainable Development of Olympic Sport Participation Legacy: A Scoping Review Based on the PAGER Framework*。



**Ainegren, M., Linnamo, V., & Lindinger, S. (2022). Effects of Aerodynamic Drag and Drafting on Propulsive Force and Oxygen Consumption in Double Poling Cross-Country Skiing. *Medicine & Science in Sports & Exercise*, 54(7), 1058-1065.**

## **ABSTRACT**

Purpose: This study aimed to investigate the effects of aerodynamic drag and drafting on propulsive force (FPROP), drag area (CDA), oxygen cost ( $\dot{V} \cdot O_2$ ), metabolic rate ( $\dot{E}$ ), and heart rate (HR) during roller skiing on a treadmill in a wind tunnel using the double poling technique. A secondary aim was to investigate the effects of wind versus no-wind test conditions on the same physiological parameters. Methods: Ten subjects of each gender participated in the experiments. One pair of skiers of the same gender roller skied simultaneously in line with the air flow; the distance between the skiers was  $\sim 2.05$  m. Each pair was tested as follows: I) with wind, leading; II) with wind, drafting; and III) without wind. The treadmill inclination was  $0^\circ$  throughout the tests. For the wind conditions, the air velocity was similar to the treadmill belt speed: 3 to 7  $m \cdot s^{-1}$  for men and 3 to 6  $m \cdot s^{-1}$  for women. Results: Drafting resulted in significantly ( $P < 0.05$ ) lower FPROP, CDA,  $\dot{V} \cdot O_2$ , and  $\dot{E}$ , compared with leading, for both genders at racing speed but not at lower speeds, whereas HR was only affected for the male skiers at racing speed. The test without wind resulted in significantly lower FPROP,  $\dot{V} \cdot O_2$ , and  $\dot{E}$  at all tested speeds compared with the tests with wind present, whereas HR was lower only at higher speeds. Conclusions: At racing speed, but not at lower speeds, the positive effects of drafting behind a skier during double poling were obvious and resulted in a lower FPROP, CDA,  $\dot{V} \cdot O_2$ ,  $\dot{E}$ , and HR. Tests without wind present put even lower demands on the skiers' physiology, which was also evident at lower speeds.

**Crandall, A. S., Mamolo, S., & Morgan, M. (2022). SkiMon: A Wireless Body Area Network for Monitoring Ski Flex and Motion during Skiing Sports. *Sensors*, 22(18), Article 6882.**

#### **ABSTRACT**

Monitoring and gathering data on sporting activities holds significant promise for athletes, equipment developers, and physical fitness clinicians. Wireless Body Area Networks are being used in sporting environments as a means of gathering data, providing feedback, and helping to gain understanding of athletic activities. Applying WBANs to skiing situations, which have higher vibration, velocities, and damp environments than many other sports, can open up opportunities to understand the dynamics of skiing equipment behaviors, skiing routes on mountains, and how individuals react when skiing. To support these outcomes, a prototype WBAN-style off the shelf component system called SkiMon was proposed, implemented, and tested. The SkiMon system uses inexpensive ESP8266, Raspberry Pi, and sensor devices to gather high quality motion and location tracking data on skiers in real-world skiing conditions. By using IEEE 802.11b/g/n wireless networks, SkiMon is able to sample data at a minimum of 50 Hz, which is enough to model most ski vibration behaviors. These data results are shown to reflect ground truth 3D maps and the acceleration data comports with earlier works on ski vibration testing. Overall, a WBAN-based commodity components solution shows promise as a high quality sensor platform for tracking and modeling skiing activities.

**Delibasic, B., Radovanovic, S., Jovanovic, M. Z., Obradovic, Z., Suknovic, M., & Lojic, R. (2022). A study on ski groups size and their relationship to the risk of injury. Proceedings of the Institution of Mechanical Engineers Part P-Journal of Sports Engineering and Technology.**

#### **ABSTRACT**

This paper addresses a novel topic in ski injury research - how a ski group size indicates the risk of ski injury. There is evidence in research literature that people ski in groups. However, the relationship between group size and the risk of injury has remained unexplored. Based on ski lift entrance data, we use the density-based clustering algorithm OPTICS to identify groups of skiers and discuss the advantages of using this algorithm. We show that the ski group size can be used to improve the identification of skiers who experience ski injury. The results of the identification of ski groups at Mt. Kopaonik Ski Resort in Serbia show that skiing alone is most susceptible to ski injury, while skiing in couples or in bigger groups reduces the risk of injury by 46%. In addition, it is confirmed that ski injuries are an early failure event phenomena. Based on the CHAID decision tree analysis, spending a small amount of time at the ski resort and skiing alone are associated with the: 6 times greater ski injury risk than the average ski injury risk.

**Happ, E., & Schnitzer, M. (2022). Ski touring on groomed slopes: Analyzing opportunities, threats and areas of conflict associated with an emerging outdoor activity. Journal of Outdoor Recreation and Tourism-Research Planning and Management, 39, Article 100521.**

#### **ABSTRACT**

Ski touring on groomed slopes (= slope ski touring) has experienced a boom in recent

years. However, investigations in terms of slope ski touring and ski tourers are scarce. Thus, there has been a call for more research that also encompasses stakeholders' opinions. This study aims to provide deeper insights into the trend of slope ski touring along with associated risks and opportunities as well as areas of conflict. Two qualitative studies were conducted: Study A covered interviews with 14 slope ski touring experts; study B surveyed 14 ropeway industry experts, who represented the main stakeholder groups. The results revealed that slope ski touring is an emerging trend (RQ1), since there is an increased number of ski tourers in ski resorts. The growing numbers of slope ski tourers are giving rise to economic, health and social opportunities. Both expert groups confirmed that this emerging trend is also associated with certain burden—relating to safety issues due to overcrowding on the one hand and to financial burdens for the ropeway infrastructure (RQ2) on the other. The studies also showed that there are areas of conflict, for example, due to a lack of ascent tracks, adverse behavior leading to rule violations and scarce parking. Furthermore, conflicts could be noted between different groups on the mountain (especially alpine skiers vs. slope ski tourers; slope ski tourers vs. mountain ropeway operators); eventually, ropeway operators have often been facing the financial burden of receiving no income from slope ski tourers. Solutions that could nip the burdens, risks and conflicts are still few and answers are missing (RQ3 and RQ4).

**Pappa, D., & Kaliampakos, D. (2022). Assessing the externalities of a ski resort in Tzoumerka: willingness to pay in order to promote or to prevent its construction. *Journal of Mountain Science*, 19(8), 2420-2434.**

#### **ABSTRACT**

The present study aims to assess the externalities of a ski resort, that is planned to be

built at Tzoumerka mountains, in Greece. The research relies on the Contingent Valuation method, which indirectly estimates the economic value of environmental and other nonmarket assets, based on the expressed preferences of members of a social group. The investigation was based on primary data. The core idea of questionnaire's design, is subject to the use of a double WTP (willingness to pay) question, aiming at the monetary assessment of the attitude of the residents, regarding the upcoming infrastructure project, taking into account both its positive and its negative externalities. Depending on the attitude of the survey respondents, they were asked to decide if they wish to offer an amount of money either to promote or to prevent the construction of the ski resort. Parametric and non-parametric models were then applied in order to calculate in economic terms the expressed opinion of the respondents. The primary question to be answered is whether the willingness to build the ski resort holds a higher economic value than the desire to prevent it. According to the results of the survey, the vast majority of residents (92.4%) supported the idea of building the ski resort, projecting their apparent desire for the tourist and economic development of the area. The reinforcement of the construction idea of the project was estimated on average at € 378,200. The very low proportion of the participants who disagreed with the project (5%), did not allow the economic assessment of its prevention, leaving room for further research into the application of Contingent Valuation method and its contribution in cost-benefit analysis and decision making, regarding upcoming projects.

