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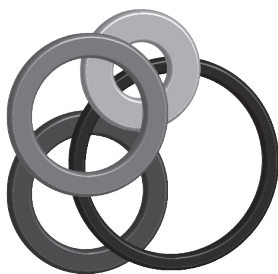


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MEETING ABSTRACTS

Abstracts from the 20th Annual Scientific Conference of Montenegrin Sports Academy and “Sport, Physical Activity and Health: Contemporary perspectives”: Dubrovnik, Croatia. 20-23 April 2023

Edited by Dusko Bjelica¹, Damir Sekulic², Maja Pajek³

Affiliations: ¹University of Montenegro, Faculty for Sport and Physical Education, Niksic, Montenegro, ²University of Split, Faculty of Kinesiology, Split, Croatia, ³University of Ljubljana, Faculty of Sport, Ljubljana, Slovenia

Correspondence: D. Bjelica, University of Montenegro, Faculty for Sport and Physical Education, Narodne omladine bb, Niksic, Montenegro, E-mail: dbjelica@ucg.ac.me



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MEETING ABSTRACTS FROM MSA DUBROVNIK 2023 CONFERENCE

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Invited speakers

S1

COVID-19 INFECTION AMONG PROFESSIONAL SOCCER PLAYERS DURING TWO SOCCER SEASONS

Anamarija Jurcev-Savicevic^{1,2,3}, Jasna Nincevic¹, Sime Versic^{4,5}, Toni Modric⁴, Ante Turic⁵, Ante Bandalovic^{5,6}, Boris Becir⁵, Marijana Mijakovic¹, Ivana Bocina¹, Damir Sekulic^{4,7}

¹Teaching Public Health Institute of Split and Dalmatia County; Split, Croatia, ²School of Medicine, University of Split, Split, Croatia, ³University Department of Health Studies, University of Split, Split, Croatia, ⁴Faculty of Kinesiology, University of Split, Split, Croatia, ⁵HNK Hajduk Split, Split, Croatia, ⁶Department of Orthopedics and Traumatology, University Hospital Split, Split, Croatia, ⁷High Performance Sport Center, Croatian Olympic Committee, Zagreb, Croatia

Correspondence: anamarijajs@gmail.com

There are limited data describing clinical patterns among professional players with COVID-19 infection, particularly related different predominant SARS-CoV-2 variants. This observational study was conducted during two consecutive soccer seasons in one professional soccer club in Split, Croatia. There were three

clusters of infection in 2020/2021 season and one cluster in 2021/2022 season characterized by low adherence to preventive measures. In this study of soccer players, COVID-19 was associated with a mild, self-limited or asymptomatic infection, not requiring hospital care, regardless dominant SARS-CoV-2 variants of concern. Regarding cardiac involvement, there were no findings of any cardiac complication. However, infected players had significantly more symptoms (t -test = 3.24; p = 0.002), a longer period of physical inactivity (c_2 = 10.000; p = 0.006) and a longer period of self-assessment for achieving full fitness (c_2 = 6.744; p = 0.034) in the 2020/2021 season (time of Wuhan wild strain and Alpha variant) than in the 2021/2022 season (time of Omicron variant). In addition, 25% of the players reported the presence of symptoms after isolation (fatigue, malaise, cough, headache, insomnia) which was not reported in any player in season 2. It was also found that, despite the milder clinical presentation of the infection in the Season 2021/2022, the players had significantly more abnormal laboratory findings (c_2 = 9.069240; p = 0.002), although without clinical significance at the time of the study. Future research is needed to replicate the findings of abnormal laboratory results and to extend the study focusing on their potential long-term clinical significance.

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Conflict of interest: None declared.

S2**HAMSTRINGS INJURIES IN FOOTBALL – ARE WE MAKING ANY PROGRESS?**Šime Veršić¹¹Faculty of Kinesiology, University of Split, ²HNK Hajduk, Split**Correspondence:** simeversic@gmail.com

Hamstring injuries represent the most common type of injury among senior male football players. Data from the UEFA Elite Club Injury Study from 2001/02 to 2021/22 showed that hamstring injuries represent 19% of all reported injuries with an upward trend of proportion from 12% during the first and 24% in the last observed season. Additionally, the proportion of all injury absence days caused by hamstring injuries has increased from 10% to 20% in the observed 20-year span. Studies also report high number of hamstring reinjuries with special risk within first 2 months after player's return to full training. Despite advances in training methodology, equipment, diagnostics and therapies, it is clear that there are no specific improvement in reducing these health related problem. Significant amount of studies are exploring potential risk factors for hamstrings injuries. Although this problem should be approached multifactorially, there are clear individual factors that contribute to a higher frequency of hamstring muscle injuries. In addition to intrinsic factors related to a reduced level of fitness (e.g. muscle strength, coordination, flexibility, etc.), there is a significant number of extrinsic factors associated with coaching staff, team or club. Among others, football medical officers highlight lack of communication between medical and coaching staff and lack of regular exposure to high-speed football during training sessions as most significant risk factors for hamstring injuries. In order to reduce the frequency of hamstring injuries in the future, the responsibility is an all football society - from the players who need to take care of their bodies, the club staffs which need better communication and control of the training process, and the football officials who determine game density and schedule.

S3**IMPORTANCE OF EXPERIENCE WHEN APPLYING MILL'S UTILITARIANISM TO SPORT SCANDALS**Robert C. Schneider¹¹State University of New York at Brockport, Faculty of Sport Management, Brockport, New York**Correspondence:** rschneid@brockport.edu

The application of John Stuart Mill's Greatest Happiness Principle (Mill, 1863/1957) can be helpful in mitigating overreactions to major sporting scandals. Knowing and understanding "effect" of management's reaction over the long-term can assist in guiding sport managers' reactions to future scandals in the interest of good long-term outcomes. The utilitarian decision making component of "experience" highlighted by Beauchamp (1982) as necessary to act related to daily affairs is also necessary in forming sport managers' reactions to large-scale scandals. Analysis of long-term outcomes resulting from management's specific reactions to the 1919 Chicago Black Sox Scandal and the 1986 Southern Methodist University American Football Scandal contribute to an experience base necessary to react to current sport scandals in a way that brings about the most long-term good. Mill's Greatest Happiness Principle with a focus on the long-term satisfaction across the sporting community, serves as the primary guide to measuring the effectiveness of managements' reactions to past scandals in the interest of developing a best practices approach to more recent and future sport scandals such as the 2020 Houston Astros Sign Stealing Scandal. Commonalities of reactions to past

scandals, which lead to the most long-term good, forms a sound basis on which sport managers can react to future sport scandals, often in the form of punishments and policies, as they aspire to bring about most long-term good..

S4**PERIODIZATION IN TEAM SPORTS: EVIDENCE VS./FOR REAL LIFE (BRIEF REPORT)**Igor Jukic¹¹Faculty of Kinesiology, University of Zagreb**Correspondence:** igor.jukic@kif.hr

The fundamental goal of a top-level team sport is to participate in the high demanding international and domestic competitions and achieve top sports results. At each of these competitions, sports teams should be in optimal sports shape. Competitions in team sports take place in league systems, cup systems and in tournament competitions. A special obstacle to the implementation of adequate periodization strategies is the congested competition schedule during the competition season. Such a competition system puts coaches in a situation to choose between short-term (microcycles) and long-term approaches (macrocycles) to planning and programming. The periodization of sports preparation in team sports is based on the synchronization of team and individual sports form. The basic task of periodization (planning and programming) is the manipulation of contents, loads and methods of sports preparation in the specific period of preparation and competition. Also, due to the possibility of applying precise training interventions, special emphasis is placed on the monitoring of load, fitness and fatigue. Players in team sports simultaneously participate in different programs (strength and conditioning, technical and technical-tactical) of sports preparation. At the same time, special attention is paid to psychological preparation, nutrition and recovery. Due to the influence of various types of stresses on the athlete and the team, it is not easy to interpret the real reasons for changes (positive and negative) in competitive efficiency. Such a multidimensional demand for sports preparation requires a multidisciplinary and interdisciplinary approach in planning and programming. That is why the coach and his staff should be equipped with evidence based knowledge and experience that will allow them to effectively manage the training process and sports form. Scientific researches dedicated to the periodization of sports preparation in team sports are a great challenge for sports scientists. In doing so, sports scientists are faced with the challenges of availability of top teams and their coaches, insufficient time periods for research, research program design that needs to fit into the regular team program, and the choice of appropriate methodological research procedures.

S5**PHYSICAL FITNESS SURVEILLANCE: THE POWER OF FEEDBACK**Gregor Jurak¹¹University of Ljubljana, Faculty of Sport, Ljubljana, Slovenia**Correspondence:** gregor.jurak@fsp.uni-lj.si

The best health indicator in youth is their physical fitness. Thus, monitoring and surveillance of children and adolescents' physical fitness provide an opportunity to promote health and physical literacy, and designing effective public health and educational policies and interventions at an individual or population level by providing feedback to: a) children, their parents and physicians (on individual level), b) teachers (on individual and class level), c) headmasters (on school level), d) policy makers (on local, regional and national level). Providing informative and timely feedback

is therefore essential for encouraging participants' responsiveness and continued involvement in monitoring/surveillance system, for providing teachers crucial information for physical education planning, and for policy makers to use this information for prompt and effective decision making. Some good practice on providing SLOfit feedback reports to various end-users in well-established national physical fitness surveillance system for Slovenian school-children and adults that has been collecting annual fitness data for over three decades will be presented. Additionally, possibility on providing feedback on fitness on free-for-use FitBack online platform will be discussed.

S6

PHYSICAL LITERACY AS A HOLISTIC CONCEPT FOR PHYSICAL ACTIVITY: FROM THE SITUATION IN EUROPE TO ITS USE WITHIN INTERVENTIONS

Johannes Carl¹

¹Friedrich-Alexander University Erlangen-Nürnberg, Department of Sport Science and Sport, Erlangen, Germany

Correspondence: johannes.carl@fau.de

Both the World Health Organization and the UNESCO propose within their most important documents on physical activity to align strategies and initiatives with the concept of physical literacy (PL) for lifelong adherence to physical activity. In his invited talk, Johannes Carl presents the most important findings of the recent EUROPLIT study, which has comprehensively assessed and compared the implementation state of PL across 25 European countries. Drawing on a mixed-methods approach with document analyses and quantitative surveys, the research team identified a heterogeneous situation of PL in Europe. Although the anglophone countries tend to better adopt the concept, research initiatives are largely fragmented within the European countries and scholarly progress often bases on the effort of single researchers. PL plays hardly any role in national health agendas and curricula often list single elements of the concept without explicitly mentioning PL. In summary, the holistic concept hesitantly permeates practice and policy in most countries, while the implementation state was strongly related to conceptual discussions (e.g., dominance of competing approaches), translation challenges, and country-specific traditions. Nevertheless, the speaker draws specific conclusions for a better dissemination of PL in the Balkan region. In this context, he will also make specific suggestions for interventions, as PL has complex conceptual-philosophic assumptions and literature has shown that PL interventions largely miss to consider this solid theoretical fundament. Accordingly, his talk concludes with recommendations for the transfer of PL into practice by presenting a reporting template with 14 items to better underpin PL interventions in the future.

S7

PROFESSIONAL ATHLETES IN TRANSITION AFTER A PROFESSIONAL CAREER - CROATIAN MODEL

Nevenka Maras¹

¹Faculty of Teacher Education, University of Zagreb

Correspondence: nevenka.maras@ufzg.hr

A review of the literature revealed that there are no longitudinal studies that examine the entire careers of athletes. The end of a professional sports career is a sensitive period in the career of each athlete. The transition to a normal life without daily activity in professional sports requires a detailed pedagogical analysis from both micro and macro perspectives. In this paper, the focus is on the period after the sports career and the same problem that arises after

the termination of active sports. There are numerous reasons for ending a professional sports career: psychological, health, financial, socio-cultural, family, etc. The aim of this work is to highlight the importance of certain aspects, on the basis of which we will develop pedagogical guidelines for the management of an athlete's career after the termination of professional sport. Through three case studies, three athletes over the age of 35 from different sports, the author presents the key factors that directly affect the process of ending a sports career, but also analyzes the role of the sports system and the state at a turning point in the life of an athlete. Research suggests that professional athlete retirement is associated with a loss of control, lower self-esteem, and overall lower life satisfaction. Top athletes are not immune to the negative consequences of retirement; on the contrary, they are more vulnerable to trauma during retirement. The need for social dialog and the active involvement of the state in this matter, together with the high level of personal responsibility of the athletes themselves, represent a path to a healthier and more efficient functioning of society, in which individuals feel like meaningful and successful members of the larger social community. The Swiss model, which provides career counseling and assistance to athletes in finding an internship or job, seems to be a very smart way to manage the transition after the end of the sports career. On the other hand, the Danish model, which is based on creating educational opportunities so that top athletes can combine an academic and a sports career, seems to be the most suitable starting point for developing an authentic Croatian model.

S8

PHYSICAL ACTIVITY AND SPORT AMONG CHILDREN WITH DISABILITY

Ingí Einarsson¹

¹Reykjavík University

Correspondence: ingithore@ru.is

Not much is known about physical activity (PA) and PA patterns measured with objective methods among children with disability or their reasons to take part in PA and sport or their ability to perform in sport. Of the few studies published, most suggest that PA levels are well below recommended guidelines and overweight and obesity are common. Furthermore, compared with typically developed individuals (TDI) at the same age, children with disability are worse off in most health-related variables. In a study done in Iceland, a significantly higher proportion ($p < 0.006$) of children with disability were categorized as having an elevated percentage of body fat (41%) than TDI children (19%). Similarly, over 20% of children with a disability had elevated waist circumference, 34% had elevated BP, between 13 and 21% were found to have unfavorable blood lipid profiles and 7% were diagnosed with metabolic syndrome. Although the PA levels of children with disability were 40% lower and they spent 9% more time sedentary than their TDI peers, there was an interaction between group and sex ($p < 0.05$). Children with disability (60%) were more likely to name weight loss as a reason to participate in PA than TDI children (34%, $p = 0.002$) but a higher proportion (96%) of TDI children than children with disability (50%) participated in PA to improve skills ($p < 0.001$). Only 25% of children with ID reached recommended levels of aerobic fitness whereas 75% of TDI children met those levels ($p < 0.001$). However, children with disability who do regular sports training do not differ from TDI children in any of the health-related variables. Further children with disability who do competition training can reach a high level in their chosen sport and are often comparable to able-body peer athletes.

Oral presentations

O1

ANALYSIS OF DIFFERENCES IN STUDENTS' ATTITUDES TOWARDS PHYSICAL EDUCATION IN RELATION TO GENDER

Mislav Lozovina¹, Igor Jelaska², Ana Penjak²

¹University of Split, Faculty of Maritime studies, Split, Croatia, ²University of Split, Faculty of Kinesiology, Split, Croatia

Correspondence: mlozovin@pfst.hr

The impact of a sedentary lifestyle is increasingly detrimental to human health. A minority of people in modern societies are physically active enough, and a change in attitude and belief is the beginning that can bring a change in an individual's behavior. **PURPOSE:** The aim of this study was to determine students' attitudes towards Physical education and to determine are there any differences in attitudes towards physical education in relation to gender. **METHODS:** The research was conducted on a sample of 365 students of the 1st and 2nd year of the Faculty of maritime studies in Split. 265 male and 100 female students were surveyed with the STZK36 questionnaire to assess the attitude towards Physical education. **RESULTS:** The results undoubtedly indicate that students have moderately positive attitudes towards Physical education. No differences were found between the sexes in the cognitive and affective components of the attitude. What statistically significantly differs male students from female students is the behavioral component of the attitude. **CONCLUSION:** The obtained results enable an insight into the actual state of students' attitudes and enable a reasoned discussion for the development and positive change of the curriculum, for the benefit of students' health.

O2

BASIC PRINCIPLES FOR MOTOR TASKS PRESCRIPTION IN PEOPLE WITH DEMENTIA

Natalia Martins Martins¹, Marta Duarte², Cátia Faria², Daniel Dionísio², Márcio Martins², Raquel Ferreira Silva³, Marlene Rosa⁴

¹Polytechnic Leiria, ²Alzheimer Portugal, ³Centro Social do Estoril, ⁴ci-TechCare, Center of Innovative Care and Health Technology

Correspondence: susana.i.lopes@gmail.com

PURPOSE: To understand executive functioning determinants in the prescription of continuous and discrete motor tasks in people with dementia. **METHODS:** Thirty-six (30 F; 6 M; 75.37±23.86 yrs) elderly with dementia were included in this study if they were able to understand easy verbal commands and to perform horizontal upper limb reaching movements. The executive function of each participant was assessed using the Frontal Assessment Battery (abstract reasoning, motor programming, and cognitive flexibility). Two different motor control categories for the upper limb movement were assessed using the EUROFIT battery (discrete motor task = it has a clear beginning and end) and the TATI board platform (continuous motor tasks = no distinctive beginning or ending; Agilidades Inc). Differences in FAB dimensions between participants with lower (G1) and higher (G2) values in EUROFIT and TATI were compared (Man Whitney Test; $p < 0.05$). **RESULTS:** Participants demonstrated significant differences in total FAB score between G1 (9.94) and G2 (6.94), according to the performance in EUROFIT ($p = 0.001$) and in TATI ($G1 = 9.56$ vs $G2 = 7.33$; 0.009). Cognitive flexibility was also statistically different between groups ($G1 = 1.39$; $G2 = 0.61$; $p = 0.032$), according to the performance in EUROFIT. Instead, and according to the performance in TATI, there was a statistical difference for abstract reasoning ($G1 = 1.94$; $G2 = 1.00$; $p = 0.009$). **CONCLUSION:** Apparently, the performance in the discrete motor tasks might be

associated with cognitive flexibility abilities, while performance in continuous motor tasks was associated with abstract reasoning abilities. Therefore, the executive function evaluation is a key element for an adequate motor task prescription in people with dementia.

O3

BRIDGING THE GAP BETWEEN THE BODY AND THE MACHINE: EMBODIED LEARNING WITH INTERVENTIONAL BRAIN COMPUTER INTERFACES?

Ali Leila^{1,2}, Clorinda Sorrentino¹, Angelina Vivona¹, Lucia Martiniello¹

¹Pegaso University, Faculty for Human Sciences, Napoli, Italy, ²University of Camerino, Macerata, Italy

Correspondence: leila.ali@unicam.it

PURPOSE: The contribute aims to understand how the body and the brain interact with different brain computer interfaces (BCI) and to analyze the implications of these tools on embodied learning in the educational field. **METHODS:** Through a theoretical approach a review of the literature is developed by studying the relationship between the body, the brain and the BCI. To conduct our research, we used the keywords "embodied learning", "cognition", "digital learning", "body", "brain-computer interface" in Pubmed, Frontiers, Google Scholar and Researchgate. **RESULTS:** There are multiple concepts related to digitization and they can vary from owning digital tools such as computers, phones, virtual reality devices to even using interventional BCI. BCI are being reported safe and capable of reversing physical and cognitive disabilities. The impact of these tools is variable according to their nature, the environmental factors, and the condition of the brain and body. **CONCLUSIONS:** With the massive development of technology nowadays many interrogations are coming into surface about the relationship between the human and the machine, and at what level the digital world will be able to interfere with our lives and integrate our bodies.

O4

CIGARETTE SMOKING, SPORT PARTICIPATION AND PHYSICAL ACTIVITY LEVELS IN UNIVERSITY STUDENTS FROM SOUTHEASTERN EUROPE; CROSS-SECTIONAL ANALYSIS OF ASSOCIATIONS AFTER COVID-19 PANDEMIC

Jasna Lulić Drenjak¹, Nataša Zenić², Miran Pehar³

¹University of Rijeka, Faculty of Health Studies, Rijeka, Croatia, ²University of Split, Faculty of Kinesiology, Split, Croatia, ³University of Mostar, Faculty of Science and Education, Mostar, Bosnia and Herzegovina

Correspondence: jasna.lulic.drenjak@uniri.hr

Low physical activity levels (PAL) and cigarette smoking (CS) are both recognized as risk factors for cardiovascular-diseases. However, few studies examined the associations between these factors in population of university students. Additionally, to the best of our knowledge no study examined this issue in period after COVID-19 pandemic considering detrimental social- and health-consequences of the pandemic. **PURPOSE:** The aim of this study was to examine correlations among sport-participation, PAL and CS among university-level students in the period after COVID-19 pandemic. **METHODS:** Participants were 761 students (411 females) from three universities in Croatia, and Bosnia and Herzegovina who were cross-sectionally examined by semi-structured anonymous questionnaires at the beginning of the 2022/2023 academic year. Questions included queries on sociodemographic characteristics, CS, PAL, and sport-participation. Differences between genders were established by Mann-Whitney test, while gender-stratified logistic regressions were calculated to evaluate the associations between sport-participation and PAL, with binomized CS (smoking vs. non-smoking). **RESULTS:**

Results showed lower PAL with no differences in sport-participation in older students, and females. PAL was strongly negatively associated with CS in females (Odds Ratio (OR) for being smokers: 2.23, 95% Confidence Interval (CI): 1.55-2.61), but not in males (OR: 1.45, 95%CI: 0.90-1.91). There was no association between sport-participation and CS in studied participants (OR: 1.34, 95%CI: 0.71-1.84; OR: 1.11, 95%CI: 0.51-1.76 for females and males, respectively). CONCLUSION: Despite expectations that sport participation would be significantly associated with CS results showed no association between these variables, which could be related to the fact that organized sport-participation dramatically decreased during COVID-19 pandemic. Further prospective studies are needed in order to evaluate the cause-effect relationships between variables.

O5

DEVELOPMENT OF MONTENEGRO TOURISM BASED ON SPORTS, REHABILITATION'S AND RELAXATION'S ACTIVITIES FOR ALL GENERATION'S SEGMENTS

Radmila Janičić¹

¹University of Belgrade, Faculty of Organizational Sciences, Department for Marketing Management and Public Relations, Belgrade, Republic of Serbia

Correspondence: radmila.janicic@gmail.com

Development of Montenegro Tourism based on sports, rehabilitation and relaxation's activities for all generation's segments is strong strategies for further positioning Montenegro as touristic brand destination. Sports, rehabilitation's and relaxation's activities give opportunities to tourists for excellent experiences, creative times, as well as, good, professional, medical rehabilitation and relaxation's activities for all generation's segments. In the paper will be given the special focus on generation's segmentation for tourism, in the way that young people enjoy sports activities, but opportunities for rehabilitations and relaxations is very important for every generation's segments. Some tourists enjoy in swimming, yachting, others enjoy in yoga, spa, while others use rehabilitation's opportunities. PURPOSE: The goal of the paper is to research theoretical approach of strategic marketing planning in development of Montenegro tourism based on sports, rehabilitation's and relaxation's activities for all generation's segments. METHODS: After theoretical review, the paper will present case studies. Using in-depth interviews with tourism managers, professors of sports and physicians, and the paper will give opinion about effectiveness of tourism based on sports, rehabilitation's and relaxations on development of Montenegro tourism. RESULTS: Results indicate that tourism based on sports, rehabilitation's and relaxation's activities for all generation's segments has impact on development of Montenegro tourism. CONCLUSION: The findings prove that development of Montenegro tourism is based on sports, rehabilitation's and relaxation's activities for generation's segments.

O6

DIFFERENCES IN PHASIC PUPILLOMETRIC RESPONSES BUT NOT OCULOMOTOR CONTROL ARE OBSERVED BETWEEN SPORTS RACING DRIVERS AND NON-SPORTING POPULATION

Janez Vodica¹

¹Faculty of sport, University of Ljubljana, Ljubljana, Slovenia

Correspondence: janez.vodicar@fsp.uni-lj.si

Sports racing drivers require superior eye movement control to perceive complex contextual environment while constantly changing head position. In addition, phasic attention is involved in collecting information from the environment and could differ between sports racing drivers and non-sporting population. PURPOSE: the

aim was to analyse precision of eye movement control and phasic attention under neutral and neck torsion position in sports drivers and controls. METHODS: infrared mobile eye trackers were used to measure eye movements and pupillometric responses during target tracking (40°/s velocity and 30° amplitude of visual angle) at neutral and neck torsion (45°) position. Ratio between eye and target movement velocities were calculated (gain) at all positions separately. Index of cognitive activity was calculated from pupillometric responses to describe phasic attention. RESULTS: sports drivers presented with statistically significant lower index of cognitive activity ($F = 4,756$; $p = .000$) but no statistically significant differences in gain were observed between the two groups. In addition, index of cognitive activity presented with no changes under neck torsion conditions in sports drivers, while in healthy controls it tended to increase under neck torsion. CONCLUSION: sports racing drivers demonstrated high level of oculomotor control with lower demands on phasic attention regardless of head position. This adaptation could enable more reliable perception during different time and location constrained driving tasks.

O7

DOES NECK KINAESTHESIA CORRELATE TO QUIET EYE CHARACTERISTICS DURING BASKETBALL JUMP SHOTS AND FREE THROWS – A PILOT STUDY

Ziva Majcen Rosker¹, Janez Vodica¹, Jernej Rosker²

¹Faculty of sport, University of Ljubljana, Ljubljana, Slovenia, ²Faculty of Health Science, University of Primorska, Koper, Slovenia

Correspondence: ziva.majcen-rosker@fp.uni-lj.si

Quiet eye phenomena during basketball shots is related to superior precision, however its correlations to neck kinaesthesia has not yet been studied. This would be of importance as they present with strong neurological interconnections. PURPOSE: the aim was to assess correlations between quiet eye and neck kinaesthesia. METHODS: infrared mobile eye trackers were used to measure quiet eye during free throws and jump shots in 10 trained basketball players. Movement control (Butterfly test) and joint position sense of the neck were measured using NeckSmart system. Quiet eye was described using its onset, offset, duration and number of fixations. Movement sense was analysed using amplitude and directional accuracy and position sense using relocation error. RESULTS: Amplitude and directional accuracy presented with significant and strong correlation to quiet eye duration and onset during free throws. During jump shots, head relocation from extension presented with significant and very strong correlations with number of fixations. Significant and strong correlations were observed between head relocation from flexion and quiet eye duration as well as between head relocation from flexion and quiet eye offset during jump shots. CONCLUSION: neck kinaesthesia could affect quiet eye characteristics, suggesting the importance of oculomotor and neck kinaesthetic training for improving precision of basketball shots.

O8

EFFECT OF MINI BASKETBALL ON PHYSICAL DEVELOPMENT AND MOTOR SKILLS OF 8 - 9 YEAR OLD CHILDREN

Mariana Borukova

¹National sports academy "Vassil levski", Bulgaria, Faculty of Pedagogy

Correspondence: marianaborukova@gmail.com

The physical development of a person is an intricate and complex concept, which can be considered as a dynamically changing state from the moment of birth to the last breath of a person. At school games mark the beginning of sports education of children. PURPOSE: The purpose of the study is to determine the dynamics of

physical development and some motor qualities of 8- 9 year-old students under the influence of organized mini basketball sessions at school within 1 academic year. **METHODS:** Subject of the study were 205 primary school students. The applied methods are an overview study of specialized literature and sports-pedagogical testing after 18 indicators, carrying information about physical development and some motor qualities. Data was processed mathematically and statistically with the help of variation, comparative and correlation analyses. **RESULTS AND CONCLUSION:** The obtained results give reason to claim that organized mini basketball activities raise the level of physical development and have a favourable effect on the development of motor skills of 8-9 year-old children.

O9

HIGH INTENSITY EXERCISE UNDER HYPOXIA AND NORMOXIA IN FEMALES: A RANDOMIZED CONTROLLED TRIAL

Erich Hohenauer^{1,2,3}, Giannina Bianchi¹, Vanessa Wellauer¹, Wolfgang Taube³, Ron Clijisen^{1,2,4}

¹RESlab, University of Applied Sciences and Arts of Southern Switzerland, Landquart Switzerland, ²International University of Applied Sciences THIM, Landquart, Switzerland, ³University of Fribourg, Fribourg, Switzerland, ⁴University of Applied Sciences Bern, Berne, Switzerland
Correspondence: erichohenauer@supsi.ch

The mechanisms behind strength training under hypoxia are not exactly known, despite the increase in popularity. **PURPOSE:** The aim of this study was to investigate the physiological impact of high-intensity exercise (HIE) under hypoxia (HYP) and to compare it to normoxia (CON) on recovery characteristics (up to 72 hrs). **METHODS:** 20 female participants completed a high-intensity trial (5x20 drop jumps) under HYP (FiO₂=12%) and CON (FiO₂=21%). **RESULTS:** Capillary oxygenation and muscle oxygenation were both constantly lower in HYP vs CON during the HIE (Δ SpO₂: 18.7%, Δ SmO₂: 8.8%; all $p < 0.05$). No changes were observed in heart rate and core temperature between conditions (all $p > 0.05$). For muscle swelling, vertical jump performance, maximum knee extensor strength and muscle soreness, no differences between conditions were detected (all $p > 0.05$) during the 72 hrs recovery period. There were also no between group-differences detected during the recovery period for CK, CRP and blood sedimentation rate up to 72 hrs post-HIE (all $p > 0.05$). **CONCLUSION:** In conclusion, the main effect of HIE under HYP can be explained by reduced tissue oxygenation and not inflammatory responses.

O10

IMPACT OF PHYSICAL ACTIVITY ON PAIN IN PRIMARY DYSMENORRHEA- AN UMBRELLA REVIEW

Slavko Rogan¹, Eefje Luijck¹, Jara Anklier¹, Linda Guggisberg¹, Beatrice Buss¹

¹Bern University of Applied Sciences, School of Health Professions, Division of Physiotherapy, Bern, Switzerland

Correspondence: slavko.rogan@bfh.ch

Primary dysmenorrhea (PD) is the most common gynaecological problem characterized by painful menstrual spasms. Frequently, these are combined with other physical and psychological symptoms. As a result of these symptoms, it can cause significant pain and further result in a reduction in quality of life and physical performance. Evidence-based pharmaceutical options exist and are widely used. For women who cannot tolerate these or prefer non-pharmaceutical options, physical activity is mentioned as a treatment option, among others. A large number of studies exist on this, but a comprehensive review is lacking. **PURPOSE:** The aim was to provide an overview of the evidence on physical activity for the

treatment of pain in women with PD. **METHODS:** Two independent reviewers performed a systematic search in Embase, Pedro and PubMed. A search was conducted for systematic reviews and meta-analyses which illustrated physical activity as a treatment option in PD. **RESULTS:** Six articles were included. A positive, statistically significant reduction in pain intensity (SMD -0.629 [-0.842, -0.416], to -2.6 [-1.41, -3.78]; VAS: -1.86 [-3.17, -0.55] cm to -1.89 [-2.96, -1.09] cm) and pain duration (by -3.92 [-4.86, -2.97] hours to -4.38 [-5.17, -3.60] hours) was found for physical activity. In general, a high heterogeneity was found in a large part of the meta-analyses. **CONCLUSION:** Since physical activity is associated with low cost and few adverse effects, it can be recommended to women with PD as a complementary or alternative modality of treatment.

