XXII International Scientific Conference

FIS COMMUNICATIONS 2019

in Physical Education, sport and recreation

Book of Abstracts

Ministry of Education, Science and Technological Development Republic of Serbia

University of Niš
Faculty of Sport and Physical Education

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FOREWORD

Dear Authors, esteemed Scientists,

It is with deep satisfaction that I write this Foreword to the Proceedings of the XXII International Scientific Conference "FIS COMMUNICATIONS 2019" held in Niš, October 17 - 19, 2019.

International Scientific Conference "FIS COMMUNICATIONS 2019" continues a tradition of bringing together researchers, academics and professionals from all over the world, experts in sport, physical education and recreation.

The Proceedings Book is consisted of 66 abstracts and full papers written by more than 180 authors from 17 countries. Papers are divided into six sessions depending on the topics investigated as follows: Physical Education, Individual Sports, Team Sports, Physical Activity and Health, Sports Medicine and Physiology and Interdiciplinary.

In addition to the contributed papers, three invited keynote presentations were given by professor Stephen Silverman from the College of Education, Florida Atlantic University, USA, professor Sigmund Loland from the Norwegian School of Sport Sciences, Oslo, Norway, and professor Sanela Škorić from the Faculty of Kinesiology, University of Zagreb, Croatia. Distinguished keynote speakers covered very interesting topics from research methods and planning successful research careers, across the very actual topic of the using new technologies in sport, to the always needed competences of the sports managers.

These Proceedings will furnish the scientists of the world with an excellent reference book. I trust also that this will be an impetus to stimulate further study and research in the field of sports science.

We thank all authors and participants for their contributions.

Chair of the Scientific Committee

Nenad Stojiljković, PhD

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Plenary Sesion

PLANNING: THE ESSENTIAL INGREDIENT FOR A PRODUCTIVE RESEARCH CAREER

Stephen Silverman[1]

[1]College of Education, Florida Atlantic University, USA

UDC 613.2:796

This presentation will focus on the key role of planning in developing and sustaining a research program. The first part of the presentation will focus on helping doctoral students to become productive researchers. Using a model for planning doctoral research (Locke, Spirduso, & Silverman, 2014) various steps will be discussed that help graduate students efficiently develop their research program. I will emphasize that quality doctoral research gives students a good start on their career so they can develop into research-active scholars who will develop a productive, focused research program. It will be noted that doctoral advisors have obligations to assist students in transitioning from the role of student to that of professor. When students understand the multidimensionality of their new role as a university faculty member, the forethought and planning by the student and academic advisor—throughout doctoral study—assists in that transition. The second part of the presentation will focus on developing and sustaining a research program as a faculty member. As part of this discussion I will address the necessity of delimiting the areas of research and planning in a rational manner to make certain that subsequent studies build on previous research and that publications follow a logical pathway. It will be stressed that researchers develop a reputation while producing consistent, focused, and quality research over a long period of time. In order to do this planning and constantly supplementing and augmenting the plan is necessary so that scholars do not have periods without research production and refereed research publications. A method to keep productive throughout a research career will be discussed and shown how it helped in my research career. I will conclude with advice for doctoral students, early-career scholars, and for seasoned scholars since planning and research production often is dependent on where scholars are in their career.

ETHICS AND TECHNOLOGY IN SPORT

Sigmund Loland[1]

[1]Norwegian School of Sport Sciences, Oslo, Norway

UDC 796:62

Technology, understood broadly as human-made means to realize human interests and goals, has many functions in sport. I discuss possibilities and challenges when it comes to the role of technology in realizing sport values.

In a first section, I provide a tentative categorization of sport technologies and list some of these possibilities and challenges. Body techniques, sport equipment, and innovative training technologies such as smart watches and movement sensors raise questions of fairness, equal access and risk of harm. Some technological innovations such as the sharkskin swimsuit, or so-called self-correcting golf balls, also challenge core ideas of the nature of performance in the affected sports.

The most heated ethical debates concern biomedical technologies used with the intention to enhance performance. I pay particular attention to technologies that are administered by external expertise and do not require athlete insight and control such as drugs (doping).

In a second section, and using practical examples and normative theory, I propose an ethically reflective way of distinguishing between admirable, acceptable, and non-acceptable technology in sport. I argue in favour of what I refer to as a thick theory of sport in which athletic performance at its best can be understood as an embodied instantiation of morally admirable human excellence. The thick theory implies opening for technology based on athlete insight, control, and responsibility, and rejecting technology administered primarily by external expert systems.

I conclude with reflections upon future technological challenges to sport, in particular challenges posed by genetic technologies.

References

Fouché R. 2017. *Game changer. The Techno-scientific Revolution in Sport.* Baltimore: Johns Hopkins University Press.

Loland S. 2011. Genetics and ethics in elite sport. In: Bouchard C, Hoffman EP (eds.) *Genetic and Molecular Aspects of Sport Performance.* Hobroken, NJ: Wiley Blackwell, 353-361.

Loland S. 2018. Ethics of technology in sport. In: Morgan, WJ (ed.) *Ethics in Sport.* Champaign, Ill.: Human Kinetics, 273-286.

Loland S. 2018. Performance-enhancing drugs, sport, and the ideal of natural athletic performance. *American Journal of Bioethics* 18 (6): 8-15. (Target article)

Oberdieck H, Tiles M. 1995. *Living in a Technological Culture: Human Tools and Human Values.* London: Routledge.

COMPETENCIES OF SPORT MANAGERS

Sanela Škorić[1]

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

UDC 796.005

First master degree programme in sport management was established in 1966 in Ohio University (Stier, 1993). The list has since than grown to almost 250 master programmes in USA, around 30 in Europe, 13 in Asia, 7 in Canada, 5 in Australia, and 1 in New Zeland, India and Africa (NASSM, 2019). According to Petry, Froberg and Madella (2006), sport management professions in Europe are educated in two main ways: "the first way is to get the basic education from "Sport Sciences" and then in the end of the studies specialize on more or less sport management related management, financing, economics etc. or special sport management subjects; the second is to star with general management, economics, financing etc. and then specialize in the end on sport management or closely sport management related subjects." (p. 173) Although some curricular guidelines to different sport management types of programmes can be found, the research of sport management master's programs within the U.S. "indicate that there is not a common core of classes students take that provide uniformity among programs." (Willet, Brown and Goldfine, 2017) which confirms (the need for) always present curricula adaptations (Braunstein-Minkove, DeLuca, 2015). In order to develop a curriculum, one should define the area (industry), occupations for that area, activities for each occupation as well as corresponding competencies, and finally learning outcomes (see Petry, Froberg, Madella, 2004, 2005, 2006). Competencies "cover a broad range of higher order skills and behaviours that represent the ability to cope with complex, unpredictable situations." (Westera, 2001:80) It is a "proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development." (Council of the European Union, 2017:14) A number of researchers addressed the issue of competencies of sport managers (Barcelona, Ross, 2004; DeSensi, Kelley, Beitel, 1990; Farner, Schüttoff, 2019; Horch, Schütte, 2003; Jamieson, 1987; Ko, Henry, Kao, 2011; Lambrecht, 1987; Petry, Froberg, Madella, 2004, 2005, 2006; Retar, Plevnik, Kolar, 2013; Škorić, 2008, 2009, 2018). Studies were conducted in different setting (private, public), included practitioners, academia and students, and covering a broad range of employment opportunities (in both recreational and competitive sport). Although competencies are context specific, majority of the research find communication and organising skills as the most important ones (DeSensi, Kelley, Beitel, 1990; Farner, Schüttoff, 2019; Horch, Schütte, 2003; Lambrecht, 1987; Petry, Froberg, Madella, 2004, 2006; Škorić, 2009, 2018) and recommend curriculum development to be broad and interdisciplinary.

References

Barcelona, B., Ross, C.M. (2004). An Analysis of the Perceived Competencies of Recreational Sport Administrators, *Journal of Park and Recreation Administration, 22*(4), pp. 25-42

Braunstein-Minkove, J.R., DeLuca, J.R. (2015). Effectively Adapting the Sport Management Curricula, Schole: *A Journal of Leisure Studies and Recreation Education, 30*(2), DOI: 10.18666/SCHOLE-2015-V30-I26634, Retrieved in January 2018

Council of the European Union (2017). *Council Recommendation on the European Qualifications Framework for lifelong learning and repealing the Recommendation of the European Parliament and of the Council of 23 April 2008 on the establishment of the European Qualifications Framework for lifelong learning* /online/ http://data.consilium.europa.eu/doc/document/ST-9620-2017-INIT/en/pdf, retrieved in September, 2019.

DeSensi, J.T., Kelley, D.R., Blanton, M.D., Beitel, P.A. (1990). Sport Management Curricular Evaluation and Needs Assessment: A Multifaced Approach, *Journal of Sport Management, 4*(1), 31-58

Farner, M., Schüttoff, U. (2019). Analysing the context-specific relevance of competencies – sport management alumni perspectives, *European Sport Management Quarterly*, DOI: 10.1080/16184742.2019.1607522

Horch, H-D. and Schütte, N. (2003). Competencies of sport managers in German sport clubs and sport federations, *Managing Leisure, 8*, 70-84

Jamieson, L.M. (1987). Competency-Based Approaches to Sport Management, *Journal of Sport Management, 1*(1), 48-56

Ko, L., Henry, I., Kao, C. (2011). The perceived importance of sport management competencies by academics and practitioners in the cultural/industrial context of Taiwan, *Managing Leisure, 16*, pp. 302-317

Lambrecht, K.W. (1987). An Analysis of the Competencies of Sports and Athletic Club Managers, *Journal of Sport Management, 1*, pp. 116-128

NASSM (2019). *Academic Programs.* /online/ https://www.nassm.org/Programs/AcademicPrograms/, retrieved in September 2019

Petry, K., Froberg, K., Madella, A. (2004). *Thematic Network Project AEHESIS Report of the First year.* Department of Leisure Studies, German Sport University Cologne /online/ http://eose.eu/wp-content/uploads/2014/03/AEHESISReport1stYEAR.pdf, retrieved in August 2019

Petry, K., Froberg, K., Madella, A. (2005). *Thematic Network Project AEHESIS Report of the Second year*. Department of Leisure Studies, German Sport University Cologne /online/ http://eose.eu/wp-content/uploads/2014/03/AEHESIS_Report_Second_Year.pdf, retrieved in August 2019

Petry, K., Froberg, K., Madella, A. (2006). *Thematic Network Project AEHESIS Report of the Third year*. Department of Leisure Studies, German Sport University Cologne /online/ http://eose.eu/wp-content/uploads/2014/03/AEHESIS_report_3rd-year.pdf, retrieved in August 2019

Retar, I., Plevnik, M., Kolar, E. (2013). Key competencies of Slovenian sport managers, *Annales Kinesiologiae, 4*(2), pp. 81-94

Stier, W.F.Jr. (1993). *Alternative Career Paths in Physical Education: Sport Management. ERIC Digest.* ERIC Clearinghouse on Teaching and Teacher Education Washington DC. /online/ https://files.eric.ed.gov/fulltext/ED362505.pdf, retrieved in September 2010.

Škorić, S. (2008). The research on desirable sport managers' characteristics. In: D. Milanović, F. Prot (eds.), *Zbornik radova 5th International Scientific Conference on Kinesiology, Zagreb, 2008, „Kinesiology research trends and applications"* (pp. 353-355). Zagreb: Faculty of Kinesiology University of Zagreb.

Škorić, S. (2009). Sport managers' acitivities, needed knowledge and skills. In: M. Mekić (ed.), *Proceedings book of Symposium Invited Papers, III. International Symposium of*

New Technologies in Sports, Sarajevo, 16th-17th April, 2009. (pp. 47-52). Sarajevo: Olimpijski komitet BiH, Fakultet sporta i tjelesnog odgoja

Škorić, S. (2018). Characteristics of sport managers and challenges facing sport organisations. In: I. Načinović Braje, B. Jaković, I. Pavić (eds.), *Elektronski zbornik radova 9th International Conference „An Enterprise Odyssey: Managing Change to Achieve Quality Development", Zagreb, 2018* (pp. 497-503). Zagreb: University of Zagreb Faculty of Economics & Business.