**Ruedl, G., Posch, M., Tecklenburg, K., Schranz, A., Faulhaber, M., Pocecco, E., & Burtscher, M. (2022). A Comparison of ACL Injury Risk, Ski Geometry and Standing Height Parameters between Skiers with Rented and with Owned Skis. *International Journal of Environmental Research and Public Health*, 19(17), Article 11124.**

#### **ABSTRACT**

Aim: to evaluate if ACL injuries are associated with recreational skiers using rented skis and whether individual factors, ski geometry parameters and standing heights differ between skiers who rented or owned skis. A retrospective questionnaire-based, case-control study of ACL-injured and uninjured recreational skiers was conducted during six winter seasons. Age, sex, body height, body weight, nationality, ownership of skis, skill level, risk-taking behavior, ski length, side-cut radius, widths of the tip, waist, and tail, and the standing heights at the front and rear components of the ski binding were assessed. Additionally, ratios between ski widths and a standing height ratio were calculated. Altogether, 1780 skiers (48.9% females) with a mean age of  $39.2 \pm 13.0$  years participated, of whom 22.0% sustained an ACL injury and 32.3% rented skis. ACL injury risk was significantly associated with rented skis (OR 3.2, 95% CI 2.5–4.0). Compared to skiers using own skis, participants who rented skis were more likely female, smaller and lighter, tourists, less skilled and more cautious. In comparison to owned skis, rented skis showed significantly lower mean values in ski length, side-cut radius, ski widths, and for the three ski widths ratios. Additionally, standing heights were significantly lower while standing height ratio was higher for rented skis. Beside individual factors, equipment-related factors should be considered when renting skis in order to reduce ACL injury risk.



**Sollie, O., & Losnegard, T. (2022). Sex Differences in Physiological Determinants of Performance in Elite Adolescent, Junior, and Senior Cross-Country Skiers. International Journal of Sports Physiology and Performance, 17(8), 1304-1311.**

## **ABSTRACT**

**Purpose:** To compare sex differences in physiological determinants of skiing performance in elite adolescent, junior, and senior cross-country skiers matched for within-age-group performance level. **Methods:** Eight male and 12 female adolescent (15 [1] y), 8 male and 7 female junior (18 [1] y), and 7 male and 6 female senior (28 [5] y) skiers participated. Gross efficiency was calculated during submaximal uphill treadmill roller skiing (approximately 84% of peak oxygen uptake [ $\dot{V}O_{2peak}$ ]) using the G2 ski-skating technique. Distance covered,  $\dot{V}O_{2peak}$ , and maximal accumulated oxygen deficit were established from a 3-minute time-trial. Fifteen-second maximal skiing power was calculated from an incremental treadmill speed test. Finally, upper- and lower-body maximal strength tests were conducted. **Results:** The 3-minute time-trial distance and maximal skiing power were, respectively, 23% and 15% (adolescent), 24% and 19% (junior), and 17% and 14% (senior) greater for men than women (all groups,  $P \leq .01$ , effect size [ES] = 2.43–4.18; very large).  $\dot{V}O_{2peak}$  relative to body mass was 17% (adolescent,  $P = .002$ , ES = 1.66, large), 21% (junior,  $P < .01$ , ES = 2.60, very large), and 19% (senior,  $P < .01$ , ES = 2.35, very large) greater for men than women. The within-age-group sex differences in gross efficiency, relative accumulated oxygen deficit, and strength were not significant, with the exception of greater lower-body strength in male than female juniors ( $P = .01$ , ES = 1.26, large). **Conclusion:** The within-age-group sex difference in skiing performance is of similar magnitude for adolescent, junior, and senior skiers. This difference can likely be attributed to the large to very large sex difference in  $\dot{V}O_{2peak}$  within all age-groups.

**Suc, N., Vidmar, G., Erpic, S. C., & Lesnik, B. (2022). Life satisfaction and athletic identity among Olympic para-alpine skiers: a survey. *International Journal of Rehabilitation Research*, 45(3), 267-272.**

#### **ABSTRACT**

The objective of this study was to examine life satisfaction and athletic identity among para-alpine skiers and explore their associations with sociodemographic, sports practice, and disability-related characteristics of the participants. The respondents to the on-site survey were 129 para-alpine ski racers with acquired disability from 33 countries on all five continents who competed in the Paralympic games in Sochi (aged 16–53 years, mean and median 30 years, 100 men). Two self-developed assessment instruments were used – a 7-point Likert-type life-satisfaction questionnaire probing seven domains (health, family, education, freedom, friends, travelling, and self) and the Athletic Identity Scale (AIS; possible score range 17–85). The independence between life-satisfaction items was confirmed by low interitem correlations (largest absolute value <0.25, 15 of 21, and <0.15). The estimated internal-consistency reliability (Guttman lambda-2) of AIS was 0.65. The reported life satisfaction was very high (median of 6 for all domains except education, where it was 5). Like life-satisfaction ratings, the AIS scores were also very high on average (mean and median score 81). In general, the level of life satisfaction and athletic identity were not notably associated with sociodemographic, sports practice, and disability characteristics of the participants. The likely reason is high average and, hence, low variability of life-satisfaction ratings, as well as imperfect metric characteristics of the AIS. Nonetheless, the overall findings encourage further research into factors that drive the participation of disabled athletes in (winter) Paralympic games and the possible role of the rehabilitation process in this regard.

**Toivo, K., Vaha-Ypya, H., Kannus, P., Tokola, K., Alanko, L., Heinonen, O. J., Vasankari, T. (2022). Physical activity measured by accelerometry among adolescents participating in sports clubs and non-participating peers. *European Journal of Sport Science*.**

#### **ABSTRACT**

The purpose of this descriptive cross-sectional study is to describe the amount and intensity of physical activity (PA) measured by accelerometry among adolescents participating in organized sports (SCP) and age-matched non-participating peers (NP). SCPs (332) and NPs (139) wore an accelerometer on the hip for seven days. PA was reported using the 1-min exponential moving average. The current moderate-to-vigorous physical activity (MVPA) recommendation of at least an average of 60 min of MVPA daily was reached by 85% of SCPs and 45% of NPs ( $p < .001$ ). During training days, the MVPA times among SCPs ranged from  $153 \pm 39$  min in males and  $109 \pm 35$  min in females participating in basketball to  $113 \pm 33$  min in males participating in floorball and  $83 \pm 32$  min in females participating in gymnastics. Sports participation contributes rather strongly to the accumulation of the recommended amount of MVPA. During training days, SCPs, except for females participating in gymnastics, accumulated more MVPA than NPs. During non-training days, only males participating in cross-country skiing and females participating in track and field accumulated more MVPA than NPs.

**HIGHLIGHTS:** PA of Finnish adolescents participating in nine different organized sports and age-matched non-participating peers was measured by accelerometry for one week and the results are reported using the 1-min exponential moving average. Adolescents participating in many organized sports accumulated more PA than non-participants; this was observed in meeting the PA recommendations, total amount of

PA at different intensities, and step count. The current PA recommendation of at least an average of 60 min of MVPA per day was reached by 85% of SCPs and 45% of non-participating peers. Vigorous physical activity at least three times per week was incorporated by 96% of SCPs and 81% of NPs. During training days, males participating in soccer, basketball, and cross-country skiing spent more time in MVPA than females participating in the same sports. During non-training days, the time spent in MVPA was similar between males and females participating in sports clubs.