O11

INCREASING LEAN MASS AND MAXIMAL STRENGTH IN ELITE CANOE ATHLETES: AN EXAMPLE OF A SINGLE MESOCYCLE DURING THE PREPARATORY TRAINING PHASE

Armin Paravlic¹

¹University of Ljubljana, Faculty of Sport, Ljubljana, Slovenia

Correspondence: armin.paravlic@hotmail.com

Maximal muscle strength is one of the most investigated physical performance measures in athletes. Although it represents a fundamental ability for many athletic disciplines, the current literature on the maximal strength development in elite canoe athletes is scarce. **PURPOSE:** The primary aim of this study was to investigate the effects of a resistance training program during a single mesocycle in preparatory training phase on maximal strength development and body composition of elite canoe athletes. Secondary aim was to investigate the relationship between total training load and training-induced changes in maximal strength and body composition. **METHODS:** A total of seven male canoe sprint athletes (26.3±1.9 years old, 5 current world champions in 3 disciplines) were recruited. Before (PRE) and after (POST) a three-week mesocycle of resistance training, athletes were assessed for maximal strength in bench press (1RMbp), bench pull (1RMbpull) and back squat (1RMbs) exercises. Furthermore, body composition measurements were conducted by dual energy X-ray absorptiometry. **RESULTS:** At POST, athletes increased their 1RMbp (percent of change [PC]=10.1%, $p=0.001$), 1RMbpull (PC=7.5%, $p=0.001$), 1RMbs (PC=30.9, $p=0.001$), body weight (PC=4.4%, $p<0.001$), lean mass (PC=3.8%, $p<0.001$), whereas bone mass density remained the same, compared to PRE. Moreover, results showed that total training load highly correlates with changes in lean body mass ($r=0.771$, $p=0.042$). **CONCLUSION:** A single mesocycle focused on maximal strength development showed positive effects on maximal strength development and lean body mass gain in elite canoe athletes.

O12

INTERINDIVIDUAL COMPARISON OF ISOKINETIC MUSCLE PERFORMANCE IN YOUTH ROWING ATHLETES - PILOT STUDY

P. Kornfeind¹, K. Ivanics¹, A. Baca¹

¹Centre for Sport Science, University of Vienna

Correspondence: arnold.baca@univie.ac.at

PURPOSE: Muscular performance is one key element in elite rowing. Rowing at race pace implies higher muscle contraction velocities and should be considered both in resistant training and during performance assessment. Our intention is to investigate interindividual differences between elite rowing athletes during velocity dependent movements w.r.t. their performance in major muscle groups. **METHODS:** Five healthy male rowing athletes from

the Austrian youth national rowing team participated in the pilot study. They showed a comparable rowing performance level. After a warm-up, all subjects had to perform a rowing specific test protocol on an isokinetic machine (HUMAC NORM) focusing on the three major muscle groups legs, hip & arms. The test procedure comprised 5 consecutive MVC repetitions at different angular velocities. Mechanical work was calculated and the 3 most reliable concentric repetitions of each trial were chosen for analysis. RESULTS: As expected, mechanical work typically decreases with increasing contraction velocity in all muscle groups investigated. Whereas 4 athletes show similar behaviour, the results of subject 2 clearly differ for arm flexion and leg extension. Especially for arm flexion, no speed-dependent drop in mechanical work can be observed. CONCLUSION: The results reveal that the velocity-dependent muscle strength can vary significantly within a team. One possible cause could be intra-individual differences in the muscular performance of the main muscle groups involved in the rowing movement.

O13

IS SENSORIMOTOR TRAINING EFFECTIVE FOR THE MANAGEMENT OF CHRONIC NECK PAIN DISORDERS? A SYSTEMATIC REVIEW

Izabela Luznik¹, Maja Pajek¹, Ziva Majcen Rosker¹

¹University of Ljubljana, Faculty of Sport, Ljubljana, Slovenia

Correspondence: izabela.luznik@gmail.com

Sensorimotor disturbances are commonly reported in patients with neck pain and can lead to alterations in functional subsystems, particularly cervical kinaesthesia, postural balance, and eye movement control. Studies suggest that these disturbances might contribute to their reoccurrence and chronicity. Therefore, addressing sensorimotor control deficits is considered an important aspect of treating patients with neck pain disorders. PURPOSE: The aim of this systematic review is to investigate the effectiveness of sensorimotor training for the management of signs and symptoms related to patients with chronic neck pain disorders. METHODS: PubMed, PEDro, ScienceDirect and Web of Science were searched for studies that assessed the effectiveness of different types of sensorimotor exercises (e.g. eye-head coordination exercises, balance training, training of cervical kinaesthesia, etc.) in patients with chronic neck pain of traumatic or non-traumatic origin and were published before December 2022. The review was conducted according to the PRISMA guidelines. RESULTS: Amongst all evaluated interventions eye-head coordination exercises, balance training, kinematic and proprioceptive training of the neck demonstrated best improvements in reducing pain and disability as well as enhancing cervicocephalic kinaesthesia. CONCLUSION: Sensorimotor training lasting for 4 to 8 weeks helps in reducing neck-related signs and symptoms. Kinematic training using newer technologies (i.e. virtual reality) demonstrated promising results also due to exercising during unpredictable movement paths, which is a common injury mechanism.

O14

PHYSICAL PERFORMANCE IN ELITE SOCCER: COMPARISON BETWEEN WORLD CUP AND UEFA CHAMPIONS LEAGUE MATCHES

Toni Modrić¹, Tine Sattler², Damir Sekulić¹

¹Faculty of Kinesiology, University of Split, Split, Croatia, ²Faculty of Sport, University of Ljubljana, Ljubljana, Slovenia

Correspondence: toni.modric@yahoo.com

PURPOSE: In order to better understand the physical performance in the most elite soccer, this study aimed to examine differences in match running performance (MRP) during the World cup (WC)

and UEFA Champions League matches (UCL). METHODS: In total, 825 players' match observations (WC; n = 581, UCL; n = 244) were analysed using optical system and classified into five groups according to their playing positions as central defenders (CD), fullbacks (FB), central midfielders (CM), wide midfielders (WM), and forwards (FW). The MRP included total distance covered (TD) and high intensity running (HIR). Differences in MRP during the WC and UCL matches were examined using one-way analysis of variance separately for each playing position. Cohen's d was used to identify effect sizes (ES). RESULTS: The CDs, FBs, CMs, and WMs covered more TD in UCL than in WC matches ($f = 6.36$ to 22.07 , all $p < 0.01$, all moderate ES). In addition, CDs covered more HIR in UCL than in WC matches ($f = 4.58$, $p = 0.03$, small ES). CONCLUSION: The UCL demonstrated greater physical performance for players on almost all playing positions compared to the WC. These findings provide important insights for physical coaches preparing players for playing in the most elite soccer competitions.

O15

PHYSIOLOGICAL AND PERCEPTUAL EFFECTS OF COOLING TROUSERS: A CROSSOVER PILOT STUDY

Ron Clijsen^{1,2,4,5}, Johanna Wildmoser², Erich Hohenauer^{1,2,3,4}

¹RES lab, University of Applied Sciences and Arts of Southern Switzerland, Landquart Switzerland, ²International University of Applied Sciences THM, Landquart, Switzerland, ³University of Fribourg, Fribourg, Switzerland, ⁴Department of Movement and Sport Sciences, Vrije Universiteit Brussel, Brussels, Belgium, ⁵Department of Health, Bern University of Applied Sciences, Berne, Switzerland

Correspondence: ron.clijsen@supsi.ch

Cryotherapy, especially cold-water immersion (CWI), is a frequently used tool to enhance recovery after exercise. Because the clinical application of CWI can be tedious and logistically difficult, popular alternative cooling strategies such as cooling trousers by Icebein™ have been developed. Although these cooling devices are regularly used in sports rehabilitation, evidence of humans' physiological and perceptual responses is lacking. PURPOSE: The goal of this study is to investigate the effect of cooling trousers on skin temperature, skin perfusion, thermal perception as well as thermal comfort. METHODS: n=15 young, physically active and non-smoking male participants were recruited to participate in this crossover pilot study. RESULTS: Statistically significant effects were observed for skin temperature ($p < .001$), perfusion ($p = 0.038$), perception ($p < .001$) and comfort ($p = 0.01$). CONCLUSION: The results show a significant decrease in temperature and perfusion and an unpleasant perception of cold from using cooling trousers. These effects suggest that cold trousers might be a viable alternative for CWI.

O16

RELATION BETWEEN ISOMETRIC STRENGTH AND TRIPLE HOP JUMP TEST AMONGST DIFFERENT AGE GROUPS OF FOOTBALL PLAYERS

Duje Radman¹, Roberto Čačan², Jelena Paušić³

¹HNK Hajduk Split, ²Kinetic center Pula, ³Faculty of Kinesiology University of Split

Correspondence: duje.radman@gmail.com

Football is mainly aerobic sport but the performance of each player can be limited by the anaerobic demands such as capacity of maximal power production. To be able to manifest power one has to first be able to produce enough force in isometric and isotonic conditions. No studies were conducted to identify correlation between isometric dynamometry and triple hop jump tests among different age groups. The identification of good correlation between these

parameters could aid in selecting more optimal training modalities, optimal strength and power development and lower risk of injury between different age groups. **PURPOSE:** The aim of this study was to determine the isometric strength of lower limb extensors and flexors (quadriceps and hamstring) between different age groups of elite young football players and relate it to the triple hop test. **METHODS:** The sample (n=108) was selected among the players from senior and youth teams from Croatian 1st division club and all have been competing in first division of national championship. **RESULTS:** The results indicated correlation between different age groups and isometric strength. **CONCLUSION:** Only among some age groups correlation of isometric strength and triple hop test was determined.

O17

SECULAR TRENDS IN SKILL-RELATED PHYSICAL FITNESS AMONG SLOVENIAN CHILDREN AND ADOLESCENTS FROM 1983 TO 2014

Vedrana Sember¹, Saša Đurić², Gregor Starc¹, Bojan Leskošek¹, Maroje Sorić^{1,3}, Marjeta Kovač¹, Gregor Jurak¹

¹University of Ljubljana, Faculty of Sports, Ljubljana, Slovenia, ²American University of Middle East, Kuwait, Kuwait, ³University of Zagreb, Faculty for Kinesiology, Zagreb, Croatia

Correspondence: vedrana.sember@fsp.uni-lj.si

It is vital from the public health and educational perspective to be familiar with changes in fitness level of population since fitness is associated with several health outcomes and cognition. The aim of the present study was to examine secular trends in skill-related physical fitness in four youth generations of Slovenian children and adolescents in years 1983, 1993/94, 2003/04 and 2013/14. Using repeated cross-sectional design, we observed fitness level of 16678 participants, divided into three age groups: 6-10, 11-14, 15-19 years. Skill-related physical performance included speed (60-metre dash), coordination (Polygon backward, Hand drumming, Hand tapping), balance (Flamingo test), and flexibility (Sit and reach, Shoulder flexibility test). ANCOVA was used to compare differences in fitness performance between decades in each age and sex group, adjusted for body height, body weight, and BMI. We observed that individual components of skill-related fitness have shown very different temporal trends. Overall, large but inconsistent changes in coordination, a small improvement in speed, and a decline in flexibility was seen. The trends over the whole examined period were not linear throughout decades. Generally, positive trends were noticed in periods 1983 – 1993/94 (range 1.4% - 17.9%; except flexibility) and 2003/04 – 2013/14 (range 0.2% - 36.4 %; except age group 15-19 years) while in the period 1993/94 – 2003/04 there are some particularities in secular trends according to individual components as well as age groups. The secular trend generally had the same direction for both sexes, with the exception of gross motor coordination. Our findings call for exercise programmes aimed at improving speed and gross motor coordination in both sexes and all age groups, especially in the group of 15-19 years old girls and boys.

O18

SOCIAL INEQUALITIES IN HEALTH-RELATED FITNESS AMONG CROATIAN ADOLESCENTS: THE CRO-PALS STUDY

Maroje Sorić^{1,2}, Antonio Martinko¹, Marjeta Mišigoj-Duraković¹

¹University of Zagreb, Faculty of Kinesiology, Zagreb, Croatia, ²University of Ljubljana, Faculty of Sport, Ljubljana, Slovenia

Correspondence: maroje.soric@kif.hr

PURPOSE: We aimed to explore inequalities in health-related fitness based on the socio-economic status (SES) among 16-yr-olds in Croatia. **METHODS:** This investigation is a part of the CRO-PALS

study, an observational, longitudinal study conducted in a random sample of youth in Zagreb (Croatia). CRO-PALS involved 903 adolescents and for the purpose of this study data from 822 participants (408 girls) with data on SES were analysed. SES was self-reported through a single question inquiring about perceived material status. BMI was calculated according to standard procedures, minimal waist circumference was measured using a tape, blood pressure was measured following European guidelines, cardiorespiratory fitness was assessed through 20-m endurance shuttle run and muscle fitness was evaluated by standing long jump. Levels of fitness components were compared to Fitback criteria for health risk assessment of physical fitness or NHBPE Program criteria. Associations of SES and health outcomes were explored using multilevel logistic regression accounting for school-level clustering and adjusting for maturation and sex. **RESULTS:** Parameter estimates tended to favour more affluent children for all indicators except high blood pressure, but the odds of having unhealthy levels were not significantly different for low SES children compared to their more affluent peers for any of the fitness components studied. **CONCLUSION:** We did not find evidence for social inequalities in health-related fitness among Croatian adolescents attending schools in Zagreb who self-reported their perceived SES compared to their peers. Whether such inequalities are present for different indicators of socio-economic position, or in other parts of Croatia, requires further investigation.

O19

STATIC AND DYNAMIC LOAD EFFECTS ON THE PALM TEMPERATURE ON HIGH BAR

Karmen Šibanc¹, Ivan Čuk¹, Maja Pajek¹, izr. Igor Pušnik²

¹University of Ljubljana, Faculty of Sport, Ljubljana, Slovenia, ²University of Ljubljana, Faculty of Electrical Engineering, Ljubljana, Slovenia

Correspondence: karmen.sibanc@fsp.uni-lj.si

PURPOSE: Artistic gymnastics is the oldest organised sport discipline. Its contents are often used in various forms of exercises, as part of treatment after injuries, etc. On the high bar, the gymnasts' palms are in contact with the apparatus, there is a specific (unilateral) physical load. The force of the body weight, the gripping force, the friction force and the pressure (the force on the contact surface with the apparatus) are among the most frequent physical loads acting on the gymnasts' palms. They all have a specific impact on the temperature change of the palm and can lead to palm injuries. In sports and exercise science, thermography is widely used to evaluate athletic performance, to study exercise-induced superficial vascular changes, and to monitor injuries. There is a lack of research in this field and we wanted to know how different loads in hang on the high bar affect hand temperature. **METHODS:** Thirty-eight students from the Faculty of Sport at the University of Ljubljana were measured using a high-quality thermal imaging camera. The students performed 30 seconds of steady hang (static loading) and 30 seconds of swings in hang (dynamic loading). Palm temperatures were measured before loading, immediately after loading, and every 30 seconds for a period of 5 minutes after loading. Each hand was divided into nine different regions of interest (ROIs). Mean (XA), standard deviation (SD), maximum and minimum, and number of pixels were calculated. **RESULTS and CONCLUSION:** Our study showed that temperatures decreased significantly immediately after loading and then increased above pre-loading levels. After dynamic loading, temperatures continued to increase throughout the measurement period. After static loading, temperatures reached a consistently higher level after 3 minutes. Further studies are needed in different body positions and to determine the time period in which the hand temperature reaches the pre-load temperature.

O20**TECHNIQUES USED AND SERVE EFFICACY OF ELITE FEMALE VOLLEYBALL PLAYERS**Suncica Pocek¹, Zoran Milosevic¹, Dusko Cvijovic¹, Jovan Vukovic¹¹University of Novi Sad, Faculty for Sport and Physical Education, Novi Sad, Serbia**Correspondence:** suncicapocекsfv@gmail.com

Serve in volleyball is the first technical-tactical element in the structure of the volleyball game. Action with the ball, which from the serve area, starts the rally between the two teams for each point. The serve is not only the opening action in the game, nor is it simple transfer of the ball over the net to the opponent's side of the field but is increasingly developing into a powerful means of attack (high speed of ball), with which one tries to win a point or make it difficult for the opponent to receive the serve. **PURPOSE:** The goal of this study was to examine differences between elite female volleyball players by techniques used and serve efficacy. **METHODS:** A total of 204 serves performed by National team players of Serbia and Italy were analyzed. **RESULTS:** There are statistically significant differences between Serbia and Italy in techniques used ($\chi^2=15,620$ df=1 p=0,00) but not in the serve efficacy ($\chi^2=4,687$, df=5, p=0,455). **CONCLUSION:** In order to excel, elite volleyball players should master the technique of jump and float serve. In terms of efficacy, player should be able to put pressure on receiving end of opponent players with as few errors as possible.

O21**TECHNOLOGY ASSISTED ORIENTEERING TO IMPROVE ORIENTATION ABILITY AND KNOWLEDGE ACQUISITION OF UPPER SECONDARY SCHOOL PUPILS**A. Baca¹, P. Steiner¹, W. Koller¹¹Centre for Sport Science and University Sport, University of Vienna**Correspondence:** arnold.baca@univie.ac.at

PURPOSE: The COMPASS Orienteering game was developed in the frame of a project funded by the Erasmus+-Sport program. It is a tool for combining outdoor activities with education and enables the integration of knowledge tasks into sporting activities. The platform consists of a web application to create and manage courses and a smartphone app to perform the courses. We investigate to which extent the app in conjunction with orienteering influences orientation ability and knowledge retention of pupils of upper secondary school classes. **METHODS:** Different school classes participate as intervention and control group. The series of experiments include a theory input, a test before and after a series of orienteering runs with the app to check knowledge retention and additional runs, to check the orientation ability. **RESULTS:** In general, pupils and teachers were positive about the use of the app in school lessons. However, initial results, obtained from experiments with six school classes, indicate that the game in conjunction with the orienteering has no positive influence on orientation ability and knowledge retention of the students. **CONCLUSION:** The general complication of lesson planning due to the corona pandemic resulted in the location of the test series to the school grounds, which did not require specific orienteering capabilities. In consequence, additional experiments are currently performed comprising more appropriate terrain not familiar to the participants.

O22**WELL-BEING IN DISABLED CHILDREN DURING AN INTERACTIVE REHABILITATION CIRCUIT – USING A CASE-BASED APPROACH FOR TESTING 3-BIOMETRIC MEASURES (HR, EEG, CORTISOL)**Marlene Rosa¹, Dara Pincegher¹, Emanuel Silva¹, Susana L. Lopes²,Natalia Martins Martins³, Filipa Ribeiro³, Mariline Ferreira³, Duarte Fernandes³, Mariana Moreira³, Rui Jesus³, Alice Gabriel³, Rafael Pinheiro³, Rui Martins³¹ciTechCare, Center of Innovative Care and Health Technology, ²University of Salamanca, ³Polytechnic Leiria**Correspondence:** marlene.rosa@ipleiria.pt

PURPOSE: To test a biometric-base methodology for assessing well-being in disabled children during an interactive rehabilitation circuit. **METHODS:** A 20-yr old children with Cerebral Palsy participated in this experiment (2 sessions;40min.) using an interactive exercise-based rehabilitation circuit, supported by a digital demo projected on a wall (e.g., dancing exercises; body movement replication; imagery guided-upper limb exercises) interrupted by relaxing exercises (e.g., breathing exercises while observing a nature scenario). Cortisol levels were collected at the beginning and at the end of each session ($\mu\text{g/dL}$). Heart rate was monitored (H10 Polar sensor); the electroencephalography (EEG) analysis were collected, both in a continuous mode (Emotiv Epoc). Mean values were introduced for data analysis. **RESULTS:** The most critical EEG values for engagement were registered in dancing exercises and in body movement replication (=58); low values of relaxation occurred during dancing exercises (=15). Maximum values in focus (70) and in interest (52) were registered during rhythmic lower limb exercises. The HR values demonstrated a range of 20.2 bpm during stimulus (101.1 maximum; 81.3 minimum); a range of 12.89 bpm during relaxation (91.3 max.; 78.41 min.). The most critical values in HR were detected in imagery guided-upper limb exercises (101.1), occurring a positive HR recovery in the following relaxing period (84.74; \downarrow 16.76). Level of salivary cortisol decreased during session (from 0.204 to 0.173). **CONCLUSION:** Building a comprehensive methodology based on biometric indicators might improve a patient-centred exercise prescription for well-being in disabled populations, specially using the EEG monitorisation and the salivary cortisol confirmation.

O23**WHAT DETERMINES THE COMPETITIVE SUCCESS OF YOUNG CROATIAN WRESTLERS: ANTHROPOMETRIC INDICES, GENERIC OR SPECIFIC FITNESS PERFORMANCE?**Kreso Skugor¹, Barbara Gilic¹, Hrvoje Karnincic¹¹University of Split, Faculty of Kinesiology, Split, Croatia**Correspondence:** kresoskugor95@gmail.com

Identifying factors influencing wrestling performance is important for determining which capacities should be developed the most. **PURPOSE:** This research aimed to investigate do anthropometric indices, generic and specific fitness performance determine the competitive success of young wrestlers. **METHODS:** This research included 51 Croatian Greco-Roman wrestlers aged 17.75 ± 1.51 years. Variables included training and competing experience, anthropometric indices, generic fitness (countermovement jump and handgrip strength), and specific wrestling fitness test (SWFT). Wrestlers were separated into two categories: medalists and non-medallists (i.e., wrestlers who won a medal at the National Championship and wrestlers who did not win a medal, respectively). The t-test for independent samples was used to determine the differences between the two categories in all variables. Also, discriminant analysis was performed to identify differences in a multivariate manner. **RESULTS:** Medalists and non-medallists did not differ in anthropometric indices and wrestling experience. Medalists reached better results in the countermovement jump ($t=2.55$, $p<0.01$), handgrip strength ($t=2.77$, $p<0.01$), and SWFT performance ($t=2.29$, $p<0.05$) compared to non-medallists. Additionally, discriminant analysis confirmed that performance

categories differed in generic and specific fitness tests (Wilks's Lambda=0.73, $p<0.05$). **CONCLUSION:** Wrestlers that are more successful in competitions have better generic and specific sports performance. Therefore, it could be suggested that coaches should develop both generic and specific fitness of their wrestlers to become successful at competitions.

O24

WHAT INFLUENCES THE INCREASED EXPOSURE TO RED-S SYNDROME IN FEMALE BALLET DANCERS?

Daša Pruš¹, Petra Zalete¹

¹University of Ljubljana, Faculty of Sport, Ljubljana, Slovenia

Correspondence: dasa.prus@fsp.uni-lj.si

Dancers report many indicators of low energy availability. Ballet dancers are especially exposed to health issues caused by LEA, due to the high amount of dance training, which altogether can impair their performance. **PURPOSE:** The goal of the research was to analyze the exposure of professional ballet dancers to RED-S factors and to determine their connection with body composition and anemia blood indicators. **METHODS:** We used the Dance-Specific Energy Availability Questionnaire, on a group of 14 professional female ballet dancers (26,79 ± 6,18 years old; BMI: 19,47 ± 1,73; 44,61 ± 10,95 hours of dance exposure/week). The body composition was analyzed with the BioScan 920-II device. **RESULTS:** The mean RED-S score was -2,43 ± 5,26, resulting in 57% of ballet dancers being exposed to developing RED-S. Exposed dancers with higher BMI are more burdened with food control, as it affects their self-image. Regardless of the RED-S score, the more dancer is burdened by weight control, the more she controls her eating. Furthermore, the strong correlation between diagnosed eating disorders and exclusion of carbohydrates from the diet. Dancers who started their dance career a little later have higher iron values compared to those who have been dancing for a longer time. **CONCLUSION:** Due to extreme physical efforts and aesthetic demands, we could assume that ballerinas are exposed to psychological stress, which reflects in excessive control of body weight, diet, and sleeping problems.

O25

ANALYSIS OF THE ASSOCIATION BETWEEN HEALTH LITERACY AND SCHOLASTIC ACHIEVEMENT; CROSS-SECTIONAL PRELIMINARY STUDY AMONG HIGH-SCHOOL STUDENTS FROM SOUTHERN CROATIA

Marijana Geets Kesić¹, Nevenka Maras², Barbara Gilić¹

¹University of Split, Faculty of Kinesiology, ²University of Zagreb, Faculty of Teacher Education

Correspondence: markes@kifst.hr

Health literacy (HL) is responsible for attaining and maintaining proper health habits through finding, understanding, and applying proper health information, which subsequently leads to better well-being. **PURPOSE:** The aim of this study was to investigate whether scholastic variables relate to HL among adolescents. **METHODS:** The research included 268 high school students (202 females, 66 males) who were assessed on their health literacy levels using the HLS-EU-47 questionnaire, and scholastic variables (grade point average, excused and unexcused number of absences from school). Spearman correlation coefficients were calculated to establish the associations between study variables, separately for each gender. **RESULTS:** HL was higher in girls, than in boys, and girls achieved better scholastic success. The correlations between HL and scholastic variables were generally poor, while statistically significant correlations between grade point average and

health literacy were noted only among girls (Spearman $R=0.16$, $p<0.05$). **CONCLUSION:** The finding that scholastic achievement was related to HL among girls could be explained by the fact that females in our study have better grades and higher HL levels compared to males. Hence, females with better grades are more aware of the importance of health and have better health information.

O26

ANTHROPOMETRIC AND MOTOR DETERMINANTS OF ROWING PERFORMANCE ON 2000M ERGOMETER TEST

Mate Kuko¹, Šime Veršić¹, Ognjen Uljević¹

¹University of Split, Faculty of Kinesiology

Correspondence: mate.kuko@gmail.com

Rowing is an Olympic sport performed on water surfaces, with high physical demands mainly put on cardiovascular, skeletal, and muscular system. **PURPOSE:** The aim of this study was to determine association between certain anthropometric and motor variables with the results of a simulated rowing 2000m race on ergometer. **METHODS:** Participants in this study were junior male rowers from HVK Gusar Split ($N = 20$). Variables included set of predictors consisted of 9 anthropometric (body height, seated body height, body mass, arm width, upper and lower limb circumference, knee circumference, thorax circumference) and 5 motor variables (sit and reach flexibility test, broad jump test, push up max repetition test, crunching 60s test, horizontal pull 20s test) while rowing on ergometer on 2000 meter (ERG2000) was used as criterion. Correlation analysis was conducted for predictor variables, followed by a multiple regression analyses where highly correlated predictors were excluded. **RESULTS:** Selected predictors (body height, body mass and horizontal pull 20s) explained 49% of the variance for ERG2000, with body height ($b=-0,56$) identified as single most significant predictor. **CONCLUSION:** The results showed that anthropometric indices and upper body repetitive strength parameters should be practically applied in terms of training and selection in youth rowing.

O27

ASSOCIATION BETWEEN POWER CAPACITY AND HIGH INTENSITY MATCH ACTIVITIES AMONG CROATIAN ELITE SOCCER PLAYERS

Tomislav Pranjić¹, Toni Modrić¹

¹University of Split, Faculty of Kinesiology, Split, Croatia

Correspondence: tomislav.pranja8@gmail.com

It is often hypothesized that high physical capacity might be advantageous for physical performance in soccer. **PURPOSE:** This study aimed to examine possible association that may exist between power capacity and high-intensity match activities among elite level soccer. **METHODS:** The sample consisted of 16 professional players from the highest level of Croatian soccer competition which were classified according to their playing positions as central defenders (CD; $n = 3$), fullbacks (FB; $n = 4$), midfielders (CM; $n = 6$), and wingers (WM; $n = 3$). Players' power capacity was assessed with countermovement jump (CMJ) and drop jump (DJ). High-intensity match activities were collected by Global Positioning System from 14 official matches, and included high-speed running distance (HSRd) and efforts (HSRe), sprinting distance (SPRd) and efforts (SPRe), high-intensity accelerations (Hacc) and decelerations (Hdec). Linear mixed model was used to establish association between players' power capacity and high-intensity match activities. **RESULTS:** Significant association between DJ and Hdec were found for WM ($t = 2.13$, $p = 0.04$). No significant

association between CMJ/DJ and HSRd, HSRe, SPRd, SPRe, Hacc and Hdec was found for CD, CM, and FB ($t =$ from 0.28 to 2.16, all $p > 0.05$). **CONCLUSION:** This study demonstrated that power capacity defined by CMJ and DJ is poorly related to the high-intensity match activities.

O28

CAN SIMPLE VISUAL REACTION TIME BE USED AS A MEASURE OF BALANCE EXERCISE INTENSITY?

Sara Moskon¹, Petra Kokalj¹, Katja Tomazin¹

¹University of Ljubljana, Faculty of Sport

Correspondence: sara.moskon@fsp.uni-lj.si

The intensity of balance exercise is not determined yet. Some previous studies developed few exertion and stability scales but they were not clinically tested yet. **PURPOSE:** The main purpose of this study is to determine whether a simple visual reaction time can be a measure of the relative intensity of balance exercises. **METHODS:** A total of 20 volunteers, randomly selected, which did not train regularly, were included in the study. On a force plate subjects performed six repetitions of bilateral stance, unilateral stance and tandem stance on hard and compliant surface. Center of pressure (COP) velocity during balance exercises and visual reaction time were assessed. **RESULTS:** Balance exercises were divided into low- and high- intensity exercises according to COP velocity. While there were significant changes in COP velocity between low- and high-intensity exercises (p -value=0.000), there were no significant differences in simple visual reaction time ($F=1.059$, p -value=0.324). When high-intensity exercise was performed, a significant negative correlation was found between simple visual reaction time and relative changes in COP velocity ($r=-0.558$, p -value=0.047). **CONCLUSION:** The findings suggest that visual reaction time cannot be used as a measure of relative intensity of balance exercise.