Westera, W. (2001). Competencies in Education: A Confusion of Tongues, *Journal of Curriculum Studies, 33*(1), pp. 75-88

Willet, J., Brown, C., Goldfine, B. (2017). An Examination of Sport Management Master's Programs in the United States, *The Sport Journal, 21September 28.* /online/ https://thesportjournal.org/article/an-examination-of-sport-management-masters-programs-in-the-united-states/#post/0, retrieved in September 2019

Individual Sports

INFLUENCE OF KINEMATIC KICK START PARAMETERS ON TIME TO 10 METERS IN MALE SPRINT SWIMMERS

Marko Đurović[1], Miloš Paunović[1], Peter Szajer[2], Dorica Šajber[3], Dejan Madić[1] and Tomislav Okičić[1]

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

[2] Swimming and Water sport Department, Physical Education University Budapest, Hungary

[3] Faculty of Sport, University of Ljubljana, Slovenia

UDC 797:531.1

The aim of this study was to examined the influence of kinematic kick start parameters on time to 10 m which determines the efficiently executed swimming start. Fifty-five male sprint swimmers (Age = 20.24 ± 2.85 yrs., Height = 1.82 ± 0.63 m, Weight = 74.8 ± 7.72 kg, FINA2017 – long course = 526.40 ± 115.49 points) completed two kick-starts corresponding to 10 m with maximum swim effort. The sample of predictor variables included four kick-start kinematic parameters for the estimation of swimming start (Angle of the rear knee joint at set position, Angle of the front knee joint at set position, Angle of the front knee joint at take-off position and Body Entry Angle) and maximum swim effort coresponding to 10 m was a criterion variable (T10m). The influence of starting parameters on T10 m was examined by regression analysis. According to the results obtained in this research there is one statistically significant optimum multiple regression model for kinematic kick start parameters to predict the T10m witch defined using variables: Angle of the front knee joint at set position and Angle of the front knee joint at take-off position ($F = 3.44$, $p = 0.04$). It can be concluded that the key kinematical parameters for the effective execution of the swimming start are represented by angle of the front knee joint at set position (127.05 ± 8.96 degrees) and angle of the front knee joint at take-off position (109.29 ± 14.14 degrees).

Keywords: swimming, starting block, take-off angle

THE INFLUENCE OF COORDINATION ON THE RESULTS IN SPORTS CLIMBING: THE UNDERLYING RELATIONS

Daniel Stanković[1], Vesna Pavlović[2] and Emilija Petković[1]

[1] Faculty of Sport and Physical Education, University of Nis, Serbia;

[2]Trainer specialist for sports climbing, PAEK "Nis", Serbia

UDC 616:796

The aim of the research was to determine the relations and influences of coordination on the result in sports climbing in women. The research was conducted on a sample of 11 female participants, aged 16±1.55 years, participants of the Youth World Cup in Arco-Italy 2015. The research was conducted by the use of 3 variables for the estimation of coordination (the obstacle course backwards in seconds - POLN, coordination with a baton - KOPA and 20 steps with a baton - 20IP), and 3 variables for the estimation of the result in sports climbing (bouldering - BOULDER, lead climbing – LEAD and speed climbing - SPEED). Based on the obtained results we can conclude the following: There aren't statistically significant relations between sets for the estimation of coordination and the overall result in sport. However, there is a statistically significant influence of coordination on the result in lead climbing both at the multivariate and some univariate level of each variable individually. This means that the participants whose coordination is at a higher level show better results in this discipline. However, the analysis of the influence of coordination on the success in disciplines of bouldering and speed climbing did not show a statistically significant influence at the multivariate level. A general conclusion is that the development of this ability of the climbers should by no means be neglected.

Keywords: coordination, bouldering, lead and speed climbing

DIFFERENCES IN PACE BETWEN MEN AND WOMEN IN THE HALFMARATHON

Daniel Stanković[1], Nemanja Stojanović[1], Aleksandar Raković[1] and Aleksandar Živković[2]

[1] Faculty of Sport and Physical Education, University of Nis, Serbia;

[2] Faculty of Physical Education and Sports Management,
Singidunum University of Belgrade, Serbia

UDC 796.42-055.2

The aim of this study was to describe the differences in the running pace between men and women in the half marathon. We used the results of first 50th man and women competitors from the 2017 Vienna Half Marathon, The race was divided into 5 segments, from 0 - 5km, 5 - 10km, 10 - 15km, 15 - 20km, 20 - 21,1km, which measured the change in pace of running in both men and women. Based on the obtained results, it can be concluded that the variability in the pace decreases to the third segment in men, but in the fourth and fifth segments it increases sharply, while the situation in women is almost similar. Mostly the reason for this is because runners generally start much faster at the start of the race, when they are more rested, there is euphoria and adrenaline at the start, overestimate their capabilities and how much they are currently ready and/or follow the pace of other runners. Women dictate the pace better than the men in the half marathon, but as the race progresses, they slow down the pace of the race too. They run above average until the third segment, ie from 10 to 15km, where there is a sharp fall in the pace of running in the fourth and fifth segments. It was found that there were statistically significant differences in the pace of running between men and women only in the third segment of the halfmatathon race (between 10 and 15km).

Keywords: pace, fatigue, race tactics, effect

DIFFERENCES IN SPINAL COLUMN POSTURAL STATUS IN CHILD AND ADOLESCENT JUDO PRACTITIONERS

Sara Božić[1], Stefan Đorđević[1] and Filip Nurkić[1]

[1] Faculty of sport and physical education, University of Niš, Serbia

UDC 796:615.085

As a form of physical activity, judo includes among its goals the development and activation of the entire musculature of the body, which is of special significance in the light of the findings of studies to date, indicating a high extent of impairment of postural status among children, as well as an attendant muscular disbalance. Consequently, the objective of this study is to identify any differences in spinal column postural status among children and adolescent judo practitioners. The participant sample comprised 30 child judo practitioners and 33 adolescent judo practitioners from the Judo Club "Kinezis" from Niš, with over one year of experience practicing judo. Diagnostics of spinal column postural status in the frontal and sagittal planes was conducted using the "Spinal Mouse" instrument. Statistical results, presented as percentages, for children judo practitioners, are as follows: KIF (10%), RLT (40%), NKT (50%), LOR (10%), RLL (36.7%), NKL (53.3%), SKO (63.3%), and NKF (36.7%). Statistical results, presented as percentages, for adolescent judo practitioners, are as follows: KIF (30,3%), RLT (36,4%), NKT (33,3%), LOR (27,3%), RLL (9,1%), NKL (63,6%), SKO (57,6%), and NKF (42,4%). Results of the Mann Whitney U test indicate no statistically significant differences between the two groups in terms of postural status for the thoracic portion of the spinal column on the sagittal plane ($p=0.549$), nor for the lumbar portion of the sagittal plane ($p=0.135$), or the frontal plane of the spinal column ($p=0.644$). The results thus obtained indicate a high incidence of postural disorders; however, this is percentually better in children practicing judo compared against their peers who do not practice judo.

Keywords: kyphosis, lordosis, scoliosis, flat back, differences, incidence

DESCRIPTIVE PROFILE OF THE REVERSE PUNCH (GYAKO TSUKI) KINEMATIC CHARACTERISTICS MEASURED BY IMU SENSOR TECHNOLOGY

Vesna Vuković[1], Nenad Koropanovski[2], Stefan Marković [1] and Anton Umek[3]

[1]Faculty of Sport and Physical Education, University of Belgrade, Belgrade, Serbia

[2]University of Criminal Investigation and Police Studies, Belgrade, Serbia

[3]Faculty of Electrical Engineering, University of Ljubljana, Ljubljana, Slovenia

UDC 531.1:796.85

Reverse punch *(Gyako tsuki)* is the most frequently used pointing technique in elite karate competitors. It is a sequential movement, coordinating lower and upper limbs, and it is executed in a less than 400ms. Variation in the movement sequence could affect kinematic variables such as acceleration, which is considered to be one of the factors that contribute effectiveness of karate technique. Therefore, the aim of this paper was qualitative evaluation of kinematic motion patterns of the reverse punch. Three male competitors, members of a Serbian national senior karate team, were included in study. Measurements of the kinematic characteristics were performed using IMU (Inertial Measurement Unit) sensor device, and descriptive analysis showed specific phases of the reverse punch performed by different subjects. It is a "double peak" acceleration which has been detected in both, hand and body acceleration, and can be explained as kinematic manifestation of muscle contraction.

Keywords: gyako tsuki, wearable sensors, motion pattern, acceleration

DIFFERENCES IN THE POSTURAL STATUS OF THE ARCHES OF THE FEET IN CHILD AND ADOLESCENT JUDO PRACTITIONERS

Stefan Đorđević[1], Sara Božić[1], Saša Milenković[1], Mima Stanković[1], Marina Milenković[2] and Dobrica Živković[1]

[1] Faculty of Sport and Physical Education, University of Niš, Niš, Serbia

[2] High School "T.S. 12. februar", Niš, Serbia

UDC 615.085

A side effect of the modern age, hypokinesia is attended by an increase in muscular disbalance, which in turn results in postural disorders. As a sport or physical activity, judo encompasses within its techniques the potential to activate the body's entire muscular system, with the legs, or rather the feet, bearing the most responsibility for providing support during the performance of various techniques. In accordance with the above, the objective of this study is to establish the differences in postural status of the arches of the foot in child and adolescent judo practitioners, as well as its incidence. The participant sample comprised 30 children judo practitioners and 33 adolescent judo practitioners, members of the Judo Club "Kinezis" from Niš, who had been practicing judo for a minimum of one year. The podoscope "Pedic" (Hungary), accompanied by the relevant software, was used in order to diagnose the postural status of the foot's arches. The results of percentage statistics for children judo practitioners are as follows: Pes Nor (23.3%), Pes PlL (70.0%), Pes P2L (6.7%). The results of percentage statistics for adolescent judo practitioners are as follows: Pes Nor (15.2%), Pes PlL (69.7.0%), Pes P2L (15.2%). The results of the Mann-Whitney U test indicate no statistically significant difference between the groups pertaining to the postural status of the arches of the feet ($p=0.233$). Based on the results, we conclude that the incidence of the flat feet postural deformity is exceptionally high among the participants, children and adolescent judo practitioners.

Keywords: flat feet, pes cavus, foot deformity incidence

INFLUENCE OF STRENGTH OF LOWER EXTREMITIES ON PERFORMANCE SUCCSESS ON FLOOR EXERCISE

Miloš Paunović[1], Saša Veličković[1], Marko Đurović[1], Tomislav Okičić[1], Vladimir Antić[1], Nikola Milošević[1] and Srđan Ostojić[1]

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

UDC 796.012

The aim of the study was to determine the influence of strength of lower extremities on performance succsess on floor exercise with young gymnasts. The sample of respondents for this research consisted of 20 top gymnasts from eight countries (Austria, Bosnia and Herzegovina, Bulgaria, Russia, Slovenia, Serbia, Croatia and Switzerland), aged 14 to 16 years, three to 10 years of training (average 6.9) and body weight from 31kg to 58kg (average weight 43.52kg). IMADAZ2H-1100 Japanese Digital Dynamometer with WinWedge 3.4 software was used to evaluate the absolute and relative strength of the lower extremity muscles. And for further statistical analysis the results from the competition were taken ("D" and "E" score, and the sum of "D" and "E" scores were taken as final score).Descriptive statistics and regression analysis were used for all variables to determine the influence of muscle force on competition score. The results of the regression analysis showed that there is no statistically significant influence of lower extremity strength on the performance success on floor exercise with gymnasts. The results of this research can provide useful guidance and serve as an adequate basis for further research in artistic gymnastics.

Keywords: artistic gymnastics, strength, muscle force, floor

THE MOST FREQUENTLY USED JUDO TECHNIQUES IN ACCORDANCE WITH CURRENT SPORT RULES

Novica Gardasevic[1] and Nemanja Stankovic[2]

[1] Faculty of Physical Education and Sports, University of East Sarajevo

[2] Faculty of Physical Education and Sports, University of Nis

UDC 796.01:853.23

The research aimed to determine which judo techniques are most commonly used in competitions, in accordance with current rules prescribed by the World Judo Federation (IJF). The analysis included 13 studies, which analyzed 34 judo competitions from 1981 to 2014. Leg judo techniques (Ashi waza) have been found to be the most commonly used techniques from 1981 to 1999, compared to other groups of techniques, especially for heavyweight competitors. In the period from 2000 to 2009, hand judo techniques (Te waza) had the most common application, and after the rule changes from 2009 and 2010, there would be a equal application of hand and leg judo techniques. The equilibrium between the use of hand and leg judo techniques continued after the 2013 rule change. The general conclusion is that the rule changes influenced what techniques the judokas commonly use during the match. Individually, the following techniques are most commonly used in judo in the studies analyzed: Uchi mata and Seoi nage (most often), Ko uchi gari, Ko soto gari, Kata guruma, Te guruma, Kuchiki taoshi, Morote seoi nage, Ippon seoi nage, O uchi gari, Harai goshi, Tani otoshi, O soto otoshi, De ashi barai and others. The conducted analysis can have practical application and contribute to judo coaches in planning the training process, especially in the part of planning the strategy and tactics for competition.