**Wallner, B., Rugg, C., Paal, P., & Stroehle, M. (2022). Collisions with another person while skiing and snowboarding: A 13-year national registry analysis. *Injury-International Journal of the Care of the Injured*, 53(7), 2485-2492.**

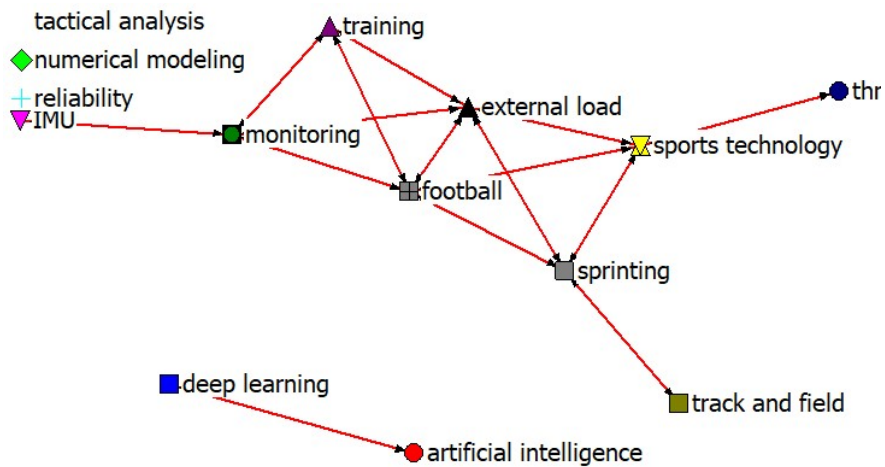
#### **ABSTRACT**

Introduction: Interindividual collisions while skiing or snowboarding occur regularly, they can be associated with severe injuries. Objective: To elucidate causes of accidents, injury patterns and potential risk factors for injury severity in interindividual collisions of skiers and snowboarders. Material and Methods: Retrospective analysis of the Austrian Registry for Mountain Accidents within a 13-year timeframe (2005 – 2018) with regard to on- or off-piste collisions of skiers and snowboarders. Results: A total of 30,503 collisions, involving 52,430 (85.9%) skiers and 8,576 (14.1%) snowboarders were analysed. Denominators are lacking, since total numbers of skiers and snowboarders were not available. Compared to skiers, snowboarders were younger (23 vs. 42 years;  $p < 0.001$ ), predominantly male (77.4% vs. 61.0%;  $p < 0.001$ ) and less often severely injured (46.8% vs. 26.2%;  $p < 0.001$ ). Most accidents occurred on slopes (>95%). Collisions involving two snowboarders occurred proportionally more often in terrain parks (4.1% of 1,664 injured snowboarders;  $p < 0.001$ ) and while one victim was

standing or sitting (9.7%;  $p < 0.001$ ). Contusions/strains/sprains were most prevalent (>23%), as were head injuries (>12%). In skiers, chest, shoulder, hip, thigh and knee injuries occurred more often, leading to fractures, dislocations, concussions and internal injuries more frequently. In snowboarders, spine/back, elbow, forearm, wrist and lower leg injuries were more prevalent. Female gender and standing or sitting prior to the accident was a risk factor for being more severely injured in collisions involving i) two skiers (OR: 4.02 (3.79 - 4.26) and 3.91 (3.26 - 4.68)), ii) a skier and a snowboarder (OR: 4.50 (3.95 - 5.14) and 11.49 (8.04 - 16.41)) or iii) two snowboarders (OR: 2.85 (2.12 - 3.84) and 12.47 (6.17 - 25.20)). Wearing a helmet increased the risk when two skiers collided (OR: 1.10 (1.03 - 1.17)). In skier vs. snowboarder collisions, the skier had a higher risk of being injured more severely (OR: 7.93 (6.98 - 9.01)). Conclusions: In interindividual collisions of skiers and snowboarders, injury patterns and preceding causes differ substantially. Skiers are more likely to be severely injured. Awareness of an increased risk of injury should be raised particularly while standing or sitting on the slope.

## 体育工程

本期体育工程学术研究共检索到英文相关文献 38 篇，研究热点主要集中为智能传感器网络的多学科协作模型在运动训练中的应用、三大球比赛成绩预测的新算法、智能穿戴产品的开发等方面。检索结果：1) 关键词共词分析。提取关键词 194 个，经过数据清洗后关键词有 178 个，词频为 2 及以上的关键词有 14 个，累计百分比为 15.46%，高频关键词有人工智能、深度学习、战略分析、数值模型、田径等，生成可视化知识图谱（见下图）。2) 来源期刊分析。涉及期刊 23 种，其中载文 3 篇及以上的期刊有 9 种，所载文献累计百分比为 54.33%，刊载体育工程前三位的期刊分别为：PROCEEDINGS OF THE INSTITUTION OF MECHANICAL ENGINEERS PART P-JOURNAL OF SPORTS ENGINEERING AND TECHNOLOGY（JCR 学科分区 Q4），COMPUTATIONAL INTELLIGENCE AND NEUROSCIENCE（JCR 学科分区 Q2、Q3），WIRELESS COMMUNICATIONS MOBILE COMPUTING（JCR 学科分区 Q3）。3) 学科交叉分析。引用文献总计 2126 篇，最多的频次为 3 次，排名前三位的分别为 *Competing with Lower Level Opponents Decreases Intra-Team Movement Synchronization and Time-Motion Demands during Pre-Season Soccer Matche*、*Association between Training Load and Well-Being Measures in Young Soccer Players during a Season*、*Virtual Reality-Based Cognitive Stimulation on People with Mild to Moderate Dementia due to Alzheimer's Disease: A Pilot Randomized Controlled Trials*。4) 学术关注度分析。文献级别用量最高的是 25 次，排名前三位的分别为 *A high output triboelectric nanogenerator integrated with wave-structure electrode for football monitoring*、*A Wearable Flexible Acceleration Sensor for Monitoring Human Motion*、*Concurrent validity and intra-unit reliability of the Speedtrack X radar gun device for measuring tennis ball speed*。



**Fernandes, R., Martins, A. D., Clemente, F. M., Brito, J. P., Nobari, H., Reis, V., & Oliveira, R. Variations of distance and accelerometry-based GPS measures and their influence on body composition in professional women soccer players. Proceedings of the Institution of Mechanical Engineers Part P-Journal of Sports Engineering and Technology.**

**ABSTRACT**

External intensity quantification and body composition assessments across the season allow soccer coaches to adjust the intensity during training sessions, thereby avoiding excessive fatigue and helping players maximize their physical fitness status during matches. Thus, the aims of this study were (1) to describe variations in external intensity periods of distance and accelerometry-based measures across the early and mid-competitive phases and (2) to analyze whether the intensity variations influenced body composition across the 2019/20 competitive season. Ten players from a Portuguese BPI Ligue team (professional league) participated in this study. The participants completed  $\geq 80\%$  of 57 training sessions and 13 matches. The athletes were assessed in three phases (before the start of the season, after 2 months, and after 4 months) for the following variables: body fat mass, soft lean mass, fat-free mass, intracellular water,

extracellular water, total body water, and phase angle (50 kHz) through bioelectrical impedance analysis (InBody S10). A 10-Hz GPS device (PlayerTek) was used to collect distance and accelerometry-based measures, which included total distance, high-speed running distance, sprint distance, acceleration, deceleration, and player load. Repeated-measures analysis of covariance (ANCOVA) with GPS-derived measures as covariates or repeated-measures analysis of variance (ANOVA) was used to compare the three moments of assessment. Although the patterns of variables' responses were not the same as the season progressed, the values of body fat mass, fat-free mass, intracellular water, extracellular water, total body water, ratios of ECW/TBW, ECW/ICW, and phase angle improved. Variations in external intensity measures seem to influence the body composition variables across the season. These results may indicate good adaptations to the training and conditioning strategies managed by the coach and technical staff.