O29

CERVICOCEPHALIC KINAESTHESIA IN SCOLIOSIS

Ahsen Buyukaslan¹, Ziva Majcen Rosker¹

¹Faculty of Sport, University of Ljubljana

Correspondence: ahsen.buyukaslan@fsp.uni-lj.si

Structural asymmetric posture caused by adolescent idiopathic scoliosis (AIS) creates a vicious cycle of sensory-motor dysfunction and compensatory mechanisms thus the progression of the deformity. Inaccurate feedback from the proprioceptors might be an important trigger for progression. Cervical proprioception plays a determining role in the mental elaboration of the visual representation of space, the fundamental reference for posture control. Despite the importance of the cervical spine via biomechanics and neurogenic multiple interactions between other parts of the kinetic chain, it has been neglected in patients with AIS in the current literature. **PURPOSE:** The purpose was to investigate the relationship between cervical proprioception and clinical characteristics of patients with AIS. **METHODS:** Nineteen AIS patients (mean age: 12.9±1.3; mean BMI: 18.3±2.6) included in the study. Cervical spine kinaesthesia was evaluated using the Butterfly test performed by the inertial motion unit (NeckSmart, NeckCare, Kopavogur, Iceland). **RESULTS:** Mean Cobb angle was 27.8±8.4°; mean apical rotation was 1.5±0.6 and mean angle of trunk rotation (ATR) was 6.2±4.7° at the thoracic level. **CONCLUSION:** Statistical analyses showed that patients who have a higher Cobb angle had more undershoot and spent less time on the target ($p \leq 0.05$). Patients who have more apical vertebral rotation had more undershooting and less smooth movement ($p \leq 0.05$). Patients who have a higher angle of trunk rotation (ATR) at the tho-

racic level showed less smooth movement of the neck in all difficulty levels ($p \leq 0.05$). Patients who have a higher angle of trunk rotation (ATR) at the thoracolumbar junction level had more undershooting and spent less time on the target ($p \leq 0.05$).

O30

CHANGES IN BIOMARKERS AND JUMPING PERFORMANCE FOLLOWING AN INTENSE TRAINING PERIOD IN ELITE HANDBALL PLAYERS – IS THERE A CONNECTION?

Kristina Drole¹, Primož Pori¹, Armin Paravlič¹

¹University of Ljubljana, Faculty of Sport, Ljubljana, Slovenia

Correspondence: kristina.drole@fsp.uni-lj.si

One of the biggest challenges for sport professionals is to plan and execute a training program with an optimal load to maximize the performance, while minimising the risk of overreaching and health-related problems. Although performance can be measured objectively with a variety of laboratory and field tests, those are not sensitive enough to predict performance decline that is yet about to happen. **PURPOSE:** The aim of current study was to investigate i) the effects of preparatory training period on biomarkers and jumping performance; ii) associations between changes in biomarkers, load and jumping performance from the beginning to the end of a 10-week preparatory period in elite handball players. **METHODS:** A prospective study was conducted on 17 elite handball players. Training, competition and academic load was reported weekly, while biomarkers and jumping performance were assessed at PRE- and POST- preparatory period. **RESULTS:** At POST, lower free testosterone (effect size [ES]=-1.69, $p < 0.001$), free testosterone to cortisol ratio (FTCR) (ES=-0.95, $p = 0.004$) and cortisol (ES=-0.18, $p = 0.503$), higher Immunoglobulin A concentrations (ES=0.77, $p = 0.013$) and unilateral tripple hop test (UTHFT) (ES = 1.05, $p = 0.002$) were observed compared to PRE. Furthermore, changes in FTCR correlated with cortisol ($r = -0.751$, $p = 0.001$) and UTHFT ($r = -0.643$, $p = 0.013$), while changes in free testosterone correlated with UTHFT ($r = -0.645$, $p = 0.013$). **CONCLUSION:** High intensity trainings with saturated competition schedule even in the preparatory period, can result in disturbed anabolic:catabolic hormone ratio observed through FTCR decrease, which could indicate either an optimal state or early exhaustiveness. Coaches may use the results for individualized monitoring of an athlete's health and performance, specifically as an aid for adjusting and prescribing training loads accordingly to prevent performance declines.

O31

COGNITIVE FUNCTIONS OF YOUTH WATER POLO PLAYERS

Neven Kovačević^{1,2}, Frane Mihanović³, Vladimir Pavlinović¹, Nikola Foretić¹, Tea Galić^{4,5}

¹Faculty of Kinesiology University of Split, Split, Croatia, ²Croatian Water Polo Federation, Zagreb, Croatia, ³Department of Health Sciences University of Split, Split, Croatia, ⁴Department of Prosthodontics, ⁵Department of Neuroscience, University of Split School of Medicine, Split, Croatia

Correspondence: nevenkovacevic57@gmail.com

Some previous studies suggested that children's engagement in sports has been associated with the improvement of cognitive functions, especially working memory, visual-spatial memory, motor coordination and cognitive flexibility. **PURPOSE:** The purpose of this study was to compare cognitive functions between female and male youth water polo players and the control group. **METHODS:** There were 18 female and 17 male water polo players (wp), members of Croatian National team enrolled in this study for cognitive testing (Stroop test). The control group consisted of 6 female and 12 male school students who did not participate in sports regularly.

Statistical analysis included calculation of descriptive statistics and Mann-Whitney U test. RESULTS: There were no statistically significant differences in psychomotor speed (Stroop Off) (wp 57.15±8.67 s vs. controls 57.72±5.62 s, $P=0.573$), while youth water polo players showed better response inhibition (Stroop On) (wp 64.50±14.09 s vs. controls 71.47±10.98 s, $P=0.016$) and psychomotor ability (StroopOn Time minus StroopOff Time) (wp 7.35±7.15 s vs. controls 13.75±8.05 s, $P<0.001$) than control subjects. CONCLUSION: The findings of this study suggest that children who participate in high level water polo develop better cognitive flexibility than school students who do not participate in sports regularly.

O32

DO FREEDIVERS AND SPEARFISHERMAN DIFFER IN LOCAL MUSCLE OXYGEN SATURATION AND ANAEROBIC POWER?

Dario Vrdoljak¹, Nikola Foretić¹, Ivan Drviš², Vladimir Ivančev¹, Mia Perić¹
¹University of Split, Faculty of Kinesiology, Split, Croatia, ²University of Split, Faculty of Kinesiology, Split, Croatia

Correspondence: dariovrdoljak42@gmail.com

Free diving is defined as an activity where athletes repetitively dive and are exposed to long efforts without oxygen consumption. Therefore, anaerobic features are expected to be an important facet of diving performance. PURPOSE: This study aimed to investigate differences in anaerobic capacity and local muscle oxygenation in spearfisherman and free divers. METHODS: The sample of participants included 16 male athletes (8 free divers, and 8 spearfishermen). Their chronological age was 37.69±8.63 years, body mass 83.57±9.33 kg, and height 184.75±5.31 cm. Participants' training experience was 10.56±9.78 years. Anthropometric characteristics included: body mass, body height, seated height, and percentage of body fat. Wingate anaerobic test was conducted, during which local muscle oxygenation was measured with a NIRS device (Moxymonitor). Wingate power outputs were measured (peak power (W/kg) and average power (W/kg)), together with muscle oxygenation variables (baseline SmO₂ (%), Desat slope (%/s), minimum SmO₂ (%), halftime recovery (sec), and maximum SmO₂ (%)). RESULTS: The differences were not obtained in power outputs (peak power ($p=0.14$); average power ($p=0.15$)) and muscle oxygenation parameters. Also, there were no significant correlations between anthropometric characteristics and anaerobic variables or muscle oxygenation in the whole sample of participants, nor within the subgroups. CONCLUSION: The non-existence of differences between groups indicates similar training adaptations to the anaerobic demands. However, the results show the anaerobic capacities of divers and could serve as an incentive for the development of these mechanisms.

O33

EFFECTIVENESS OF COOPERATIVE LEARNING FOR TRAINING YOUNG ATHLETES

Lea Železnik Mežan¹, Branko Škof¹, Saša Cević Erpič¹

¹University of Ljubljana, Faculty of Sport, Ljubljana, Slovenia

Correspondence: lea.zeleznikmezan@fsp.uni-lj.si

According to long-term athlete development, prepuberty should be devoted to learning athletic skills. As they have a positive impact on interpersonal relationships, success and satisfaction in sport, the development of various social skills is also important for young athletes. Good peer relationships, as well as a good self-concept and a mastery motivational climate, have a positive impact on the length of an athlete's career. PURPOSE: The aim of this study was to compare the effects of Cooperative Learning and Direct Instruction (most commonly used) on the physical, psychological and so-

cial learning of young track and field athletes. METHODS: Twelve trainers and their 157 athletes (9-11 years old) were divided into an experimental group (six trainers, 89 children) who completed 30 training sessions of Cooperative Learning and a control group (six trainers, 68 children) who continued to work with Direct Instruction. RESULTS: Cooperative Learning had significantly greater effects on the children's motor learning, emotional self-concept, peer relationships and motivational climate than Direct Instruction. Posttest differences between groups in movement skills were not statistically significant. CONCLUSION: Cooperative Learning is an effective training approach for young athletes. Because it facilitates improvements in motor learning, it should become the most commonly used pedagogical model for preadolescent children. As it has a positive effect on self-concept, group and motivational climate, it could help to reduce the dropout rate in youth sport.

O34

EXPERIENCES AND ATTITUDES OF PARENTS ABOUT CHILDREN'S LEISURE TIME AT CHILDREN'S SPORTS PLAYGROUNDS

Paula Matijašević¹, Antonija Vukašinić¹, Bruno Matijašević¹

¹Faculty of Humanities and Social Science of Osijek, Croatia

Correspondence: antonija.vukasiniovic@gmail.com

The importance of children's stay at children's sports playgrounds is important for the overall development of children. Numerous studies support children's stay at playgrounds with the goal of developing social, cognitive, and psychomotor skills. PURPOSE: The goal of this study is to determine the attitudes of parents of early and preschool children about children's stay at playgrounds and parents' experiences about the equipment of children's sports playgrounds and elements that contribute to the overall development of children. METHODS: For the purposes of the research, a questionnaire Parental assessment of children's playground attendance (PACPA) was constructed that examine the equipment of children's playgrounds, frequency of visits to children's sports playgrounds, and attitudes about the importance of visiting children's playgrounds. It showed satisfactory metric characteristics. The research is conducted online and covers the population of 220 parents from Republic of Croatia. RESULTS The results showed regional differences of frequency of visiting children's sports playground, equipment of it and parental attitude of importance of visiting it. Frequency of visiting children's sports playground is correlated to parental attitude of importance of visiting children's sports playground. CONCLUSION: The findings suggest that existence of quality equipped children's sports playground condition parental view of importance children's visit to them. It also showed different role of non-organised sport leisure culture in different Croatian regions.

O35

FAMILIARIZATION; HOW MANY TRIALS IS ENOUGH TO ACCESS BALANCE ON THE BIODEX BALANCE SYSTEM?

Marin Barisic¹, Miodrag Spasic¹, Vladimir Pavlinovic¹

¹University of Split, Faculty of Kinesiology, Split, Croatia

Correspondence: marin.barisic.ets@gmail.com

While the Biodex Balance System (BBS) proved to be a reliable apparatus for testing balance, there is lacking evidence of the number of familiarization trials the subject has to undergo before being tested, especially when lower stability levels are used on the BBS. PURPOSE: The goal of this study is to determine after how many attempts does the result of the balance test on the BBS stabilize. METHODS: The sample consisted of 66 boys and 57 girls aged 13 to 14 years old not active in sports. The subjects underwent the same

balance test three times and the Overall Stability Index parameter on the BBS was examined. In the analysis the results were separately examined for boys and girls using the t-test. RESULTS: Statistically significant differences were found in all three measurements for boys while for girls there was no statistically significant difference between the second and third measurement. CONCLUSION: The results of this study indicate that, for boys of this age, the results did not stabilize through the three trials conducted which could mean a need for more than three attempts so that the negative effects of familiarization could be avoided. For girls it seems that the result stabilized at the second trial which could indicate that only one trial is needed for them to familiarize themselves with the test.

O36

GENDER DIFFERENCES IN BALANCE PERFORMANCE

Antonela Karmen Ivišić¹, Šime Veršić¹, Nikola Foretić¹

¹Faculty of Kinesiology, University of Split, Croatia

Correspondence: nela.ivicic97@gmail.com

Maintaining balanced body position through complex-combined motor movements is an important ability in many sports. Due to a diverse manifestation of balance ability in gender sports performance, difference between gender' anthropometric characteristics should be considered as an influential factor. Considering the lack of the studies and following the deficiency of specific balance tests in sports, balance performance is still insufficiently examined. PURPOSE: Therefore, the aim of the study was to compare specific gymnastics balance ability in student's population, including observation of some anthropometric characteristics. METHODS: 45 students, male and female, performed on newly-developed balance gymnastics test, including three measured trials. Statistical procedures multivariate analysis (MANOVA) and univariate analysis (ANOVA) were used for analysing measuring results. RESULTS: The results indicated that there was no significant difference between two observed groups in specific gymnastic balance performance. Additionally, female students accomplished better results in performing balance on Biodex postural stability test. CONCLUSION: Accordingly, newly developed sport-specific balance test did not show good stratification in results of tested groups. Observed anthropometric characteristics do not necessarily have to influence balance performance in sport-specific test. Finally, in order to establish balance assessment of newly developed sport-specific gymnastics balance test, it is necessary to extend research on different sample of respondents.

O37

GROUND CONTACT - FLIGHT TIME RATIO AND RUNNING SPEED

Miljan Malovic¹, Igor Malovic¹, Milos Djuric¹, Dejan Radovic¹, Milos Miskovic¹

¹Institute for Sports and Sports Medicine of the Republic of Serbia, Belgrade, Serbia

Correspondence: mmalovic90@gmail.com

Fast power growth represents a key ability in developing speed. Research has shown a correlation between power and speed while focal point was on average and maximal power output but no data was used to reveal reactive power (RP) significance. Ground contact (CT) time can be an important parameter in power growth, and the "7 repeated jumps" (7RJ) test was chosen to extract RP, specifically CT ratio to flight time (FT). Regarding speed, split flying time took advantage over acceleration phase upon test selection. PURPOSE: The objective of this work is to show correlation between FT:CT in RP test and maximal speed running test. METHODS: This research included 19 female participants, (age 21.0±2.1), with following an-

thropometric characteristics: body height F = 171.7cm (5.6), body mass F = 67.1 kg (4.8). Participants are members of the developmental national women's handball team. Applied tests were 7RJ and „flying start 10m sprint" (10FS). RESULTS: A negative correlation coefficient of moderate strength was obtained and amounts 'r = -0.54. CONCLUSION: Based on confirmed correlation, it is suggested that RP demands attention through a single-speed training unit planning. The non-contextual nature of the selected RP test is considered a shortcoming. Future effort should be put into defining a more specific test setup that would assemble the aforementioned characteristics within the same context.

O38

HAMSTRINGS STRENGTH-ENDURANCE AS AN INDICATOR OF PREVIOUS INJURIES IN YOUTH FOOTBALL

Jakša Škomrlj^{1,2}, Dario Vrdoljak¹, Šime Veršić^{1,2}

¹University of Split, Faculty of Kinesiology, ²HNK Hajduk, Split

Correspondence: skomrljj@gmail.com

Young football players are faced with increasingly higher volumes and intensities in order to develop their skills and abilities. This increase in exposure time and intensity results in higher injury risk. PURPOSE: The main aim of this study was to identify differences in performance of the Single Leg Hamstring Bridge test (SLHB) between group of players with and without previous knee or hamstring injury. METHODS: 22 elite youth football players from the U-15 category were enrolled in this study. As an indicator of the strength endurance of the hamstring muscle group, SLHB test was performed, separately for left and right leg. Chronological age and maturity offset, as well as previous knee and hamstring injuries, were recorded. Nonparametric Mann-Whitney was used to assess the difference between players that experienced knee or hamstring injury and uninjured players. Additionally, Sign test was used to identify possible differences between injured and uninjured leg among players with previous knee or hamstrings injuries. RESULTS: No difference was found in the SLHB test/score (i) between previously injured and non-injured players, and (ii) between injured and non-injured leg of the players with previous injury history (all p>0.05). CONCLUSION: These results can be explained with relatively small sample size included in the study. Another potential explanation is that the SLHB test may be simply inappropriate for the football players in the U- 15 category. In future studies larger sample should be included and test should be conducted in other age categories.

O39

INSPIRATORY MUSCLE FATIGUE AT THE SWIMMING TUMBLE TURNS: ITS OCCURRENCE AND EFFECTS ON KINEMATIC PARAMETERS OF THE TURNS

Tadeja Moravec¹, Mitch Lomax², Anton Usaj³, Jernej Kapus⁴

¹Primary school Toneta Pavcka, Slovenia, ²School of Sport, Health & Exercise Science, University of Portsmouth, United Kingdom ³Laboratory of Biodynamics, Faculty of Sport, University of Ljubljana, Slovenia ⁴Laboratory of Biodynamics, Faculty of Sport, University of Ljubljana, Slovenia

Correspondence: tadeja.moravec@gmail.com

PURPOSE: The present study had two objectives: 1) to investigate the effects of tumble turns on the development of inspiratory muscle fatigue (IMF) and compare this to whole swimming, and 2) to evaluate the effects of pre-induced IMF on the kinematic parameters of tumble turns. METHODS: Fourteen young club-level swimmers completed three swim trials. The first trial was used to determine the 400-m front crawl swim time at maximal effort (400FC). The other two trials consisted of a series of 15 tumble

turns at 400FC pace. In one of the turn-only trials, IMF was pre-induced (TURNS-IMF), whereas in the other turn-only trial it was not (control trial, i.e., TURNS-C). RESULTS: Compared with baseline values, the values for maximal inspiratory mouth pressure at the end of the swim were significantly lower at TURNS-C. However, the magnitude of inspiratory muscle fatigue was less than that observed after 400FC. There were no significant differences in total turn times between TURNS-C and TURNS-IMF. However, compared to TURNS-C, turns at TURNS-IMF were performed with higher rotation times and shorter apnea and swim-out times. CONCLUSION: The results of the present study suggest that tumble turns put a strain on the inspiratory muscles and directly contribute to the IMF observed during FC swimming. Furthermore, pre-induced IMF resulted in significantly shorter apneas and slower rotations during tumble turns. IMF therefore has the potential to negatively affect overall swimming performance, and strategies should be sought to reduce its effects.

O40

LINKING CARDIORESPIRATORY FITNESS AND OBJECTIVELY MEASURED PHYSICAL ACTIVITY IN ADOLESCENTS

Mate Pikunic¹, Natasa Zenic¹, Barbara Gilic¹

¹University of Split, Faculty of Kinesiology

Correspondence: m.pikunic03@gmail.com

Cardiorespiratory fitness (CRF) is considered a major determinant of health and is thought to be linked with PA. PURPOSE: This research aimed to establish whether the relationship between CRF and objectively measured PA exists in the sample of Croatian adolescents. METHODS: High school students (98 females, 41 males, 14-18 years of age) were tested on the beep test, which is a measure of CRF, while PA was assessed by pedometers (Yamax SW200). Pearson's correlation coefficients were calculated to determine the relationship between CRF and PA for the total sample and gender stratified. RESULTS: CRF and PA were positively correlated in the total sample ($R=0.28$, $p<0.01$) and among females ($R=0.30$, $p<0.001$), while there was no significant correlation among males. Males had higher results than females in the beep test (level 11.62 ± 3.23 vs. 7.96 ± 2.43), while there were no gender differences in PA. CONCLUSION: Adolescents with higher PA had better CRF, which was emphasized in females. This could be because females are participating less in sports, which means that the primary source of their PA is walking, leading to the conclusion that females with higher step number have better CRF. Future studies should longitudinally observe this relationship and perhaps observe whether an increase in PA would lead to better CRF, especially among females.

O41

MY SLOFIT: INTERACTIVE EDUCATIONAL TOOL FOR PHYSICAL EDUCATION

Žan Luca Potočnik¹, Bojan Leskošek¹, Gregor Starc¹, Marjeta Kovač¹, Gregor Jurak¹

¹University of Ljubljana, Faculty of Sport, Slovenia

Correspondence: zan-luca.potocnik@fsp.uni-lj.si

Technology has not been used profoundly in school gyms, aside from heart rate monitors or the use of audio-visual equipment. PURPOSE: The SLOfit research team set out to develop a useful interactive educational tool for physical education. METHODS: The development of the interactive tool was based on nearly 30 years of experience in monitoring physical fitness in schools. Data collection was long based on pens and paper until a web-based application My SLOfit was introduced in 2016. In addition to physi-

cal fitness expertise, a great deal of IT programming and graphical design effort was required. RESULTS: The My SLOfit app allows registered users to enter fitness scores into a shared database and instantly get user-friendly feedback. Moreover, entered data is automatically checked with smart algorithms, which also inform users on deviations. App generates reports at different levels, i.e., school, generation, class, and individual. The higher-level reports help teachers in annual work planning while the individual reports are used for learning. Parents can grant access to students' data also to other persons, e.g. physician, coaches. With the help of the teacher's explanations, students learn about the importance of physical fitness through the report, observe how their fitness changes over time, and plan their own lifestyle intervention. In addition to visual representations of the results, the report provides links to a blog with educational materials and expert advice created by university professors, their assistants, and cooperating school teachers. CONCLUSION: The My SLOfit application offers benefits for physical education teachers, students, their parents, and others interested in the school process.

O42

PHYSICAL ACTIVITY IN KINDERGARTEN – CHILDREN'S PERSPECTIVE

Paula Matijašević¹, Antonija Vukašinović¹, Bruno Matijašević¹, Martina Jularić¹, Iva Klarić¹, Kristina Horvat¹

¹Faculty of Humanities and Social Sciences in Osijek, Osijek, Croatia

Correspondence: martina.stojanac2@gmail.com

Regular physical exercise is one of the prerequisites for a healthy life style. It is of the outmost importance to teach children healthy life style habits, such as regular physical activity, from the earliest age. This is why it is the task of a preschool teacher to teach children the importance of physical activity with the aim of achieving and preserving overall wellbeing of a child. The purpose of physical activities in kindergarten is manifold; development of motor skills, secretion of dopamine, improving child's social skills and more. Sport programs in kindergarten introduce to children the diversity of sports allowing them to make informed decisions when and if they decide to pursue a particular sport. PURPOSE: The aim of the study is to determine the range of activities which are preferred by the respondents. METHOD: The research was conducted in kindergarten that is based on a sport program taking in the account the Ethic Code due to conducting the research with preschool children. RESULTS: The results of the research show the respondents' preferred physical activities. Activities that respondents find difficult have been identified as well. CONCLUSION: The results show that it is possible, and important, to implement a habit of conducting regular physical activities in Early Childhood Education Curriculum with individual adjustment to the abilities of each child.

O43

POSITIONAL DIFFERENCES IN RUNNING PERFORMANCE: ANALYSIS ON WORLD CUP 2022

Ante Mandić¹, Šime Veršić^{1,2}, Toni Modrić¹

¹University of Split, Faculty of Kinesiology, ²HNK Hajduk, Split

Correspondence: amandick7@gmail.com

The FIFA World Cup is the highest-level international soccer tournament contested by the best national teams in the world. PURPOSE: The main aim of this study was to determine positional differences in the running performance of players at the World Cup 2022 (WC). METHODS: The sample of participants consisted of 641 individual running performance (RP) by the players that appeared on WC. Players were divided according to six positions in

the game (central defender, full back, defensive midfielder, central midfielder, wide midfielder, forwards). Running in five speed zones, number of high speed runs and sprints and maximal speed were analysed. Statistic included descriptive parameters and the analysis of differences between player positions in RP (ANOVA and Scheffe test). RESULTS: Results showed significant differences between positions in all observed variables ($f = 15.73$ to 93.86 , all $p < 0.01$). The lowest total distance was noted for central defenders (9761 m), and greatest for defensive midfielders (11574 m). Players on these positions had lowest sprint distances (140 and 142 m respectively), while wide midfielders had greatest (316 m). CONCLUSION: The results show that the RP in the highest national team competitive level significantly differs between playing positions. In accordance with the obtained data, it is clear that the training process should be positionally specified in order to maximize players RP.

O44

ASYMMETRY IN BALL KICKING SPEED BETWEEN PREFERRED AND NON- PREFERRED LEG IN YOUNG SOCCER PLAYERS

Ante Rađa¹, Jakov Marasović¹, Marko Erceg¹

¹Faculty of Kinesiology, University of Split

Correspondence: xxxxxxxxxxxx

Kicking ability is one of the most important skills in soccer. It is very important to have good kicking ability with both feet. PURPOSE: The main goal of this research was to determine ball kicking asymmetry (KA) between preferred and non-preferred leg in young soccer players for the U-15 and the U-17 age category. Second goal was to determine differences in kicking asymmetry (KA) between players of different playing positions. METHODS: 183 young players in U-15 category as well as 87 players from U-17 age category were tested with simple soccer specific test to evaluate kicking velocity (km/h) with preferred and non-preferred leg using Pocket radar. Testing took place on the artificial grass during dry and warm weather and ball was kicked while stationary at the 11-m spot. RESULTS: Results obtained with Student's T-test showed that differences in the maximum kicking velocity with the preferred and non-preferred leg were statistically significant ($p \leq 0.05$) in both age groups (90.2 ± 8.8 km/h / 78.5 ± 9.8 km/h for U-15) and (102.7 ± 6.4 km/h / 89.5 ± 9.4 km/h for U-17) which confirmed KA is present. Additionally, univariate analysis of variance (ANOVA) showed that there were significant differences in KA between different playing positions in U-17 group (KA=14.57 / 9.72 / 14.1 for defenders, midfielders and attackers, respectively). CONCLUSION: Soccer kicking can be a quality indicator for assessing the soccer kicking ability. By assessing kicking ability, relevant results can be obtained in a fast, and efficient way and can be utilized in the selection process of young talents.

O45

RELATIONS OF BIOLOGICAL AGE, SPEED, POWER AND AGILITY IN SEVENTH AND EIGHTH GRADE ELEMENTARY SCHOOL PUPILS

Vladimir Pavlinović¹, Nikola Foretić¹, Jakša Škomrlj¹, Dario Vrdoljak¹, Mia Perić¹

¹University of Split, Faculty of Kinesiology

Correspondence: vladimirpavlinovic@gmail.com

Previous studies suggest importance of biological age in overall motor development and maturation. Hence, it could be used as important indicator of right time for starting with power abilities training in youth. PURPOSE: The goal of this study is to determine relations of biological age, speed, power and agility in seventh and eighth grade primary

school pupils. METHODS: The participants were primary school boys ($n = 39$) and girls ($n = 43$) aged 13–15. Set of variables included: body height, seated height, body mass, body fat percentage, 10 and 20 m sprint, broad jump, squat jump, countermovement jump, drop jump, two tests of agility (CODS and RAG), predicted peak height velocity age and maturation offset. Statistical analysis included calculation of descriptive statistics and correlation among variables of biological maturation, anthropometric indices, and motor abilities. RESULTS: Only significant correlation was established between generic agility test 20Y and MO (in M sample $r = -0.53$, in F sample $r = -0.56$). No significant correlations were noticed among other motor abilities and biological age. In fact, measured correlations were relatively small and ranged from 0.02 to 0.29. Boys and girls show similar relations of biological age and speed, power and agility development. CONCLUSION: The findings suggest that biological age doesn't have to be an important factor of power performance prediction in older elementary school children. This is specifically relating to reactive agility.

O46

THE POTENTIAL FOR INCORPORATING CRIMINAL LAW PRINCIPLES AND OTHER BEST PRACTICES INTO SPORTS ARBITRATION IN DISCIPLINARY DISPUTES: A STUDY OF EVIDENTIARY ISSUES

Surbhi Kuwelker¹

¹University of Neuchatel, Switzerland (Faculty for Law)

Correspondence: ron.clijssen@supsi.ch

With the Court of Arbitration for Sport ("CAS") seeing an increasing number of appellate awards in disciplinary matters (Mavromati and Reeb 2015, pp. 45, 401 and 419) while not being a criminal forum and unbound by principles such as stare decisis (Downie 2011; p. 16, Baddeley 2020, p. 9; Lindholm 2019, pp. 85-117) there may be observed increased decision-making discretion and variable procedural thresholds, inter alia, which compromise principles such as certainty, and human-rights obligations, which should be sacrosanct (Kuwelker, 2021 pp. 177- 178). PURPOSE: The goal of this paper is to highlight these lacunae in disciplinary dispute- arbitration to ascertain the obligation and ability of the CAS to apply best practices seen in criminal law to strengthen procedural safeguards. METHODS: A review of legal literature, relevant jurisprudence (federation, CAS, Swiss Federal Tribunal and European Court of Human Rights) and best practices through practitioner interviews was undertaken. Evidentiary aspects as selected to demonstrate key issues. RESULTS/CONCLUSION: The severity of issued disciplinary sanctions (Diaconu et al., 2021), prominence and applicability of human-rights standards (Rigozzi 2020; Duval 2022), inter alia, render such disputes criminal 'adjacent' which magnifies the consequence of CAS 'autonomy' (see, for example, CAS 2011/A/2426, para 68 and 90). This necessitates the institution of procedural safeguards (such as set burdens and standards of proof, admissibility of evidence within evidentiary issues, inter alia) borrowing from criminal law, human rights discourse and arbitration best practices, with the paper providing concrete examples.

O47

REACTIVE STRENGTH INDEX OF VOLLEYBALL-SPECIFIC APPROACH JUMP

Jernej Pleša¹, Tine Sattler²

¹Basketball club Cedevita Olimpija, Ljubljana, Slovenia, ²University of Ljubljana, Faculty of Sport, Ljubljana, Slovenia

Correspondence: jernej.plesa@hotmail.com

Jumping performance is crucial component of volleyball game, with approach jump being the most common used test to eval-

uate physical performance of volleyball players. Approach jump presents a combination of countermovement jump and drop jump and is characterized by explosive penultimate step to create high horizontal force, which is later transferred into vertical direction to jump as high as possible. **PURPOSE:** The aim of this study was to evaluate approach jump technique of sixteen experienced volleyball players (> 3 years of experience in 1st Slovenian league) through one- and two-legged reactive strength index (RSI) score. **METHODS:** Participants performed three maximal approach jumps, while being recorded in slow motion (240 fps) with Iphone 13. Analysis of the jump was performed in Kinovea program, with RSI being calculated as ratio between flight time and contact time. **RESULTS:** On one hand our results can represent normative values for RSIfone-leg = 2.2 ± 0.3 and RSItwo-legs = 4.5 ± 0.5 ; while further analysis showed moderate correlations between jump height and both RSI calculations (0.57-0.65; $p > 0.001$). Additionally although not being significant, small inverse correlations were observed between contact times and jump height, indicating the importance of fast jump execution for approach jump performance. **CONCLUSION:** Further research is needed to reveal more about the potential of implementing these findings for training optimization through monitoring approach jump RSI.