Keywords: judo, techniques, analysis, rules

PREDICTION OF RESULTS OF FEMALE PARASWIMMERS IN FREESTYLE DISCIPLINES AT TOKYO 2020 PARALYMPICS

Aleksandar Mojsilović[1], Anastasia Tsismalidou[2], Parissis Doulgeridis[3], Aleksandra Projović[4], Miljan Hadžović[5], Saša Kostić[6] and Marko Aleksandrović[5]

[1] Primary School, Ub, Serbia

[2]Vocational School for Special Needs, Education and Training, Ptolemaida, Greece

[3] Center for Differential Diagnosis and Support for Children with Special Needs and Disabilities, Greece

[4]Primary School „Stefan Nemanja", Niš Serbia

[5]Faculty of Sport and Physical Education, University of Niš, Niš Serbia

[6]The Inspire Foundation, Marsascala, Malta

UDC 797.034-056.26(520)

The aim of the research was to determine the trend in the development of the results of female paraswimmers who won medals in freestyle disciplines in the last five Paralympic Games (POG) and the formation of a prediction result model at the next Tokyo 2020 POG. First of all, a database of the best results on the last five POG in all classes was created. After that, the equation of the trend and the results (times) that the female paraswimmers are to achieve are calculated in order, hypothetically, to win the appropriate medal at the next POG. Due to the lack of continuity of some disciplines, the results for classes S1, S2, S3, S4 and S14 were not processed. The trend of development of results on the POG for the class of S5, S6, S7, S8, S9, S10, S11, S12 and S13 in the freestyle has been determined. The significance of this research is that the problem of women in the Paralympic sport is being addressed, which is a rarity in the previous research. Also, the results and the conclusion of this research provide a (mathematical) response to coaches of para-swimmers, and that is the result of which their female para-swimmer must swim in order to expect a medal at the next Tokyo 2020 POG.

Keywords: Paralympic Games, Para swimmers, female, freestyle.

SEXUAL MATURITY IN FEMALE RHYTHMIC GYMNASTS OF DIFFERENT COMPETITION PROGRAMS AND AGE GROUP CATEGORIES

Tijana Purenović-Ivanović[1], Nevena Maljković[1], Ružena Popović[1], Emilija Petković[1] and Vladimir Antić[1]

[1] University of Niš, Faculty of Sport and Physical Education, Niš, Serbia

UDC 796.412:616

Rhythmic gymnastics is a sport discipline with specific physiological, biomechanical and aesthetic requirements which change with the level of skills, training load, and they usually increase with the competition level. Serbian Gymnastics Federation formed three competition programs ("A", "B" and "C", i.e. high-, medium- and low-level program), which differentiate in the competition rules, and it can be assumed that these different requirements of the different types of competition programs have resulted in some differences between these groups, and in particular in the dynamics of growth and maturation. The main objective of this study was to examine and compare sexual maturity of 126 rhythmic gymnasts (RGs) distributed in five age group categories (15 seniors, aged 16 years and older; 25 juniors, aged 14-16 years; 26 advanced-level RGs, aged 12-14 years; 38 intermediate-level RGs, aged 9-12 years; 22 beginners, aged 6-9 years) and two competition programs ("A"=42; "B"=84). Their baseline characteristics (age, body height and mass, body mass index, onset of menarche, years of training experience) were established, as well as their sexual maturity (telarche, adrenarche and length of period since menarche). The data were analyzed (Descriptive statistics, Kolmogorov-Smirnov test, Mann-Whitney *U* test) using the SPSS 21.0. Research results showed the absence of statistically significant differences in sexual maturity of "A" and "B" competitors and in each of five age group categories. Taken as a whole, sexual maturity does not discriminate significantly "A" and "B" RGs, irrespective of age group category.

Keywords: rhythmic gymnastics, breast development, axillary hair development, menarche

PREDICTING OF THE BUTTERFLY RESULTS OF FEMALE PARASWIMMERS AT 2020 PARALYMPICS

Stefan Đorđević[1], Anastasia Tsismalidou[2], Parissis Doulgeridis[3], Bojan Jorgić[4] and Marko Aleksandrović[4]

[1] Swimming club "Niš 2005", Niš, Serbia

[2]Vocational School for Special Needs, Education and Training, Ptolemaida, Greece

[3] Center for Differential Diagnosis and Support for Children with Special Needs and Disabilities, Greece

[4]Faculty of Sport and Physical Education, University of Niš, Niš Serbia

UDC 797.034-056.26

The aim of the study is to predict the results of medal winners in the following Paralympic Games (POG) in the butterfly discipline in female competition in physical disability. Database of all results of medal winners in the 50m and 100m butterfly disciplines at the last five POG (2000 Sydney, 2004 Athens, 2008 Beijing, 2012 London and 2016 Rio de Janeiro) has been created. The data in classes S5 to S10 were taken into consideration in the data processing. Due to the lack of continuity in the discipline of 50m butterfly for class S5, no results were processed for this class. Based on the established trend of results development, medal winners in the 50m and 100m butterfly disciplines in the last five POG. A model for predicting the results of possible medal winners at the next POG 2020 has been developed. The obtained results will be of significance for further detailed analyzes on prediction of results in the 50m and 100m butterfly disciplines. It should be noted that the results obtained will primarily be used for the purpose of achieving better results than previously achieved. This work is gaining in importance as coaches can now know (hypothetically) what result their Para swimmer needs to achieve in order to hope for one of the medals.

Keywords: Paralympic Games, Para swimmers, female, butterfly.

Team Sports

GOAL ORIENTATION AND MENTAL TOUGHNESS OF YOUNG SERBIAN BASKETBALL PLAYERS

Marijana Mladenovic[1] and Nenad Trunic[2]

[1]College of Sport and Health, Belgrade, Serbia

[2] Faculty of Physical Culture and Sports Management,
Singidunum University, Belgrade, Serbia

UDC 796.323(497.11)

Goal orientations depict the ways in which a player defines and experiences success and failure and evaluates his competence. Mental toughness is a quality of a player to cope with many demands in sport and stay determined, focused, confident and more in control under pressure situations. The aim of this research was to explore goal orientation and mental toughness of young athletes involved in major international competition. Sample included members of Serbian national U16 basketball team at Euro 2015 (N=21). TEOSQ (Duda, 1989) and MTQ (Goldberg, 1998) were applied. Descriptive statistics, Cronbach's alpha and Pearson correlation coefficient were conducted in SPSS, version 22. Mean values, for task (M=4.26; SD=0.50) and ego (M=3.71; SD=0.69) goal orientation, and for all mental toughness variables: motivation (M=5.54; SD=0.66), pressure (M=5.52; SD=0.92), concentration (M=5.44; SD=0.79), confidence (M=5.23; SD=0.93), rebound (M=5.09; SD=1.03) were significant. Significant correlations were found between motivation and task (r=0.604) and ego (r=0.513) orientation. Young basketball players showed orientation toward goal of achieving higher levels of one's own competencies rather than status and normative achievement related to others. Their strongest component of mental toughness was motivation, and the weakest point was rebound ability. Motivation appeared to be the key component for promoting sports development and enhancing overall mental toughness.

Keywords: goal orientation, mental toughness, motivation, basketball

DRIBBLE DEFICIT IN FOOTBALL: IS THERE ANY DIFFERENCE ACCORDING TO TEAM POSITION

Zoran Milanović[1] and Marko Jezdimirović[1]

[1] Faculty of Sport and Physical Education, University of Niš, Niš, Serbia;

UDC 796.332

Introduction: Modern football is characterized by different technique and tactical elements. Despite movements without a ball are dominant in football, many key situations are performed with a ball. Thus dribbling performance is important in football. Therefore, the purpose of this study was to compare dribble deficit performance according to team position in sub-elite football players.

Methods: Nineteen sub-elite football players completed two change of direction speed (CODS) tests (Slalom and Zig-Zag test) with and without ball. Dribble deficit was calculated as difference between the best total time for the dribbling trial and the best total time for the corresponding non-dribbling trial (Scanlan et al., 2018). Players completed two trials of each test.

Results: There is no statistically significant difference ($p>0.05$) between team position in Dribble deficit parameters. The smallest values for Dribble deficit was observed in defenders (Slalom test: 2.62s, Zig-Zag: 1.09s) and attackers (Slalom test: 2.93s, Zig-Zag: 0.97s). Surprisingly, midfield players showed higher Dribble deficit compared to all other positions.

Discussion & Conclusion: Positional comparisons showed similar Dribble deficit values because players are required to repeatedly execute highly demanding technical action regardless of team position. Moreover, there is no difference in technical approach during training according to position demands. Therefore, all players possess similar technical abilities.

References

Scanlan, A. T., Wen, N., Spiteri, T., Milanovic, Z., Conte, D., Guy, J. H., . . . Dalbo, V. J. (2018). Dribble Deficit: A novel method to measure dribbling speed independent of sprinting speed in basketball players. *Journal of Sports Sciences, 36*(22), 2596-2602. doi: 10.1080/02640414.2018.1470217

RELATIONSHIP BETWEEN SPEED, CHANGE OF DIRECTION SPEED AND JUMPING ABILITY OF YOUNG FEMALE VOLLEYBALL PLAYERS

Damir Pekas[1], Nebojša Trajković[2] , Lidija Marković[2] and Špela Bogataj[3 4]

[1] Faculty of Kinesiology, Department of Sport Kinesiology, University of Zagreb, Croatia

[2] Faculty of sport and physical education, Novi Sad, Serbia

[3] University Medical Centre, Department of Nephrology, Ljubljana, Slovenia

[4]University of Ljubljana, Faculty of Sport, Ljubljana, Slovenia

UDC 796.325.42

Introduction: Most programs are design to improve strength and power in an effort to translate these improvements into decreases in sprint and change of direction times (Nimphius, McGuigan, & Newton, 2010). However, findings concerning relationships between power, speed and change of direction speed have been somewhat equivocal (Barnes et al., 2007). Therefore, the purpose of this study was to determine the relationships between sprint, change of direction speed and jump performance of young female volleyball players.

Methods: Forty two national level young female volleyball players (age = 13.5 ± 0.6 years, and 4.5 years of experience) participated in this study. The jumping ability of each player was determined using squat jump, countermovement jump (CMJ), and countermovement jump with arm movement (CMJAM). Speed on 5, 10 and 20 m and the T test were assessed to determine the change of direction speed, and sprint performance. Magnitude of effect for the correlations was based on the following scale. trivial: ,0.10, small: <0.10–0.29, moderate: <0.30–0.49, large: <0.50– 0.69, very large: <0.70–0.89, and nearly perfect: <0.90 (Hopkins, 2014).

Results: The results of the Pearson correlation analysis indicated moderate to large correlations between jumping ability and change of direction speed ($p<0.01$; $r = -0.418$ to -0.514). Similarly, jumping ability showed moderate to large correlations with sprint performance with smallest correlation found between speed on 5m and jumping ability ($p<0.05$; $r = -0.320$ to -0.354). However, the results of correlation analysis indicated large correlation between speed on 10m and jumping ability ($p<0.01$; $r = -0.554$ to -0.602).

Discussion & Conclusion: Because jumping ability is an obvious potential performance predictor for volleyball it is important to see if it is related with both, sprint and change of direction speed performance. The relationship between speed, change of direction speed and jumping performance found in this study is also in agreement with other studies in other sports. This suggests that training in the vertical domain may increase speed and change of direction performance.

References

Nimphius, S., McGuigan, M. R., & Newton, R. U. (2010). Relationship between strength, power, speed, and change of direction performance of female softball players. *Journal of Strength & Conditioning Research, 24*(4), 885-895.

Barnes, J. L., Schilling, B. K., Falvo, M. J., Weiss, L. W., Creasy, A. K., & Fry, A. C. (2007). Relationship of jumping and agility performance in female volleyball athletes. *Journal of Strength and Conditioning research, 21(4),* 1192-1198.

Hopkins, W. G. (2014). *A scale of magnitudes for effect statistics. 2002. A new view of statistics.* Retrieved from http://sportsci. org/resource/stats/effectmag. html.