**Garcia-de-Alcaraz, A., Rico-Gonzalez, M., & Pino-Ortega, J. Criterion validity and reliability of a new algorithm to detect jump performance in women's volleyball players [Article; Early Access]. Proceedings of the Institution of Mechanical Engineers Part P-Journal of Sports Engineering and Technology.**

#### **ABSTRACT**

The limitation of tracking systems to assess short high intensity efforts has led to an exponential growth of inertial measurement units (IMU), capable of recording jumps at a very high sampling rate. However, the validity and reliability of each of them should be tested. This study aimed to assess the criterion validity and reliability of a new algorithm to detect jump performance in professional women's volleyball players during training using an IMU. A total of 1581 jumps performed by 13 players ( $17.31 \pm 7.34$  years' experience, and  $6.77 \pm 7$  years playing in the first league) were video recorded during two volleyball training sessions. Data were recorded with Realtrack Systems IMU



(WIMU PRO™, RealTrack Systems, Almeria, Spain), and extracted data were compared against a video system (Sony HDR-CX240 high-definition camera, Sony Corporation, Tokyo, Japan) using an observational procedure (ICC = 0.99). The results showed that WIMU PRO™ identified 1569 from the total of 1581 jumps performed (i.e. 99.24%). Therefore, this wearable device proved to have excellent jump count accuracy in top-level women's volleyball players, making its use feasible in this sport context. This finding supports the use of this IMU as a valid method to guide the monitoring of jump training load.

**Guo, R., & Qi, B. (2022). Intelligent Recognition of Sports Players' Wrong Actions in view of Computer Pattern Recognition. Computational Intelligence and Neuroscience, 2022, Article 5336017.**

#### **ABSTRACT**

In the context of the vigorous development of the sports industry and rapid technological innovation, the wrong actions of sports athletes can also be intelligently recognized. Human action recognition based on computer pattern recognition is becoming more and more popular and ubiquitous in life. This article aims to study how to recognize the human body based on the computer model and how to apply intelligent recognition to the wrong actions of sports athletes. The study of the application of intelligent recognition to the wrong actions of sports athletes is of great significance to sports athletes. This article proposes how to intelligently recognize the wrong actions of sports athletes based on computer pattern recognition. In the experiment in this article, wrong sports actions can cause a series of undesirable consequences, such as joint sprains and muscle damage. Among them, the proportion of joint damage caused by wrong actions has reached 24% and has been rising with the increase of the number of experiments and finally reached 35%, which shows that the probability is still very high. After the pull-up

adopts intelligent recognition, the error of the pull-up action can be quickly identified and corrected in time, with the correct rate reaching 78%. Therefore, in order to reduce the physical damage caused by sports athletes' wrong movements, it is necessary to study the intelligent recognition of sports athletes' wrong movements. The recognition of wrong actions of sports athletes can be carried out through intelligent recognition based on 3D convolutional neural networks, which is of great significance to intelligent recognition.

**He, Z. Q., Wang, K., Zhao, Z., Zhang, T. H., Li, Y. H., & Wang, L. (2022). A Wearable Flexible Acceleration Sensor for Monitoring Human Motion. Biosensors-Basel, 12(8), Article 620.**

#### **ABSTRACT**

Skin-inspired flexible wearable acceleration sensors attract much attention due to their advantages of portability, personalized and comfortable experience, and potential application in healthcare monitoring, human - machine interfaces, artificial intelligence, and physical sports performance evaluation. This paper presents a flexible wearable acceleration sensor for monitoring human motion by introducing the island - bridge configuration and serpentine interconnects. Compared with traditional wearable accelerometers, the flexible accelerometer proposed in this paper improves the wearing comfort while reducing the cost of the device. Simulation and experiments under bending, stretching, and torsion conditions demonstrate that the flexible performance of the flexible acceleration sensor can meet the needs of monitoring the daily movement of the human body, and it can work normally under various conditions. The measurement accuracy of the flexible acceleration sensor is verified by comparing it with the data of the commercial acceleration sensor. The flexible acceleration sensor can measure the acceleration and the angular velocity of the human body with six degrees of freedom and

recognize the gesture and motion features according to the acceleration characteristics. The presented flexible accelerometers provide great potential in recognizing the motion features that are critical for healthcare monitoring and physical sports performance evaluation.

**Jin, L., Zhang, G. Q., Wang, Y., & Li, S. RNN-Based Quadratic Programming Scheme for Tennis-Training Robots With Flexible Capabilities. Ieee Transactions on Systems Man Cybernetics-Systems.**

#### **ABSTRACT**

Sports intelligence receives constant attention, especially with the development of information technology. Existing tennis-launching machines, a kind of device launching tennis balls from a fixed point, have shortcomings such as limited launching height and low control accuracy, which are lack of considerable flexibility when applied in a practical situation. In this article, a tennis-training robot based on a redundant manipulator cooperated with a tennis-launching structure is presented to realize a high-precision and flexible ball-launching task. In order to construct a control scheme of the robotic system, the physical situation of tennis launching is modeled, and further transformed into a quadratic programming problem. Then, a recurrent neural network (RNN) is built to obtain the optimal solution. Furthermore, simulative experiments based on the CoppeliaSim platform using a FRANKA EMIKA manipulator are carried out to demonstrate the realizability of the designed application scenarios.

**Nobari, H., Fani, M., Mainer-Pardos, E., & Oliveira, R. Comparison of GPS derived variables based on home versus away matches in the Asian professional soccer team. Proceedings of the Institution of Mechanical Engineers Part P-Journal of Sports Engineering and Technology.**

**ABSTRACT**

Professional soccer with high training loads is defined with weekly competition. The purpose of this study was to compare external training load data of GPS derived variables that preceded a home versus away match. Twenty-two weeks of a national league meet schedule were analyzed, which included 11 home and 11 away matches. Twelve professional soccer players (age,  $28.6 \pm 2.7$  years; height,  $182.1 \pm 8.6$  cm; BMI,  $22.6 \pm 0.7$  kg/m<sup>2</sup>) participated in this study. All matches were monitored using GPSPTS systems Pty Ltd. The following variables were selected: total duration of the matches and training sessions, high-speed running distance ( $18\text{--}23$  km h<sup>-1</sup>), sprint distance ( $>23$  km h<sup>-1</sup>), maximal speed, body load, metabolic power, accelerations Zone1 ( $<2$  m s<sup>-2</sup>) (AccZ1), accelerations Zone2 ( $2\text{--}4$  m s<sup>-2</sup>) (AccZ2), accelerations Zone3 ( $>4$  m s<sup>-2</sup>) (AccZ3), decelerations Zone1 ( $<-2$  m s<sup>-2</sup>) (DecZ1), decelerations Zone2 ( $-2$  to  $-4$  m s<sup>-2</sup>) (DecZ2) and decelerations Zone3 ( $>-4$  m s<sup>-2</sup>) (DecZ3). The results indicated that metabolic power showed higher values at home than away matches [ $p=0.047$ , ES = 0.53, (-0.28, 1.34)]. Furthermore, there was a higher value in accumulated external training load that preceded away matches for high-speed running and lower value [ $p < 0.001$ , ES = -0.95 (-1.79, -0.10)] for DecZ1 than home matches. In conclusion, external load variables had a higher value in home matches. However, the results showed that high-speed running was higher in away matches, which could be the discretion of the coaches to prepare players for different conditions on the opponent's field.

**Praca, G. M., Moreira, P. E. D., de Andrade, A. G. P., Clemente, F. M., de Oliveira, W. B., & Demetrio, G. Integrating notational and positional analysis to investigate tactical behavior in offensive and defensive phases of football matches. Proceedings of the Institution of Mechanical Engineers Part P-Journal of Sports Engineering and Technology.**

#### **ABSTRACT**

Most literature has neglected the possible influence of game phase – offensive and defensive – on players’ and teams’ behaviors measured by positional data. Also, the combined effect of contextual variables – match period, match venue, and match outcome – and game phases has not been investigated yet. Therefore, this study aimed to integrate notational and positional analysis to investigate individual and collective tactical behavior in different game phases (offensive and defensive) in football matches under different contextual conditions. The sample comprised 18 matches played by 24 U-20 elite Brazilian athletes during the 2021 national championship. The authors designed a notational system to classify the start and the end of the offensive phase (and consequently, the defensive phase of the opposing team). The positional data was gathered through global positioning system devices and manually integrated with the notational analysis. Contextual variables comprised match period (first vs second halves), match venue (home vs away matches), and match outcome (win vs draw versus lose matches). Results showed significant differences between game phases, with a more spread tactical positioning observed in the offensive phase. Furthermore, interactions between contextual variables and the game phase were observed, although the game phase presented the highest impact on the dependent variables. We conclude that a more spread tactical positioning characterizes offensive behavior and that the impact of the game phase was higher than contextual variables on tactical behavior, which emphasizes the need for future studies to split positional data into attacking and defensive ones. Also,

integrating notational and positional analysis are a viable alternative to enrich the data interpretation of football matches concerning the influence of game phases on players' and teams' behaviors.