O48

LATENT STRUCTURE OF SITUATIONAL EFFICIENCY VARIABLES IN ELITE WOMEN'S BASKETBALL

Xavier Manza^{1,3}, Mario Jelcic^{1,2}

¹International Basketball Coaching and Management, Kaunas, Lithuania & Split, Croatia, ²Faculty of Kinesiology, Split, Croatia, ³Melsoft games company, Vilnius, Lithuania

Correspondence: mariojelcic@yahoo.com

PURPOSE: The main goals of this work were to investigate the differences between the winning and losing teams in the observed situational parameters and to determine the latent structure of situational efficiency in top women's basketball. For this purpose, we have established 13 standard situational efficiency indicators derived from the 124 total games that were played in FIBA Euroleague for women in the 2018/2019 regular season and postseason. The postseason consisted of eight quarterfinals games, two semi-finals games, a third-place game and the final championship game. **METHODS:** In order to determine differences in situational efficiency variables between winning and losing teams, an independent samples t-test was used. Furthermore, in order to determine the latent structure of situational efficiency in top female basketball players, factor analysis with varimax rotation was used. **RESULTS:** The results suggest that the winning and losing teams are statistically significantly different in all the analyzed variables, except for the offensive rebound. Furthermore, the results of the component analysis show that six factors (six latent dimensions) can be distinguished in the space of standard parameters of situational efficiency. These are labeled as the 1) efficiency of the player in the front line of offense, 2) the efficiency of the player in shooting from the free throw line, 3) the efficiency of the player in shooting from three points and cooperation, 4) the defensive ability of front and back line players, 5) the defensive efficiency of player at the center position 6) the offensive ability of center players in rebounding. **CONCLUSION:** These results suggest that neither the thirteen indicators of situational efficiency nor the derived latent dimensions are fully capable of explaining the multifaceted structure of basketball game.

Poster presentations

P1

ADAPTATION OF FACTORS IMPORTANT FOR MARATHON RUNNING

Dusan Stupar¹, Igor Beretic¹, Romana Romanov¹

¹Educons University, Faculty for Sport and Psychology - Tims, Novi Sad, Serbia

Correspondence: dusan.stupa@tims.edu.rs

By definition, adaptation is the adjustment to environmental conditions. Every organism is in a dynamic relationship with its environment, striving to stay alive. Adaptation is the way in which the organism is kept alive in changing life circumstances. From this definition it is absolutely clear that running a marathon requires a change in life circumstances. **PURPOSE:** The goal of this study is to review available literature on research related to adaptation of factors important for marathon running. **METHODS:** Specific key words "marathon running", "physiological adaptation", "social adaptation", "economic adaptation", were used to search relevant electronic databases, such as PubMed, Web of Science, Google Scholar and Scopus. The research was conducted according to PRISMA guidelines. **RESULTS:** The results of studies that fit the inclusion criteria have showed that running a marathon depends on many factors. In addition to physical preparation, which affects physiological adaptation, runners must completely adjust their lives, family, work and free time, as well as their own economy, because the entire process of running a marathon requires adequate financial resources. **CONCLUSION:** The findings suggest that various factors play an important role in achieving the final goal, running a marathon. In addition to the training itself, physiological, social, and economic adaptation play a significant role.

P2

ADVANTAGES OF X-RAY EXAMINATION FOR THE DIAGNOSIS OF FRACTURES IN YOUNG ATHLETES

Lora Vasileva^{1,2}

¹Helios Klinik, Institute of radiology and nuclear medicine, Pforzheim, Germany, ²Sofia University, Department of "Sports Games and Mountain Sports", Sofia, Bulgaria

Correspondence: vasilevalora@yahoo.com

Diagnosing fractures is a daily challenge for any emergency center. Regardless of the precise work of the clinicians, for a correct diagnosis and subsequent treatment, in many cases, the availability of an imaging study is also required. **PURPOSE:** The purpose is to demonstrate and describe the fractures of three patients sustained during sports activity and to present the advantages of using X-ray as a method of investigation of this type of trauma in athletes. **METHODS:** The study included three young athletes (a basketball player, a handball player, and a trampoliner athlete) who were admitted to the emergency department for various injuries in November 2022. The average age of the athletes was 16 years. All are X-rayed. **RESULTS:** After the X-ray examination, a fracture of the nasal bone in the basketball player, a fracture of the medial epicondyle of the humerus in the handball player and a displaced diaphyseal fracture of the radius in the trampoliner jumper were found. In all three cases, regardless of the different nature of the trauma, the use of X-ray contributed to a quick and accurate diagnosis. After diagnosis by a radiologist, the athletes were referred to the relevant specialists for further treatment. **CONCLUSION:** For the diagnosis of fractures in young athletes, we recommend using an X-ray due to the availability and duration of the examination, the information it provides and the minimal dose of ionizing radiation compared to other imaging studies.

P3**ANALYSIS OF SPRINTING SPEED IN DIFFERENT DIRECTIONS**Jere Gulin¹, Vlatko Vučetić¹¹Faculty of Kinesiology, University of Zagreb, Croatia**Correspondence:** jere.gulin@kif.hr

The ability to sprint is very important in many team sports. Information about top sprinting speed can help practitioners not only to select players, but also to create more precise HIIT programs in terms of intensity prescription. **PURPOSE:** The main goal of this study was to analyze the sprinting speed of three sprinting directions (frontal, sideways, and backwards). **METHODS:** The study included 11 male kinesiology students with a background in team sports (age 20.2 ± 2.0 yrs, height 180.0 ± 5.2 cm, weight 73.8 ± 10.5 kg). All subjects completed a total of six sprints (two for each direction) in randomized order over a distance of 40m. Sprinting speed was measured with a radar gun (Stalker ATS II, USA). The rest between sprints was 3 minutes. **RESULTS:** The results clearly point to the conclusion that forward sprint speed (30.5 ± 0.8 km/h) is statistically significantly higher ($p < 0.05$) than sprints in other running directions, specifically sideways (19.0 ± 1.6 km/h) and backwards (19.3 ± 0.9 km/h). **CONCLUSION:** Lower speeds in the acceleration phase during backward running are primarily due to less horizontal ground reaction force, which then results in a shorter stride length and a shorter flight phase in comparison to forward running. Running backwards and sideways is characterized by shorter stride length and, at the same time, a higher stride frequency, which directly affects a longer duration of ground contact and a shorter flight phase.

P4**ASSOCIATION OF YO-YO INTERMITTENT TEST WITH HIGH METABOLIC LOAD DISTANCE IN STANDARD TRAINING GAMES: DO WE NEED TO TEST OUR PLAYERS?**Predrag Božić¹¹Serbian Institute of Sport and Sports Medicine (Belgrade, Serbia)**Correspondence:** vlatko.vucetic@kif.hr

PURPOSE: The purpose of this study was to explore if the volume of high intensity activities, obtained from standard football training game, is associated with endurance ability assessed through Yo-Yo intermittent recovery level 1 test (YYIR1). **METHODS:** Twenty-two (25 ± 4 years; 75.2 ± 8.1 kg; 178 ± 8 cm) professional soccer players participated in the study. All data were collected during two training sessions with players' soccer activity recorded using 10-Hz GPS. Additionally, in one session players are tested through YYIR1 protocol. GPS data were recorded during two sessions of typical big-sided games 11v11. For the purpose of this study, from GPS data we used High Metabolic Load Distance (HMDL) parameter. It is a metric which measures the total amount of high-speed running an athlete does, coupled with the total distance of accelerations and decelerations throughout a session. **RESULTS:** Significant correlations ($p < 0.05$) were found between the distance covered in YYIR1 and HMDL obtained during standard training game ($r = 0.83$). **CONCLUSION:** The results suggest that while the YYIR1 is useful tool to guide training prescription and monitor players preparedness, specific parameters obtained from standard training games, such as HMDL, might be efficient tool that contribute in player monitoring on daily or weekly basis.

P5**ATTITUDES OF PROFESSIONAL AND SEMI-PROFESSIONAL CROATIA MMA FIGHTERS TOWARDS INJURY MANAGEMENT**Ivan Jurak¹, Lucija Gnjiđić¹, Vatroslav Jelovica^{1,2}¹University of Applied Health Sciences, Croatia, Zagreb, ²Faculty of Political Science, Croatia, Zagreb**Correspondence:** ivan.jurak@zvu.hr

A positive attitude towards good injury management practice increases the likelihood of adherence to full rehabilitation protocol. **PURPOSE:** The purpose of this study is to explore athletes' attitudes towards injury management within the setting of their respective clubs and their level of trust in coaches to adhere to rehabilitation protocol. **METHODS:** Deep interview with three coaches and three professional fighters was conducted to structure the questions and afterwards questions were evaluated by an 8-participant focus group. Questionnaires were administered to a group of 34 professional and semi-professional fighters. Using Explorative Factor Analysis, two factors were extracted – "Attitude toward injury management" and "Trust in coach regarding injury". Linear regression was used to ascertain relationships between each of factors, fighters age, experience, and general injury knowledge. **RESULTS:** Mean age was 22.3 (17 - 37) and their mean fighter experience was 5.55 (1 - 18). Age was positively correlated with fighters' general knowledge of injuries ($\rho = 0.5$), although it was not significantly correlated with either age or their experience as fighters. Attitude toward injury management was positively correlated with Trust in coach regarding injury. **CONCLUSION:** MMA coaches are usually the first person of contact for fighters regarding injuries. While trust in coaches is generally high, their attitude towards injury management is not. More effort should be made towards enhancing the cooperation between coaches and health specialists.

P6**BODY COMPOSITION OF BOSNIA AND HERZEGOVINA U-19 NATIONAL FUTSAL TEAM ACCORDING TO PLAYING POSITION**Ivana Cerkez Zovko¹, Dusko Bjelica², Borko Katanic³, Marin Corluka¹¹University of Mostar, Faculty of Science and Education, Mostar, Bosnia and Herzegovina, ²University of Montenegro, Faculty for Sport and Physical Education, Niksic, Montenegro, ³University of Nis, Faculty of Sport and Physical Education, Nis, Serbia**Correspondence:** ivana.cerkez.zovko@fpmoz.sum.ba

Elite futsal players in addition to other characteristics, must have suitable anthropometric and body composition according to their playing position. **PURPOSE:** The research aimed to determine body composition of Bosnia and Herzegovina U-19 national futsal team players and also determine differences in anthropometric and body composition of players according to their playing position. **METHODS:** The sample of respondents consisted of Bosnia and Herzegovina U-19 National Futsal Team players ($n=14$, average age 18.07 ± 0.48 yrs, body height 181.40 ± 5.72 cm, and body weight 77.66 ± 10.60 kg). Morphological characteristics and body composition were evaluated by a battery of 11 variables: body height (BH), body mass (BM), triceps skinfold (TS), biceps skinfold (BiS), back skinfold (BS), abdominal skinfold (AS), upper leg skinfold (ULS), lower leg skinfold (LLS), body mass index (BMI), fat percentage (FP), and muscle mass percentages (MP). Futsal players were divided according to their positions in the team into goalkeepers, defenders, wingers and pivots. **RESULTS:** Based on ANOVA and post-hoc tests, the findings showed that there were significant differences between groups in 8 out of 11 morphological parameters. The results show that goalkeepers have a higher percentage of body fat than other players, but also pivots in 3 morphological variables have higher values than defenders and wing players. **CONCLUSION:** Although this study is important, because it examines the morphology of elite futsal players and in-

dicates certain differences in the morphology of athletes according to the positions in team. However, we must take these results with a grain of salt, due to the small sample of respondents.

P7

CORRELATION BETWEEN THE LUMBAR SYNDROME AND QUALITY OF LIFE ELEMENTS OF THE ADULT POPULATION: A SYSTEMATIC REVIEW

Zoran Milic¹, Sanja Šumonja¹, Sandra Vujkov¹

¹College of Vocational Studies for the Education of Preschool Teachers and Sports Trainers

Correspondence: zoranmilic@yahoo.com

Lumbar back pain (LS) occurs very often at all ages, especially when there is a lack of physical activity. The cause of LS in most cases is unknown and is multifactorial in nature. Very often, LS is associated with different lifestyles, sedentary behaviors and different biomechanical adaptations. In most industrialized countries, the frequency of LS occurrence exceeds seventy percent. **PURPOSE:** By reviewing the relevant scientific material, determine the connection between LS and the quality of life elements. **METHODS:** Specific key words "exercise", "lumbar syndrome", "quality of life", "relations", "health", were used to search relevant electronic databases, such as PubMed, Web of Science and Scopus. **RESULTS:** Studies that fit the inclusion criteria such as containing the data with the publication time that was from 2008 and later indicate the association of the lumbar syndrome with quality of life elements. **CONCLUSION:** In most cases, the lumbar syndrome negatively affects the mental and physical indicators of health, as well as the psychosocial aspects.

P8

DIFFERENCES IN BODY COMPOSITION BETWEEN ELITE FEMALE FUTSAL PLAYERS, MEMBERS OF THE BEST FUTSAL CLUBS IN MONTENEGRO, NORTH MACEDONIA, AND CROATIA

Borko Katanic¹, Dusko Bjelica², Lejla Sebic³, Adem Preljevic⁴

¹University of Nis, Faculty of Sport and Physical Education, Nis, Serbia,

²University of Montenegro, Faculty for Sport and Physical Education, Niksic, Montenegro, ³University of Sarajevo, Faculty of Sport and Physical Education, Sarajevo, Bosnia and Herzegovina, ⁴State University of Novi Pazar, Novi Pazar, Serbia

Correspondence: borkokatanic@gmail.com

Morphological characteristics and body composition plays an important role in achievements in most sports, however there are still no specific recommendations on anthropometry-body composition for this sport. **PURPOSE:** The research aimed to determine differences in body composition between elite female futsal players, members of the best futsal clubs in Montenegro, North Macedonia, and Croatia. **METHODS:** The sample of respondents consisted of 30 elite female futsal players. The first sub-sample was consisted by players of ZFK Breznica Pljevlja from Montenegro (n=11, 19.18±2.44 yrs), the second sub-sample was consisted by players of ZFK Tiverija Strumica from North Macedonia (n=10, 18.10±3.03), and the last sub-sample was consisted by players of ZFK Neretva Metkovic from Croatia (n=9, 20.33±5.17). Morphological characteristics and body composition were evaluated by a battery of 11 variables: body height (BH), body mass (BM), triceps skinfold (TS), biceps skinfold (BiS), back skinfold (BS), abdominal skinfold (AS), upper leg skinfold (ULS), lower leg skinfold (LLS), body mass index (BMI), fat percentage (FP), and muscle mass percentages (MP). **RESULTS:** Based on the ANOVA and post-hoc tests, findings showed that have differences between the groups in 4 morphological variables such body height, body mass, abdominal skinfold and muscle mass percentages. Female futsal players from Montenegro and

Croatia have significantly higher results in parameters such as body height, body mass, and muscle mass percentages. While futsal players from Montenegro have significantly higher abdominal skinfold values than Croatia. **CONCLUSION:** The results suggest that there is some difference in anthropometry-body composition between groups of female futsal players, but for more complete conclusions an analysis should be performed on a larger sample of high-level female futsal players.

P9

DIFFERENCES IN HEART RATE DURING RUNNING IN DIFFERENT MODALITIES

Vlatko Vučetić¹, Jere Gulin¹

¹Faculty of Kinesiology, University of Zagreb

Correspondence: vlatko.vucetic@kif.hr

Tracking the cardiovascular demands of football matches and training sessions is critical for creating an appropriate training program. Because of the nature of movement in football, it is necessary to understand the demands of movement in different modalities. **PURPOSE:** The aim of this study was to analyze differences in heart rate (HR) during different running modalities (frontal, sideways, and backwards). **METHODS:** The study included 16 male football players (age 23,0±1,40 yrs, height 182,8±6,64 cm, weight 79,73±9,14 kg). All subjects ran for 5 minutes on a motorized treadmill, and their HR was measured during all forementioned modalities at 8 km/h. Sessions were randomized, rest between sessions was 30 minutes. **RESULTS:** A statistically significant difference (p<0,05) was found between all HR values from different running modalities. During frontal running, HR values (136,81±14,31 bpm) were significantly lower than during lateral movement (176,19±11,91 bpm) and backward movement (168,19±12,68 bpm). HR values during backward movement were significantly lower than HR values during lateral movement. **CONCLUSION:** The results show that when moving sideways, the subjects are under a greater load, that is, the demand of the activity is higher than when moving frontally and/or backwards. This indicates that we need to incorporate a different approach in evaluating the level of cardiovascular demand during movement that is not forward, even at the same apparent intensity.

P10

DIFFERENCES IN SOME INDICATORS OF SITUATIONAL EFFICIENCY BETWEEN CROATIAN MEN'S HANDBALL TEAM AND MEDALISTS AT MAJOR COMPETITIONS FROM 2017 TO 2023

Goran Bobic¹, Tatjana Trost Bobic²

¹University of applied sciences Ivanic-Grad, Ivanic-Grad, Croatia, ²University of Zagreb, Faculty of kinesiology, Zagreb, Croatia

Correspondence: goranbobic12@gmail.com

Handball is a very dynamic polystructural game in which a lot of factors determine the final outcome and one of them are situational efficiency parameters **PURPOSE:** The aim of this study is to determine the differences in some indicators of situational efficiency between Croatian men's handball team and medalists at major competitions that took place from the year 2017 to 2023. **METHODS:** The sample of entities consisted of 301 handball games played by Croatian men's handball team and medalists at major competitions. The sample of variables consisted of 14 parameters of situational efficiency which included average percentage of successfully performed shots on a goal in attack phase and average percentage of successfully performed saves by a goalkeeper. The differences between the two groups were determined using Mann Whitney U test. **RESULTS:** The results showed that there is no significant

difference between the two groups but there are some indicators which are suggesting that goalkeeper position in Croatian men's handball team is not so efficient as it is in medalist team. **CONCLUSION:** It can be concluded that the two groups had a similar model of playing strategies which provided them a good shooting efficiency with a negative trend in goalkeeper's position of Croatian men's national handball team.

P11

DIFFERENCES IN THE MOTOR SKILLS OF SOCCER PLAYERS URBAN AND RURAL ENVIRONMENTS

Dejan Javorac¹, Momcilo Stanojkovic¹, Sasa Markovic², Slavko Molnar¹

¹Faculty of Sport and Physical Education, University of Novi Sad, Serbia

²Faculty of sport and physical education, University of Banja Luka, Bosnia and Herzegovina

Correspondence: javorac.dejan@gmail.com

The basic assumption for this research is that children from different living environments have different degrees of motor skills development. **PURPOSE:** The main goal of the work is to determine whether there are statistically significant differences in motor skills between urban and rural football players. **METHOD:** The sample consisted of male respondents, aged 13.1 (± 0.9), who play soccer. The total sample consisted of 44 football players from the Pioneer League of Vojvodina "North," from the urban environment, 23 respondents from Novi Sad, and from the rural setting, 21 respondents from Backa Palanka. For the purpose of testing motor skills, eight variables were used. The level of statistical significance was $p < 0.05$. **RESULTS:** Using the t-test for independent samples, quantitative differences between two defined groups of athletes were determined. Based on the obtained results, it was concluded that there are statistically significant differences in some variables: Speed at 20 m ($p = 0.03$), Slalom running at 20 m ($p = 0.02$), and Slalom with a ball (0.00), in favor of football players from rural areas. **CONCLUSION:** Based on everything, it can be concluded that programmed training can reduce these motoric differences between urban-rural environments, which further indicates that it is not the living environment that is decisive, but the quality and quantity of physical activity.

P12

EFFECTS OF A SIX-WEEK PROGRAMMED EXERCISE ON STUDENTS' BODY COMPOSITION

Milenko Jankovic¹, Sanja Sumonja², Sandra Vujkov²

¹Preschool Teachers Training College, Novi Sad, Serbia, ²College of Vocational Studies for Education of Preschool Teachers and Sports Trainers, Subotica, Serbia

Correspondence: milenkojankovic@live.com

Health status significantly arouses the interest of researchers from various scientific fields, including sports and physical education. The results available from research on health status indicate that physical activity has a positive effect on reducing body fat and increasing muscle mass and cardiorespiratory functions. **PURPOSE:** The goal of this study was to investigate the effects of a six-week programmed, self-induced exercise on body composition improvement in college students. **METHODS:** Overall 39 physically inactive students were divided into two groups Nexp=24 (Age 23.0 \pm 5.5) and Ncont=15 (Age 27.8 \pm 7.2). Body composition was measured with InBody 230 (Biospace Co., Ltd, Corea) on initial testing and after six weeks. During six weeks, the experimental group followed programmed training sessions 4 times per week for 30 min at home, the combination of muscle strength/endurance, and aerobic and mobility exercises. **RESULTS:** Results showed no differences between

the experimental and control group in the initial or final measurement. A significant difference was found in the experimental group ($p < 0.05$) in 5 out of 6 variables between the initial and final measurements, indicating body composition improvement **CONCLUSION:** The findings suggest that the body composition in students significantly improved after six weeks of treatment, leading to better health status in students.

P13

EFFECTS OF SELF-MANAGEMENT EMPHASIZING DIET AND EXERCISE PROGRAM ON BODY WEIGHT AND CD4 LEVELS IN PEOPLE LIVING WITH HIV/AIDS.

Weerapol Chunthima¹, Kulyanee Junthima², Nongyao Perthprapasi³

¹Suranaree university of technology, ²The Office of Disease Prevention and Control 9th Nakhon Ratchasima, ³Nongbuarawea hospital, Thailand

Correspondence: weepoon@sut.ac.th

Thailand is globally recognized for its achievements in controlling the HIV epidemic and establishing quality care and treatment programs for people living with HIV /AIDS. **PURPOSE:** This quasi-experimental study aimed to test effect of self-management emphasizing diet and exercise program on body weight and CD4 Levels In people living with HIV/aids. **METHODS:**Self- management theory was used as a conceptual framework to develop the program. Forty persons living with HIV/aids who received antiretroviral therapy at Nongbuarawea hospital, Chaiyaphum were matched by age, sex into each group. The control group received conventional care while the experimental group received 8 weeks of the self- management emphasizing diet and exercise program. The research instruments composed of 1) demographic sheet 2) perceived self - management emphasizing diet and exercise questionnaire 3) collecting data sheet of body weight and CD4 level and 4) the self-management emphasizing diet and exercise program. Content validity of the perceived self - management emphasizing diet and exercise questionnaire was approved by three experts. Descriptive statistics, Wilcoxon Signed-Rank test and pair t-test were used in data analysis. **RESULTS:**The finding showed that the self- management emphasizing diet and exercise score, the body weight after participating in the exercise program were statistically significant higher at the level of p-value = 0.001, 0.001 respectively. However CD4 level was not statistically difference (p-value = 0.06). **CONCLUSION:**The finding suggests that this exercise program is effective in improving exercise behavior. Therefore, this program could be used for promoting health among people living with HIV/aids.

P14

ELBOW JOINT DISLOCATION IN HANDBALL PLAYERS – DIAGNOSIS AND CONSERVATIVE TREATMENT

Iren Peltekova¹, Hashem Malla Houech², Lora Vasileva³

¹Sofia University, Department of "Sports Games and Mountain Sports", Sofia, Bulgaria, ²Helios Klinik, Orthopedics and trauma surgery department, Pforzheim, Germany, ³Helios Klinik, Institute of radiology and nuclear medicine, Pforzheim, Germany

Correspondence: iren.peltekova@gmail.com

In this article, we present a specific medical case of a 22-year-old handball player who was admitted to a medical center with a suspected luxation of the elbow joint following a direct impact with another player during training and a subsequent fall to the ground. **PURPOSE:** The goal of the study is to establish a relationship between imaging studies when making a decision to plan conservative treatment. **METHODS:** X-ray, computed tomography, 3-D reconstruction, magnetic resonance tomography. **RESULTS:** After taking the history and status, a deformity in the elbow joint, edema, lim-

itation in flexion and extension and a clinical suspicion of luxation were found. X-ray of the elbow joint in a profile projection showed an anterior luxation, without the presence of a fracture. Due to the age of the injury and the patient's musculature, reposition of the luxation was performed by traction, supination and flexion in the elbow joint under general anesthesia. **CONCLUSION:** The study shows correct articulation relationships between the three bones in the elbow joint, without the presence of fracture after reposition. A clear connection relationship and multidisciplinary approach in the diagnosis and treatment of luxations. Joint work between orthopedic traumatologists and radiologists helps quick and correct decisions.

P15

ENERGY INTAKE AND NUTRITION BALANCE IN ACROBATIC ROCK'N'ROLL DANCE

Petra Zaletel¹, Manca Kutnjak¹, Daša Pruš¹

¹University of Ljubljana, Faculty of Sport, Ljubljana, Slovenia

Correspondence: petra.zaletel@fsp.uni-lj.si

Athletes need to consume enough nutrients to maintain their performance and preserve adequate energy intake (EI) throughout the day, achieving optimal recovery after exercise and avoiding the occurrence of fatigue and possible injuries. In aesthetic sports the EI and thus nutrients that would meet the high physiological requirements of exercise are often hardly adequate. Acrobatic rock and roll (RNR) is a very fast, powerful, and explosive dance sport where a lean body is preferred. RNR dancers are among the most injured ones (89%), mostly at the ankle (44.83%) and knee (41.38%). **PURPOSE:** The purpose of our research was to analyze energy balance, the intake of individual macronutrients and to evaluate their nutritional regime regarding dancers' general health. **METHODS:** Fifteen top Slovenian RNR dancers of both genders monitored daily EI with a food diary and energy expenditure with acetometers. **RESULTS:** More than half of dancers had negative energy balance (53,33%), mostly females. 80% of dancers had reduced intake of at least one nutrient, with carbohydrates being the most commonly reduced (average $3,60 \pm 1,2$ g/kgBW). Females with lower energy balance exhibit stronger fatigue and worse quality of sleep. **CONCLUSION:** Although there was no significant correlation between inadequate EI and injury prevalence, special attention should be paid to maintaining adequate nutrition that will provide optimal available energy for the demands of training and performing.

P16

GENDER DIFFERENCES OF CROATIAN ARTISTIC GYMNASTICS COACHES

Marijo Možnik¹, Tomislav Krističević¹

¹University of Zagreb, Faculty of Kinesiology

Correspondence: marijo.moznik@kif.unizg.hr

In women's artistic gymnastics, we have a coach of both genders, while men's artistic gymnastics coaches are mostly men. In Croatia, there are 8146 female gymnasts compared to 2234 male gymnasts. **PURPOSE:** The purpose of this study was to identify differences between men and women in coaches' distribution in artistic gymnastics in Croatia. **METHODS:** In this study a sample of 221 gymnastics coaches from 50 clubs was used; There were 113 men and 108 women (divided in North, South, East and West region of Croatia). A questionnaire was used to collect data. The K-S test is used to calculate basic descriptive parameters, and the Mann-Whitney U Test is used to analyze gender differences. **RESULTS:** 14 female coaches and 36 male coaches participates in the absolute (elite level) program. The results indicated that there is a statistically significant difference be-

tween male and female coaches in the variable absolute (elite level) program, with $p=0.02$. Other gender-related factors failed to provide statistically significant differences. **CONCLUSION:** Although Croatia has a similar number of coaches, the elite gymnastics field (absolute program) has more male coaches than female coaches. The cause may be the complexity of the elements or assistance. Further research is needed to identify the true causes of the gender gap in coaching.

P17

IMMEDIATE AND SHORT-TERM EFFECTS OF KINESIOTAPING ON HANDGRIP STRENGTH

Iva Skleme Kokic¹, Stjepan Jelica², Tomislav Kokic³

¹J. J. Strossmayer University of Osijek, Faculty of Kinesiology, Osijek, Croatia, ²College of Applied Sciences „Lavoslav Ruzicka“ in Vukovar, Vukovar, Croatia, ³J. J. Strossmayer University of Osijek, Faculty of Medicine, Osijek, Croatia

Correspondence: ivaskleme@yahoo.com

Kinesiotaping is popular method in sports physiotherapy despite contradictory evidence regarding its effects. **PURPOSE:** The aim was to investigate whether application of kinesiotaping influences handgrip strength among healthy individuals. **METHODS:** Kinesiotaping was applied to dominant (N=58) and non-dominant (N=58) forearm of 116 healthy individuals (age: 22.6 ± 2.1 ; 50% females; BMI = 23.2 ± 2.7 kg/m²). It was applied on wrist flexors using methodology for medial epicondylitis. Handgrip strength was measured using digital dynamometer three times before the kinesiotaping application, and 30 min and 24h after the kinesiotape application. Mean of these measurements was used for analysis. The Wilcoxon signed-rank test was used for comparisons of handgrip strength between baseline and later measurements. **RESULTS:** Kinesiotaping applied to non-dominant forearm significantly increased handgrip strength 30 min after its application (37.6 ± 13.5 kg vs 38.8 ± 13.6 kg; $p=0.028$), as well as after 24h (39.3 ± 14.3 kg; $p=0.002$). Furthermore, kinesiotaping applied to dominant forearm significantly increased handgrip strength 24h after its application (40.1 ± 12 kg vs 40.9 ± 11.4 kg; $p=0.009$) without significant changes 30 min after its application. There were no other significant changes. **CONCLUSION:** Kinesiotaping of wrist flexors has small positive effects on handgrip strength 24h after its application.

P18

IMPACT OF PHYSICAL EDUCATION AND SPORTS ON THE PHYSICAL ABILITY OF GIRLS

Petko Stanislavov Mavrudiev¹

¹National Sports Academy "Vassil Levski", Faculty of Pedagogy, Department of Theory and Methodology of Physical Education, Sofia, Bulgaria

Correspondence: petkomavrudiev@gmail.com

PURPOSE: The purpose of the study is to determine the changes that occur in the level of the main signs of physical ability under the influence of physical education and sports within one academic year of the compulsory curriculum. **METHODS:** At the beginning and at the end of the school year, 45 girls from the 4th grade of middle school in Sofia were tested according to 5 indicators, carrying information about the main signs of physical capacity. Literature review, variance analysis, method of signal deviations and comparative Student's t-test are applied. **RESULTS:** The analysis shows that for two of the five investigated indicators carrying information about the explosive power of the upper limbs and endurance the values of the t- criterion are higher than the critical one, which gives us reason to claim that statistically significant differences exist. For three of the investigated indicators the t-criterion is lower than the critical one, which gives us a reason, with a high guarantee probability

($P \geq 95\%$) to assert that in the studied contingent of girls there were no statistically significant differences in terms of speed, explosive power of the lower limbs and agility, and all observed differences were due to random causes. **CONCLUSION:** In future work, the pedagogue should emphasize the qualities where there are no statistically significant differences.