DIFFERENCES IN AGILITY OF BASKETBALLS IN RELATION TO PLAYING POSITIONS IN THE TEAM DURING THE COMPETITION SEASON

Miodrag Kocic[1], Milan Mitic[1], Dragana Beric[1], Ivana Bojic[1] and Dejan Milenkovic[2]

[1]Faculty of Sports and Physical Education, University of Nis

[2]Faculty of Sport, Union - Nikola Tesla University, Belgrade

UDC 796.323

Agility is one of the most important abilities for successful basketball, as the activities of this motor ability are very present during the game. Agility development should be tailored to player positions in the team. On a sample of 15 basketball players in regard to positions in the team (Agility T Test, Hexagon Agility Test, Illinois Agility Test and Lane Agility Drill) differences in agility were found in relation to player positions at the beginning and the end of the competitive season. Differences were determined by Student's T-test. The results showed that the basketball players achieved qualitatively better numerical values at the final testing in agility in all player positions, that this difference is the greatest in the positions of the backs and centers and that the players in the position of the wing are somewhat less pronounced, which was expected. Based on these results, it is possible to monitor the status of the basketball player in relation to the positions on the team and on that basis program the training more correctly and precisely during the competitive season.

Keywords: basketball, agility, competitive season, team positions, differences.

DIFFERENCES IN BODY COMPOSITION AND MOTOR ABILITIES AMONG FEMALE HANDBALL PLAYERS RELATING TO POSITIONS IN THE TEAM

Ivana Bojić[1], Miodrag Kocić[1], Zoran Valdevit[2] and Aleksandar Pejčić[3]

[1]Faculty of Sport and Physical Education, University in Niš

[2] Faculty of Sport and Physical Education, University in Beograd

[3]Adult Elementary Education School "Dositej Obradović", Leskovac

UDC 796.322

Handball belongs to complex sports, structured by different simple and complex movements, and the demands and tasks of the game differ between the player positions in the team. The objective of this study was to provide body composition and motoric abilities of an Serbian elite woman handball team. On a sample of 15 handball players divided into three groups by playing positions (backs n=5, wings n=5 and pivots/goalkeepers n=5)were determined differences in body composition on the "Omron BF511" body scale, speed (Sprint 5, 10, and 30 m), agility (New agility without ball, Straight Slalom without ball, Straight Slalom with ball, Zig-Zag 100 without ball and Zig-Zag 100 with a ball) and explosive leg strength (Squat jump, Counter Movement Jump - CMJ, CMJ free arm, Single-leg vertical countermovement jumps (CMJ right leg, CMJ left leg). To determine the differences among the female handball players in relation to their positions in the team, the ANOVA and a post-hoc analysis were used. The results showed that the backs and the pivot/goalkeepers group were statistically significantly higher in body height and mass than the wing players, and also had higher basal metabolism values. No statistically significant difference was found between the groups in speed, as well as in the explosive power of the legs, except in the CMJ left leg test, where players at the back and wing positions had greater jump height. Agility results show the difference only in the Zig-Zag 100 with a ball test, in favor of a group of players on the back and wing positions.

Keywords: Female handball, body composition, motoric abilities, differences, playing positions.

INFLUENCE OF KINEMATIC PARAMETERS ON BALL VELOCITY OF THE HANDBALL PENALTY THROW

Saša Marković[1] and Kristina Marković[1]

[1]Faculty of sport and physical education, University of Nis

UDC 531.1:796.322

The aim of this study was to investigate the influence of some kinematics parameters (upper extremity, trunk position) on ball velocity of the handball penalty throw. Thirty female elite handball players (height: 1.73 ± 0.08 m; mass: 69 ± 8.9 kg; BMI 22.9 ± 2; training experience: 12.3 ± 6.2 yrs), playing in the first Serbian Handball League from two different clubs volunteered to participate in the present study. The research was of transversal character, during the competition period. An angle of upper body relative to the ground (deg); Shoulder internal rotation (deg); Elbow flexion (deg), that is, the angle closing the longitudinal axis of the upper arm with the longitudinal axis of the forearm was analyzed by Kinovea 0.8.2 kinematic analysis software. Pearson linear correlations were used to calculate the influence of kinematic parameters to throwing ball velocity. A strong negative correlation was calculated between the angle of upper body relative to the ground with the throwing ball velocity (r=-0,496) whereby the big angles relative to the ground was followed by the reduction throwing ball velocity. It has been proven existence of the mean negative correlation between variables shoulder internal rotation and the throwing ball velocity (r=-0,299). Between variables the elbow flexion and the throwing ball velocity there was mean positive correlation (r=0,402), which means that by increasing the angle of elbow flexion increases ball velocity. It can be concluded that the tested kinematic parameters have an influence on the throwing ball velocity in performing a penalty throw in team handball.

Keywords: team handball, throwing velocity, ball velocity, kinematics, penalty throw

RELATIONSHIP BETWEEN ANTHROPOMETRIC CHARACTERISTICS AND EXPLOSIVE STRENGTH OF ARM AND SHOULDER REGION IN WHEELCHAIR BASKETBALL PLAYERS

Miloš Stamenković[1]

[1]Faculty of Sport and Physical Education, University in Niš, Niš, Serbia

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The aim of this study was to investigate the relationship between anthropometric characteristics and explosive strength of arm and shouldar region in wheelchair basketball players.The sample of respondents were wheelchair basketball players, national team of Serbia (n=12), age (22-49 ± 7,61), with at least three years of sports experience in this sport. In this study, the following variables were used to access anthropometric characteristics: sitting height (SEDVIS), body weight (TT), arm length (DUZRU), shoulder width (SIRRAM), upper arm circumference (OBNA), and chest circumference (OBGR). For the motor variable, the explosive strength of arm and shoulder region (BCMED) was selected. Of the statistical techniques, Pearson's correlation was used to determine the association between the variables. The results of this study showed that there was a statistically significant association between the variables (DUZRU, BCMED) (p=0,02) and between the variables (OBGR, BCMED) (p=0,02), while there was no statistically significant association with the other variables. Future research should include other motor abilities, especially situational motor abilities that are relevant to basketball, given that it is abundant in different situational and motor phases. It would be interesting to see to what extent the efficiency of wheelchair basketball players from different positions in the game is determined by anthropometric characteristics along with situational motor abilities, in order to more easily understand the complexity of the wheelchair basketball itself.

Keywords:wheelchair basketball, anthropometric characteristics, explosive strength, relationship.

THE RELATIONSHIP BETWEEN MUSCULAR FITNESS AND BODY COMPOSITION IN FOOTBALL

Ana Lilić[1], Marko Jezdimirović[1], Nikola Prvulović[1] and Marko Joksimović[2]

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

[2]Football club National, Podgorica, Montenegro

UDC 796.012.332

Introduction: The characteristics of players based on their positions on the team are useful for determining a player's profile, which based on specific requirements. Body height and body weight are significantly connected to the physical requirements of the game of football among young football players. The aim of this research is to determine the connections between body composition and the differences based on player position on the team on a sample of young football players.

The method: The study is of the transversal kind, and includes junior and cadet football players. It included 49 football players, 23 cadets, competing in the Cadet league of Serbia, and 26 juniors competing in the Quality league of Serbia. The sample of variables which was used in the research consists of the following set of eight variables: five variables for the evaluation of body composition, and three variables for the evaluation of explosive power (countermovement jump (CMJ), countermovement jump free arms (CMJA), and the squat jump (SJ)).

The results: No statistically significant connection was determined between the variables of explosive power and the variables of body composition among the cadets, while among the juniors the TM shows a statistically significant, moderate, negative connection on the tests CMJ (-.472), CMJA (-.408), and SJ (-.467). Statistically significant differences between the groups can be found only between midfielders and forward players in lean body mass (.027) and variables of muscle mass (.031).

Discussion and conclusion: The research indicates that there is a statistically significant connection between the variables of the percentage of body fat and the tests of explosive power only among the juniors, while in the case of the remaining variables, and the cadets, no connections were determined. The results indicate that it could be assumed that this increase in the percentage of body fat has a negative impact on the fitness of the players. In the case of differences in terms of player position on the team, the results indicate that there is no great and significant difference in the values of explosive power and body composition of football players.

Keywords: maturation, power, reaction rate, hamstring, Q ankle

DIFFERENCES IN THE AGILITY OF FEMALE FOOTBALLERS IN RELATION TO THE TEAM POSITION

Ana Nikolic[1] and Mladen Zivkovic[1]

[1] Fakulty of Sport and Physical Education, University of Nis

UDC 796.012

A game of football is characterized by richness and variety of movement. High level of motor skills is a basic prerequisite for a quality and effective display of technique and tactics in football (Joksimović, 2008). The aim of this paper is to determine the differences in the agility of female footballers in relation to the player position. The sample consisted of 20 female footballers aged 17 to 20. The sample of measuring instruments consisted of a three-test battery (T-test, Zigzag and Slalom). A T-test for independent samples was used to determine differences between groups of subjects. Based on the obtained results, it can be concluded that there are no statistically significant differences in agility between female footballers at different positions in a team.

Keywords: agility, football, women, motor skills.

DIFFERENCES IN THE PRECISION OF PERFORMING THE TECHNICAL ELEMENT - OVERHEAD PASSING SKILL OF DIFFERENT AGE VOLLEYBALL PLAYERS

Katarina Nejić[1], Nikola Đurić[1], Dragan Nejić[1], Živorad Ljubić[1] and Andrijana Zafirovska Misovski[2]

[1] University of Niš, Faculty of Sport and Physical Education, Niš, Serbia

[2]Faculty of physical education, sport and health - University Ss Cyril and Methodius

UDC 796.325

The aim of this study was to investigate the differences in the precision of performing the technical element of overhead passing skill of volleyball players of different ages. The study involved 60 male respondents, divided into two age groups. The first group consisted of respondents aged 15 to 17 years, and the second group consisted of respondents aged 17 and a half to 19 years. The measurements are carried out at the club "VGSK" in Veliko Gradiste. The study used a group of tests that were designed to determine the motor ability (precision) of a volleyball player in conducting of a given technical element. Based on the data it can be concluded that the differences between the older and the younger group of respondents regarding the passing the ball into the wall circle (t - value = -4.838, df. = 58, Sig. <.01) are statistically significant. In other words, there is a difference in the accuracy of overhead passing between the older and younger groups, with the older group (Mean = 13.73, Std. = 2.83, Std. Err = .52) performing better on this test than the younger group (Mean = 9.34, Std. = 4.08, Std. Err = .74). On the other hand, the results indicate that there is no statistically significant difference (t - value = -1.532, df. = 58, Sig. > .05) between the older and the younger group of respondents when it comes to the Elevational precision of overhead passing skill from the base position. Also, there is no statistically significant difference with respect to age (t – value = -1.478, df. = 58, Sig. > .05) when looking at the results of a test that measures the Elevational precision of jumping overhead passing skill.

Keywords: technique, cadets, juniors

DIFFERENCE IN EXPLOSIVE POWER OF LOWER EXTREMITIES BETWEEN FOOTBALL PLAYERS AND NONATHLETES

Dejan Martinović[1] and Andreja Miljković[1]

[1]Faculty of Sport and Physical Education, University of Niš, Serbia

UDC 796.332.012

Introduction: Explosive strength is the ability of an athlete to achieve as much strain as possible in a short time interval. The more force is required and available time for its manifestation is as short as possible, the more it manifests itself.

The explosive power of a football player is reflected in the power of reflection in jumps, the power of thrust in sprints, the power of stopping and pushing when changing the direction of movement, the power of ejecting the ball by hand, the stability on the ground and in the air, in duels. The aim of this study is to determine the differences in the explosive power of the lower extremities and the level of successful performance of the tested variables between footballers and non-athletes of the youth.

Methods: The sample consisted of 14 football players (13.64 ± 0.49 years) and 28 non-athletes who attended regular physical education (13.93 ± 0.89 years). Four tests (countermovement jump, countermovement jump free arms, squat jump, five jump) were used to determine the level of explosive power of the subjects. Data processing was performed with the statistical program IBM SPSS20. To determine differences between groups, a T-test for independent samples was used while calculating descriptive statistics parameters to determine differences in the level of successful performance of the tested variables.