**Sun, Y., & She, L. R. (2022). Intelligent Sports Auxiliary Training Method Based on Collaborative Filtering Recommendation Algorithm. *Wireless Communications & Mobile Computing*, 2022, Article 8703707.**

#### **ABSTRACT**

In recent years, people's living standards are rising, and the demand for health is also rising. National physical exercise has become the current trend. Using personalized recommendation technology to screen appropriate information and assist people in sports training can improve the efficiency of users to obtain relevant information and improve users' physical quality. Therefore, the collaborative filtering recommendation algorithm is optimized by combining bisection, and the intelligent recommendation model of sports training resources is constructed based on the algorithm. This paper uses the improved algorithm to calculate the similarity between users. Compared with other traditional algorithms, the user algorithm in this paper has higher accuracy and certain reference value. To sum up, the intelligent recommendation model of sports training resources proposed in the research can more accurately recommend suitable sports training resources for users, so as to assist users in correct sports training and improve users' physical quality, which plays an improvement of the physical quality of the whole people in China.

**Talebanpour, A., Smith, L. V., & Paudel, A. The effect of the head surrogate on the performance of bicycle helmets. Proceedings of the Institution of Mechanical Engineers Part P-Journal of Sports Engineering and Technology.**

**ABSTRACT**

Inconsistent results have been reported for helmeted impact responses between the two most commonly used headforms: The National Operating Committee on Standards for Athletic Equipment (NOCSAE) and the Hybrid III (HIII). There is a need to understand the reasons for the different responses of the headforms so that helmet protection may be discerned independent of the headform. In this study, the kinematic response and brain injury measures of the NOCSAE and HIII headforms at three impact orientations with three helmet models on an inclined anvil were compared. The results showed that the peak linear acceleration from the two headforms were within 6.3% on average for all impacts. However, despite the higher moment of inertia of the HIII headform, it did not have a consistently lower rotational acceleration compared to the NOCSAE headform. The differing headform rotational responses were primarily due to differences in the headforms' center of gravity location. This led to differences in couples and accelerations, which tended to be most severe in frontal impact orientations. The variation in rotational responses of the headforms seems to be also dependent on the helmet type, with helmet A having greater variation compared to helmets B and C. Differences in the rotational kinematics of the two headforms led to a 47% average difference in their brain injury measures.

**Wu, C., Zhao, X., & Jin, G. (2022). Application of Intelligent Analysis Technology of Football Video Based on Online Target Tracking Algorithm of Motion Characteristics in Football Training. Computational Intelligence and Neuroscience, 2022.**

**ABSTRACT**

Because the scene of football video is fixed and simple, the events in football video, such as shooting and offside , also have clear semantics. At the same time, they have sufficient domain knowledge and have broad application prospects. The research framework of sports video intelligence analysis is usually regarded as a three-level framework, namely, the low-level feature layer, the middle-level key primitive generation layer, and the high-level event analysis layer. A MF\_O2T (Moving Feature Online Target Tracking) algorithm is proposed. First, based on the marked first frame image, this algorithm extracts a set of standardized local images from the target areas of visible and infrared images as target convolution filters, removes the main color of the stadium by using HSV color space nonuniform quantization algorithm, and extracts the histogram of the main color of players in upper and lower blocks. Experimental results show that the algorithm designed in this paper has strong robustness, can better adapt to player tracking in different scenes of football video, and meets the real-time requirements of football training.

**Zhang, S. B., Zhang, J. H., & Zhou, X. M. (2022). Design and Development of Smart Wearable Products for Basketball Dribble Teaching Training Posture Monitoring. Wireless Communications & Mobile Computing, 2022, Article 2222081.**

**ABSTRACT**

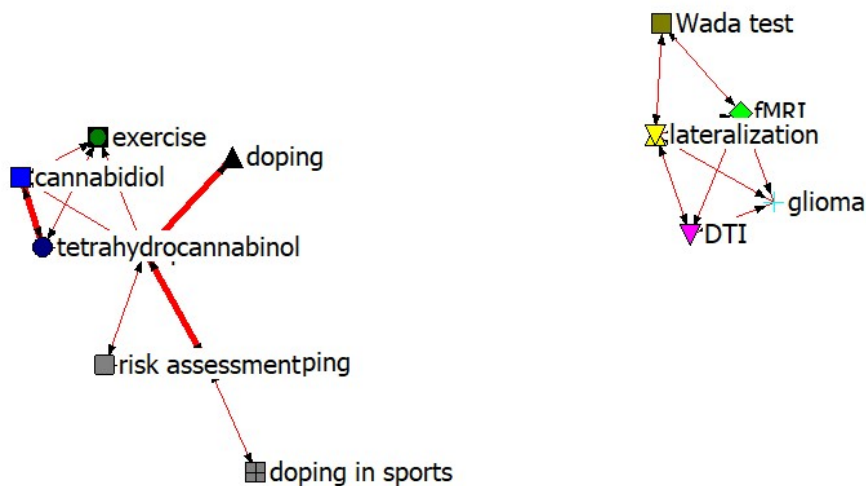
Basketball is one of the most popular sports, but apart from a small number of sports



specialties, ordinary people rarely have the opportunity to receive professional basketball training, let alone coaches who provide one-on-one dribbling posture guidance. Dribbling is a very basic and important technique in basketball. Mastering the correct dribbling posture can help people further improve their basketball skills. In response to this problem, this article designed a smart wearable product to monitor the user's posture in basketball dribbling training. If the user has a wrong dribble posture, the product will automatically prompt and give relevant suggestions. This article focuses on user demand research, product conceptual design, prototype development, and dribbling posture determination experiments and elaborates the design and development process of the product. Based on the experimental data, this article believes that the optimal parameters of the monitoring standard for the "head down too long" during basketball dribbling are the -axis angle value of the motion sensor is critical for  $-120^{\circ}$ , and the duration of exceeding the critical value is 1 second. The optimal parameters of the "dribbling wrist flip" monitoring standard are the -axis angle value of the motion sensor has a critical value of  $105^{\circ}$ , and the duration of exceeding the critical value is 0.4 seconds. Judging from the end user's experience and rating of the product's trial experience, it can be seen that the smart product can indeed play a very good auxiliary effect in the field of dribbling posture monitoring. Popularizing it in the daily training of basketball players can effectively promote the full informatization and intelligent development of sports.