P19

INCIDENCE OF INJURIES IN PROFESSIONAL DANCERS

Kamenka Zivcic¹, Lucija Milcic¹, Dan Lanc¹, Aleksandra Aleksic-Veljkovic², Marija Milas¹

¹University of Zagreb, Faculty of Kinesiology, Zagreb, Croatia, ²University of Niš, Faculty of Sport and Physical Education, Niš, Serbia

Correspondence: kamenka.zivcic@kif.hr

Due to the constant physical and mental demand that training, rehearsing, and performances puts on the body, almost all professional dancers have injuries at some point in their careers. Despite an increase in studies over the past few years, it is still unknown how often dance injuries are and how to prevent them. **PURPOSE:** This study aimed to identify the most frequent injuries and find out causes of injuries among male and female dancers. **METHODS:** Data were collected through a questionnaire, on a sample of 86 dancers (ballet, folklore, hip-hop, modern dance, a combination of several dances) aged from 15 to 57 years, consisting of 17 (19,8%) male and 69 (80,2%) female dancers. Mann-Whitney U test was used to determine the difference in the number of injuries between male and female dancers. **RESULTS:** 74,1% of dancers were injured during their career, with an average number of injuries being 2,12 +/- 2,11. There was no statistically significant difference in the number of injuries incurred by male and female dancers over their active careers. Ankle injuries represented the majority of incidents, followed by knee injuries (18.6%), foot injuries (17.4%), and lumbar spine injuries (16.3%). 7% of the dancers who were examined reported having hip injuries. Most injuries (73,9%) occurred during the training process. **CONCLUSION:** To better prevent injuries, it is crucial to understand how they happen, what stages of the training process, they occur in, which injuries are most common, and the location of the body they occur.

P20

MOTIVATION IN SPORTS PRACTICE DURING COVID-19 PANDEMIC: DIFFERENCES BETWEEN SENIOR AND JUNIOR PROFESSIONAL FOOTBALL PLAYERS IN BOSNIA AND HERZEGOVINA

Dusko Bjelica¹, Borko Katanic², Marin Corluka³, Zoran Milosevic⁴, Ivana Cerkez Zovko³, Ivona Radojevic Aleksic⁵

¹University of Montenegro, Faculty for Sport and Physical Education, Niksic, Montenegro, ²University of Nis, Faculty of Sport and Physical Education, Nis, Serbia, ³University of Mostar, Faculty of Science and Education, Mostar, Bosnia and Herzegovina, ⁴University of Novi Sad, Faculty of Sport and Physical Education, Novi Sad, Serbia, ⁵University of Kragujevac, Faculty of Technical Sciences, Cacak, Serbia

Correspondence: sportmont@t-com.me

During the Covid-19 pandemic period due to changes in athletes' routines, the role of motivation to play sports could be even more important. **PURPOSE:** The research aimed to determine differences in motivation in sports practice during the Covid-19 pandemic between senior and junior professional football players. **METHODS:** The sample of respondents consisted of 358 football players from the Premier League of Bosnia and Herzegovina. Players were divided into two groups senior ($n=193$, 24.87 ± 3.78 yrs) and junior ($n=165$, 18.08 ± 1.00 yrs) football players. The Participation Motivation Ques-

tionnaire (PMQ) was used. The questionnaire consists of 18 items classified into 6 dimensions. A five-point Likert scale was used in the questionnaire. The questionnaire was in electronic form and was sent to the football players via Google form. **RESULTS:** Junior football players achieved significantly higher values in 3 variables out of 18, namely 'Want to be popular', 'Want to gain status', and 'Wished of friendly games', while in the other 15 motivation variables, there was no difference between the groups. It should also be noted that both groups achieved extremely high values in the following dimensions 'Sports success', 'Physical health', and 'Friendship', while the weakest results were achieved in the dimension 'Support' in both groups. **CONCLUSION:** Despite the specific Covid-19 pandemic situation, the motivation to play football is at a very high level among both senior and junior football players. All of this points to the importance of this research, because on the one hand, it determined the level of motivation for training among young and senior players in Bosnia and Herzegovina, and also examined motivation during the Covid-19 pandemic.

P21

NEW PERSPECTIVES IN TEACHING AND LEARNING FUNDAMENTAL MOVEMENT SKILLS IN CHILDHOOD

Elisa Pugliese^{1,2}, Silvia Coppola³, Pasqualina Forte³, Cristiana D'anna¹

¹Pegaso University, Faculty for Human Sciences, Napoli, Italy, ²University of Camerino, School of Advanced studies, Camerino, Italy, ³University of Salerno, Department of Human, Philosophical and Educational Sciences, Fisciano, Italy

Correspondence: elisa.pugliese@unicam.it

In recent decades, educational neuroscientific studies have been tracing important trajectories to design effective learning environments which support the acquisition, development and improvement of motor skills. **PURPOSE:** The aim of the study is to provide a synthetic framework of the most recent empirical studies on motor learning in the developmental age, specifically investigating the new educational perspectives for the teaching of fundamental movement skills. **METHODS:** Through the study of the key points of the different theoretical approaches for the acquisition of motor skills and the analysis of the scientific evidence, a summary framework will be developed, highlighting strengths and critical points, focusing on the specific phase of the acquisition of fundamental movement skills. **RESULTS:** the two main approach in the theoretical framework are cognitive approach, in which prevails the concept of prescriptive method and ecological- dynamic approach, in which prevails the concept of heuristic method. The criterion for the methodological-didactic choice is based on scientific theories and the studies examined have shown a change of direction from the theory of generalized motor programs to the dynamical systems theory. **CONCLUSION:** The systemic perspective leads to new research possibilities to verify how much the implementation of learning environments based on the Ecologic-Dynamic approach allow the most appropriate basic motor development.

P22

NOTATION ANALYSIS OF THE MEN'S OLYMPIC WATER POLO TOURNAMENT HELD IN TOKYO IN 2021

Mladen Hraste¹, Igor Jelaska²

¹Faculty of Science, University of Split, Croatia, ²Faculty of Kinesiology, University of Split, Croatia

Correspondence: mhraste@pmfst.hr

Notation analysis is basically the gathering and analyzing of information that has been gained from observing performance in a competitive situation **PURPOSE:** The aim of this paper is to deter-

mine and explain the results and differences in technical and tactical efficiency in men's water polo. **METHODS:** The sample of the entities are the matches of the men's tournament of the Olympic Games in Tokyo 2021. The sample of variables are 18 defense and attack parameters of efficiency. **RESULTS:** Using a t-test for independent samples the winning and losing teams differ statistically significantly in forth variables. Statistically significant differences of winning teams in the realization with an equal number of players is probably stems from better skills in achieving optimal conditions in the preparation and execution. The reasons for the superiority of the winning teams in the part of defensive actions can probably be found because of better and more coordinated actions of all defensive players in exclusions, blocking the ball and goalkeeper shot saves. **CONCLUSION:** These findings encourage coaches to improve the player's skills in providing optimal conditions for the part of the technical-tactical solutions in defense and attack.

P23

PHYSICAL ACTIVITY AND FOOD INTAKE IN A SAMPLE OF COLLEGE STUDENTS FROM SUBOTICA, NORTHERN SERBIA

Sanja Šumonja¹, Milenko Jankovic¹, Zoran Milić¹

¹College of Vocational Studies for the Education of Preschool Teachers and Sports Trainers, Subotica, Serbia, ²Preschool Teachers Training College, Novi Sad, Serbia

Correspondence: sanjasumonja@gmail.com

Inadequate nutrition and lack of physical activity are major risk factors for chronic non- communicable diseases. Previous studies suggest that students do not achieve recommendations for a healthy diet and physical activity. **PURPOSE:** The purpose of this study was to investigate food intake and physical activity habits in college students. **METHODS:** The sample included college students from Subotica, Serbia. Data about food intake were collected using a modified KOMPAN questionnaire and the data about the current level of physical activity using a combination of IPAQ and ALPHA questionnaires. The sample included 42 female participants. The majority of the sample size was from the second year of study 29(69%). **RESULTS:** Results showed that 21,4% of respondents reported that they did not practice any form of physical activity during leisure time. The majority of respondents (57%) indicated that their typical day in terms of physical exertion was medium (including sitting and standing). Only 35,7% of respondents ate fruit and 19% consumed vegetables once a day. Furthermore, 23,8% of respondents have never consumed whole grains, and 33,7% of respondents consumed fast food at least once a week. **CONCLUSION:** Physical inactivity and inadequate food intake are significant health risk factors in college students.

P24

PHYSICAL EDUCATION SUCH AS "LIQUID KNOWLEDGE" TO ENCOURAGE LEARNING TRANSVERSAL KNOWLEDGE, SKILLS AND COMPETENCES

Pasqualina Forte³, Elisa Pugliese^{1,2}, Angelina Vivona¹, Cristiana D'anna¹

¹Pegaso University, Faculty for Human Sciences, Napoli, Italy, ²University of Camerino, School of Advanced studies, Camerino, Italy

Correspondence: pasqualina.forte@unicam.it

Recent neuroscientific research highlights interesting interactions between superior cognitive functions and the sensorimotor system. Overcoming the traditional views of the philosophy of mind and cognitive sciences, current empirical evidence shows that bodily states are the basis of information processing and that incarnation contributes to various aspects of mental phenomena. **PURPOSE:** Starting from this theoretical framework, the aim of this contribu-

tion is to outline, through a synthesis on the most significant discoveries in the world of neuroscience, the importance of Embodied Cognition as an emerging vision that considers the cognitive processes deep rooted in the interaction of the body with the world. **METHODS:** After careful selection and analysis of studies on neuroscience applied to teaching in the school context, the study focuses on those which have tested embodied-based approaches aimed at promoting transversal learning through movement and corporeality in action and interaction. **RESULTS:** The analysis highlights the strengths and critical points of the studies implemented in recent decades that focus on the integration and transversality of the body in learning. This in order to understand whether embodied based learning environments, involving all spheres of personality, are able to promote perception, knowledge and conscious action in teaching- learning processes. **CONCLUSIONS:** The contemporary theoretical framework highlights the great potential of corporeality and physical education as amplifiers of learning, but at the same time place in the foreground the need to experiment and disseminate new teaching approaches and perspective.

P25

PSYCHOMETRIC PROPERTIES AND GENDER-RELATED DIFFERENCES IN THE HULA-HOOP TEST FOR CHILDREN

Sunčica Delas Kalinski¹, Ana Kezic¹, Ana Penjak¹, Jelena Pausic¹, Cain C.T. Clark²

¹University of Split, Faculty of Kinesiology, Croatia, ²Coventry University, United Kingdom

Correspondence: suncica.delas@kifst.eu

The Hula-Hoop is accessible, easy to use, fun and interesting piece of sports equipment for pre- school children whose usage appears to promote body/spatial awareness, control of movements, balance, coordination and proper development of body posture. **PURPOSE:** The purpose of this research was to develop and assess the reliability and validity of the Hula-Hoop test for children, and to subsequently identify any gender mediated differences. **METHODS:** A sample of 44 randomly selected children (Boys: N1=22, mean age: 4.92±0.47y; Girls: N2=22, mean age 5.01±0.63 y) were assessed by 6 expert judges according to defined criteria. One-way ANOVA, inter item correlation (IIR), Cronbach alpha (Ca) and Factor analysis were used to analyse psychometric properties of newly constructed test. T-test for independent samples analysed gender-related differences. **RESULTS:** Utilising a one-way ANOVA, no systematic bias between judges scores ($p=0.35$; $\eta^2=0.03$) was evident, while average inter item correlation (IIR=0.90) and Cronbach alpha (Ca=0.98) further indicated appropriate reliability. Factor analysis demonstrated the validity of scoring system through extraction of one significant factor, named Hula-Hoop-specific coordination & movement, explaining 91.3% of judge's scores variability. Independent samples t-tests revealed significant gender-related differences ($p=0.01$). **CONCLUSION:** The results indicate that the Hula-Hoop test can be used as simple and cheap way to assess motor skills in pre-school children. Further studies are needed to introduce, develop and inspect psychometric characteristics, and the veracity of the Hula-Hoop test in larger samples, ages and ethnicities.

P26

RELATIONSHIP BETWEEN VERY LOW-CALORIE KETOGENIC DIET AND HANDGRIP STRENGTH IN WOMEN WITH OBESITY

Francesca Argentino^{1,2}, Ludovica Verde³, Giovanna Muscogiuri^{3,4,5}, Luigi Barrea^{2,3}

¹University of Camerino, Italy, ²Telematic University Pegaso, Department of Human Sciences, Naples, Italy, ³Unit of Endocrinology, Department of Clinical Medicine and Surgery, Federico II University Medical School of

Naples, Italy, ⁴Centro Italiano per la Cura e il Benessere del Paziente con Obesità (C.I.B.O.), Italy, ⁵Cattedra Unesco "Educazione Alla Salute e Allo Sviluppo Sostenibile", University Federico II, Naples, Italy
Correspondence: francesca.argentino@unicam.it

The preservation of muscle mass – associated with muscle strength – is a benefit of ketogenic diets thanks to the reduction in adipose tissue and obesity-related inflammation. The handgrip strength (HGS) test evaluates overall muscle strength. **PURPOSE:** This study aimed to assess whether very low-calorie ketogenic diet (VLCKD) can affect HGS and high-sensitivity C- reactive protein (hs-CRP) levels (marker of obesity-related inflammation). **METHODS:** 247 women with obesity followed 45 days of the VLCKD. Evaluations included: anthropometric measures, muscle strength (measuring HGS with a grip strength dynamometer), body composition (using a bioelectrical impedance analysis phase-sensitive system), hs-CRP levels (determined by nephelometric assay). Adherence to the VLCKD, ketosis status, and physical activity were checked by telephone. **RESULTS:** At day 45, BMI, fat mass, and hs-CRP levels were decreased, while HGS had increased, with a statistically significant and independent of the percentage of weight loss correlation. **CONCLUSION:** In conclusion, the HGS test can be an additional diagnostic tool to CRP to evaluate improvement in the overall status of patients who follow VLCKD.

P27

RETROSPECTIVE ANALYSIS OF GENDER DIFFERENCES IN SUCCESSIVE MOTOR PERFORMANCE USING TWO MOTOR COORDINATION TESTS

Ozren Rađenović¹, Ivan Jurak¹, Vjeran Švaić¹, Ivan Vrbik^{1,2}, Dalibor Kiseljak¹
¹University of Applied Health Sciences, Zagreb, Croatia, ²University of Slavonski Brod, Croatia

Correspondence: ozren.radenovic@zvuh.hr

PURPOSE: Improving motor skills is achieved through fast on-the-job training or by slow learning through multiple sessions. In study, we concentrated on the faster aspect of motor learning, particularly on potential differences between genders in fast motor learning. **METHODS:** By doing a retrospective analysis of available data, gathered by using two motor coordination tests performed three times, we used a mixed model ANOVA. The sample consisted of 1074 students. Average height was 181 (±7.04) and 166 (±17.0) centimeters respectively, while average mass was 80.5 (±13.3) and 62.6 (±12.7) kilograms. **RESULTS:** Males were better at performing the tasks in all three runs and both genders performed better in subsequent trials, however, females had a larger relative improvement from trial to trial than males on both Crawling and Jumping over Obstacles Test ($F(1.74, 1693.33) = 12.45$; $p < 0.001$; $\eta^2 = 0.013$) and Backwards Polygon Test ($F(1.77, 1843.59) = 11.17$; $p < 0.001$; $\eta^2 = 0.011$). **CONCLUSION:** Such difference in improvements in the coordination tests is likely to be a result of different motor learning strategies and cognitive processing. In addition, differences can be partly explained by psychological differences between genders such as risk aversion and competitiveness which are always present when measuring motor coordination using such motor tests as proxies.

P28

RUN-UP VELOCITY IN ARTISTIC GYMNASTICS FLOOR EXERCISES

Lucija Milicic¹, Kamenka Zivcic¹, Aleksandra Aleksic-Veljkojic², Marija Milas¹

¹University of Zagreb, Faculty of Kinesiology, Zagreb, Croatia, ²University of Niš, Faculty of Sport and Physical Education, Niš, Serbia

Correspondence: lucija.milicic@kif.hr

Round-off on the floor is used to change the direction of the run-up from front to back. It is connected with other acrobatic elements like handsprings and somersaults. Round-off it is also performed in acro series on the balance beam and on vault like Yurchenko and Tsukahara jumps. **PURPOSE:** The purpose of this research was to investigate the round-off run up velocities of male and female gymnasts. **METHODS:** Sample of variable consisted of 95 run up for round- off diagonals, which 39 were performed by women and 36 by man, competitors of the World Challenge Cup in Osijek, 2022. Run-up velocity was measured by Radar Stalker ATS, S PRO II instrument. Descriptive statistics, frequency tables and K-S test were calculated. The Mann- Whitney U test was used to examine the differences in run-up velocity between genders. **RESULTS:** Results indicate that there are no statistically significant differences between the genders in round-off run-up velocities, with a p value of 0.31. However, there are very slight variations of approximately 0.04 m/s in favour of man. Men's average run-up velocity was 6.35 m/s, while women's average run-up velocity was 6.49 m/s. Also in men, the third and fifth diagonals were used to round off, while the first diagonal was used frequently for 48.72% in women. **CONCLUSION:** In order to accurately describe the run-up velocity, next research should incorporate biomechanical analyses of acrobatic elements in acro series.

P29

SEVEN PROPOSALS FOR THE REVITALIZATION OF JAPAN'S GOLF COURSES: THE VIEWS OF GOLF COURSE MANAGERS IN JAPAN, THE U.S., AND THE U.K.

Testuro KITA¹

¹Musashino Art University, JAPAN

Correspondence: kita@musabi.ac.jp

There are approximately 2,200 golf courses in Japan. This number is the third largest in the world after the United States and Canada. However, the number of golf courses in Japan is decreasing every year. Based on prior studies, Kita et al. have developed seven proposals for modernizing the Japanese golfing style. **PURPOSE:** A survey was conducted to clarify the views of golf course managers in Japan, the U.S., and the U.K. on seven proposals for the revitalization of golf courses in Japan. **METHODS:** The survey was conducted between August 2020 and April 2021 using the postal mail method. Responses were received from 67 respondents in Japan and 13 from managers in the United States and the United Kingdom. **RESULTS:** "Very useful" and "Somewhat useful" responses in Japanese managers, there were many answers in the order of Smart golf course (65.7%), Use of golf courses for purposes other than golf (49.2%), Loosening of club regulations (34.5%), Liberalization of dress code (37.4%), Pricing by hole (20.9%), Hourly course rentals (17.9%), Bowling style (11.9%). **CONCLUSION:** The promotion of "smart golf courses" is rated high in Japan, the U.K., and the U.S., and is expected to be introduced sooner or later. The seven proposals may be suitable for some golf courses and difficult to incorporate into others, depending on the situation, target, history, region, etc.

P30

SHORT-TERM PLYOMETRIC TRAINING ON ROWING PERFORMANCE IN PARA- ROWING

Khaothin Thawichai¹, Rachnave Pornthep¹

¹School of Sports Science, Institute of Science, Suranaree University of Technology

Correspondence: thawicha.ikhaothin@gmail.com

Plyometric training is an effective method for improving strength and power even in the short- term among able-bodied rowers.

PURPOSE: The aim of this study was to examine the effects of short-term plyometrics training on rowing performance in para-rowers. **METHODS:** Eight para-rowers from the Thai national team volunteered to participate in the study (sports class PR1 = 1 male, 1 female; PR2 = 1 male, 1 female; PR3 = 2 male, 2 female). The participants were healthy, well-trained, free from injuries, and were not involved in any type of plyometrics training at the time of the study. All participants were assigned to participate in a 4-week upper plyometric training program of upper extremity plyometric exercises with three training sessions per week. **RESULTS:** Participants were tested before and after the 4-week upper plyometrics training period with a rowing performance test that was assessed with a 500-meter rowing ergometer time trial and a 15-second maximal rowing ergometer test which were selected as testing variables to evaluate the training program. The results of this study indicate statistically significant rowing performance differences before and after short-term plyometric training. The 500-meter rowing time, average rowing power, and peak rowing power statistically significantly increased ($p < 0.05$), but no significant increase in rowing stroke rate was found ($p > 0.05$). **CONCLUSION:** In conclusion, short-term plyometrics training is found to significantly increase 500-meter rowing time, average rowing power, and peak rowing power, but the training did not significantly increase stroke rate. This study suggests that short-term plyometrics training can be used to improve rowing performance among para-rowers.

P31

SLOVENIA IN SOCIAL TRANSITION: THE 2021 REPUBLIC OF SLOVENIA REPORT CARD ON PHYSICAL ACTIVITY OF CHILDREN AND ADOLESCENTS

Shawnda A. Morrison^{1,2}, Gregor Jurak¹, Gregor Starc¹, Marjeta Kovač¹, Mojca Golobič³, Poljanka Pavletič Samardžija⁴, Mojca Gabrijelčič⁵, Primož Kotnik⁶, Kaja Meh¹, Vedrana Sember¹

¹Faculty of Sport, University of Ljubljana, Ljubljana, Slovenia, ²Yong Loo Lin School of Medicine, National University of Singapore, Singapore, ³Biotechnical Faculty, University of Ljubljana, ⁴Republic of Slovenia National Olympic Committee, ⁵Slovenian National Institute of Public Health, ⁶Medical Faculty, University of Ljubljana

Correspondence: vedrana.sember@fsp.uni-lj.si

Slovenians are in a phase of dramatic social transition, a concept developed for nations moving from a poor to an affluent society, pre-supposing that the trajectory of a given health indicator will follow a U-shape recovery pattern. To overlay the social transition concept to the established Report Card model as a means of contextualising the extreme changes in physical activity and fitness observed over several years. We followed a standard method of grading based on established benchmarks for 10 core indicators, plus two (Sleep, Seasonal Variations). Active Healthy Kids Slovenia members met (predominantly via zoom) liaising with team leader(s) on a flexible, individual basis, based on COVID-19 regulations, over the ~2-year assessment period of the project. Data were separated to the 'years before' (2018-2020) and 'during' the global pandemic (2020-2021). Where sufficient data existed for both timeframes, grades were averaged producing an overall grade. Grade results were (pre/during/final grade): Overall Physical Activity (A-/A-/A-), Organized Sport and Physical Activity (C+/C/C), Active Play (D/C+/C), Active Transport (C/INC/C), Sedentary Behaviour (B/C/C+), Physical Fitness (A+/A-/A), Family and Peers (B+/INC/B+), Schools (A/A/A), Community and Environment (A+/A+/A+), Government (A/F/D), Sleep (D-/INC/D-), Seasonal Variations (D/C-/D+). Although Slovenia has some of the most consistently physically-active children in the world, the effects of the COVID-19 pandemic exerted significant reductions in physical

activity opportunities, and especially when coupled with funding re-distributions, resulted in the steepest decline of child physical fitness observed within the >35-year history of Slovenia's well-established national fitness surveillance monitoring systems.

P32

SOCIO-DEMOGRAPHIC AND PHYSICAL ACTIVITY CHARACTERISTICS AS CORRELATES OF NUTRITIONAL STATUS OF ADULTS IN VOJVODINA

Lidija Marković¹, Višnja Djordjić¹, Jovan Vuković¹, Bojan Rašković¹, Zoran Milošević¹

¹University of Novi Sad, Faculty of Sport and Physical Education, Serbia

Correspondence: markoviclidija169@gmail.com

Special Eurobarometer surveys on physical activity have been conducted in EU countries since 2002. The same methodology was implemented in the Autonomous Province of Vojvodina in 2011 and 2019 in order to provide relevant and comparable data on citizens' physical activity. **PURPOSE:** The aim of this study was to examine how demographic and physical activity characteristics are related to nutritional status of adults in Vojvodina. **METHOD:** The sample consisted of adults aged 18 and over (452 men, 511 women), divided in four age groups. Data on education, urbanization and physical activity level were collected by the survey, while participants' BMI was calculated based on self-reported data. **RESULTS:** The prevalence of overweight and obesity was significantly higher in males (χ^2 (6, 903) = 129,03; $p < .0001$), older age groups (χ^2 (6, 963) = 102,21; $p < .0001$), and among adults with a lower educational level (χ^2 (6, 963) = 52,84; $p < .0001$). Participants who rarely engaged in physical activity as part of their daily life activities, represented the highest risk group (χ^2 (6, 961) = 17,01; $p = .0092$), opposite to those who walked more on a weekly basis (χ^2 (6, 932) = 16,69; $p = .0105$), and were less sedentary during the day (χ^2 (6, 903) = 12,68; $p = .0484$). **CONCLUSION:** The demographic and physical activity characteristics identified as correlates of the nutritional status of adults in Vojvodina, should be considered when developing tailored strategies of obesity prevention and physical activity promotion in Vojvodina.

P33

SPORT RELATED INJURY OF THE DISTAL BICEPS TENDON IN A FITNESS CLUB EXERCISER RECOGNIZED ON MAGNETIC RESONANCE (MR) IMAGING

Victoria M. Houeche^{1,2}, Iren Peltekova³

¹Department of Diagnostic Imaging, University Hospital "Alexandrovska", Sofia, Bulgaria, ²Department of Diagnostic Imaging, Faculty of Medicine, Medical University of Sofia, Bulgaria, ³Sector: Team Sports and Mountain Sports, Department of Sport, Sofia University "St. Kliment Ohridski", Sofia, Bulgaria

Correspondence: victoria_malla@yahoo.com

The severity of sport trauma is determined by the absence duration of the athlete from active training and competitions. Therefore prompt assessing of injuries and treatment management are crucial. **PURPOSE:** To highlight the role of MR as an imaging method in detecting a suspected distal biceps tendon rupture. **METHODS:** MR examination of the elbow of a forty-year-old sport club exerciser was carried out on a 1.5 Tesla machine due to complain of elbow pain, inability to supinate the forearm and to flex in the elbow. Fluid sensitive fat suppressing (STIR) and fat saturated proton density (PD) techniques in all three planes were performed. Processing and analyzing of the images was done on a Syngo workstation. **RESULTS:** The findings showed absence of the inserting distal biceps tendon at the radial tuberosity. The tendon appeared coiled

and thinned. Peritendinous edema and hemorrhage were also visualized. **CONCLUSION:** Distal biceps tendon rupture is not a so rare injury in sportsman. Treatment and recovery take time as in professional athletes this results in missing a season of playing. MR is the imaging modality in detecting tendon injuries and has an impact on treatment planning.

P34

STRATEGIES IN CLASSIFICATION IN PARALYMPIC SPORTS

Romana Romanov¹, Dusan Stupar¹, Igor Beretic¹

¹Educons University, Faculty for Sport and Psychology - Tims, Novi Sad, Serbia

Correspondence: romana.romanov@tims.edu.rs

Classification is a method by which an athlete with a disability is placed in a group, so as to minimize the impact of the disability on the achievement of results. The classification system has evolved significantly in recent years, but for individual Paralympic sports, the application of different classification strategies can be observed. **PURPOSE:** The aim of this review study is to present different classification strategies in Paralympic sports. **METHODS:** Specific keywords "classification", "sport for disability", "Paralympic sports", "history of classification" and "classification methods", were used to search relevant electronic databases, such as PubMed, Web of Science and Scopus, Google Scholar and the International Paralympic Committee as well. **RESULTS:** The results of studies, and relevant documents such as the IPC Athletes Classification Code, and Classification Code for every Paralympic sport indicate the application of different strategies in the process of classifying athletes with disabilities. Strategies are closely related to different models of health that have changed during historical epochs. Models of health that ranged from ancient to biomedical, adaptation, and even socioecological, influenced the development of the classification. **CONCLUSION:** There are two classification models, the medical one based on the anatomical strategy and the functional one, which is developed on the strategy of combining different types and degrees of disability with the goal of similar sports abilities. In accordance with the functional strategy, the classifier defines what the athlete is capable of performing, not just what he or she demonstrates.

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THE EFFECTS OF A SIX-WEEK PROGRAMMED EXERCISE ON THE FITNESS FORM OF FEMALE STUDENTS

Sandra Vujkov¹, Milenko Jankovic², Zoran Milic¹

¹College of Vocational Studies for Education of Preschool Teachers and Sports Trainers, Subotica, Serbia, ²Preschool Teachers Training College, Novi Sad, Serbia

Correspondence: vujkovsandra@gmail.com

The largest part of the world's population is physically inactive. The negative consequences of physical inactivity also reflect in the student population, leading to decreased physical fitness and health. **PURPOSE:** The goal of this study was to investigate the effects of a six-week programmed, self-induced exercise on fitness form improvement in college students. **METHODS:** Overall 39 physically inactive students were divided into two groups $N_{exp}=24$ (Age 23.0 ± 5.5) and $K_{cont}=15$ (Age 27.8 ± 7.2). Physical fitness was assessed through AlphaFit® on initial testing and after six weeks. During six weeks, the experimental group followed programmed training sessions 3 times per week for 30 min and 2 times for 15 min mobility drills at home, the combination of muscle strength/endurance, and aerobic and mobility exercises. **RESULTS:** Results showed no differences between the experi-

mental and control group in the initial measurement. Differences occurred in 3 of 7 tests ($p<0.05$) between the experimental and control group in the final testing. A significant difference was found in the experimental group ($p<0.01$) in 6 out of 7 tests between the initial and final measurements, indicating physical fitness improvement. **CONCLUSION:** The findings suggest that the inclusion of 30 min moderate physical activity during the day can improve fitness form in students, leading to better health status.

P36

THE EFFECTS OF STUDENT-CENTERED LEARNING METHODS AND MOTIVATIONAL CLIMATE ON DANCE LEARNING

Alen Miletić¹, Đurđica Miletić¹, Sunčica Delaš Kalinski¹

¹University of Split, Faculty for Kinesiology

Correspondence: alen.miletic@kifst.eu

Student-centered pedagogy is based on constructivist and democratic principles where students are encouraged to develop their reflective and critical thinking and sense of responsibility. This study was conducted in order to gain insight into usage of different self-centered learning methods while learning to dance. **PURPOSE:** The objectives of this study are to: (1) to determine which of the three student-centered learning methods (in group, in pair or individually) will best influence students while learning to dance; (2) to analyse the impact of motivational climate on different student-centered learning methods among female and male students. **METHODS:** Dances from Adriatic dance zone are analyzed because of their applicability to physical education curricula. The sample of subjects consisted of 30 female and 28 male kinesiology students (aged 21-24) were divided in three groups according to their preferred learning method: group, pair or individual). Three experts evaluated the performance of dancers according to beforehand and in detail determined criteria. For assessment of motivational climate, MCPES scale was used which contains subscales: autonomy, social relatedness, task involving climate and ego involving climate. **RESULTS:** According to a two way ANOVA with the independent variables of gender and learning methods, and Tukey post hoc test, the most successful students preferred in pair method while learning Lindo, and individual method while learning Quattro passi. Significant differences were found in task involving climate subscale between in pair and group learning method. **CONCLUSION:** Further investigation of learning methods in PE classes is needed to confirm optimal student-centered method defined by gender, age and type of motor skills.