Results: Specifically, differences existed in favor of football players in two of the four variables countermovement jump free arms ($p < .044$) and five jump ($p < .025$). The results of the T-test of independent samples allow us to observe that no statistically significant difference was observed between the mean values of groups of footballers and non-athletes at countermovement jump ($p > .135$) and squat jump ($p > .121$), while there was a statistically significant difference between the mean values of two tests: countermovement jump free arms ($p < .044$) and five jump ($p < .025$).

Discussion & Conclusion: The analysis of the obtained results shows that the subjects included in the training program show significantly better results with the tested variables of lower limb explosive power.

References

Rebelo-Gonçalves, R., Figueiredo, A. J., Coelho-e-Silva, M. J., & Tessitore, A. (2016). Assessment of technical skills in young soccer goalkeepers: Reliability and validity of two goalkeeper-specific tests. *Journal of sports science & medicine*, 15(3), 516-523.

Suchomel, T. J., Lamont, H. S., & Moir, G. L. (2016). Understanding vertical jump potentiation: A deterministic model. *Sports medicine*, 46(6), 809-828.

Glatthorn, J.F., Gouge, S., Nussbaumer, S., Stauffacher, S., Impellizzeri, F.M., & Maffiuletti, N.A. (2011). Validity and reliability of Optojump photoelectric cells for

estimating vertical jump height. *The Journal of Strength & Conditioning Research*, 25(2), 556-560.

Gardašević, J., & Goranović, K. (2011). Efekti programiranog rada u pripremnom periodu na transformaciju eksplozivne snage kod fudbalera kadeta. *Sport Mont Journal,* 30(9), 55-62.

SPEED AND VERTICAL JUMP IN U-19 SERBIAN SOCCER PLAYERS: POSITION AND LEVEL DIFFERENCES

Slavko Molnar[1], Marko Gušić[1], Bojan Rašković[1], Borislav Obradović[1] and Slobodan Andrašić[2]

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

[2] Faculty of Economics, University of Novi Sad, Subotica, Serbia

UDC 796.332(497.11)

Introduction: It is generally expected that youth players at the late adolescent age are ready to compete at the highest levels, and are also reasonably established in a specific field position (Rebelo et al., 2013). Speed and vertical jump are observed as essential specific fitness component in soccer. The purpose of this study was to compare Speed and vertical jump of male U19 soccer players by level of competition and playing position.

Methods: Data were collected from 64 players from teams in elite (n = 30) and sub-elite (n = 34) soccer players at national (highly skilled) and regional (moderately skilled) level. Speed was evaluated with a 5, 10 and 20-m sprint test. Jumping height was evaluated with a squat jump (SJ), countermovement jump and a countermovement jump with arm movement (CMJAM) on a force plate (KISTLER).

Results: The analysis revealed significant differences in favour of elite players in speed 5 ($p = 0.001$), speed 10 ($p = 0.001$), and speed 20 m (0.001) while no differences ($p>0.05$) were observed in vertical jump assessment. However, we found no significant differences ($p>0.05$) in speed and vertical jump among central defender, fullback, midfield, forward U19 soccer players.

Discussion & Conclusion: Under19 players differed in speed by competitive level. Our results highlight that there is no influence of playing position on some physical qualities in adolescent players.

References

Rebelo, A., Brito, J., Maia, J., Coelho-e-Silva, M. J., Figueiredo, A. J., Bangsbo, J., ... & Seabra, A. (2013). Anthropometric characteristics, physical fitness and technical performance of under-19 soccer players by competitive level and field position. *International journal of sports medicine,* 34(04), 312-317.

SMALL-SIDED GAMES VERSUS SPRINT INTERVAL TRAINING IN ADOLESCENT SOCCER PLAYERS: EFFECTS ON BODY COMPOSITION

Marko Gušić[1], Nebojša Trajković[1], Slobodan Andrašić[2], Slavko Molnar[1], Danilo Radanović[1] and Milan Cvetković[1]

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

[2]Faculty of Economics, University of Novi Sad, Serbia

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Introduction: Even though several studies have compared the effects of small-sided games and other training methods on physical performance (Hill-Hass et al., 2009; Impellizzeri et al., 2006; Los Arcos et al., 2015; Reilly et al., 2005), studies comparing the effects of small-sided games vs interval training in adolescent soccer players during the last competition phase are very limited. The aim of this research was to determine the effects of small-sided games and sprint interval training on body composition in adolescent soccer players.

Methods: A total of 60 young male soccer players (Age: 15.6 ± 0.6 years) were recruited. We registered the following body composition variables: fat-free mass, percentage of fat mass, muscle mass, body fat mass, total body water, and BMI. Players were assigned to small-sided games or sprint interval training group during the last 6 weeks of the season.

Results: Small-sided games and sprint interval training group showed significantly changed body mass after 6 weeks ($p < 0.05$). Sprint interval training group showed significantly improved body fat, muscle mass and body water ($p \leq 0.05$), whereas no change were observed for the body fat and BMI in small-sided games group.

Discussion & Conclusion: Sprint interval training improved or maintained body composition status in adolescent soccer players during the last 6 weeks of the season. On contrary, small-sided games training seems to increase body fat and consequently affect players' performance in the end of the season.

References

Hill-Haas, S. V., Coutts, A. J., Rowsell, G. J., & Dawson, B. T. (2009). Generic versus small-sided game training in soccer. *International journal of sports medicine, 30*(09), 636-642.

Impellizzeri, F. M., Marcora, S. M., Castagna, C., Reilly, T., Sassi, A., Iaia, F. M., & Rampinini, E. (2006). Physiological and performance effects of generic versus specific aerobic training in soccer players. *International journal of sports medicine, 27*(06), 483-492.

Los Arcos, A., Vázquez, J. S., Martín, J., Lerga, J., Sánchez, F., Villagra, F., & Zulueta, J. J. (2015). Effects of small-sided games vs. interval training in aerobic fitness and physical enjoyment in young elite soccer players. *PloS one, 10*(9), e0137224.

Reilly, T and White, C. (2005). Small-sided games as an alternative tointerval training for soccer players. In: Reilly, T., Cabri, J., & Araujo, D. (Eds) *Science and Soccer* (pp.344–347). New York: Routledge.

Physical Education

THE RELATION OF THE RESULTS IN MOTOR ABILITY TESTS AND THE SUCCESS IN ACQISITION OF GENERAL EDUCATIONAL KNOWLEDGE OF YOUNGER SCHOOL STUDENTS

Živorad Marković[1], Aleksandar Ignjatović[1], SladjanStanković[1] and Sandra Milanović[1]

[1]University of Kragujevac, Faculty of Pedagogical Sciences, Jagodina, Serbia

UDC 796.012:572.087

Introduction: Body movement-exercise is a daily need and Physical Education lessons have a positive influence on intellectual work of students. Physical Education is basic part of educational work, without which there is no survival and development of the civilization. In younger school age classes, Physical Education is realised as a class education and in some schools in the fourth year as a subject education. The goal of the research was to determine the relation of the results in motor ability tests and the success in school subjects for younger age students.

Methods: The research has transversal character, and it was realised in the second term of 2018/2019 school year in primary school "Jovan Jovanovic Zmaj" in Svilajnac, Serbia. The research involved 60 second grade students, divided into two sub samples in relation to gender: the sub sample of 30 boys age 8 (± 6 months) and the sub sample of 30 girls age 8 (± 6 months). All pupils were healthy on the day of testing and they had written consent of their parents and from the school principal. For the evaluation of motor abilities five tests of Eurofit battery were applied: Plate tapping – EFTA, Sit – and - reach – EFPS, Standing broad jump _EFSK, Handgrip test –EFZG, and 10x5m shuttle run – EFAG. The tests were performed in the sports hall during regular PE lessons. The PE teachers with the experience did the evaluations from previous tests, so that one test was measured by the same teacher. The success of the pupils was measured by the grades at the end of the second school term from the following subjects: Serbian language, English language, Mathematics, The World around us, and Physical Education. In the processing of the data acquired by empirical tests, apart from descriptive statistics for the evaluation of statistically significant differences, in the processing of the data Pearson coefficient of correlation was applied as well as partial correlations and T-test for small independent samples.

Results: On the basis of the results of motor abilities and the success from the subjects we can see statistically significant differences only in Sit-and-Reach and they are in favour of the girls (p=0.000). For general knowledge statistically significant differences exist only in English language (p=0,0013) and they are in favour of girls. There was significantly moderate negative correlation between the successes in the test Plate tapping –EFTA and the Serbian language marks for boys. Between the results achieved in the tests of motor abilities and academic success of the girls, there were no statistically significant correlations. Additional analysis which considered the age indicates that is influenced statistically significant differences in 10x5m shuttle run (r = 0,523, p=0,003).

On the basis of negative moderate correlation it can be stated that for boys by their age the success is raised on this test. For girls negative moderate correlations were determined between their age and the test results. Plate tapping – EFTA (r=0,450, p=0,013), 10x5m shuttle run – EFAG (r = 0,381, p=0,038) and Standing broad jump –EFSK (r=0,401, p=0,028). In relation to younger girls, the older ones have more success in these tests. When the influence of age is controlled, for boys there were statistically significant relations of Serbian language grades and the test results. Plate tapping (r=0,464, p=0,011) Standing broad jump –EFSK (r=0,423, p=0,022) and Mathematics grade with the results in tests Standing broad jump (r=0,358, p=0,056). For girls there was only statistically significant correlation of Serbian language grade and the test result 10 x 5 m shuttle run (r=0,367, p=0,050).

Discussion and conclusion: The results on the motor ability tests are not significantly related to the subjects which boys and girls study. Additional analyses indicated the significance of the age on the manifestation of motor abilities. By the use of partial correlations and by the control of age, for boys some correlations were determined between the grades from Serbian language and the test results Plate tapping and Standing broadg jump, as well as between the Mathematics grades and Standing broad jump. For girls border values were determined between Serbian language and the results on the test 10 x 5 m shuttle run. The variability of the grades in the first three years of primary school is very small, so it is more difficult to get statistically significant correlations of the grades from the subjects and the results on the motor ability tests. Based on this it can be stated that the grade from the subjects is desirable to apply only in scientific research with older school age students.

Key words: relation, motor abilities, grade, younger school age

VISUAL-MOTOR INTEGRATION AND COORDINATION IN PRESCHOOL CHILDREN AGED 4 TO 7 YEARS

Tonči Bavčević[1] and Nikolina Gujić[1]

[1]Faculty of Kinesiology, University of Split

UDC 796.012-053.2

The study was conducted with the aim of determining relations between visual-motor integration and coordination in children aged 4 to 7 years who were divided into two subsamples. Visual-motor integration of graphomotor type was assessed by the use of the Visual-Motor Integration Test (VMI Test), while coordination was measured by the use of the Backward Obstacle Course motor test. The obtained findings confirmed a statistically significant correlation between the observed dimensions at the level of motor manifestations in the subsample aged 4 to 6 years as well as in in the subsample aged 6 to 7 years. This implies the possibility of common mechanisms responsible for motor control of both fine motor skills and gross motor skills. Further research is suggested to identify possible neurological mechanisms underlying different motor skills.

Keywords: fine motor skills, motor abilities, motor control

RELATIONS OF PHYSICAL FITNESS, INTELLECTUAL MATURITY, ACADEMIC ACHIEVEMENT AND AGE OF SPECIAL ELEMENTARY SCHOOL STUDENTS: GENDER DIFFERENCES

Miloš Popović[1], Hana Válková[2], Ružena Popović[3] and Milan Dolga[4]

[1]University of Pristine/Kosovska Mitrovica, Faculty of Sport and Physical Education, Leposavić (Kosovo), Serbia

[2]Masaryk University of Brno, Faculty of Sports Studies, Brno, Czech Republic

[3]University of Niš, Faculty of Sport and Physical Education, Niš, Serbia

[4]Agency for Multivariate Data Analysis - "Smart-Line", Novi Sad, Serbia

UDC 796.015.132

Mind and body are never independent in modern human's approach to education. It has been fairly well established that the total development of an individual is a result of a complex interaction among heredity, environment, and maturation. While educators speak in terms of motor, social, emotional, or intellectual development, the interrelationship and interaction among these processes' is complex. Physical educators have alluded to this positive relationship for years without much research support. Studies attempting to evaluate the relationship of motor function and cognitive function are of three major tip's: (1) those correlation studies in which statistical comparisons are made between the academic or mental score and the perceptual motor scores, (2) those which evaluate the academic attributes when specific programs of motor skills are conducted, and (3) those studying the motor and mental development of adolescents. Movement and manipulative routines have long been employed in physical activity programs for those classified as intellectually deficient. The basic purpose of this study was to determine the significance of the relations between motor development, and intellectual maturity (performance) in Secondary school students with special needs. The total sample of 77 subjects of both genders (51 males and 26 females) was included in the study. A battery of Physical Fitness Tests (PFT) for the evaluation of motor development was applied, comprising nine different tasks (including running, jumping, throwing and climbing) for the estimation of explosive strength, running speed, agility and endurance of participants. Study Results were processed using descriptive statistics, ANOVA, and CORREL Methods. It was established statistically significant between gender difference (p=.001) in 7 of 9 components for the estimation of motor development (PFT), with discriminative coefficient (up .000 to .037) in favor of male sample of participants. Special interest for this study was stated in regard of the relationship estimation among variables for assessment of chronological age (AGE), academic achievement (SCSS), intellectual maturity (IQ) and motor development (PFT) of Special Elementary School Students (male and female), using Pearson's, Kendall's, and Spearman's Correlations

Coefficient (r). In Special Elementary school boys relations are established between IQ and SCSS (,257) Kendall's, and between Physical Fitness Test- Z and SCSS (,351) Spearman's. At the low level of significance was established Pearson's Correlation Coefficient (0.205) between AGE and Physical Fitness Z score, as well as between AGE and IQ with negative sign (-0.234), and IQ and SCSS (0.272). In Special Elementary school girls relations are established between IQ and SCSS: .527 - Pearson's coefficient, .417 - Kendall's coefficient, and .538 - Spearman's coefficient. Physical *Fitness Test - Z-* value has not established any kind of correlation with others variables.