## 反兴奋剂

本期反兴奋剂学术研究共检索到英文相关文献 46 篇，研究热点主要集中在自体输血中生物护照检测的补充方法、干血点及血液微采样作为体育药物检测的新趋势、不同国家优秀运动员对兴奋剂的认知等方面。检索结果：1) 关键词共词分析。提取关键词 213 个，经过数据清洗后关键词有 188 个，词频为 2 及以上的关键词有 13 个，累计百分比为 17.84%，高频关键词有反兴奋剂、体育兴奋剂、WADA 检测、风险评估等，生成可视化知识图谱（见下图）。2) 来源期刊分析。涉及期刊 37 种，其中载文 2 篇及以上的期刊有 5 种，累计百分比为 36.0%，刊载反兴奋剂前三位的期刊分别为：DRUG TESTING AND ANALYSIS（JCR 学科分区 Q2, Q3），ASTROPHYSICAL JOURNAL（JCR 学科分区 Q2、Q1），PSYCHOLOGY OF SPORT AND EXERCISE（JCR 学科分区 Q4、Q3）。3) 交叉学科分析。引用文献总计 2319 篇，最多的频次为 5 次，排名前三位的文献分别是 *Prevalence of Doping Use in Elite Sports: A Review of Numbers and Methods*、*Do dried blood spots have the potential to support result management processes in routine sports drug testing?-Part 2: Proactive sampling for follow-up investigations concerning atypical or adverse analytical findings*、*American Society of Functional Neuroradiology-Recommended fMRI Paradigm Algorithms for Presurgical Language Assessment*。4) 学术关注度分析。文献级别用量最高的是 38 次，排名前三位的文献分别是：*Rapid, on-site quantitative determination of higenamine in functional food using a time-resolved fluorescence microsphere test strip*、*Experience of using a smartphone WeChat applet for dental anxiety assessment and preoperative evaluation: A nationwide multicenter study*、*DropWise: current role and future perspectives of dried blood spots (DBS), blood microsampling, and their analysis in sports drug testing*。



Andersen, A. B., Bejder, J., Bonne, T. C., Sorensen, H., Jung, G., Ganz, T., Nordsborg, N. B. Hepcidin and Erythroferrone Complement the Athlete Biological Passport in the Detection of Autologous Blood Transfusion. *Medicine & Science in Sports & Exercise*, 54(9), 1604-1616.

#### ABSTRACT

Purpose: We investigated whether hepcidin and erythroferrone (ERFE) could complement the athlete biological passport (ABP) in indirectly detecting a 130-mL packed red blood cells (RBC) autologous blood transfusion. Endurance performance was evaluated. Methods: Forty-eight healthy men (n = 24) and women (n = 24) participated. Baseline samples were collected weekly followed by randomization to a blood transfusion (BT, n = 24) or control group (CON, n = 24). Only the BT group donated 450 mL whole blood from which 130 mL red blood cell was reinfused 4 wk later. Blood samples were collected 3, 7, 14, 21, and 28 d after donation, and 3, 6, and 24 h and 2, 3, and 6 d after reinfusion. In the CON group samples were collected with the same frequency. Endurance performance was evaluated by a 650-kCal time trial (n = 13) before and 1 and 6 d after reinfusion. Results: A time - treatment effect existed ( $P < 0.05$ )

for hepcidin and ERFE. Hepcidin was increased ( $P < 0.01$ )  $\sim 110$  and  $89\%$  6 and 24 h after reinfusion. Using an individual approach ( $99\%$  specificity, e.g., allowing 1:100 false-positive), sensitivities, i.e., true positives, of  $30\%$  and  $61\%$  was found for hepcidin and ERFE, respectively. For the ABP, the most sensitive marker was Off-hr score ( $[\text{Hb}] (\text{g} \cdot \text{L}^{-1}) - 60 \times \sqrt{\text{RET}\%}$ ) ( $P < 0.05$ ) with a maximal sensitivity of  $\sim 58\%$  and  $\sim 9\%$  after donation and reinfusion, respectively. Combining the findings for hepcidin, ERFE, and the ABP yielded a sensitivity across all time-points of  $83\%$  after reinfusion in BT. Endurance performance increased 24 h ( $+6.4\%$ ,  $P < 0.01$ ) and 6 d after reinfusion ( $+5.8\%$ ,  $P < 0.01$ ). Conclusions: Hepcidin and ERFE may serve as biomarkers in an antidoping context after an ergogenic, small-volume blood transfusion.

**Arioli, F., Gamberini, M. C., Pavlovic, R., Di Cesare, F., Draghi, S., Bussei, G., Fidani, M. Quantification of cortisol and its metabolites in human urine by LC-MSn: applications in clinical diagnosis and anti-doping control. Analytical and Bioanalytical Chemistry, 414(23), 6841-6853.**

#### **ABSTRACT**

The objective of the current research was to develop a liquid chromatography-MSn (LC-MSn) methodology for the determination of free cortisol and its 15 endogenous metabolites (6 $\beta$ -hydroxycortisol, 20 $\alpha$ -dihydrocortisol, 20 $\alpha$ -dihydrocortisone, 20 $\beta$ -dihydrocortisol, 20 $\beta$ -dihydrocortisone, prednisolone, cortisone,  $\alpha$ -cortolone,  $\beta$ -cortolone, allotetrahydrocortisol, 5 $\alpha$ -dihydrocortisol, tetrahydrocortisol, allotetrahydrocortisone, 5 $\beta$ -dihydrocortisol, tetrahydrocortisone) in human urine. Due to its optimal performance, a linear ion trap operating in ESI negative ion mode was chosen for the spectrometric analysis, performing MS3 and MS4 experiments. The method was validated for limit of detection (LOD) and limit of quantification (LOQ) ( $0.01 \text{ ng mL}^{-1}$  and  $0.05 \text{ ng mL}^{-1}$ , for all compounds, respectively), intra- and inter-day precision

(CV = 1.4–9.2% and CV = 3.6–10.4%, respectively), intra- and inter-day accuracy (95–110%), extraction recovery (65–95%), linearity ( $R^2 > 0.995$ ), and matrix effect that was absent for all molecules. Additionally, for each compound, the percentage of glucuronated conjugates was estimated. The method was successfully applied to the urine (2 mL) of 50 healthy subjects (25 males, 25 females). It was also successfully employed on urine samples of two patients with Cushing syndrome and one with Addison's disease. This analytical approach could be more appropriate than commonly used determination of urinary free cortisol collected in 24-h urine. The possibility of considering the differences and relationship between cortisol and its metabolites allows analytical problems related to quantitative analysis of cortisol alone to be overcome. Furthermore, the developed method has been demonstrated as efficient for antidoping control regarding the potential abuse of corticosteroids, which could interfere with the cortisol metabolism, due to negative feedback on the hypothalamus-hypophysis-adrenal axis. Lastly, this method was found to be suitable for the follow-up of prednisolone that was particularly important considering its pseudo-endogenous origin and correlation with cortisol metabolism.

**Berezanskaya, J., Cade, W., Best, T. M., Paultre, K., & Kienstra, C. ADHD Prescription Medications and Their Effect on Athletic Performance: A Systematic Review and Meta-analysis. *Sports Medicine-Open*, 8(1), Article 5.**

#### **ABSTRACT**

Background: Stimulant medications used for the treatment of Attention Deficit-Hyperactivity Disorder (ADHD) are believed to provide a physical advantage in athletics, but several of these medications are not regulated by the World Anti-Doping Association. Given the prevalence of ADHD among the athlete population and concern for abuse of ADHD medications, this review and meta-analysis aimed to evaluate effects

of ADHD medications on athletic performance, thereby appraising the validity of claims of performance enhancement. Methods: A search of MEDLINE, Embase, CINAHL, and Cochrane Review databases was performed for all randomized controlled trials evaluating athletic performance after ingestion of placebo or ADHD treatment medications from August 2020 through November 2020. All RCTs identified from these search criteria were included for screening, with exclusion of any animal studies. Two reviewers (JB, CK) assessed methodological quality and risk of bias using CONSORT 2010 and Cochrane Collaboration tools. Study results were compiled with corresponding p values for each finding. Effect sizes (Cohen's D) for athletic performance and physiological changes were aggregated for each study. Studies were further screened for homogeneity that would allow for meta-analysis. Heterogeneity was calculated using I<sup>2</sup>. Results: A total of 13,033 abstracts evaluating amphetamine, methamphetamine, methylphenidate, and bupropion were screened. The final analysis included nine studies, six of which found significant improvement in athletic performance with use of stimulant medications ( $p < 0.05$ ). Methylphenidate and amphetamine were consistently identified to have a performance effect. Secondary effects identified included significant increase in heart rate, core temperature, and elevation of various serum hormone levels ( $p < 0.05$ ). Effect size evaluation found seven studies demonstrating small to large effects on physical performance, as well as in categories of cardiometabolic, temperature, hormone, and ratings of perceived exertion, to varying degrees. A meta-analysis was performed on two studies, demonstrating conflicting results. Conclusions: Dopaminergic/noradrenergic agonist medications appear to have a positive effect on athletic performance, as well as effects on physiological parameters. Further consideration of medications currently not regulated, i.e. bupropion, is warranted given evidence of athletic performance enhancement.