P37

THE IMPACT OF THE SOCCER TRAINING SEASON ON THE BODY COMPOSITION AND PHYSICAL PERFORMANCES OF YOUNG SOCCER PLAYERS

Sami Sermahaj¹, Fitim Arifi², Iber Alaj¹, Suela Sermahaj¹

¹Department of Physical Culture, Sport and Recreation, Universi College, Prishtina, Kosovo, ²Faculty of Physical Education and Sport, University of Tetova, North Macedonia

Correspondence: sami.sermahaj@kolegjiuniversi-edu.net

PURPOSE: of this research's was proving a soccer training programme effectiveness during a macrocycle (preparation, competition season) on young players' body composition, physical performances. Research was conducted on 12 U15 and 12 U17 players. **METHODS:** Initial testing was performed before preseason, whereas final testing was performed after four months of training. Results were analysed using two-way repeated-measures analysis

of variance based on F values and their significance. **RESULTS:** the prove U15 soccer training programme causes isokinetic force (knee flexion/extension peak torque) statistical differences. No body composition (body height/mass, muscle/fat mass), vertical jump (Squat Jump SJ, Counter-Movement Jump CMJ, Maximal Counter-Movement Jump CMJmax) statistically significant changes were found. Results prove U17 soccer training programme causes muscle mass, fat mass, SJ, CMJ, CMJmax, knee flexion peak torque statistical differences without knee extension peak torque, body height/mass changes. **CONCLUSION:** This research shows sensitive phase for relevant explosive force improvements occurs after 15-yr age, a period characterized by muscle mass dramatic development.

P38

THE SLOFIT PHYSICAL FITNESS MONITORING IN ADULTS

Jerneja Premelč¹, Kaja Meh¹, Žan Luca Potočnik¹, Vedrana Sember¹, Maroje Sorič², Marjeta Kovač¹, Bojan Leskošek¹, Gregor Starc¹, Gregor Jurak¹
¹University of Ljubljana, Faculty of Sport, Slovenia, ²University of Zagreb, Faculty of Kinesiology, Croatia

Correspondence: jerneja.premelc@fsp.uni-lj.si

Physical inactivity can lead to various chronic diseases that develop as we age. Monitoring physical fitness throughout life is an important marker of health status and potential risks of disease development. The SLOfit Students system is a national physical fitness monitoring system for Slovenian school children that has collected fitness and health data annually for over three decades. The SLOfit Adults is an extended system for adults and elderly. For this purpose, two batteries were defined, SLOfit Adults (19-64 years) and SLOfit Senior (65+ years). The SLOfit Adults measurements start with health-risk check, including measurements of heart rate, arterial blood pressure and blood oxygen saturation, supplemented by brief medical history questionnaire. Further, participants complete anthropometry measurements, warm up, and then begin the motor tests: vertical jump (leg strength), figure-8 run (agility), handgrip (arm strength), arm plate tapping (coordination), sit and reach (flexibility), partial curl-up (core strength), and a 6-minute walk (cardio-respiratory endurance). All results are entered into the online application "My SLOfit", which graphically displays each test compared to the results of the population of the same age and health risk. Consulting on lifestyle changes, proper exercising and suitable exercise programmes are being discussed with participants. Additionally, participants are appointed to follow short web contributions on exercising (SLOfit advise) and social media posts on SLOfit YouTube, Facebook and Instagram.

P39

THE SUCCESS OF CROATIAN KICKBOXING NATIONAL TEAM - ANALYSIS BY REGION

Matej Babič^{1,2}, Dražen Čular¹

¹Faculty of Kinesiology, University in Split, Croatia, ²Faculty of Kinesiology, University in Zagreb, Croatia

Correspondence: matej.babic1996@gmail.com

Croatia seems to be a country where combat sports are relatively popular. The current level of amateur kickboxing quality varies from town to town, from region to region. **PURPOSE:** The aim of this research was to determine how many current national team members, medalists and champions come from each Croatian region. **METHODS:** The authors utilized recent data from the last WAKO European and World youth and senior amateur championships. **RESULTS:** Relative proportion within the national

team between Croatian regions revealed Dalmatia as most represented in senior and Istria & Kvarner in youth national team, which suits their relative final success. Speaking of final success, there is a strong domination of Coastal Croatia (Dalmatia, Istria & Kvarner), as 13 senior champion titles come from Dalmatia and 6 youth champion titles come from Istria & Kvarner. Visible data suggest there is a lack of quality in kickboxing organization in nearly half of the Croatian counties, because 10 of 21 counties do not have any representative within the national team. **CONCLUSION:** This research should encourage the Croatian ministry of tourism and sport and the Croatian Kickboxing federation to promote kickboxing in all, especially addressed Croatian regions to achieve certain equality in regional prevalence of quality. Development of competitive regions in every sport will result in greater quality of national teams, and consequently more successful results.

P40

VENTILATORY TRESHOLDS DETERMINATION BY USING NEAR-INFRARED SPECTROSCOPY

Igor Beretic¹, Romana Romanov¹, Dusan Stupar¹

¹Educons University, Faculty for Sport and Psychology - Tims, Novi Sad, Serbia

Correspondence: igor.beretic@tims.edu.rs

The near-infrared spectroscopy (NIRS) technique is based on the light absorption of oxygenated and deoxygenated hemoglobin and myoglobin in the near infrared tissue, using the interaction of light at different wavelengths. NIRS is a non-invasive method that has been shown to be a significant tool capable of estimating the muscle oxygenation events, such as variations in oxyhemoglobin (O₂Hb), deoxyhemoglobin (HHb), total hemoglobin (tHb) and tissue saturation index (TSI) in skeletal muscle. **PURPOSE:** The aim of this review study is to present thresholds determination by using near-infrared spectroscopy. **METHODS:** Specific keywords "anaerobic threshold", "ventilatory threshold", "Oxygen consumption", and "NIRS", were used to search relevant electronic databases, such as PubMed, Web of Science and Scopus. **RESULTS:** The results of studies, indicated that ventilatory thresholds (VT1 and VT2) could be determined using NIRS based on the break-point of skeletal muscle oxygenation and blood flow (deoxy[Hb + Mb] and total hemoglobin [Hb + Mb]), muscle oxygenation, the difference between muscle oxygenation and deoxygenation (D[O₂HbMb-HHbMb]) and respiratory muscle oxygenation. Results of the studies showed that decreased muscle oxygenation was a good predictor of VT1 and peak of total Hemoglobin was good predictor for VT2. **CONCLUSION:** NIRS muscle oxygenation and deoxygenation is reliable and valid non-invasive method based on oxygen delivery, utilization, and blood flow during exercise for different thresholds determination.

P41

AGE AND GENDER DIFFERENCES IN MOTIVATION FOR PLAYING RECREATIONAL TENNIS

Vanja Vojderek¹, Petar Barbaros¹, Zlatan Bilic¹

¹Faculty of Kinesiology, University of Zagreb, Zagreb, Croatia

Correspondence: zlatan.bilic@kif.hr

There are various motivational reasons why someone plays tennis recreationally. **PURPOSE:** The aim of this paper is to determine the differences in motivation with regard to gender and age, and the combination of these two categories. **METHODS:** The study included 116 participants (M=66, W=50), aged 25 to 68 (AM=38.6) who play tennis recreationally once or twice a

week. The study was conducted according to the Campbell questionnaire. Participants were divided by age and gender groups. Within the gender group, male and female participants are distinguished, and within the age group, they are divided into: younger age (25–40 years) and older age (40–68). RESULTS: The results of a multivariate two-factor analysis of variance have shown that with regard to gender there is a statistically significant difference ($p < 0.05$) in motivational reasons for playing tennis. Differences in results related to age and age-sex interaction are not statistically significant. The most important motives that arose in the respondents were: relaxing and forgetting about worries, playing tennis for fun and feeling physically in good shape. CONCLUSION: Playing tennis at a recreational level represents an overall positive impact on human health.

P42

ANALYSIS OF ALTERATION OF THE VOLUME OF BRAIN STRUCTURES IN PATIENTS WITH ALZHEIMER'S DISEASE USING THE METHOD OF MAGNETIC RESONANCE VOLUMETRY

Rastko Kornjaca¹, Ana Segedi¹

¹University of Novi Sad, Faculty of Medicine, Novi Sad, Serbia

Correspondence: rastko353@gmail.com

Many studies indicate conversion of amnesic mild cognitive impairment (aMCI) to Alzheimer's disease (AD) characterized with greater atrophy of limbic system structures and some parts of cerebral cortex, leading to progression of cognitive impairment and independence in daily functioning. PURPOSE: The purpose of this study was to compare brain volume reduction in patients with AD and aMCI with age-related changes in age- and gender-matched healthy individuals. METHODS: Ninety patients were divided in three groups based on medical history, neurological and neurocognitive assessment: 30 patients with AD, 30 patients with aMCI and 30 healthy controls. All participants underwent high-resolution magnetic resonance (MR) imaging on 3 T unit. MR volumetry of hippocampus, entorhinal cortex, thalamus anterior and posterior cingular gyrus. RESULTS: Total volumes of thalamus, hippocampus and entorhinal cortex were significantly lower in AD patients compared to controls. aMCI patients have had significantly lower thalamic total volume compared to controls, but both hippocampal and entorhinal cortex total volumes were not significantly lower than in controls. Total volumes of anterior and posterior cingular gyri were not significantly lower in AD and aMCI patients compared to controls. CONCLUSION: Our results show that hippocampal and entorhinal cortex total volume loss could be an early sign associated with progression of cognitive symptoms from aMCI to AD, following the atrophy of total thalamic volume.

P43

CONSUMPTION OF NON-STEROID ANTI-INFLAMMATORY DRUGS IN SERBIA

Milica Knežević¹

¹Medicinski fakultet

Correspondence: mknezevic700@gmail.com

Non-steroidal anti-inflammatory drugs (NSAIDs) are widely used drugs. However, numerous studies have shown that nonselective cyclooxygenase (COX) inhibitors can also significantly increase the risk of cardiovascular side effects. Diclofenac has the highest risk while naproxen has the lowest risk of developing these complications. PURPOSE: The aim of this study was to analyze the amount and structure of NSAIDs consumed in the Republic of Serbia during the last 10 years and to determine whether there is

a correlation between the price and consumption of these drugs. METHODS: In our investigation we used drug utilization 90% and ATC/DDD methodology. Prices of drugs per DDD are presented in euros (€). The relationship between drug consumption and price was examined by linear regression at the level of statistical significance of 0.05. RESULTS: Diclofenac consumption in the Republic of Serbia is 2 to 3 times higher than in Croatia and 4 to 8 times higher than in Finland. The average price of diclofenac in the Republic of Serbia was around € 0.11 per DDD, in Finland around € 0.26 per DDD, and in Croatia € 0.19 per DDD. In the Republic of Serbia, there is no relationship between the consumption of certain NSAIDs and their prices. CONCLUSION: High consumption of diclofenac should be replaced by some NSAIDs with a better side effect profile such as naproxen or ibuprofen. The current situation is unfavorable and it is necessary to change the attitude and awareness of doctors and patients about the use of diclofenac.

P44

EFFECTS OF A SPECIFIC SIX-WEEK INTENSIVE PROGRAM ON BIOMECHANICAL PARAMETERS OF FUTSAL PLAYERS

Bojan Rašković¹, Lidija Marković¹, Miloš Kojić¹, Borislav Obradović¹

¹University of Novi Sad, Faculty of Sport and Physical Education, Serbia

Correspondence: bojan.raskovic@yahoo.com

Futsal is a very intensive sport with high physical, technical and tactical demands. The game is conditioned by many factors, such as linear speed, running technique, muscle strength, etc. Reducing the risk of injury is one of the main factors for achieving results. PURPOSE: The aim of this research is to determine the effect of a six-week specific training program on the abilities and biomechanical parameters of futsal players, in order to influence the reduction of the risk of injuries and the best possible preparation of athletes. METHOD: Motor and functional tests were applied to players who were divided into the experimental (N=21) and the control group (N=19). Experimental treatment consisted of exercises for the development of muscle strength, speed, agility, improvement of coordination, balance and specific motor skills, with an emphasis on injury prevention. RESULTS: The results of this study showed that after 6 weeks of application of a specific training model in futsal, it had a significant effect on improving performance in most variables (12 out of 13 parameters), compared to the control group and in relation to the initial state of both teams. The experimental model caused statistically significant improvements in aerobic capacity, vertical jump, speed, agility, step frequency, and step length. CONCLUSION: The study could raise awareness of the importance of sport-specific programs focused on preventing injuries and improving performance through strengthening, plyometric, agility, balance, and dynamic stretching with characteristic movement patterns repeated in futsal.

P45

EFFECTS OF EXERCISE AND EXERCISE COUNSELLING IN PATIENTS WITH LUMBAR SPINAL STENOSIS: STUDY ANNOUNCEMENT

Katja Plaskan¹, Maja Pajek¹, Miha Vodičar²

¹University of Ljubljana, Faculty of Sport, Slovenia, ²University Medical Centre Ljubljana, Orthopedic Clinic, University of Ljubljana, Medical faculty, Chair of orthopedics

Correspondence: plaskankatja@gmail.com

Patients with lumbar spinal stenosis (LSS) have significant disability and functional limitations in walking. They frequently report balance problems, loss of sensation, and weakness of lower ex-

tremity muscles. The prevalence and economic burden associated with LSS is expected to increase dramatically due to the aging population. Recently, exercise and walking programs have been presented as potential interventions to improve the daily lives of patients with lumbar spinal stenosis (LSS). Our systematic review found a lack of clear descriptions of nonsurgical treatment protocols and how the combination of these interventions affects patients' daily lives and helps extend the time to surgery. **PURPOSE:** The purpose of this study is to determine whether an exercise program as a conservative treatment can have positive effects on reducing clinical symptoms associated with LSS, whether a program improves walking distance, and whether an exercise program is a more successful conservative treatment than simple physical therapy. **Methods:** Using specific keywords such as "degenerative spinal disease," "neurogenic claudication," "physical performance," "individualized training," "exercise program," "walking," electronic databases such as PubMed, Web of Science, and Scopus were mainly searched. Systematic review was performed according to PRISMA guidelines. We searched for randomized controlled trials of physical training or walking programs and other nonsurgical treatments that examined effects on physical abilities/performance in daily living. **METHODS:** were planned according to the Guidelines for the Design and Conduct of Randomized Clinical Trials - CONSORT statement. **RESULTS:** Studies that met inclusion criteria, such as data with a publication date of 2017 and later, and that described an exercise and walking program related to improving LSS symptoms were reviewed. Results showed that positive effects of exercise on LSS symptoms were observed. In a recent study, all exercise interventions lasted 6 weeks, 2-3 times per week. Exercise intensity was individualized and gradually changed to prevent pain. There are no studies with a structured exercise protocol with walking program as we plan in our study. **CONCLUSION:** All studies concluded that it is limited to draw conclusions about their effectiveness. Further studies are needed.

P46

EXAMINATION OF THE CORRELATION OF VITAMIN D AND C-REACTIVE PROTEIN IN PATIENTS WITH NEWLY DISCOVERED ARTERIAL HYPERTENSION

Anastasija Dimitric¹

¹University of Novi Sad, Medical Faculty of Novi Sad, Serbia

Correspondence: 1dimitricana@gmail.com

Arterial hypertension is one of the most common multifactorial diseases that affects today's population. Elevated blood pressure values can occur in states of physical and mental activity, when taking medicaments, coffee and tobacco. Low values are observed during sleep. The blood pressure is affected by race, gender, age etc. **PURPOSE:** The goal of research is to investigate the existence of a relationship between the levels of vitamin D and C-reactive protein in patients with newly diagnosed arterial hypertension. **METHODS:** According to the criteria for inclusion in the study, data from 50 patients of both sexes with newly diagnosed arterial hypertension were isolated. The control group consisted of 45 clinically and biochemically healthy examinees, who according to gender and age structure corresponded to the examined groups of patients. Data on the levels of systolic and diastolic blood pressure, highly sensitive C-reactive protein (hsCRP) and vitamin D (25 (OH) D) were taken from the medical records of all subjects included in the study. **RESULTS** When comparing C-reactive protein in patients suffering from arterial hypertension and C-reactive protein from healthy subjects, we get a significant difference: C-reactive protein is significantly higher in hypertensive examinees. The concentration of vitamin D is statistically significantly lower in patients with newly diagnosed hypertension compared

to the control group of subjects. Vitamin D and C-reactive protein were found to have a negative correlation ($r = -0.605$; $p < 0.01$). **CONCLUSION:** When CRP increases, vitamin D levels will be lower and vice versa. In hypertensive patients, a significant increase in CRP was observed, and a significantly lower concentration of vitamin D.

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INFLUENCE OF CIRCADIAN RHYTHM AND DAILY PHYSICAL ACTIVITY ON SHORT-TERM HEART RATE VARIABILITY IN YOUNG HEALTHY ADULTS: A PILOT STUDY

Marko Atanasković¹, Ivona Stanić Hadžalić¹, Marko Nemet¹, Borislav Tapavički¹, Milica Vasilčić¹, Enis Garip²

¹University of Novi Sad, Faculty of Medicine, Novi Sad, Serbia, ²University Clinical Center of Vojvodina, Department of Physical Medicine and Rehabilitation, Novi Sad, Serbia

Correspondence: atanaskovic.marko5@gmail.com

PURPOSE: Heart rate variability (HRV) is the leading non-invasive method of assessing the autonomic nervous system. Investigating changes in the autonomic nervous system activity under the influence of circadian rhythm and daily physical activity can be beneficial in placing exercise at the optimal time of day and at regular time intervals. Furthermore, it can be used to determine the optimal level of overall daily physical activity. This study aimed to demonstrate the influence of circadian rhythm and daily physical activity on the autonomic nervous system at rest by short-term HRV measurements. **Methods:** Fifteen 20-year-old healthy adults participated in the study. HRV was measured on three different occasions. During these visits, HRV measurements were obtained in the morning, in the afternoon following a physically active day, and in the afternoon after a physically inactive day. **Results:** Our study showed no significant differences in HRV parameters measured at different times of the day. A comparison of HRV values after a physically inactive day and HRV values after a physically active day did not show a significant difference in any of the HRV indices. **Conclusion:** Short-term measurements of HRV did not show the influence of circadian rhythm and daily physical activity on HRV at rest.

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INJURIES IN SPORT: CAUSES, PREVENTION AND REHABILITATION

Danica Sosic¹

¹University of Novi Sad, Faculty of Medicine

Correspondence: danicasosic17@gmail.com

The labor explores the most common injuries in sports with the accent on injuries of the bony- joint system. First, an overview is given of the different types of injuries and their frequency in different sports. Then are shown preventive measures that can be undertaken to reduce the risk of injury with various injury treatments analyzed including physical therapy, medical interventions and surgical procedures. **PURPOSE:** The aim of the labor is to deepen knowledge on the content of the topic itself with a systematic approach to the same. Prior to the recovery program is to establish an accurate diagnosis of the injury and to make program of the rehabilitation. Rehabilitation programs are different and each athlete should be given a personalized treatment depending on age, condition of the organism, type of sport he deals with, etc. The goal is to give an accent on the prevention itself and give the wide image through practical examples. **Methods:** It includes reading professional literature as a prerequisite for research with the necessary inclusion of knowledge and results proven in practice and obtained

by surveying respondents. **CONCLUSION:** Finally, the labor shows the most common faults made in the training processes of the athletes that lead to injuries and present the best treatment. Labor suggests further research in the field of training technology and rehabilitation that could be carried out to solve practical problems and improve performance in sports.

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INTRAPLEURAL FIBRINOLYTIC THERAPY WITH ALTEPLASE FOR THE MANAGEMENT OF MULTILOCULATED MALIGNANT PLEURAL EFFUSION: A CASE SERIES

Marko Nemet¹, Milica Vasilic¹, Sanja Ergelasev², Ivan Kuhajda^{3,4}, Ivan Ergelasev^{3,4}

¹Internal Medicine, Faculty of Medicine, University of Novi Sad, Novi Sad, SRB, ²Cardiology, Institute for Cardiovascular Diseases of Vojvodina, Sremska Kamenica, SRB, ³Thoracic Surgery, Institute for Pulmonary Diseases of Vojvodina, Sremska Kamenica, SRB, ⁴Surgery, Faculty of Medicine, University of Novi Sad, Novi Sad, SRB

Correspondence: vasilicmica96@live.com

PURPOSE: Malignant pleural effusion (MPE) refers to the presence of fluid in the pleural space due to an underlying malignancy. Malignant pleural effusion is sometimes accompanied by the formation of fibrous adhesions resulting in a multiloculated effusion. This diminishes the efficacy of drainage and makes successful pleurodesis impossible, leaving the patients with severe shortness of breath. In the process of freeing the pleural space from fluid-filled loculations, intrapleural application of fibrinolytic is being investigated as a possible therapeutic approach. **CASE PRESENTATION:** In our article, we report four cases of adult patients hospitalized for malignant pleural effusions who were treated with intrapleural fibrinolytic therapy at the Institute for Pulmonary Diseases of Vojvodina, Republic of Serbia. **RESULTS:** Fibrinolytic agents were first used to enhance drainage in complicated parapneumonic effusions and empyema. As IPFT showed positive effects in these cases, the question arose whether it could be used in loculated MPEs. The hypothesis is that IPFT causes lysis of the fibrinous bands and thereby enhances drainage and lung re-expansion. This would subsequently lead to adequate apposition of pleural membranes, which is needed for successful pleurodesis. **CONCLUSION:** Radiographic improvement and symptomatic relief after intrapleural fibrinolytic therapy (IPFT) were observed in our four cases. Thus, we suggest considering IPFT as a potential therapy for loculated and hard-to-drain MPEs. This is important when palliative treatment options are limited, especially when patients are suffering from severe shortness of breath. In the light of our results, we would advise further research on IPFT as an approach to loculated MPEs.

P50

INTRA-POSITIONAL AND INTER-POSITIONAL DIFFERENCES IN SPIKE SPEED AMONG YOUTH FEMALE VOLLEYBALL PLAYERS

Mirjana Milić¹, Karla Đolo¹, Dario Vrdoljak¹, Zoran Grgantov¹

¹University of Split, Faculty of Kinesiology, Split, Croatia

Correspondence: karla.djolo@gmail.com

In volleyball, speed is one of the most important abilities to successfully perform almost all technical-tactical elements in a match. It consists of repeated arm actions such as spiking which is the most complex movement. **PURPOSE:** The objective of this research was to evaluate metric characteristics of the specific speed of the ball and to determine the differences between less-successful and more successful youth female volleyball players as well as inter-positional and intra-positional differences in the spiking speed of the ball. **METHODS:** The sample included 204 young female volleyball play-

ers mean chronological age of 14.11 ± 0.84 years. All players were divided by their playing position (setters, opposite hitters, passer-hitters, middle blockers and libero players). The variable included two tests: the Speed of the spiking ball from the surface and the Speed of the spiking ball over the net. A Brown timing system was used to measure the spike speed. **RESULTS:** The findings of this research show high values of Cronbach alpha for both tests (0.98 and 0.97) with a coefficient of variation (0.04 and 0.05). Using discriminant analysis more successful players achieved better results in both spike speed tests. Furthermore, inter-positional and intra-positional differences significantly impact biological age indicators in spike speed tests. **CONCLUSION:** It can be concluded that in this age group, greater biological maturity and training experience clearly represents a great advantage in the competition.

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LIPID PEROXIDATION MARKERS IN ANTITUMOR DRUGS TREATED HUMAN ERYTHROLEUKEMIA CELLS

Lora Savić¹

¹University of Novi Sad, Faculty of Medicine, Novi Sad, Serbia

Correspondence: lora.savic@gmail.com

Many drugs used in anticancer therapy induce oxidative stress. Oxidative stress occurs as a result of imbalance between the levels of antioxidants and reactive oxygen species (ROS). Antitumor drugs doxorubicine (DOX) and mitomycin C (MMC) are very efficient chemotherapeutics that generate ROS. However, the oxidative stress also induces normal cells toxicity, reducing the DOX and MMC therapeutic index. In cells exposed to DOX and MMC the addition of antioxidants N-acetylcysteine (NAC) and proanthocyanidins (PAC) may increase the efficacy of drugs in malignant and decrease the toxic effects towards normal cells. **PURPOSE:** The aim of our study was to compare the concentration of lipid peroxidation marker malonyldialdehyde (MDA) in cells exposed to DOX or MMC and in combination with NAC or PAC. **METHODS:** We carried out our experiments in two cell lines, malignant K562 and normal CHO cells, and determined the MDA concentration by standard photometric methods. **Results:** Antitumor drugs DOX and MMC induce statistically significant increase in concentration of MDA in malignant K562 and normal CHO cell lines. Pre-treatment by NAC and PAC in CHO cells decreases the concentration of MDA in comparison with cells treated only by antitumor drugs, but this effect is detected also in malignant cell line K562. **CONCLUSION:** According to our results we may conclude that antitumor drugs DOX and MMC induce statistically significant increase in MDA concentration (lipid peroxidation marker), whereas pre-treatment with antioxidants NAC and PAC decreases MDA concentration both in malignant and normal cells treated by cytostatic drugs.

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MONITORING THE DEVELOPMENT OF COORDINATION ON PRIMARY SCHOOL STUDENTS IN PHYSICAL EDUCATION: A SCIENTIFIC PAPER

Anja Topolovec¹, Jadranka Vlasic¹, Maja Horvatin¹

¹University of Zagreb, Faculty of Kinesiology, Zagreb, Croatia

Correspondence: anja.topolovec@student.kif.hr

PURPOSE: The basis of this research is monitoring the development of coordination in primary school students during physical education lessons. The goal of this study is to determine the differences in coordination and its manifestations among primary school students with the purpose of creating a contribution to the tendency of frequent anthropological monitoring at the state level. **METHODS:** 74 primary school students from 5th to 8th

grade were evaluated in the area of coordination with different tests examining coordination and its manifestations. Statistica for Windows version 14.0. was used to determine the statistical significance of the differences among research groups. RESULTS: Results showed that there is a statistically significant difference between groups in coordination tests, but not in the agility test where the statistically significant difference was found only between 5th grade and 8th grade students. CONCLUSION: Results showed that displayed differences between groups can be used to establish recommendations in coordination and agility development during primary school education. Annual testing of coordination and its manifestations could be carried out with the aim of determining the beginning of the sensitive phases of development for further individual approaches in developing and expanding motor capacities.

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POST-ACTIVATION POTENTIATION BASED ON SQUAT IMPROVES THE VERTICAL JUMP HEIGHT OF FOOTBALL PLAYERS UNDER 18

Stefan Maričić¹, Vladimir Šipka¹, Filip Sadri¹, Damjan Jakšić¹

¹University of Novi Sad, Faculty of Sport and Physical Education, Novi Sad, Serbia

Correspondence: stefan.maricic@uns.ac.rs

The height of the vertical jump is a combination of maximum strength and speed of the lower extremities. The explosive power of the legs is one of the most important motor skills for football players. PURPOSE: Evaluating the effect of the squat exercise with 90% of 1RM load on the jump height of elite young football players. METHODS: 18 football players were divided into two groups: experimental and control. The first part of the protocol was the same for both groups – warming up with the stationary bike, dynamic exercises, and core activation. Countermovement jump height was tested. Then experimental group performed two sets of squats with 50% and 90% of 1RM. The first set was 5 repetitions, the second 3 repetitions, with 3 minutes break in between. After the second round of the squats, the break was 8 minutes. Then again testing of CMJ height. After the first part of the protocol, the control group started CMJ testing immediately, without squat exercises. RESULTS: The experimental group achieved an improvement of 5.3% after the squat exercises, while the control group that only did the dynamic warm-up protocol had an improvement of 1.6%. CONCLUSION: A positive effect of post-activation potentiation has been demonstrated through the improved performance of the maximal vertical jump for the experimental group. It may be relevant to introduce these activation methods in the warm-up protocols of football players.

P54

PSYCHOLOGICAL STRESS BEFORE THE DIAGNOSIS OF CUTANEOUS MELANOMA IN PATIENTS OF THE CLINIC FOR DERMATOVENEROLOGY, CLINICAL CENTER OF VOJVODINA

Ana Segedi¹, Rastko Kornjaca¹

¹University of Novi Sad, Faculty of Medicine, Novi Sad, Serbia

Correspondence: whitecat.segedi@gmail.com

Melanoma is the most aggressive type of cutaneous malignant tumor. Beside numerous etiological factors, recent studies show that stress may also play a significant role in its development. PURPOSE: The purpose of this research was to determine the intensity and duration of psychological stress and the correlation between stress characteristics and the depth of invasion of melanoma. METHODS: Two questionnaires were filled out by patients: Perceived Stress

Scale and a questionnaire designed for research purposes consisting 27 stressful situations. RESULTS: According to the Perceived Stress Scale, 61.6% of patients were exposed to a moderate level of stress, 21.8% of patients were exposed to a low level of stress, and 12.5% to a high level of stress. The largest number of patients (21.9%) experienced three stressful situations before diagnosis. The most common stressful events were: changes in the health condition of a close family member, business problems and changes in working conditions. We found that men were exposed to a statistically significantly higher number of stressful situations than women ($p=0.010$). No correlation was found between the intensity and duration of psychological stress and the depth of invasion of cutaneous melanoma. CONCLUSION: The largest number of patients had stress of moderate intensity before the onset of melanoma. Men were exposed to a significantly greater number of stressful situations.

P55

RELIABILITY OF ANTEROPOSTERIOR DIAMETER OF LIVER IN DETECTING HEPATOMEGALY

Tijana Radiša¹

¹Medicinski fakultet u Novom Sadu

Correspondence: radisa.tijana@yahoo.com

PURPOSE: The aim of this observational retrospective study is to compare the conventional anteroposterior diameter of the liver obtained from transverse computed tomography scans with the actual liver volume obtained from automatic image processing. METHODS: A retrospective search of the information system of the Oncology Institute selected 100 patients who underwent computed tomography examination in the Radiological Diagnostic Service following the standard protocol for abdominal examination. The standard anteroposterior diameter of the liver was measured in the midclavicular line on transverse sections. The liver volume was automatically calculated from the obtained images using the Clara Deploy SDK software package (NVIDIA Corporation, California, USA) or one of the other available software solutions of the same purpose. The obtained liver volume values were compared to the measured anteroposterior diameter of the liver and the degree of correlation was determined using standard statistical tests.