Keywords: special physical education, physical-fitness-test, intellectual maturity, academic success, age and gender differences

DEVELOPMENT OF VISUAL-MOTOR INTEGRATION IN PRESCHOOL CHILDREN AGED 4 TO 7 YEARS

Damir Bavčević[1]

[1]Faculty of Kinesiology, University of Split

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The study was conducted with the aim of determining differences in the degree of visual-motor integration between preschool children of different age. Measurements were using the Visual Motor-Integration Assessment Test (VMI Test) on a sample of 36 subjects aged 4 to 7 years, divided into two subsamples; one sample included 20 children from 4 to 6 and the other 16 children from 6 to 7 years. A statistically significant difference was observed among the subsamples in the degree of visual-motor integration using the T-Test. Hereditary as well as environmental factors, such as programmed kinesiological activities and graphomotor exercises in the preschool system are possible causes for the noticed differences. In conclusion, further research of the above mentioned processes is recommended with a particular emphasis on the detection of neurological mechanisms responsible for visual-motor integration.

Keywords: fine motor skills, graphomotor skills, ontogenetic development

PHYSICAL DEVELOPMENT AND MOTOR ABILITIES OF PRIMARY SCHOOL BOYS

Branislav Strajnić[1], Goran Glamočić[1], Snežana Vujanović[1] and Branko Đukić[1]

[1]Provincial Institute for Sport and Sports Medicine, Novi Sad

UDC 796.012-005.3

In order to determine differences in motor abilities and basic anthropometric characteristics, 185 elementary schools pupils of the fourth and fifth grade age from 11-12 years from the autonomous region Vojvodina participated. A battery of 5 basic anthropometric measurements (body height, body weight, muscle mass, body fat, body mass index), 6 motoric tests and a short survey were assessed to the sample. Based on the research results, we conclude that boys who are involved in regular organized sports activities have better motor abilities than boys who do not train. A statistically significant difference was found in the sit-ups tests, plate hand tapping, standing long jump and shuttle run 10x5m test, all for the benefit of boys involved in sports, which is the result of continuous work in sports clubs. Also, based on the results of anthropometric measurements and body mass index, we conclude that boys involved in spme sports have higher body height, lower body fat, lower body mass and greater muscle mass than boys who do not practice any sport.

Keywords: body mass index, motor ability, pupils 11-12 years

CORRELATION BETWEEN MORPHOLOGICAL CHARACTERISTICS AND MOTOR SKILLS IN PRIMARY-SCHOOL STUDENTS FROM THE SEVENTH AND EIGHTH FORM

Luka Androja[1], Tonči Bavčević[2] and Damir Bavčević[2]

[1] Aspira College, Split, Croatia

[2] University of Split, Faculty of Kinesiology, Croatia

UDC 796.012-057.08

The sample consisted of 88 male students from the seventh and eighth primary-school forms from the city of Split. In order to achieve tasks and objectives of Physical Education, it is necessary to determine the current state of the subjects. The research was conducted during Physical Education classes in order to determine the correlation of morphological characteristics and motor skills. The implementation of canonical correlation analysis between a set of morphological characteristics and set of motor skills where obtained by the canonical correlation coefficient of 0,631, with the forms of the test statistics $\chi 2 = 56,226$ while the degrees of freedom were 18. Correlation between the set of morphological and motor variables was statistically significant as the empirical significance level of the canonical correlation coefficient was less than 0,05. The percentage of the set of morphological variables explained in variables of motor skills was 19,481%, and the percentage of the set motor variables explained in variables of morphology was 11,535%. Only the first extracted canonical pair is statistically significant ($p = 0,000$), unlike the other two canonical pairs ($p > 0,05$). The largest eigenvalue had the first canonical pair (0,398). The first canonical factor was determined by the anthropometric body height and the variable MPR. Such canonical factor could be interpreted as a flexibility factor. This study offers an insight into correlation of morphological characteristics and motor abilities. The obtained results show relationship between the characteristics and skills. Such findings might represent a foundation for planning and programming in the immediate kinesiological practise.

Keywords: primary school, male students, Physical Education, canonical correlation analysis

CHANGES IN MORPHOLOGICAL CHARACTERISTICS UNDER THE INFLUENCE OF PHYSICAL EDUCATION EXTENDED CLASSES PROGRAMME

Velibor Srdić[1], Osmo Bajrić[1] and Boris Jeličić[2]

[1]Paneuropean University 'Apeiron', Banja Luka, Bosnia and Herzegovina

[2]High School Centre 'Gemit-Apeiron', Banja Luka, Bosnia and Herzegovina

UDC 796.012.1

The research was conducted aiming to determine quantitative changes in morphological characteristics of high school students under the influence of extended classes programme. The respondents' sample consisted of 51 male students from "Gemit-Apeiron" High School Centre in Banja Luka, between 15 to 18 years of age. The whole sample was divided into two groups through random selection, an experimental group (N=25) and control group (N=26). In accordance with the set goal, 17 variables of morphological characteristics were applied in the research, as well as the body mass index (BMI). Canonical discriminant analysis was applied to determine global quantitative changes in morphological characteristics of high school students under the influence of extended classes. Analysing the results of canonical discriminant analysis, it can be seen that the respondents in experimental group with whom the extended classes programme was implemented had statistically significant global quantitative changes in morphological characteristics. The resulting changes are especially evident in reduction of subcutaneous adipose tissue (adipose tissue has a negative sign, which means reduction), which is essentially the main task and primary goal of applied kinesiology activity programmes through extracurricular activities of students in accordance with their developmental stages.

Keywords: changes, morphological characteristics, students, extended classes.

SCHOOL SPORT, PHYSICAL EDUCATION CLASSES AND ACADEMIC PERFORMANCE: A BRIEF REVIEW

Nikola Stojanović[1], Nenad Đokić[1] and Zvezdan Savić[1]

[1] Faculty of Sport and Physical Education, University of Nis

UDC 796/799.01

Introduction: The aim of this review was to determine whether participation in physical education classes and school sports has a positive effect on academic achievement, motor skills and participation in physical activity. Moreover, the aim of this paper was to formulate some conclusions based on previous research, but also to come up with new information related to the assumption that physical education and school sports significantly influence academic achievement of students.

Methods: The literature was searched by terms that reflected exposure of interest (e.g., physical education classes, sport, and physical activity), academic performance (e.g., grade point average, grades, standardized test scores and course grades, assessment of concentration, memory, and classroom behaviour), as well as methods (experimental, systematic reviews and meta-analyses).

Results and Discussion: The results of this review showed that physical education and school sports have a positive impact on the examined phenomena.

Conclusion: There is some compelling evidence to suggest that physical activity can improve attention and arousal in children, which may indirectly contribute to academic achievement. Some authors point out that there may be a short improvement in attention after physical activity, but that long-term improvement in academic achievement as a result of stronger physical activity is not well substantiated. Regardless of the mechanisms that affect academic development, the implication is that daily physical education should be introduced from the first day of school, without the consequences of endangering academic development. Moreover, there is a valid claim that aspects of aerobic fitness may be globally related to the academic performance of pre-adolescents.

Keywords: School sports, Physical education, Physical activity, Academic performance.

Physical Activity and Health

COGNITIVE-MOTOR INTERFERENCE AFTER PROLONGED BED REST

Uroš Marušič[1,2] and Rado Pišot[1,3]

[1] Institute for Kinesiology Research, Science and Research Centre Koper, Koper, Slovenia (EU)

[2] Department of Health Sciences, Alma Mater Europaea – ECM, Maribor, Slovenia (EU)

[3] Faculty of Sport, University of Ljubljana, Slovenia (EU)

UDC 796.012

Introduction: Prolonged physical inactivity or immobilization after sports injuries and/or surgery could lead to serious cognitive and motor dysfunction that prevent rapid recovery and lead to future falls. Previous research has shown that gait control provides the demand for cognitive centres of the brain (Al-Yahya et al., 2011; Marusic, Verghese & Mahoney, 2018) and that dual-task assessments may indicate an increased risk of falling or a protection strategy to prevent falls (Nordin et al., 2010). The aim of the present study was to evaluate the cognitive-motor interference after 10 days of complete physical inactivity/bed rest.

Methods: Ten healthy young volunteers (average age = 23 years) successfully completed 10 days of horizontal bed rest. Gait speed parameter was obtained with the 2D OptoGait system (Microgate, Italy) under four different conditions: self-selected and fast paced walking condition with (dual-task) and without (single-task) typing on the smartphone (random order).

Results: Ten days of horizontal bed rest had no significant impact on the self-selected gait speed in both, single- ($p=0.190$) and dual-task ($p=0.339$) conditions. In contrast, bed rest significantly decreased gait speed in fast paced walking condition in single- ($p=0.009$) and dual-task conditions ($p=0.002$).

Discussion & Conclusion: Our results showed that 10 days of bed rest are long enough to affect the locomotory function in healthy adults. Moreover, the effects are larger in tasks that require more attentional resources (higher complexity tasks). The results can be used for the future development of effective countermeasures for rehabilitation and/or space flight purposes.

References

Al-Yahya, E., Dawes, H., Smith, L., Dennis, A., Howells, K., & Cockburn, J. (2011). Cognitive motor interference while walking: a systematic review and meta-analysis. *Neuroscience & Biobehavioral Reviews*, *35*(3), 715-728.

Marusic, U., Verghese, J., & Mahoney, J. R. (2018). Cognitive-based interventions to improve mobility: a systematic review and meta-analysis. *Journal of the American Medical Directors Association*, *19*(6), 484-491.

Nordin, E., Moe-Nilssen, R., Ramnemark, A., & Lundin-Olsson, L. (2010). Changes in step-width during dual-task walking predicts falls. *Gait & posture*, *32*(1), 92-97.

INFLUENCE OF PERSONAL DETERMINANTS AND GOAL ORIENTATION ON SELF- EFFICACY WITH SAMBO ATHLETES

Galina Domuschieva-Rogleva[1], Tatiana Iancheva[1] and Mariya Yancheva[1]

[1]National Sports Academy, Sofia, Bulgaria

UDC 796.818

Introduction: Self-efficacy is connected to one's confidence in one's own ability to act in a way so that one's manifestations lead to the desired result. Temperament is a genetically based aspect of personality. Most experimental and theoretical statements concerning the biological substrates of personality are related to the theory of H. Eysenck of introversion-extraversion, neuroticism-stability, and socialization-psychoticism. The achievement goal theory offers a theoretical frame for research of the way people interpret their success and abilities in environment connected to achievements. With high task orientation, success is defined as the result of mastering skills, self-improvement, and serious work. Dispositional ego orientation is connected to comparing one's own abilities with the abilities of the others.

Methods: The aim of the present study is to reveal the particulars of the typological features, self-efficacy and goal orientation of athletes depending on their gender and sports results.

The subjects are 71 sambo athletes, aged 15 to 20; 24 women, 47 men; 40 medalists, and 31 ranking after the third place. We used: The Eysenck Personality Questionnaire (EPQ); Task and Ego Orientation in Sport Questionnaire (TEOSQ) Methods to research self-efficacy in sport.