**Hayward, G., Gaborini, L., Sims, D., Schumacher, Y. O., Millet, G. P., Rhumorbarbe, D., Robinson, N. The athletic characteristics of Olympic sports to assist anti-doping strategies. *Drug Testing and Analysis*, 14(9), 1599-1613.**

**ABSTRACT**

The determinants of success in Olympic Games competition are specific to the athletic demands of the sporting event. A global evaluation to quantify the athletic demands across the spectrum of the Olympic Games sport events has not previously been conducted. Thus far, the interpretation and the comparison of sport physiological characteristics within anti-doping organisations (ADOs) risk assessments remains subjective without a standardised framework. Despite its subjective assessment, this information is a key component of any anti-doping programme. Sport characteristics inevitably influence the type of substances and/or methods used for doping purposes and should be captured through a comprehensive analysis. Seven applied sport scientists independently conducted an assessment to quantify the athletic demands across six preselected athletic variables. A principal component analysis was performed on the results of the panel's quantitative assessment for 160 Olympic sport events. Sport events were clustered using the Hierarchical Density Based Spatial Clustering of Applications with Noise (HDBSCAN) algorithm. The HDBSCAN identified 19 independent cluster groups; 36 sport events remained statistically unassigned to a cluster group representing unique and event-specific athletic demands. This investigation provides guidance to the anti-doping community to assist in the development of the sport specific physiology component of the risk assessment for Olympic Games disciplines. The dominant athletic characteristics to excel in each of these individual events will highlight areas of how athletes may strive to gain a competitive advantage through doping strategies, and inform the development of an effective and proportionate allocation of testing resources.

**Iannella, L., Comunita, F., Botre, F., Colamonici, C., Curcio, D., de la Torre, X., & Mazzarino, M. Urinary excretion profile of prednisolone and prednisone after rectal administration: Significance in antidoping analysis. Drug Testing and Analysis.**

**ABSTRACT**

The rectal administration of glucocorticoids, as well as any injectable, and oral ones, is currently prohibited by the World Anti-Doping Agency when occurs “in competition.” A reporting level of 100 ng/ml for prednisolone and 300 ng/ml for prednisone was established to discriminate the allowed and the prohibited administration. Here, the urinary excretion profiles of prednisone and prednisolone were evaluated in five volunteers in therapy with glucocorticoid-based rectal formulations containing prednisone or prednisolone caproate. The urinary levels of the excreted target compounds were determined by liquid chromatography – tandem mass spectrometry (LC-MS/MS) following the procedure validated and currently in use in our laboratory to detect and quantitate glucocorticoids in urine. Predictably, the excretion trend of the analytes of interest were generally comparable with those obtained after oral administration, even if the excretion profile showed a broad interindividual variability, with the absorption rate and the systemic bioavailability after rectal administration being strongly influenced by the type of formulations (suppository or rectal cream, in our case) as well as the physiological conditions of the absorption area. Results showed that the target compounds were detectable for at least 30 h after drug administration. After suppository administration, prednisolone levels reached the maximum after 3 h from drug administration and then dropped below the reporting level after 15 – 21 h; prednisone reached the maximum after 3 h from drug administration, and then dropped below the reporting level after 12 – 15 h. After cream administration, both prednisone and prednisolone levels remained in a concentration below the reporting level



throughout the entire monitored period.

**Kavussanu, M., Barkoukis, V., Hurst, P., Yukhymenko-Lescroart, M., Skoufa, L., Chirico, A., Ring, C. S. P. A psychological intervention reduces doping likelihood in British and Greek athletes: A cluster randomized controlled trial. *Psychology of Sport and Exercise*, 61, Article 102099.**

#### **ABSTRACT**

Background: Current attempts to prevent doping through deterrence and education have had limited success and have been constrained to one country. Targeting psychological variables that have been empirically associated with doping likelihood, intention, or behaviour may help in developing interventions that are effective in preventing doping in sport. Objectives: Guided by social cognitive theory and empirical research, the main purpose of this research was to develop an anti-doping intervention that targets three psychological variables (i.e., anticipated guilt, moral disengagement, and self-regulatory efficacy) and determine whether it is more effective than an educational intervention in reducing doping likelihood in British and Greek athletes. Method: Eligible participants were identified via a screening survey administered to 934 athletes in the United Kingdom and Greece. A total of 19 sport clubs (208 athletes) across the two countries were randomly assigned to either the psychological or the educational intervention. Each intervention consisted of six 1-h sessions delivered to small groups of athletes over 6–8 weeks. Athletes completed measures of doping likelihood, anticipated guilt, moral disengagement, and self-regulatory efficacy pre and postintervention and at a 2-month follow-up. Results: A multilevel piecewise growth model was used to examine changes in study outcomes. Analysis showed that the psychological intervention was more effective than the educational intervention in reducing doping likelihood from pre to post, but the effects of the two interventions were similar at follow-up. These effects

were not affected by country. Both interventions reduced moral disengagement from pre to post, and these effects were maintained at follow-up. The psychological intervention was also more effective than the educational intervention in increasing anticipated guilt from pre to follow-up. Conclusions: Targeting psychological variables in anti-doping interventions should aid our efforts to prevent doping in sport.

**Konig, S., Rzeppa, S., Thieme, D., & Keiler, A. M. Agreement of steroid profiles in Athlete Biological Passport residues and corresponding serum samples. Drug Testing and Analysis.**

**ABSTRACT**

The steroid module of the Athlete Biological Passport (ABP) is based on the analysis of six endogenous steroids in urine samples and a Bayesian statistical approach. However, the urinary steroid concentrations may be affected by confounders like microbial degradation, possible co-administration of diuretics as masking agents, insufficient conjugate hydrolysis or UGT2B17 gene polymorphisms affecting glucuronidation. Therefore, it can be helpful to use other matrices (ABP blood and serum samples) to quantify steroids and thereby support noticeable deviations in the Athlete Biological Passport, for example, abnormally increased urinary testosterone/epitestosterone (T/E) ratios. Aim of the study was to investigate the feasibility to re-use plasma obtained from athlete ABP blood samples for measuring a steroid profile. Therefore, testosterone, androstenedione, cortisol and cortisone were quantified in 36 intra-individual matching ABP blood and serum samples. The steroid levels measured in both matrices showed a high agreement indicating a good stability uninfluenced by storage temperature and duration. Our results pointed out the possibility to expand the athlete ABP blood analysis for steroid profiling.

**Marchand, A., Miller, G., Martin, L., Gobbo, C., Crouch, A. K., Eichner, D., & Ericsson, M. Detection of erythropoiesis stimulating agent Luspatercept after administration to healthy volunteers for antidoping purposes. Drug Testing and Analysis.**

#### **ABSTRACT**

Luspatercept (Reblozyl®) is a newly approved anti-anemic drug prohibited by the World Anti-Doping Agency. It promotes erythropoiesis by limiting apoptosis of immature erythroblasts and the risk of misuse by athletes for doping is high. Proposed detection methods have been published recently but only evaluated in vitro. The objective of this study was to perform the first administration of luspatercept in healthy volunteers for antidoping purpose and to evaluate the detectability in serum, dried capillary blood spots (DBS, collected using TASSO M20 device), and urine. Indirect detection was also evaluated by analyzing hematological parameters for the Athlete Biological Passport. Four volunteers (two males, two females) received one subtherapeutic dose of luspatercept (0.25 mg/kg) followed 3 weeks after by a second dose. Samples were collected from before administration until 7 weeks after the second dose. After immunopurification, electrophoretic separation SDS-/SAR-/IEF- polyacrylamide gel electrophoresis (PAGE), and immunodetection, luspatercept was detected at high levels in serum until the end of the collection, sign of a very slow elimination and similarly detected unchanged at lower levels in urine from 2 days after the first administration until 7 weeks postadministration. DBS showed also the same long window of detection. Luspatercept effects were however of limited amplitude on hematological markers, and only two subjects presented atypical points outside the physiological limits during the study. The direct detection method was very efficient, and change of electrophoretic method and detection antibody can be used for confirmation of suspicious samples.