P56

SIX-MINUTE WALK TEST IN ADULTS WITH DOWN SYNDROME: TEST-RETEST RELIABILITY

Petra Rajkovic Vuletic^{1,2}, Marijana Cavala¹, Jelena Pausic¹

¹University of Split, Faculty of Kinesiology, Split, Croatia, ²University of Zagreb, Faculty of Kinesiology, Zagreb, Croatia

Correspondence: petra.rajkovic@kifst.eu

The six-minute walk distance test (6MWT) is a simple, practical, feasible, objective and inexpensive field test that is easy to perform and suitable for individuals with Down Syndrome (DS). However, although the test has proven to be valid in people with DS, there is few of research related to that subject. PURPOSE: Purpose of this study was to determine the test-retest reliability of the Six-minute Walk Test among adults with DS in Croatia. METHODS: Twenty-eight adults with Down syndrome (11 men and 17 women) aged 18–46 years completed a 6MWT twice in a two-week period. Participants were instructed to walk as many laps as possible within the allocated 6 min. For data analysis, Reliability analysis and T-test were utilized. RESULTS: Test-retest reliability of this test item revealed an intraclass correlation coefficient value of 0.975 in adults with DS. There was no significant difference in distance walked during the 6MWT in adults with DS. CONCLUSION: Our results showed that overall test-retest reliability was excellent. In practice,

this means that the 6MWT has high repeatability and can be used as a measure of the development of functional abilities in adults with Down syndrome.

P57

TEACHING SPORTS FOR CHILDREN WITH AUSTISM SPECTRUM DISORDER

Neza Adamic¹, Tanja Kajtna¹

¹University of Ljubljana, Faculty of Sport

Correspondence: adamic.neza@gmail.com

Previous studies shows that the attitudes of teachers in general have a significant impact on their pedagogical work, but the area of specific attitudes towards teaching students with ASD in sports lessons is still modestly researched. **PURPOSE:** The aim of the qualitative research is to examine teachers' attitudes towards teaching sports to students with ASD. The results will serve for the preparation of our own questionnaire, which will measure teachers' attitudes towards the inclusion of students with ASD in sports lessons. **METHODS:** Data were collected using focus groups. The participants were teachers with three different qualifications: physical education teachers, special and rehabilitation pedagogues and primary school teachers. The questions were open-ended and related to the following topics: inclusion, additional education, general knowledge about ASD, experiences, attitude towards sports,... **RESULTS:** Teachers generally have positive attitudes towards students with ASD. There are large differences in general knowledge of the ASD population based on experience and previous education. Primary school teachers and physical education teachers often do not feel qualified enough to successfully integrate students with ASD into PE classes. All teachers point out that the system does not support enough to optimally include students with ASD in sports activities. **CONCLUSION:** The results of this research will help us make survey questionnaire, which will measure teachers' attitudes towards teaching students with ASD in physical education on a larger sample.

P58

THE IMPACT OF BIOLOGICAL THERAPY ON DISEASE CONTROL AND LIFE QUALITY OF PATIENTS WITH SEVERE ASTHMA

Mila Crnojevic¹

¹University of Novi Sad, Faculty of Medicine, Novi Sad, Serbia

Correspondence: milcrn@gmail.com

Severe asthma is a serious, heterogeneous disease that remains poorly controlled despite the use of high doses of standard therapy. Biological therapy, or so-called phenotype-guided therapy, involves the use of recombinant monoclonal antibodies, targeting IgE antibodies in the allergic phenotype, and IL-5 as well as IL-5 receptor in the eosinophilic phenotype. The use of anti-IgE antibodies (omalizumab-Xolair[®]), anti-IL-5 antibodies (reslizumab-Cinqaero[®]) and antibodies for the IL-5 receptor (beneralizumab-Fasenra[®]) allows better disease control and reduces exacerbations in patients with severe asthma. **PURPOSE:** Evaluation of the impact of biological therapy on disease control and quality of life in patients with severe asthma who do not have good disease control. **METHODS:** Three groups of patients were included in this retrospective study: 15 patients treated with omalizumab, 15 with reslizumab and 15 with beneralizumab. The following data were analyzed: age, gender, duration of asthma, duration of severe asthma, asthma phenotype, spirometry parameters such as FVC, FEV1 and FEV1/FVC, degree of asthma control using ACT and ACQ, quality of life using AQLQ, skin testing for inhalant allergens, history of exacerbation, therapy. Mentioned parameters were analyzed after 4 and 12 months from the start of biological therapy.

P59

THE IMPACT OF DANCE AS A FORM OF PHYSICAL ACTIVITY ON COGNITIVE RESERVE AND SLEEP QUALITY

Tijana Tovilović¹

¹Univerzitet u Novom Sadu, Medicinski fakultet, Novi Sad, Srbija

Correspondence: tijana.tovilovic1@gmail.com

The results of previous research indicate that physical activity can be a notable protective factor of cognitive reserve and sleep quality, which is an effective way of delaying process of cognitive aging. It has been established that dance, as a form of physical activity, is an effective tool for improving cognitive functions and preventing neurodegenerative diseases in elderly population. **PURPOSE:** To examine the possible positive impact of continuous physical activity (dance) on the cognitive reserve and sleep quality of people over 50 years old. **METHODS:** In the cross-section study there were two groups included: 30 subjects who are actively engaged in dancing and a control group with the same number of people. The subjects were taken under a neurological examination, questionnaire for assessment of cognitive reserve (CRIQ), a questionnaire for assessing the quality of their sleep (PSQI), a questionnaire for assessing physical activity (IPAQ-SF) and a questionnaire regarding their personal habits and previous diseases. Measurements were taken as well to determine subject's body mass index and waist-to-hip ratio.

P60

THE INSIDE TEMPERATURE OF RED AND WHITE CAP OF ELEMENTARY CHILDREN DURING EXERCISE

Yukio Hattori¹, Tetsuro Kita¹

¹Musashino Art University graduate school, JAPAN

Correspondence: ninjahattori2010@gmail.com

We measured surface temperature of red and white cap in direct sunlight in midsummer for preventing heat attack. Red and white cap that is reversible has been used in P.E. class of elementary school in Japan traditionally. Surface temperature of red cap was higher than white significantly. It was thought that putting red cap on is able to cause heat attack. **PURPOSE:** So, furthermore, we should measure the inside temperature of red and white cap during exercise of elementary children. And we surveyed the risk of red and white cap. **METHODS:** 2 subjects{A(M,10y), B(M,5y)} participated in this study. Subjects putting red and white cap on exercised 45minutes with middle intensity. This experiment was conducted on July 3 and July 10, 2022. They were fine. The temperature was 32.1°C at noon on July 3, and was 29.5°C at noon on July 10. Subject A put red cap on on July 3, and white cap on on July 10. Subject B put white cap on on July 3, and red cap on on July 10. **RESULTS:** The inside temperature of red cap was higher than white significantly. **CONCLUSION:** In this study, red cap is higher risk. And we suggest stopping using red cap. We are suggesting using "yellow and white cap" or "pink and white cap" in substitution for red and white cap.

P61

THE RELATIONSHIP BETWEEN THE STATIC ALIGNMENT OF THE UPPER LIMB AND MOVEMENT PERFORMANCE OF ATHLETES WITH SPINAL CORD INJURY

Lale Pooryamanesh¹, Petra Rajkovic Vuletic^{2,3} and Miran Kondric³

¹University of Guilan, Faculty of Sports Science and Physical Education, Guilan, Iran, ²University of Split, Faculty of Kinesiology, Split, Croatia, ³University of Zagreb, Faculty of Kinesiology, Zagreb, Croatia, ⁴University of Ljubljana, Faculty of Sport, Slovenia

Correspondence: lala.pooryamanesh@gmail.com

Physical activity, exercise and sports have engaged individuals with various disabilities. For athletes with spinal cord injuries, it is vital to be physically active to improve and maintain their health. Due to relying on their upper limbs and activities such as driving a wheelchair and repeating specific movement patterns, significant structural changes occur in their upper limbs. Those changes lead to muscle imbalance and disorders in the shoulder girdle and upper limb. **PURPOSE:** The goal of this research was to investigate the relationship between forward head angle, round shoulder, and kyphosis with physical capabilities (power, range of motion, wheelchair propulsion and sitting balance) in wheelchair athletes. **METHODS:** 15 male and 13 female wheelchair athletes with Spinal cord injury (age: 27.64 ± 7.24) in basketball, pétanque and table tennis were selected. The sagittal view photography method was used to measure the forward head angle and round shoulder angle. A flexible ruler was used to measure the thoracic kyphosis angle. Additionally, a medicine ball throw was used to measure power, a goniometer to estimate the range of motion, a 20-meter propulsion test to measure propulsion speed, and a sitting balance test to measure balance. Descriptive statistics, Pearson correlation coefficient and stepwise multiple regression, were applied to examine the relationship between the variables at the 0.05 significance level. **RESULTS:** The research findings showed that there is only a significant relationship between the round shoulder with the balance in three directions and throwing the ball. However, in other variables, there is no significant relationship with static alignment. **CONCLUSION:** Changing the alignment of the shoulder decreases the quality of movement performance. Despite the slight difference in this study's investigated indicators, the results are significant from a clinical point of view. Improving the alignment of the upper limb through the modification of movement patterns and muscle balance improves movement performance. For coaches, it is better to include preventive and corrective measures in athletes' training programs.

P62

THE RELATION BETWEEN DISRUPTIVE FACTORS AND SUCCES IN SAILING

Petar Kir Hromatko¹, Nikola Prlenda¹, Mate Maglov¹

¹University of Zagreb, Faculty of Kinesiology

Correspondence: mate.maglov@gmail.com

There are many factors that affect the success of sailors. Psychological factors are some of the unavoidable ones that are connected to the sports performance. One of the key factors is anxiety which is changing according to the experience and the situation the sportsmen find themselves in. **PURPOSE:** The goal of this paper was to determine the effect of disruptive factors on the success in sailing conducted on 29 students of Kinesiology faculty in Zagreb. **METHODS:** In the research wave height, visibility, wind strength and anxiety level were measured and analysed. Anxiety was analysed through multidimensional approach to anxiety as a temporary state of the examinee, and the anxiety as a personality trait. Every examinee has filled out the Endlerov EMAS-T questionnaire which evaluates the anxiety as a personality trait, while everyday they were filling out EMAS-S questionnaire prior to every regatta, so that current anxiety could be compared to the regatta results. **RESULTS:** Statistically significant correlation between anxiety and success in sailing was proved in 2 out of 8 regattas, so it can hardly be said that the hypothesis was proved. Statistical significance was proved in lessening of the somatic anxiety level of sailors in correlation with the number of days and the exposure to the stressor. **CONCLUSION:** It can be concluded that the level of anxiety is changing the more days passes and the more the sailor is exposed to the stressor and that some indications of the correlation of anxiety and the success in regatta sailing exist.

P63

EVALUATING THE IMPACT OF A NOVEL RAPID WEIGHT LOSS STRATEGY ON THE PERFORMANCE OF JUDO ATHLETES

Ghelnaci Mohamed El Amine¹, Benourra Salah¹, Belkadi Adel¹

¹Laboratory of Applied Sciences to Human Movement, Institute of Physical Education and Sports, University of Mostaganem, 27000 Algeria

Correspondence: labopaps@univ-mosta.dz

PURPOSE: The objective of this study was to investigate the effects of rapid weight loss on athletic performance among judo athletes. **METHODS:** This study utilized a survey research approach and a quasi-experimental design to record weight measurements of 32 high school judo team athletes (23 male, 9 female) at three different stages: usual, pre-competition, and post-competition. The pre- and post-test comparison of muscle strength, attention, and reaction rate tests were conducted to evaluate the impact of weight loss. The weight loss before the change was used for data analysis, and the t-test of independent samples was utilized to compare the reduced and non-reduced groups based on the changes in muscle strength, attention, and reaction speed after weight loss and after competition. **RESULTS:** The findings of the study showed that the rapid weight loss group did not reach the expected research hypothesis. The weight loss of 2 to 3% per week did not significantly impact the variables measured in this study. While there was a tendency for maximum muscle strength to decline after rapid weight loss, the decline was not statistically significant. Moreover, attention was not significantly impacted and even showed some improvement in reaction speed. **CONCLUSION:** The results of this study suggest that rapid weight loss does not significantly affect the athletic performance of judo athletes. This research contributes to the existing body of knowledge on the effects of rapid weight loss on athletic performance and provides evidence that a 2-3% weekly weight loss does not pose significant problems for athletes in the actual field. Further research is required to investigate the impact of more drastic weight loss measures on athletic performance among judo athletes.

P64

GENDER (IN)EQUALITY IN DECISION-MAKING ROLES IN SPORT : A CASE STUDY IN BOSNIA AND HERZEGOVINA

Adriana Ljubojevic¹, Andjela Pepic², Borko Petrovic¹, Kristina Pantelic Babic¹, Nikolina Gerdijan¹, Tamara Karalic¹

¹University of Banja Luka, Faculty of Physical Education and Sport, Banja Luka, ²University of Banja Luka, Centre for Development and Research Support, Banja Luka

Correspondence: adriana.ljubojevic@ffvs.unibl.org

The inclusion of women in sports competitions influenced the development of new sports that on the other hand over time strengthened the contribution of women in sports in general. The importance of women's sports development is evidenced by the efforts of the IOC and International sports organizations to increase the number of girls and women in sports. Nevertheless, there is still distinct gender-marked unbalance in all leadership and management structures of sports, and women still seem insufficiently represented and recognized. **PURPOSE:** The aim of this research is to examine gender-based involvement in all organizational structures of professional and recreational sports organizations. **METHODS:** Online questionnaire was distributed to 45 active sports organizations from 10 different sports in wider region of Banja Luka (B&H). The questionnaire focused on the following gender (in)equality indicators: gender balance in sports organizations, quantitative indicators of gender distribution at different competition levels, quantitative data on gender distribution in management and organizational structures, as well as existence of spe-

cific rulebooks and procedures related to gender equality. Collected data are presented both as general descriptive statistics per each sport, as well as comparative analyzes between different types of sport and sport organizations. RESULTS: The results of the research indicate distinct gender inequality in all observed categories and significantly small percentage of women in management and leadership roles in decision-making in sports environment. CONCLUSION: Sport institutions play a key role for future generations of sport teachers, coaches and managers, as well as sport practitioners. Establishing gender equality in decision-making processes in those institutions will ensure a long-term sustainability of all aspects of sports development.

P65

DISCRIMINATIVE VARIABLES BETWEEN THE TOP4 AND LOWER RANKING TEAMS IN SEMI-PROFESSIONAL HANDBALL LEAGUE OVER THREE SEASONS

Sveinn Þorgeirsson^{1,2}, Ólafur Sigurgeirsson³, Damir Sekulic², Jose M. Saavedra¹

¹Physical Activity, Physical Education, Sport and Health Research Centre, Sports Science Department, School of Social Sciences, Reykjavik, Iceland, ²Faculty of Kinesiology, Split, Croatia, ³HBStatz Company, Reykjavik, Iceland

Correspondence: sveintheo@ru.is

Handball is a complex sport where offensive and defensive parameters are relevant. PURPOSE: To analyze the discriminative variables of the top four (TOP4) teams in the Icelandic semi-professional league across three consecutive seasons (2018-'19, '19-'20, '20-'21) and compare to the lower finishing positions (league of 12 teams for males and eight for females). METHODS: The game-related statistics from 384 male and 213 female matches were analyzed with a discriminant analysis using a stepwise method. The dependent variable was the final league ranking position. The analysis included 23 independent variables for offense and defense. RESULTS: A discriminative model for male teams were produced and able to classify the TOP4 teams correctly in 64.7% of cases using five variables. The variables discriminating were more assists, fewer technical fouls, more two minutes suspensions, better goalkeeping save efficiency, and better wing player scoring efficiency (Wilks lambda 0.890 and CCI 0.332). Likewise, a female model was produced and included only two variables in the final step: fewer technical fouls and more blocked shots resulting in 63.1% of cases correctly classified (Wilks lambda 0.887 and CCI 0.336). CONCLUSION: Results for males are more mixed with offensive and defense variables included. The assist variable might indicate the TOP4 teams' ability to create high-scoring chances with a critical pass on offense while keeping technical fouls to a minimum. Coaches could benefit from systematically analyzing the situations where their team loses the ball due to technical faults to enhance tactical situational efficiency.

P66

GENDER-SPECIFIC ANALYSIS OF THE ASSOCIATION BETWEEN ANTHROPOMETRIC INDICES AND OBJECTIVELY MEASURED PHYSICAL ACTIVITY IN HIGH-SCHOOL ADOLESCENTS

Filip Primorac¹, Elia Cichetti², Mirela Sunda³

¹University of Split, Faculty of Kinesiology, Split, Croatia, ²Università degli Studi Chieti Pescara, Pescara, Italy, ³Antun Gustav Matos High School, Dakovo, Croatia

Correspondence: sundamirela@gmail.com

Theoretically, anthropometric indices in children and adolescents should be associated with levels of physical activity. PURPOSE:

The aim of this study was to evaluate gender-specific associations between anthropometric indices, and objectively measured physical activity (OPA). METHODS: We observed 139 high-school students from Dakovo, Croatia (98 girls). OPA was measured using the Yamax SW-200 pedometers (Yamasa Tokei Keiki Co. Ltd., Tokio, Japan), while anthropometric indices included body height, body mass, and calculated body mass index (BMI). To evaluate the associations between variables Spearman's correlations were calculated. RESULTS: The associations between OPA and anthropometrics were not significant, when observed for total sample (less than 1% of the common variance), in boys (up to 2% of the common variance), and girls (less than 1% of the common variance). CONCLUSION: Our study did not confirm regular considerations on strong association between physical activity and anthropometric indices in high-school students. Possible explanation can be found in the fact that other than BMI we didn't include any other measure of body composition. Also, OAP was measured by pedometers which are not applicable as a measurement tool during some form of physical exercising (team sports, martial arts, etc.).

P67

THE ASSOCIATION BETWEEN OBJECTIVELY MEASURED PHYSICAL ACTIVITY AND MOTOR CAPACITIES IN ADOLESCENTS; GENDER-STRATIFIED STUDY

Mirela Sunda¹, Brigita Rando², Alessandro Tella³

¹Antun Gustav Matos High School, Dakovo, Croatia, ²University of Naples Parthenope, Naples, Italy, ³Università degli Studi Chieti Pescara, Pescara, Italy

Correspondence: sundamirela@gmail.com

Physical activity levels are considered to be directly associated with motor capacities, especially in childhood and adolescence. PURPOSE: This study aimed to identify the associations between objectively measured physical activity (OPA), and motor capacities in high-school adolescents, considering gender differences. METHODS: Participants were 139 high-school students from Croatia (41 boys). OPA was measured using the Yamax SW-200 pedometers (Yamasa Tokei Keiki Co. Ltd., Tokio, Japan). Tests of motor capacities included broad jump test of power capacity – BJ, sit-and-reach test of flexibility – S&R, and sit-ups test of abdominal strength – SU. Spearman's correlations were calculated for total sample, and gender-stratified. RESULTS: Correlations did not reach statistical significance neither for total sample ($R = 0.05, 0.08, 0.09$, all $p > 0.05$), in boys ($R = 0.15, 0.16, 0.06$), nor in girls ($R = 0.11, 0.8, 0.06$ for correlation between OPA and BJ, S&R, and SU, respectively, all $p > 0.05$). CONCLUSION: Despite initial considerations, correlations between OAP and motor capacities in adolescents were not significant. However, this is probably the result of the fact that measurement tools used in this study (pedometers) do not allow continuous monitoring of the physical activity, mainly during the sport training participation (athletes should not wear it during the training). Therefore, further studies are needed to clearly identify the studied associations.

P68

HELMINTHIASIS AMONG THE LAM NAM CHI RESERVOIR PROJECT, CHAIYAPHUM PROVINCE.

Kulyanee Junthima¹, Chamaiporn Nilrat¹, Chutchawal Noiwangkang¹

¹Office of Disease Prevention and Control 9, Nakhon Ratchasima Province, Thailand, ¹Chaiyaphum Provincial Public Health Office, Thailand

Correspondence: kul4080@yahoo.com

The Lam Nam Chi reservoir project is one of the responsible of the Irrigation department which needs to study the impact of this project on the environment and people's health in the surround-

ing community. **PURPOSE:** This cross-sectional study aimed to explore the situation of helminthiasis in people, animal reservoirs, and intermediate hosts around the dam areas with geographic coordinate surveys. **METHODS:** 333 stool samples were randomized to examine for egg and larva of helminthes by using formalin-ether concentration technique (FECT) while floating and sedimentation technique together with FECT were applied to examine parasite infection in their reservoir stool samples. The cercariae in fresh water snails were detected by shedding and crushing technique while the metacercariae in fresh water fishes were detected by pepsin digestion methods. **RESULTS:** The research result showed that the helminth infection rate among the studied people was 10.5% and the intestinal protozoan infection rate was 0%. The infection rate of zoonotic helminthes in dogs, cats, cows and buffaloes were 66.7%, 75.0%, 42.0%, and 63.3 % respectively. The cercarial or metacercarial infection rate in fresh water snails was 1.1% while in fresh water fishes was 1.28%. **CONCLUSION:** In this study, *Opisthorchis viverrini* eggs were detected in stool human samples and their metacercariae were detected in fishes. Liver fluke is one of the recent etiological factors of cholangiocarcinoma in Thai people.

P69

ANALYSIS OF JOINT FORCE IN KICK TOPSPIN TENNIS SERVE IN ELITE AND AMATEUR TENNIS PLAYERS

Pornthep Rachnavy¹, Thawichai Khaothin¹

¹Suranaree University of Technology, Faculty of Science, School of Sports Science, Thailand

Correspondence: rachnavy@sut.ac.th

Tennis serving is a skill in which an athlete can determine how to use strategies to gain an advantage over their opponents. **PURPOSE:** The objectives of this study were to compare the joint force in kick-top-spin tennis serve between professional and amateur tennis players. **METHODS:** The subjects of this study were male professional (5) and amateur (5) tennis players between the ages of 19 and 23 who were right hand kick-top-spin tennis served. Use the video position indicator to create a 3D image and determine the angle of the body's joints to study the force on each joint using two force platforms and a 3D motion analysis program. The three best servings were used for motion analysis. The recorded images were analyzed by Kinematics and Kinetics using the Visual 3D Motion Analysis program. **RESULTS:** Results showed that the applied force on the wrist, elbows, and hips in the follow-through phase was the greatest. The force generates on hip in the follow-through phase corresponds to Newton's 3rd law, in which the hip movement is backward to generate compensating forces from

the reduction of the racquet's momentum in the follow-through phase. **CONCLUSION:** The findings suggest that the risk factors for injury relate to increased power resulting from a combination of ground reaction and muscular forces combined with incorrect technique.

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AGILITY AND INJURY OCCURRENCE IN FOOTBALL/SOCCER

Dragan Mijatović¹, Miran Pehar², Ivan Kvesić²

¹Faculty of Health Sciences, University of Mostar, Mostar, Bosnia and Herzegovina, ²Faculty of Science and Education, University of Mostar, Mostar, Bosnia and Herzegovina

Correspondence: mijatovicdragan@gmail.com

Agility is important quality regularly considered as being predictor of sport performance in sports where rapid and effective changes of direction and speed is needed (i.e. basketball, football/soccer, handball). However, recently agility is considered as being theoretically correlated to injury occurrence in sports. **PURPOSE:** The aim of this study was to evaluate possible associations which may exist between agility performances and injury occurrence in professional football. **METHODS:** The sample of participants included 123 professional football players from Bosnia and Herzegovina (all males, 23.4±2.1 years of age). Players were tested on football specific - reactive agility (RAG) and - change of direction speed (CODS) performed on dominant- and non-dominant-side, at the beginning of the competitive season. The injury occurrence was prospectively observed over half-season period. Logistic regression was calculated to evidence relationships between pre-season RAG and CODS, and injury occurrence. **RESULTS:** Results showed significant association between RAG performed on dominant and non-dominant side with injury occurrence (OR = 0.89, 95%CI: 0.81-0.97, and OR = 0.66, 95%CI: 0.41-0.89 for dominant and non-dominant side performances, respectively), indicating higher risk for being injured for players who had poorer results in RAG. CODS is not found as being significantly correlated to injury occurrence. **CONCLUSION:** The study highlighted potential importance of RAG in occurrence of injuries in professional football male players. Further analyses in younger players and females are warranted.

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- Maximum number of references is 100.

Editorials are written or commissioned by the editors, but suggestions for possible topics and authors are welcome. It could be peer reviewed by two reviewers who may be external or by the Editorial Board.

☐Open Submissions

☒Indexed

☒Peer Reviewed

Editorials should be:

- Up to 1000 words (excluding title, abstract, tables/figures, figure legends, Acknowledgements, Conflict of Interest, and References);
- A structured abstract of less than 250 words;
- Maximum number of references is 10.

Short reports of experimental work, new methods, or a preliminary report can be accepted as two page papers. Your manuscript should include the following sections: Introduction, Methods, Results, and Discussion.

☒Open Submissions

☒Indexed

☒Peer Reviewed

Short reports should be:

- Up to 1500 words (excluding title, abstract, tables/figures, figure legends, Acknowledgements, Conflict of Interest, and References);
- A structured abstract of less than 250 words;
- Maximum number of references is 15.

Peer review - fair review provides authors who feel their paper has been unfairly rejected (at any journal) the opportunity to share reviewer comments, explain their concerns, and have their paper reviewed for possible publication in MJSSM.

☒Open Submissions

☒Indexed

☐Peer Reviewed

Peer review - fair review should be:

- Up to 1500 words (excluding title, abstract, tables/figures, figure legends, Acknowledgements, Conflict of Interest, and References);
- A structured abstract of less than 250 words;
- Maximum number of references is 15.

Invited papers and award papers include invited papers from authors with outstanding scientific credentials. Nomination of invited authors is at the discretion of the MJSSM editorial board. MJSSM also publishes award papers selected by the scientific committee of the MSA annual conference.

☐Open Submissions

☒Indexed

☐Peer Reviewed

Invited papers and award papers should be:

- Up to 3000 words (excluding title, abstract, tables/figures, figure legends, Acknowledgements, Conflict of Interest, and References);
- A structured abstract of less than 250 words;
- Maximum number of references is 30;
- Maximum combined total of 6 Tables/Figures.

Meeting Abstracts contain conference abstracts of the sports science papers presented at the MSA annual conference and MSA-sponsored meetings. This publication offers a first look into the current research in the field of Sports Science.

☐ Open Submissions

☒ Indexed

☐ Peer Reviewed

Meeting Abstracts should be:

- Restricted to 250 words (including title, authors and institutions) and must include the following separate sections: [1] purpose; [2] methods; [3] results; [4] conclusion;
- Without references;
- Without Tables/Figures.

1.3. Submission

MJSSM only accepts electronic submission to the e-mail of the Journal Office: **office@mjssm.me**.

Submitted material includes:

- A manuscript prepared according to the Guidelines for the Authors;
- A signed form that states the study was not previously published, nor has been submitted simultaneously for consideration of publication elsewhere, that states that all of the authors are in agreement with submission of the manuscript to MJSSM, and that, for studies that use animal or human individuals, authors must include information regarding their institution's ethics committee, and which identifies the official approval number;
- A signed form that there is no conflict of interest.

Name the files according to the family name of the first author. Authors submitting revised versions of the manuscript can use the identification number of their manuscript as provided by the Journal Office. *See example:*

- ✓ FAMILY NAME-manuscript.doc – (main manuscript file)
- ✓ FAMILY NAME-statement.PDF – (authorship statement)
- ✓ FAMILY NAME-declaration.PDF – (declaration of potential conflict of interest)
- ✓ FAMILY NAME-fig1.tiff – (Figure 1)

1.4. Peer Review Process

An original manuscript submitted for publication will be submitted to the review process as long as it fits the following criteria:

- The study was not previously published, nor has been submitted simultaneously for consideration of publication elsewhere;
- All persons listed as authors approved its submission to MJSSM;
- Any person cited as a source of personal communication has approved the quote;
- The opinions expressed by the authors are their exclusive responsibility;
- The author signs a formal statement that the submitted manuscript complies with the directions and guidelines of MJSSM.

The editors-in-chief, executive editor and associate editors will make a preliminary analysis regarding the appropriateness, quality, originality and written style/grammar of the submitted manuscript. The editors reserve the right to request additional information, corrections, and guideline compliance before they submit the manuscript to the ad-hoc review process.

MJSSM uses ad-hoc reviewers, who volunteer to analyze the merit of the study. Typically, one or two expert reviewers are consulted in a double-blind process. Authors are notified by e-mail when their submission has been accepted (or rejected). Minor changes in the text may be made at the discretion of the editors-in-chief, executive editor and/or associate editors. Changes can include spelling and grammar in the chosen language, written style, journal citations, and reference guidelines. The author is notified of changes via email. The final version is available to the author for his or her approval before it is published.

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The editors of MJSSM consider plagiarism to be a serious breach of academic ethics. Any author who practices plagiarism (in part or totality) will be suspended for six years from submitting new submissions to MJSSM. If such a manuscript is approved and published, public exposure of the article with a printed mark ("plagiarized" or "retracted") on each page of the published file, as well as suspension for future publication for at least six years, or a period determined by the editorial board. Third party plagiarized authors or institutions will be notified, informing them about the faulty authors. Plagiarism will result in immediate rejection of the manuscript.

MJSSM only publishes studies that have been approved by an institutional ethics committee (when a study involves humans or animals). Fail to provide such information prevent its publication. To ensure these requirements, it is essential that submission documentation is complete. If you have not completed this step yet, go to MJSSM website and fill out the two required documents: Declaration of Potential Conflict of Interest and Authorship Statement. Whether or not your study uses humans or animals, these documents must be completed and signed by all authors and attached as supplementary files in the originally submitted manuscript.

1.6. After Acceptance

After the manuscript has been accepted, authors will receive a PDF version of the manuscripts for authorization, as it should look in printed version of MJSSM. Authors should carefully check for omissions. Reporting errors after this point will not be possible and the Editorial Board will not be eligible for them.

Should there be any errors, authors should report them to the Office e-mail address office@mjssm.me. If there are not any errors authors should also write a short e-mail stating that they agree with the received version.