Results: The medalists were characterized by statistically significant higher level of extraversion and psychoticism compared to athletes ranked after third place. The task goal orientation dominates with athletes in the research. With the athletes-medalists we observe higher levels of both types of goal orientation. There are higher results in terms of self-efficacy compared to self-hindering. Self-hindering is a significant negative factor when forming the task goal orientation, while neuroticism is a significant factor when forming the ego goal orientation.

Discussion & Conclusion: Studying and analyzing the interrelations of typological features, self-efficacy and goal orientation are the basis for the solution of a number of practical problems in the field of combat sports.

References

Bandura, A. (2008). Social cognitive theory. In W. Donsbach, (Ed.) *International encyclopedia of communication*. (pp. 4654-4659). Oxford, UK: Blackwell.

Domuschieva - Rogleva, G. (2003). Aprobaciia na testa za orientaciia kym zadachata i kym sebe si (TEOSQ) v bylgarski usloviia. *Lichnost, motivaciia, sport*. T. 9, Sofia; NSA.

Eysenck, H. J., & Eysenck, M. W. (1985). *Personality and individual differences.* New York: Plenum.

Paspalanov, I., Shtetinski, D., & Eysenck, S. (1984). Bulgarska adaptatsia na lichnostnia vaprosnik na Hans Eysenck [Bulgarian adaptation of Eysenck Personality Questionnaire]. *Psihologia,* 11(5), 279 – 293.

CONNECTION BETWEEN PHYSICAL ACTIVITY AND OBESITY IN CHILDREN AND ADOLESCENTS

Izet Kahrović[1], Oliver Radenković[1], Benin Murić[1], Vladan Milić[1] and Omer Špirtović[1]

[1]State University of Novi Pazar, Department of biomedical sciences,
Studies program: Sports and physical education,

UDC 796:613.25

The period of puberty and the subsequent adolescent period are recognized as a particularly vulnerable time for the development of obesity due to sexual maturation and in many individuals a simultaneous decrease in physical activity. In order to determine the degree of correlation between physical activity and obesity in children and adolescents, we conducted a study review using Internet browsers in available sports science journals. The results and conclusions of studies conducted in recent decades show that the incidence of obesity is epidemic in many parts of the world, and the best way to prevent it is through regular physical activity and moderate-intensity exercise that burns fat and preserves muscle and other non-fat tissues. The positive energy balance of increased caloric intake and their inadequate consumption due to inactivity is a leading cause of overweight in children and adolescents. These studies show that physical activity plays a significant role not only in the development of obesity, but also in the future way of living and maintaining psycho - social health. Although physical activity does not lead to rapid weight loss, in combination with diet it facilitates maintenance of the achieved therapeutic effect. Treatment with controlled diet and exercise leads to significant changes in morphological characteristics in children and adolescents with increased body mass.

Keywords: physical activity, exercise, obesity, children.

EFFECTS OF PHYSICAL ACTIVITY ON FITNESS ABILITIES AND BONE DENSITY IN POSTMENOPAUSAL WOMEN

Anđela Đošić[1], Danijela Živković[1], Mladen Živković[1], Nebojša Čokorilo[2], and Saša Pantelić[1]

[1] Faculty of Sport and Physical Education, University of Nis

[2] Faculty of Sport and Physical Education, University of Novi Sad

UDC 796.015.132

Osteopenia and osteoporosis are characterized by low bone mineral density and they represent a risk of fracture in humans. The most common occurrence of osteoporosis is in postmenopausal women. Bone loss occurs faster if there is no load on the bone. The aim of this study is to determine, on the basis of the analyzed studies, the effects of individual exercise programs on fitness (FS) and bone density (BD) in postmenopausal women. The study includes 33 closely related studies. The search is limited to papers published between 2000 and 2019. Most studies have measured bone density in the lumbar spine, hip, proximal femur, distal tibia, and forearm. The most commonly treated fitness abilities are muscle strength, flexibility, body balance and cardiorespiratory endurance (VO2MAX). The shortest duration of the program was six weeks (Roghani et al, 2013) and the longest was 12 years (Kemmler et al, 2012). All the studies obtained results that showed an increase in fitness abilities among women who were covered by the exercise program compared to the control groups. Exercise in the form of walking, jogging and moderate intensity three to five times a week is the best effect. This can increase bone density, especially in the lumbar spine and the entire hip.

Keywords: osteoporosis, physical activity, bone density, postmenopausal women, prevention.

THE ROLE OF DIFFERENT TYPES PHYSICAL ACTIVITY IN OBESITY TREATMENT

Ljiljana Bjelaković[1], Nebojša Ranđelović[1], Danijela Živković[1] and Aleksandar Golubović[1]

[1] Faculty of Sport and Physical Education, University of Niš

UDC 796:613.25

Obesity is a global health problem and one of the greatest public health challenges of today. The treatment of obesity is complex and implies a multidisciplinary approach. Physical activity is an important segment of obesity treatment. Recent literature data suggest a correlation between weight loss and health benefits, as well as a decrease in the risk of coronary artery disease, atherosclerosis and hypertension,all of which are directly responsible for the death of obese people. The aim of the review article was to consider the effects of various forms of physical activity in the treatment of obese persons.The literature data whose aim was to evaluate the effects of aerobic exercise, highintensity interval exercise, and resistance training were taken into consideration. The paper studied scientific research data that monitored the effect of combined exercise, aerobic exercise and resistance training on weight loss reduction.

Keywords: aerobic exerise, resistance training, high intensity interval exercise, obesity, treatment.

KINANTHROPOLOGICAL ANALYSIS OF THE CORE

Strahinja Nikolic[1], Zlatko Ahmetovic[1] and Zoran Djokic[1]

[1]Faculty of sports and tourism – TIMS, Department of Sport,
University of Educons, Novi Sad, Serbia

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The term core is most commonly used to refer to the trunk, or more precisely, for the lumbar region. The stability of the lumbar region, or more reather the lumbar part of the spinal column, is crucial for creating the foundation for the movement of the upper and lower extremities, for supporting the load and protecting the spinal cord and nerve originating from it. The muscles of the core act as a bridge between the cranial and caudal parts of the body, transferring kinetic energy to the upper and lower limbs. The development of core strength to improve the efficiency of sports technique has been a controversial issue that has yielded different results. The purpose of this study was to investigate a number of papers that theoretically, empirically and experimentally address the problems of the muscular system, which is nominated by the term "core", considering the functional and morphological status, as well as the relationship between core stability and athletic competence.

Keywords: Core stability, Core strenght training, Core exercise principles, Trunk muscle, Lumbar spinal stabilization, Lumbar pain.

DEVELOPMENT OF SPECIFIC DYNAMIC MOVEMENT SKILLS IN PERSONS DIAGNOSED WITH PARAPARESIS ASSOCIATED WITH THE WHEELCHAIR USE – CASE REPORT

Anja Lazić[1,2] and Miljan Hadžović[1,2]

[1]Faculty of Sport and Physical Education, University of Nis

[2]Wheelchair Basketball Club „Nais", Nis, Serbia

UDC 796:616

Physical exercise has a positive effect on cardiovascular system, motor skills and psychological wellbeing of persons affected with paraparesis. Most of the activities of persons affected are performed in wheelchairs, including physical exercise. Wheelchair use is a specific dynamic activity with characteristics of its own, taught by therapist and physical therapists, and furthermore, if the person who is wheelchair bound has an interest in sports, by coaches of the chosen sport. The purpose of this research – case study, was to determine the development of specific dynamics in persons diagnosed with paraparesis. Examinee with paraparesis, male (185 cm, 75 kg, 32 years) physically active, diagnosed with Spastic Paraplegia which appeared, due to the complications of encephalitis, sepsis and laryngotracheobronchoscopy procedure, 10 years before this research. The following parameters were observed, in particular – wheelchair dynamic movement skills: 5 m sprint, 20 m sprint, 5 m Sprint with dribbling (ball), 20 m sprint with dribbling (ball), Slalom without a ball and Slalom with a ball (dribbling). Examinations were performed before and after an exercise program. The training program lasted 5 days, with 2 training sessions per day, every training session lasted 90 min. The results have showed an improvement in the final assessment in four of the six variables. Further researches of this topic are necessary.

Keywords: wheelchair use, paresis, case report

CONNECTION OF BODY COMPOSITION AND CARDIORRESPIRATORY FITNESS IN PHYSICALLY ACTIVE WOMEN

Lora Kostić[1], Slavoljub Uzunović[1], Bojan Ugrinić[1], Dejan Stošić[2], Vladan Petrović[3] and Jovan Marković[4]

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

[2] Faculty of Sport and Physical Education, University of Pristina, Leposavic, Serbia

[3] Faculty of Mechanical Engineering, University of Niš

[4] Teachers`Faculty Užice, University of Kragujevac

UDC 796.015-055.2

The aim of the study is to determine the correlation between body composition and cardiorespiratory fitness in physically active women. The sample of subject consisted 50 women of aged from 22 to 25. The sample of participants included in the experiment were students from different faculties of the University of Niš, except the Faculty of Sports and Physical Education in Niš, who belong to the group of physically active women (minimum activity of 3 times per week, 60 minutes each). All subjects were involved in a regular recreational aerobic exercise program with music, and had a minimum of 3 months of regular exercise experience. Body composition indicators were calculated: Body fat [%] Body fat [kg] Muscle mass [%] Muscle mass [kg] and cardiorespiratory fitness: Systolic ABP [mmHg] Diastolic ABP [mmHg] Pulse at rest [rpm] pulse at load [rpm] VO2max [ml / kg / min] VO2max [L]. The correlation between the body composition and the cardiorespiratory fitness of physically active women was found by canonical correlation analysis.

Keywords: body composition, cardiorespiratory fitness, female students, aerobic exercise

BACK PAIN SYNDROME

Lora Kostić[1], Predrag Ilić[1], Borko Katanić[1], Aleksandar Stojmenović[1], Vladan Petrović[2] and Jovan Marković[3]

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

[2] Faculty of Mechanical Engineering, University of Niš

[3] Teachers`Faculty Užice, University of Kragujevac

UDC 615:796

Diseases of the lumbar spine manifest as back pain syndrome. Lumbar syndrome implies pain with impaired functioning of the lumbar spine. There are multiple causes of lumbar syndrome, but the underlying cause is the muscle imbalance of the lumbar and abdominal regions. Lumbar syndrome is one of the most common pain syndromes, currently affecting 75-80% of the population, who at some point of their lifetime experience lumbar spine pain. The sample of respondents included both male and female population who either did or did not engage in sports, of different age categories, from different sports, who were of different training status and age categories. Studies were included if they indicated the presence of back pain syndrome. The following methods were used in the paper: selection method, descriptive method, systematization method, analyses and syntheses, as well as comparative method. The study leads to the conclusion that in order to prevent back pain syndrome, which most commonly manifests as lumbar pain syndrome, it is important to implement targeted measures to examine patterns, risk factors and prevent back pain syndrome.

Keywords: back pain syndrome, lumbar syndrome, sport, prevalences

UPPER LIMB COORDINATION: IS THERE ANY DIFFERENCE BETWEEN GENDERS IN MILD INTELLECTULLY DISABLED YOUTH

Marija Stojanovic [1]

[1] Faculty of Sport and Physical Education in Niš, Serbia

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The aim of this study was to examine the Upper limb coordination status of the young people with mild intellectual disabilities (ID), and to determine if there are any differences between genders. Subjects who participated in this study were 27 adolescents (15 males and 12 females) age 15 to 19 years (17.12±1.24 years) with mild ID attending special school ”October 14th ” in Nis. Upper limb coordination was tested by seven items of subtest Upper limb coordination up to Bruininks-Oseretsky Test of Motor Proficiency, Second Edition (BOT-2). Results showed low level of examined motor ability, according to descriptive criteria. There were no statistically significant differences between genders ($t(25) = .720$, $p=.478$) in a status of Upper limb coordination. Obtained results indicate the need to improve the Upper limb coordination in this population, as fine motor skill necessary for every day’s life and work.

Keywords: mild intellectually disabled, upper limb coordination, BOT-2.

QUALITATIVE ASSESSMENT OF MOVEMENT AND SUCCESS OF PERFORMING TASKS OF THE MABC-2 TEST IN CHILDREN AGE 3 TO 6

Ivana Djordjević [1]

[1]Department of Adapted Physical Activity, Faculty of Physical Culture, Palacký University Olomouc, Czech Republic

UDC 796.1

Introduction: The Movement Assessment Battery for Children Test, 2nd edition (MABC-2 test) (Henderson, Sugden, & Barnett, 2007) widely accepted standardized assessment, appears to be the most effective of identifying motor difficulties and diagnosis of developmental coordination disorder.