**Okada, T., Matsuo, S., Shimada, K., & Minamino, T. Practical Efficacy of Prior Checks on Athletes' Medication Use for the Prevention of Unintentional Doping. Substance Use & Misuse.**

**ABSTRACT**

Background: Athletes are subjected to disciplinary action for even unintentional doping. This study aimed to clarify the effectiveness of prior checks on athletes' drug regimens by medical personnel with knowledge of anti-doping to prevent unintentional doping. Methods: This is a retrospective evaluation of the inquiries to the Anti-Doping Committee by the Japan Table Tennis Association national team athletes and athlete support personnel between 2011 and 2019 regarding whether the drug in question was permitted and whether it contained any prohibited substance. Discrete evaluations were performed for ethical and over-the-counter drugs, in addition to the evaluation of all drugs. Additionally, we evaluated the drugs according to therapeutic category and World Anti-Doping Agency's classification. Results: Overall, 85/1238 (6.9%) ethical drugs, 49/259 (18.9%) over-the-counter drugs and 134/1497 (9.0%) total drugs were considered as not allowed for use. The proportion of over-the-counter drugs judged as not allowed for use was higher than that of ethical drugs ( $p < 0.001$ ). When tabulating the drugs not allowed for use in the therapeutic category, numerous prohibited substances were identified in adrenal hormone preparations, Kampo products, synthetic narcotics, antitussives, antihemorrhoidals, and bronchodilators among ethical drugs and in cold remedies, gastrointestinal drugs, and antitussives and expectorants among over-the-counter drugs. Conclusions: Of the ethical and over-the-counter drugs that elite athletes wanted to use, approximately 10% were not allowed because of the risk of unintentional doping. These results suggest that conducting prior checks of the athletes' drug regimens by medical personnel with anti-doping knowledge are effective measures to prevent unintentional doping.

**Salm, J., & Sefiha, O. Restorative justice in sports: does restorative justice have a place in anti-doping governance? COMMENT [Editorial Material; Early Access]. Sport in Society.**

**ABSTRACT**

Current policies and practices of anti-doping regulators present athletes as an inherent risk population in need of increased surveillance, testing, and punishment. The myriad rules and regulations supporting these policies engender a range of harms not only to athletes but the wider sport community. Unsurprisingly, this environment has strained relations between athletes and anti-doping regulators and engendered suspicion and varying levels of shame and trauma, while being weighted in favour of regulators. Considering the current climate, we explore whether restorative justice principles and practices may offer a useful approach to address the limitations that exist within the anti-doping environment. When applied properly, use of talking circles as described by Pranis, can be a powerful tool to foster and strengthen a more balanced and equitable relationship among not only athletes and regulators, but all members of the sport ecosystem.

**Sugasawa, T., Kanki, Y., Komine, R., Watanabe, K., & Takekoshi, K. (2022). Identification of RNA Markers in Red Blood Cells for Doping Control in Autologous Blood Transfusion. Genes, 13(7), Article 1255.**

**ABSTRACT**

The World Anti-Doping Agency (WADA) has prohibited the use of autologous blood transfusion (ABT) as a doping method by athletes. It is difficult to detect this doping method in laboratory tests, and a robust testing method has not yet been established. We conducted an animal experiment and used total RNA sequencing (RNA-Seq) to identify

novel RNA markers to detect ABT doping within red blood cells (RBCs) as a pilot study before human trials. This study used whole blood samples from Wistar rats. The whole blood samples were mixed with a citrate – phosphate – dextrose solution with adenine (CPDA) and then stored in a refrigerator at 4 ° C for 0 (control), 10, or 20 days. After each storage period, total RNA-Seq and bioinformatics were performed following RNA extraction and the purification of the RBCs. In the results, clear patterns of expression fluctuations were observed depending on the storage period, and it was found that there were large numbers of genes whose expression decreased in the 10- and 20-day periods compared to the control. Moreover, additional bioinformatic analysis identified three significant genes whose expression levels were drastically decreased according to the storage period. These results provide novel insights that may allow future studies to develop a testing method for ABT doping.

**Terreros, J. L., Manonelles, P., & Lopez-Plaza, D. (2022). Relationship between Doping Prevalence and Socioeconomic Parameters: An Analysis by Sport Categories and World Areas. *International Journal of Environmental Research and Public Health*, 19(15), Article 9329.**

#### **ABSTRACT**

Socioeconomic differences between countries, including corruption and doping scandals, have increased in the last few decades. The aims of the current investigation were to examine doping prevalence according to world areas and sport groups and its association with socioeconomic factors worldwide. The Anti-Doping Rule Violations (ADRVs) of 160 countries competing at 2016 Olympics were analyzed between 2013 and 2018. In addition, the relationship between doping prevalence and socioeconomic characteristics, including Human Development Index (HDI), Per Capita Income (PCI) and Corruption Index (CI), was investigated. Africa, Asia, and America were revealed to have a

significantly lower doping prevalence than Europe and Oceania when observing the sum and the mean ADRV/10,000 inhabitants ( $p < 0.01$ ). Strong to moderate correlations were identified between Corruption Index and ADRVs and HDI and ADRVs ( $p < 0.01$ ). However, the number of Olympic athletes was positively associated with the ADRVs and the HDI ( $r = 0.663$  and  $0.424$ , respectively). In the comparison by sport groups, the Independent Recognized Sports (AIMS) showed significantly higher Adverse Analytical Findings (AAF) and ADRVs ( $p < 0.01$ ) than Olympic and Recognized International Sports (ARISF). In conclusion, the results of the current study reveal doping prevalence differences between world areas and sport categories, identifying associations with socioeconomic characteristics of each country.

**Weber, K., Patterson, L. B., & Blank, C. (2022). Doping in disabled elite sport: Perceptions, knowledge and opinions from the of German and UK coaches. *Psychology of Sport and Exercise*, 62, Article 102233.**

#### **ABSTRACT**

**Objectives:** The phenomenon of doping is rarely researched in Paralympic sport, especially from the coach perspective. This study responds directly to this gap in research by exploring coaches' doping-related perceptions, knowledge, and opinions of the current anti-doping system in order to inform future interventions specific to disabled elite sport contexts. **Method:** Eleven coaches from Germany ( $n = 6$ ) and the UK ( $n = 5$ ) working across physiological ( $n = 7$ ) and skill-based ( $n = 4$ ) sport disciplines at an elite level (Paralympic,  $n = 10$  and World Championship,  $n = 1$ ) took part in semi-structured interviews. Data were analysed using abductive reflexive thematic analysis (Braun & Clarke, 2019a). **Findings:** Four themes were developed to capture the coaches' perspectives. The first represents coaches' perception that doping is an issue in Paralympic sport. The second theme shows that risk factors to dope are typically

multiple and intertwined, stemming especially from financial incentives and pressure to win. Theme three captures coaches' opinion of differences in testing and education across countries due to budget, resource, or infrastructure issues. Finally, data showed that coaches prefer to refer responsibility for doping prevention to their national anti-doping organization, rather than taking on personal responsibility for anti-doping efforts. Conclusions: According to the interviewed coaches, doping has the potential to be a big issue in disabled elite sport. The main risk factors of money and pressure to win (earn prize money or funding/sponsorship) are knitted together and can be additionally impacted (negatively) by a nation's sporting system. These factors should be addressed by thinking both on an individual level (e.g., support dual careers) and a structural/policy level (e.g., aim to have minimum standards to level the global inconsistent anti-doping systems, including anti-doping education/testing). Furthermore, coaches should take their role and be proactively made aware of their responsibility in doping prevention to coach clean and protect their athletes properly.