1.7. Code of Conduct Ethics Committee of Publications



MJSSM is hosting the Code of Conduct Ethics Committee of Publications of the COPE (the Committee on Publication Ethics), which provides a forum for publishers and Editors of scientific journals to discuss issues relating to the integrity of the work submitted to or

published in their journals.

2. MANUSCRIPT STRUCTURE

2.1. Title Page

The first page of the manuscripts should be the title page, containing: title, type of publication, running head, authors, affiliations, corresponding author, and manuscript information. *See example:*

Transfer of Learning on a Spatial Memory Task between the Blind and Sighted People Spatial Memory among Blind and Sighted

Original Scientific Paper

Transfer of learning on a spatial memory task

Selcuk Akpınar¹, Stevo Popović^{1,2}, Sadettin Kirazci¹

¹Middle East Technical University, Physical Education and Sports Department, Ankara, Turkey

²University of Montenegro, Faculty for Sport and Physical Education, Niksic, Montenegro

Corresponding author:

S. Popovic

University of Montenegro

Faculty for Sport and Physical Education

Narodne omladine bb, 84000 Niksic, Montenegro

E-mail: stevop@ac.me

Word count: 2,980

Abstract word count: 236

Number of Tables: 3

Number of Figures: 3

2.1.1. Title

Title should be short and informative and the recommended length is no more than 20 words. The title should be in Title Case, written in uppercase and lowercase letters (initial uppercase for all words except articles, conjunctions, short prepositions no longer than four letters etc.) so that first letters of the words in the title are capitalized. Exceptions are words like: “and”, “or”, “between” etc. The word following a colon (:) or a hyphen (-) in the title is always capitalized.

2.1.2. Type of publication

Authors should suggest the type of their submission.

2.1.3. Running head

Short running title should not exceed 50 characters including spaces.

2.1.4. Authors

The form of an author's name is first name, middle initial(s), and last name. In one line list all authors with full names separated by a comma (and space). Avoid any abbreviations of academic or professional titles. If authors belong to different institutions, following a family name of the author there should be a number in superscript designating affiliation.

2.1.5. Affiliations

Affiliation consists of the name of an institution, department, city, country/territory(in this order) to which the author(s) belong and to which the presented / submitted work should be attributed. List all affiliations (each in a separate line) in the order corresponding to the list of

authors. Affiliations must be written in English, so carefully check the official English translation of the names of institutions and departments.

Only if there is more than one affiliation, should a number be given to each affiliation in order of appearance. This number should be written in superscript at the beginning of the line, separated from corresponding affiliation with a space. This number should also be put after corresponding name of the author, in superscript with no space in between.

If an author belongs to more than one institution, all corresponding superscript digits, separated with a comma with no space in between, should be present behind the family name of this author.

In case all authors belong to the same institution affiliation numbering is not needed.

Whenever possible expand your authors' affiliations with departments, or some other, specific and lower levels of organization.

2.1.6. Corresponding author

Corresponding author's name with full postal address in English and e-mail address should appear, after the affiliations. It is preferred that submitted address is institutional and not private. Corresponding author's name should include only initials of the first and middle names separated by a full stop (and a space) and the last name. Postal address should be written in the following line in sentence case. Parts of the address should be separated by a comma instead of a line break. E-mail (if possible) should be placed in the line following the postal address. Author should clearly state whether or not the e-mail should be published.

2.1.7. Manuscript information

All authors are required to provide word count (excluding title page, abstract, tables/figures, figure legends, Acknowledgements, Conflict of Interest, and References), the Abstract word count, the number of Tables, and the number of Figures.

2.2. Abstract

The second page of the manuscripts should be the abstract and key words. It should be placed on second page of the manuscripts after the standard title written in upper and lower case letters, bold.

Since abstract is independent part of your paper, all abbreviations used in the abstract should also be explained in it. If an abbreviation is used, the term should always be first written in full with the abbreviation in parentheses immediately after it. Abstract should not have any special headings (e.g., Aim, Results...).

Authors should provide up to six key words that capture the main topics of the article. Terms from the Medical Subject Headings (MeSH) list of Index Medicus are recommended to be used.

Key words should be placed on the second page of the manuscript right below the abstract, written in italic. Separate each key word by a comma (and a space). Do not put a full stop after the last key word. *See example:*

Abstract

Results of the analysis of...

Key words: spatial memory, blind, transfer of learning, feedback

2.3. Main Chapters

Starting from the third page of the manuscripts, it should be the main chapters. Depending on the type of publication main manuscript chapters may vary. The general outline is: Introduction, Methods, Results, Discussion, Acknowledgements (optional), Conflict of Interest (optional), and Title and Abstract in Montenegrin (only for the authors from former Yugoslavia, excluding Macedonians and Slovenes). However, this scheme may not be suitable for reviews or publications from some areas and authors should then adjust their chapters accordingly but use the general outline as much as possible.

2.3.1. Headings

Main chapter headings: written in bold and in Title Case. *See example:*

✓ **Methods**

Sub-headings: written in italic and in normal sentence case. Do not put a full stop or any other sign at the end of the title. Do not create more than one level of sub-heading. *See example:*

- ✓ *Table position of the research football team*

2.3.2 Ethics

When reporting experiments on human subjects, there must be a declaration of Ethics compliance. Inclusion of a statement such as follow in Methods section will be understood by the Editor as authors' affirmation of compliance: "This study was approved in advance by [name of committee and/or its institutional sponsor]. Each participant voluntarily provided written informed consent before participating." Authors that fail to submit an Ethics statement will be asked to resubmit the manuscripts, which may delay publication.

2.3.3 Statistics reporting

MJSSM encourages authors to report precise p-values. When possible, quantify findings and present them with appropriate indicators of measurement error or uncertainty (such as confidence intervals). Use normal text (i.e., non-capitalized, non-italic) for statistical term "p".

2.3.4. 'Acknowledgements' and 'Conflict of Interest' (optional)

All contributors who do not meet the criteria for authorship should be listed in the 'Acknowledgements' section. If applicable, in 'Conflict of Interest' section, authors must clearly disclose any grants, financial or material supports, or any sort of technical assistances from an institution, organization, group or an individual that might be perceived as leading to a conflict of interest.

2.4. References

References should be placed on a new page after the standard title written in upper and lower case letters, bold.

All information needed for each type of must be present as specified in guidelines. Authors are solely responsible for accuracy of each reference. Use authoritative source for information such as Web of Science, Medline, or PubMed to check the validity of citations.

2.4.1. References style

MJSSM adheres to the American Psychological Association 7th Edition reference style. Check the Publication Manual of the American Psychological Association (2019), Seventh Edition that is the official source for APA Style, to ensure the manuscripts conform to this reference style. Authors using EndNote® to organize the references must convert the citations and bibliography to plain text before submission.

2.4.2. Examples for Reference citations

One work by one author

- ✓ In one study (Reilly, 1997), soccer players...
- ✓ In the study by Reilly (1997), soccer players...
- ✓ In 1997, Reilly's study of soccer players...

Works by two authors

- ✓ Duffield and Marino (2007) studied...
- ✓ In one study (Duffield & Marino, 2007), soccer players...
- ✓ In 2007, Duffield and Marino's study of soccer players...

Works by three or more authors: cite only the name of the first author followed by et al. and the year

- ✓ Bangsbo et al. (2008) stated that...
- ✓ In one study (Bangsbo et al., 2008), soccer players...

Works by organization as an author: cite the source, just as you would an individual person

- ✓ According to the American Psychological Association (2000)...
- ✓ In the APA Manual (American Psychological Association, 2003), it is explained...

Two or more works in the same parenthetical citation: citation of two or more works in the same parentheses should be listed in the order they appear in the reference list (i.e., alphabetically); separated by a semi-colon

- ✓ Several studies (Bangsbo et al., 2008; Duffield & Marino, 2007; Reilly, 1997) suggest that...

2.4.3. Examples for Reference list

Works by one author

Borg, G. (1998). *Borg's perceived exertion and pain scales*: Human Kinetics.

Works by two authors

Duffield, R., & Marino, F. E. (2007). *Effects of pre-cooling procedures on intermittent-sprint exercise performance in warm conditions*. *European Journal of Applied Physiology*, 100(6), 727–735. <https://doi.org/10.1007/s00421-007-0468-x>

Works by three to twenty authors

Nepocatych, S., Balilionis, G., & O'Neal, E. K. (2017). Analysis of dietary intake and body composition of female athletes over a competitive season. *Montenegrin Journal of Sports Science and Medicine*, 6(2), 57–65. <https://doi.org/10.26773/mjssm.2017.09.008>

Works by more than twenty authors

Krustrup, P., Mohr, M., Amstrup, T., Rysgaard, T., Johansen, J., Steensberg, A.,... Bangsbo, J. (2003). The yo-yo intermittent recovery test: physiological response, reliability, and validity. *Medicine & Science in Sports & Exercise*, 35(4), 697–705. <https://doi.org/10.1249/01.mss.0000058441.94520.32>

Works by group of authors

NCD-RisC. (2017). Worldwide trends in body-mass index, underweight, overweight, and obesity from 1975 to 2016: a pooled analysis of 2416 population-based measurement studies in 128.9 million children, adolescents, and adults. *Lancet*, 390(10113), 2627–2642. [https://doi.org/10.1016/s0140-6736\(17\)32129-3](https://doi.org/10.1016/s0140-6736(17)32129-3)

Works by unknown authors

Merriam-Webster's collegiate dictionary (11th ed.). (2003). Merriam-Webster.

Journal article (print)

Scruton, R. (1996). The eclipse of listening. *The New Criterion*, 15(3), 5–13.

Journal article (electronic)

Aarnivala, H., Pokka, T., Soinen, R., Mottonen, M., Harila-Saari, A., & Niinimäki, R. (2020). Trends in age- and sex-adjusted body mass index and the prevalence of malnutrition in children with cancer over 42 months after diagnosis: a single-center cohort study. *European Journal of Pediatrics*, 179(1), 91–98. <https://doi.org/10.1007/s00431-019-03482-w>

Thesis and dissertation

Pyun, D. Y. (2006). *The proposed model of attitude toward advertising through sport*. [Unpublished Doctoral Dissertation]. The Florida State University.

Book

Borg, G. (1998). *Borg's perceived exertion and pain scales*: Human Kinetics.

Chapter of a book

Armstrong, D. (2019). Malory and character. In M. G. Leitch & C. J. Rushton (Eds.), *A new companion to Malory* (pp. 144–163). D. S. Brewer.

Reference to a Facebook profile

Little River Canyon National Preserve (n.d.). *Home* [Facebook page]. Facebook. Retrieved January 12, 2020 from <https://www.facebook.com/lirinps/>

2.5. Tables

All tables should be included in the main manuscript file, each on a separate page right after the Reference section.

Tables should be presented as standard MS Word tables.

Number (Arabic) tables consecutively in the order of their first citation in the text.

Tables and table headings should be completely intelligible without reference to the text. Give each column a short or abbreviated

heading. Authors should place explanatory matter in footnotes, not in the heading. All abbreviations appearing in a table and not considered standard must be explained in a footnote of that table. Avoid any shading or coloring in your tables and be sure that each table is cited in the text.

If you use data from another published or unpublished source, it is the authors' responsibility to obtain permission and acknowledge them fully.

2.5.1. Table heading

Table heading should be written above the table, in Title Case, and without a full stop at the end of the heading. Do not use suffix letters (e.g., Table 1a, 1b, 1c); instead, combine the related tables. *See example:*

✓ **Table 1.** Repeated Sprint Time Following Ingestion of Carbohydrate-Electrolyte Beverage

2.5.2. Table sub-heading

All text appearing in tables should be written beginning only with first letter of the first word in all capitals, i.e., all words for variable names, column headings etc. in tables should start with the first letter in all capitals. Avoid any formatting (e.g., bold, italic, underline) in tables.

2.5.3. Table footnotes

Table footnotes should be written below the table.

General notes explain, qualify or provide information about the table as a whole. Put explanations of abbreviations, symbols, etc. here. General notes are designated by the word Note (italicized) followed by a period.

✓ *Note.* CI: confidence interval; Con: control group; CE: carbohydrate-electrolyte group.

Specific notes explain, qualify or provide information about a particular column, row, or individual entry. To indicate specific notes, use superscript lowercase letters (e.g. ^{a,b,c}), and order the superscripts from left to right, top to bottom. Each table's first footnote must be the superscript ^a.

✓ ^aOne participant was diagnosed with heat illness and n = 19.^bn = 20.

Probability notes provide the reader with the results of the tests for statistical significance. Probability notes must be indicated with consecutive use of the following symbols: * † ‡ § ¶ || etc.

✓ *P<0.05, †p<0.01.

2.5.4. Table citation

In the text, tables should be cited as full words. *See example:*

- ✓ Table 1 (first letter in all capitals and no full stop)
- ✓ ...as shown in Tables 1 and 3. (citing more tables at once)
- ✓ ...result has shown (Tables 1-3) that... (citing more tables at once)
- ✓in our results (Tables 1, 2 and 5)... (citing more tables at once)

2.6. Figures

On the last separate page of the main manuscript file, authors should place the legends of all the figures submitted separately.

All graphic materials should be of sufficient quality for print with a minimum resolution of 600 dpi. MJSSM prefers TIFF, EPS and PNG formats.

If a figure has been published previously, acknowledge the original source and submit a written permission from the copyright holder to reproduce the material. Permission is required irrespective of authorship or publisher except for documents in the public domain. If photographs of people are used, either the subjects must not be identifiable or their pictures must be accompanied by written permission to use the photograph whenever possible permission for publication should be obtained.

Figures and figure legends should be completely intelligible without reference to the text.

The price of printing in color is 50 EUR per page as printed in an issue of MJSSM.

2.6.1. Figure legends

Figures should not contain footnotes. All information, including explanations of abbreviations must be present in figure legends. Figure legends should be written below the figure, in sentence case. *See example:*

- ✓ **Figure 1.** Changes in accuracy of instep football kick measured before and after fatigued. SR – resting state, SF – state of fatigue, * $p > 0.01$, † $p > 0.05$.

2.6.2. Figure citation

All graphic materials should be referred to as Figures in the text. Figures are cited in the text as full words. *See example:*

- ✓ Figure 1
- × figure 1
- × Figure 1.
- ✓exhibit greater variance than the year before (Figure 2). Therefore...
- ✓as shown in Figures 1 and 3. (citing more figures at once)
- ✓result has shown (Figures 1-3) that... (citing more figures at once)
- ✓in our results (Figures 1, 2 and 5)... (citing more figures at once)

2.6.3. Sub-figures

If there is a figure divided in several sub-figures, each sub-figure should be marked with a small letter, starting with a, b, c etc. The letter should be marked for each subfigure in a logical and consistent way. *See example:*

- ✓ Figure 1a
- ✓ ...in Figures 1a and b we can...
- ✓ ...data represent (Figures 1a-d)...

2.7. Scientific Terminology

All units of measures should conform to the International System of Units (SI).

Measurements of length, height, weight, and volume should be reported in metric units (meter, kilogram, or liter) or their decimal multiples.

Decimal places in English language are separated with a full stop and not with a comma. Thousands are separated with a comma.

Percentage	Degrees	All other units of measure	Ratios	Decimal numbers
✓ 10%	✓ 10°	✓ 10 kg	✓ 12:2	✓ 0.056
× 10 %	× 10 °	× 10kg	× 12 : 2	× .056

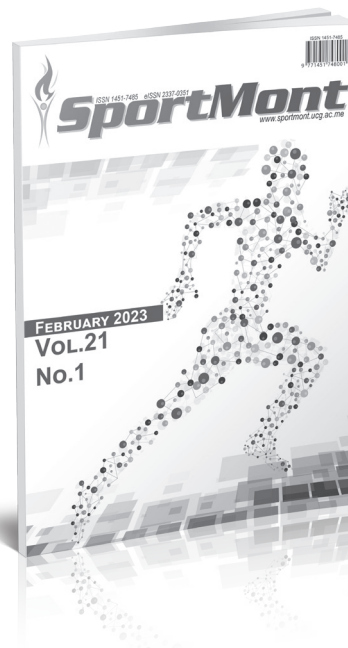
Signs should be placed immediately preceding the relevant number.

✓ 45±3.4	✓ $p < 0.01$	✓ males >30 years of age
× 45 ± 3.4	× $p < 0.01$	× males > 30 years of age

2.8. Latin Names

Latin names of species, families etc. should be written in italics (even in titles). If you mention Latin names in your abstract they should be written in non-italic since the rest of the text in abstract is in italic. The first time the name of a species appears in the text both genus and species must be present; later on in the text it is possible to use genus abbreviations. *See example:*

- ✓ First time appearing: *musculus biceps brachii*
- ✓ Abbreviated: *m. biceps brachii*



ISSN 1451-7485

Sport Mont (SM) is a print (ISSN 1451-7485) and electronic scientific journal (eISSN 2337-0351) aims to present easy access to the scientific knowledge for sport-conscious individuals using contemporary methods. The purpose is to minimize the problems like the delays in publishing process of the articles or to acquire previous issues by drawing advantage from electronic medium. Hence, it provides:

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- Fast publication time;
- Peer review by expert, practicing researchers;
- Post-publication tools to indicate quality and impact;
- Community-based dialogue on articles;
- Worldwide media coverage.

SM is published three times a year, in February, June and October of each year. SM publishes original scientific papers, review papers, editorials, short reports, peer review - fair review, as well as invited papers and award papers in the fields of Sports Science and Medicine, as well as it can function as an open discussion forum on significant issues of current interest.

SM covers all aspects of sports science and medicine; all clinical aspects of exercise, health, and sport; exercise physiology and biophysical investigation of sports performance; sport biomechanics; sports nutrition; rehabilitation, physiotherapy; sports psychology; sport pedagogy, sport history, sport philosophy, sport sociology, sport management; and all aspects of scientific support of the sports coaches from the natural, social and humanistic side.

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Publication date: Autumn issue – October 2022
Winter issue – February 2023
Summer issue – June 2023

Montenegrin Sports Academy welcomes you to *Dubrovnik, Croatia*

KEY DATES

- » **1st of July 2022, 24:00 CET**
Abstract submission opening and opening of registration
- » **1st of December 2022, 24:00 CET**
Abstract submission deadline
- » **15th of January 2023, 24:00 CET**
Notification to authors about acceptance
- » **1st of February 2023, 24:00 CET**
Deadline for early-bird registration for presenting authors
- » **15th of February 2023, 24:00 CET**
Deadline for late registration for presenting authors

* CET = Central European Time

CONTACT

Montenegrin Sports Academy
Đoka Miraševića 1/10 | 81000 Podgorica
Phone: +382 67 615 090
+382 69 040 150
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MSA Dubrovnik 2023

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MSA Dubrovnik 2023

20th Annual Scientific Conference
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"Sport, Physical Activity and Health:
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WELCOME TO DUBROVNIK

Regardless of whether you are visiting Dubrovnik for the first time or the hundredth, the sense of awe never fails to descend when you set eyes on the beauty of the old town. Indeed it's hard to imagine anyone becoming jaded by the city's white limestone streets, baroque buildings and the endless shimmer of the Adriatic, or failing to be inspired by a walk along the ancient city walls that protected a civilised, sophisticated republic for centuries.

LANGUAGE

The official Conference language is English.



FIRST ANNOUNCEMENT

Dear Friends and Colleagues,

Montenegrin Sports Academy will mark its 20th Anniversary by organising the 20th Annual Scientific Conference during 20.-23. April 2023 in Dubrovnik Croatia. The 20th Anniversary Conference will be held in Hotel Croatia, Cavtat.

Reserve your calendars, let us gather in person after these turbulent times and make our conference even more prestigious. Guarantee for our further prosperity is our international partners and Montenegrin Sports Academy. See you in Dubrovnik next spring!

We look forward to seeing you in spring 2023,

Prof. Duško Bjelica, Conference President



Conference sub-themes include:

Adapted Physical Activity; Anthropology; Architecture and Urbanism; Biochemistry; Biomechanics; Coaching; Economics; Health and Fitness; History; Molecular Biology; Motor Learning; Neuromuscular Physiology; Nutrition; Olympism; Philosophy and Ethics; Physical Education and Pedagogics; Physiology; Physiotherapy; Psychology; Rehabilitation; Sociology; Sport Management and Law; Sport Statistics and Analyses; Sport Technology; Sport Tourism; Sports Medicine and Orthopaedics; Training and Testing; Traumatology; and other Multi- & Interdisciplinary Themes.

CALL FOR ABSTRACTS

Research scholars and students are invited to present their original work in any of the conference sub-themes. The list of the conference sub-themes is not exhaustive and, therefore, authors should not feel limited by them. Authors can submit their original work in the form of an ABSTRACT, free of charge. An author may submit only one abstract as the first author and two abstracts as the co-author. After undergoing the reviewing process, all authors will be notified about the condition of their submission (accepted or rejected). Presenters (= the first authors) must be registered and have paid registration fees for the conference to secure their oral or poster (not debated) presentation during the conference and the publication in Montenegrin Journal of Sports Science and Medicine that is abstracted/indexed in Emerging Sources Citation Index, SCOPUS and other database, under the condition that the first author has paid registration fee.

Look inside!

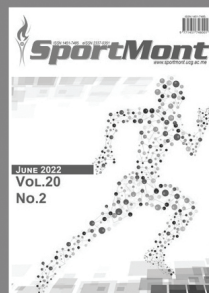


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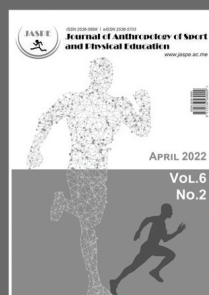


Sport Mont

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www.sportmont.ucg.ac.me



Journal of Anthropology of Sport and Physical Education

Volume 6, 2022, 4 issues per year;

Print ISSN: 2636-569X, Online ISSN: 2536-5703

www.jaspe.ac.me

CALL FOR PAPERS

Full-length manuscripts may be submitted for publishing in the Sport Mont journal (see at HYPERLINK "<http://www.sportmont.ucg.ac.me>" www.sportmont.ucg.ac.me), an international peer-reviewed scientific journal, indexed in Scopus, DOAJ, SPORTDiscus, Index Copernicus, ERIH PLUS, et cetera. Full-length paper submission is free of charge but author(s) has to pay additional 50 euros per accepted full-length paper to cover publication costs. Full manuscripts should be submitted for consideration of publication by the 15th of March, 2023 and prepared according to the guidelines for authors.

REGISTRATION FEES

For participants 260 EUR (220 EUR early-bird)

For students 190 EUR (160 EUR early-bird)

For accompanying persons 140 EUR (110 EUR early-bird)



MONTENEGRIN SPORTS ACADEMY

Founded in 2003 in Podgorica (Montenegro), the Montenegrin Sports Academy (MSA) is a sports scientific society dedicated to the collection, generation and dissemination of scientific knowledge at the Montenegrin level and beyond.

The Montenegrin Sports Academy (MSA) is the leading association of sports scientists at the Montenegrin level, which maintains extensive co-operation with the corresponding associations from abroad. The purpose of the MSA is the promotion of science and research, with special attention to sports science across Montenegro and beyond. Its topics include motivation, attitudes, values and responses, adaptation, performance and health aspects of people engaged in physical activity and the relation of physical activity and lifestyle to health, prevention and aging. These topics are investigated on an interdisciplinary basis and they bring together scientists from all areas of sports science, such as adapted physical activity, biochemistry, biomechanics, chronic disease and exercise, coaching and performance, doping, education, engineering

and technology, environmental physiology, ethics, exercise and health, exercise, lifestyle and fitness, gender in sports, growth and development, human performance and aging, management and sports law, molecular biology and genetics, motor control and learning, muscle mechanics and neuromuscular control, muscle metabolism and hemodynamics, nutrition and exercise, overtraining, physiology, physiotherapy, rehabilitation, sports history, sports medicine, sports pedagogy, sports philosophy, sports psychology, sports sociology, training and testing.

The MSA is a non-profit organization. It supports Montenegrin institutions, such as the Ministry of Education and Sports, the Ministry of Science and the Montenegrin Olympic Committee, by offering scientific advice and assistance for carrying out coordinated national and European research projects defined by these bodies. In addition, the MSA serves as the most important Montenegrin and regional network of sports scientists from all relevant subdisciplines.

The main scientific event organized by the Montenegrin Sports Academy (MSA) is the annual conference held in the first week of April.

Annual conferences have been organized since the inauguration of the MSA in 2003. Today the MSA conference ranks among the leading sports scientific congresses in the Western Balkans. The conference comprises a range of invited lecturers, oral and poster presentations from multi- and mono-disciplinary areas, as well as various types of workshops. The MSA conference is attended by national, regional and international sports scientists with academic careers. The MSA conference now welcomes up to 200 participants from all over the world.

It is our great pleasure to announce the upcoming 19th Annual Scientific Conference of Montenegrin Sports Academy "Sport, Physical Activity and Health: Contemporary Perspectives" to be held in Dubrovnik, Croatia, from 7 to 10 April, 2022. It is planned to be once again organized by the Montenegrin Sports Academy, in cooperation with the Faculty of Sport and Physical Education, University of Montenegro and other international partner institutions (specified in the partner section).

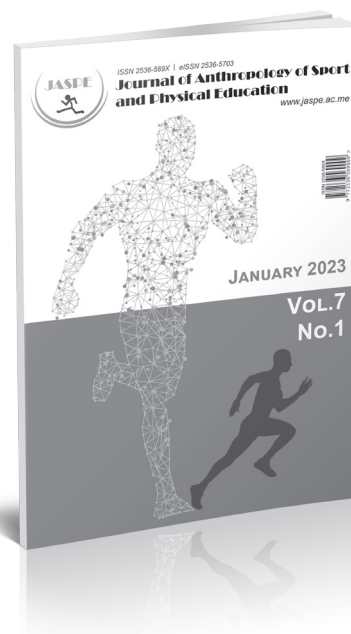
The conference is focused on very current topics from all areas of sports science and sports medicine including physiology and sports medicine, social sciences and humanities, biomechanics and neuromuscular (see Abstract Submission page for more information).

We do believe that the topics offered to our conference participants will serve as a useful forum for the presentation of the latest research, as well as both for the theoretical and applied insight into the field of sports science and sports medicine disciplines.





Journal of Anthropology of Sport and Physical Education



ISSN 2536-569X

Journal of Anthropology of Sport and Physical Education (JASPE) is a print (ISSN 2536-569X) and electronic scientific journal (eISSN 2536-5703) aims to present easy access to the scientific knowledge for sport-conscious individuals using contemporary methods. The purpose is to minimize the problems like the delays in publishing process of the articles or to acquire previous issues by drawing advantage from electronic medium. Hence, it provides:

- Open-access and freely accessible online;
- Fast publication time;
- Peer review by expert, practicing researchers;
- Post-publication tools to indicate quality and impact;
- Community-based dialogue on articles;
- Worldwide media coverage.

JASPE is published four times a year, in January, April, July and October of each year. JASPE publishes original scientific papers, review papers, editorials, short reports, peer review - fair review, as well as invited papers and award papers in the fields of Anthropology of Sport and Physical Education, as well as it can function as an open discussion forum on significant issues of current interest.

JASPE covers all aspects of anthropology of sport and physical education from five major fields of anthropology: cultural, global, biological, linguistic and medical.

Prospective authors should submit manuscripts for consideration in Microsoft Word-compatible format. For more complete descriptions and submission instructions, please access the Guidelines for Authors pages at the JASPE website: <http://www.jaspe.ac.me/?sekciya=page&p=51>. Contributors are urged to read JASPE's guidelines for the authors carefully before submitting manuscripts. Manuscripts submissions should be sent in electronic format to jaspe@ucg.ac.me or contact JASPE's Editor:

Fidanka VASILEVA, *Editor-in Chief* – vasileva.jaspe@gmail.com

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USEFUL CONTACTS

Editorial enquiries and journal proposals:

Dusko Bjelica

Damir Sekulic

Editors-in-Chief

Email: damirsekulic.mjssm@gmail.com

Selcuk Akpinar

Executive Editor

Email: office@mjssm.me

Marketing enquiries:

Fidanka Vasileva

Marketing Manager

Email: damirsekulic.mjssm@gmail.com

Sports Science and Medicine Journals from Montenegrin Sports Academy

We have expanded the quality of our journals considerably over the past years and can now claim to be the market leader in terms of breadth of coverage.

As we continue to increase the quality of our publications across the field, we hope that you will continue to regard MSA journals as authoritative and stimulating sources for your research. We would be delighted to receive your comments and suggestions, mostly due to the reason your proposals are always welcome.

Look Inside!



Sport Mont Journal

Editors-in-Chief: **Dusko Bjelica**, Montenegro; **Zoran Milosevic**, Serbia

Managing Editor: **Borko Katanic**, Montenegro; **Nedim Covic**, Bosnia and Herzegovina

Volume 20, 2022, 3 issues per year; Print ISSN: 1451-7485, Online ISSN: 2337-0351

Sport Mont Journal is a scientific journal that provides: Open-access and freely accessible online; Fast publication time; Peer review by expert, practicing researchers; Post-publication tools to indicate quality and impact; Community-based dialogue on articles; Worldwide media coverage. SMJ is published three times a year, in February, June and October of each year. SMJ publishes original scientific papers, review papers, editorials, short reports, peer review - fair review, as well as invited papers and award papers in the fields of Sports Science and Medicine, as well as it can function as an open discussion forum on significant issues of current interest.

www.sportmont.ucg.ac.me



Montenegrin Journal of Sports Science and Medicine

Editors-in-Chief: **Dusko Bjelica**, Montenegro; **Damir Sekulic**, Croatia

Executive Editor: **Selcuk Akpinar**, Turkey

Associate Editors: **Mehmet Uygur**, USA; **Catalina Casaru**, USA; and **Predrag Bozic**, Serbia

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Montenegrin Journal of Sports Science and Medicine (MJSSM) is published biannually, in September and March of each year. MJSSM publishes original scientific papers, review papers, editorials, short reports, peer review - fair review, as well as invited papers and award papers in the fields of Sports Science and Medicine, as well as it can function as an open discussion forum on significant issues of current interest. MJSSM covers all aspects of sports science and medicine; all clinical aspects of exercise, health, and sport; exercise physiology and biophysical investigation of sports performance; sport biomechanics; sports nutrition; rehabilitation, physiotherapy; sports psychology; sport pedagogy, sport history, sport philosophy, sport sociology, sport management; and all aspects of scientific support of the sports coaches from the natural, social and humanistic side.

www.mjssm.me

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MSA Conference 2023

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<http://www.csakademija.me/conference/>



20th - 23th April 2023,
Dubrovnik - Croatia