The objective is to determine whether the perceived difficulty with movement control, poor body posture and the attempt to adjust movement in a particular task affect the success of children to accomplish the tasks of MABC-2 test, age band 1 (3-6 years) and to what extent.

Methods: Test record form consist manual dexterity (MD) items, balance (BAL), aiming & catching (A&C), also allows qualitative observation assessment of each task performance considering posture/body control and adjustment to task requirements. According to qualitative observational assessment, three experienced examiners have estimated 112 children, with and without motor difficulties, during performing MABC-2 test that show characteristic movements detected as critical movement signs or described atypical movement which might have influence on success of performing the task.

Results: Signs of poor body posture or body control did not affect the success of accomplish the tasks performance of MD1 and MD3 items even if those tasks were the most commented. Critical signs of posture/body control and adjustment to task requirements affect the success of MD2 and BAL1 in almost all respondents.

Discussion & Conclusion: While we measure motor performance it is important to understand the nature and mechanisms of the condition in which child is.

References

Henderson, S. E., Sugden, D. A., & Barnett, A. L. (2007). *Movement Assessment Battery for Children-2.* London, United Kingdom: Pearson Education.

Sugden, D. A., & Henderson, S. E. (2007). *Ecological intervention for children with movement difficulties.* London, United Kingdom: Pearson Education.

Sugden, D., & Wade, M. (2013). *Typical and atypical motor development.* London, United Kingdom: Mac Keith Press.

THE EFFECTS OF STRENGTH TRAINING ON THE BODY COMPOSITION OF OLDER WOMEN

Andreja Miljković[1], Dejan Martinović[1] and Nataša Branković[1]

[1] Faculty of Sport and Physical Education, University of Niš, Serbia

UDC 796.015

Introduction: Changes in body composition caused by exercise training have also been extensively investigated, indicating that this training method produces significant changes in body fat percentages in women. Fat free mass, Fat mass, Body mass and percentage of body fat are the most commonly used components when evaluating body composition. There is an extremely high importance of strength training on the rise of strong muscle characteristics and a range of functional ability parameters in a sample of third age women. The aim of this study was to analyze the effects of strength training on the body composition in older women through a systematic review of experimental research.

Methods: In order to participate in the study, scientific papers with applied training programs on the body composition of women were consulted. The criterion for inclusion in the study were female over 60 years old. The parameters monitored were body mass, fat mass, fat free mass, body fat percentage and body mass index. Searching the academic databases of Google Scholar, Medline and Kobson for the given keywords and their variations, relevant studies on the relationship between strength and body composition were identified. The search was limited in English, academic articles, review and full text to ensure a better way of searching the literature. Search of scientific papers was performed using the following keywords: exercises, women, eldery, strength, body composition. Studies that focused solely on one specific parameter of body composition were excluded, then studies that investigated the impact in younger women as well as studies involving men were also excluded from the search. Based on the data collected, a total of 400 female respondents were recorded, with an average above 60 years of age and 11 different strength training programs.

Results: According to the obtained results, applied training programs have led to the greatest changes in some of the parameters of body composition, resistance training (body fat percentage 31,9±1,9 - 29,2±2,3), intensity aerobic exercise (body mass from 83,7±12,3 to 81,7±12,4), resistance training (body mass from 70,7±12,5 to 69,2±12,1), heavy resistance training (fat free mass from 41,0±1,2 to 42,5±1,3), circuit training program (body mass index from 22±1,0 to 21±1,0), in women over 50 years of age, led to the greatest changes in the presented parameters.

Discussion & Conclusion: Increase in fat free mass in older women can be achieved by consuming protein supplements in combination with strength training. Specifically, 24-week strength training, supported by an increase in protein intake, leads to an increase in muscle cross-section of nearly 5% in a sample of older women.

References

Bocalini, D. S., Lima, L. S., de Andrade, S., Madureira, A., Rica, R. L., dos Santos, R. N., Serra, A. J., Silva, J. A., Rodriguez, D., Figueira, A., & Pontes Jr, F. L. (2012). Effects of circuit-based exercise programs on the body composition of elderly obese women. *Clinical interventions in aging*, 7, 551-557.

Botero, J. P., Shiguemoto, G. E., Prestes, J., Marin, C. T., Do Prado, W. L., Pontes, C. S., Guerra, R.L.F., Ferreia, F. C., Baldissera, V., & Perez, S. E. (2013). Effects of long-term periodized resistance training on body composition, leptin, resistin and muscle strength in elderly post-menopausal women. *Journal of Sports Medicine and Physical Fitness*, 53(3), 289-94.

da Silva, C. M., Gurjão, A. L. D., Ferreira, L., Gobbi, L. T. B., & Gobbi, S. (2006). Effect of resistance training, prescribed by zone of maximum repetitions, on the muscular strength and body composition in older women. *Brazilian Journal of Kinanthropometry and Human Performance*, 8(4), 39-45.

Romero-Arenas, S., Martínez-Pascual, M., & Alcaraz, P. E. (2013). Impact of resistance circuit training on neuromuscular, cardiorespiratory and body composition adaptations in the elderly. *Aging and disease*, 4(5), 256-262.

Romero-Arenas, S., Blazevich, A. J., Martínez-Pascual, M., Pérez-Gómez, J., Luque, A. J., López-Román, F. J., & Alcaraz, P. E. (2013). Effects of high-resistance circuit training in an elderly population. *Experimental Gerontology*, 48(3), 334-340.

EFFECTS OF INDIVIDUAL STRENGTH TRAINING ON FUNCTIONAL MOVEMENT IN MIDDLE AGED ADULTS

Özkan Güler[1]

[1] Faculty of Sports Science Ankara University Ankara Turkey

UDC 796.015.01

Introduction: Functional movement has an important role to carry out daily activities safely and efficiently. Flexibility and Muscle Strength have an important role to perform functional movement (Reinman and Manske, 2011). Age-related loss in the neuromuscular system may effect on flexibility, muscle strength and functional movement (Nakano et all 2014). Therefore the purpose of this study was effects of strength training on functional movement in middle ages individuals.

Methods: Twenty-eight men (n = 13) and women (n = 15) between the ages of 40 and 52 years participated in this study. Each participant performed 24 resistance training session three times a week. Strength training session was individualized for each participant in terms of intensity. The resistance was determined an estimate for each movement by calculating one repeated maximal(1RM) with formula of 4-6 repetitions. Each participant performed FMS™ test. The FMS™ is a test battery that involves seven movement patterns (deep squat, hurdle step, inline lunge, shoulder mobility, active straight-leg raise, trunk stability pushup and rotary stability). Body mass index(BMI) was calculated by using body weight and height.

Results: The result of this study there were significantly difference between pre test and post test of functional movement screen score and 1RM maximal strength in both men and women ($p<0,01$). Body mass index score was significantly decreased after a strength training intervention.

Discussion & Conclusion: In conclusion the total functional movement screen score and 1RM strength was increased after 8 weeks functional strength training intervention. Additionally BMI score and total fat ratio was decreased in middle age adults.

References

Nakano MM, Otonari TS, Takara KS, Carmo CM, Tanaka C. Physicalperformance, balance, mobility, and muscle strength decline at different rates in elderly people. *J Phys Ther Sci* 2014;**26**:583–6.

Reiman MP, Manske RC. The assessment of function: how is it measured? A clinical perspective. *J Man Manip Ther* 2011;**19**:91–9.

Sport Medicine and Physiology

IS ONE MONTH OF PHYSICAL ACTIVITY PROGRAM ENOUGH TO LOWER AGES LEVELS IN DIABETIC TYPE II PATIENTS?

Giovanni Vanni Frajese[1] , Antonio Tessitore[1], Daniele Pagano[1], Luca Milo[2] and Saverio Giampaoli[1]

[1]University of Rome "Foro Italico", Department of Movement, Human and Health Sciences, Rome, Italy

[2]Centro Studi del Metabolismo, Rome Italy.

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Introduction: During prolonged hyperglycaemic states, common in diabetes mellitus, through a non-enzymatic process known as glycation, compounds named Advanced glycation end products (AGEs) are accumulated in tissues. Long-standing AGEs accumulation are associated with tissue and end-organ damages (1) and muscle's decline (2). However, there is evidence that a regular practice of physical activity might be effective on reducing the AGEs levels in diabetic patients (3). Thus, this study aimed to investigate if a short (30 days) change of lifestyle, from sedentary to exercising (anaerobic and resistance exercises), could lower the AGE's level in diabetic patients, without pharmaceutical or nutritional variations.

Methods: An experimental group (EG) of 12 patients (5 males and 7 females, aged 45-84 years), diagnosed with Type 2 diabetes in an academic hospital in Rome (Italy) were recruited to undergo a 1-month exercise program and compared to a control group (CG) of 12 subjects (6 males and 6 females, aged 45-72 years) classified as physically inactive. AGEs values were detected using the AGE Reader mu by means of skin autofluorescence (SAF), which is highly correlated to the level of AGEs (4). Measures were fixed at the beginning (T0) and after 1-month (T1) during which EG undertook a tailored training program (Balducci et al, 2010) based on a 60% of aerobic (by means of treadmill, syncro, rowing machine, bike ergometer, wave and top) and 40% of resistance with both lower and upper limbs (by means of the Technogym's system "EasyLine") loads, respectively. The individuals' resistance loads were selected (within 5 levels) also based on the RPE by means of CR10 Borg's scale.

Results: After 4 weeks EG showed an average decrease of 1.7 Autofluorescence (AU) ($p<0.001$) while Control group showed a slight increase.

Discussion & Conclusion: A short tailored training program is enough to increase glycaemic control.

References

Meerwaldt et al., (2007). *Diabetes Care*, 30(1), pp.107-112.

Momma et al., (2011). *European Journal of Applied Physiology*, 111(7), pp.1545-1552.

Magalhães et al., (2008). *European Review of Aging and Physical Activity*, 5(1), p.17.

Meerwaldt et al., (2004). *Diabetologia*, 47(7):1324-1330.

Balducci et al., (2008). *Nutrition, Metabolism & Cardiovascular Diseases*, 18, 585-595

RADIAL TWITCH DISPLACEMENT AS AN EARLY HALLMARK OF MUSCLE ATROPHY

Boštjan Šimunič[1]

[1] Science and Research Centre Koper, Institute for Kinesiology Research, Koper, Slovenia

UDC 796:61

Introduction: Muscle atrophy after disuse is higher in older than in younger participants where older also experience slower recovery afterwards (Pišot et al., 2016). Therefore, there is substantial need to detect early atrophy processes to prevent important clinical consequences. Increased amplitude of tensiomyographic (TMG) response was reported after 35-day bed rest and correlated to the anatomical atrophy rate (Pišot et al., 2008). However, little is known about the sensitivity of TMG to detect early atrophy changes.

Methods: We aimed (Šimunič et al., 2019) to assess the time course of changes in muscle architecture and TMG parameters during 35-day bed rest and the following 30-day recovery in 10 young men (age: 24.3±2.6 years). The data were collected at baseline (BDC), at days 1-10 (BR1-BR10), day 16 (BR16), 28 (BR28) and 35 (BR35) of bed rest, and day 1 (R+1), 3 (R+3) and 30 (R+30) during recovery. Muscle architecture was determined with B-mode ultrasonography (Mylab 25, 13-4 MHz LA523, Esaote Biomedica, Geneva, Italy). Scans and TMG assessment were performed in biceps femoris (BF), vastus medialis obliquus (VMO) and longus (VML). For each muscle, thickness (d in mm) and pennation angle (Θ in °) were determined as well as TMG-derived parameter maximal amplitude (Dm).

Results: Skeletal muscle thickness changed during the study ($P<.001$; $\eta^2=.865$). Specifically, thickness declined progressively by 4.5% at BR7 ($P=.048$) to 15.2% at BR35 ($P<.001$) and recovered to BDC thickness at R+30 ($P=.22$) without time x muscle interaction ($P=.50$). The time x muscle interaction ($P<.001$; $\eta^2=.938$) for Θ indicates that the changes in Θ over time differed between the three muscles. While the time course was qualitatively similar for the three muscles ($P<.001$; $\eta^2=.592$), post-hoc analysis revealed that in the VMO Θ was first decreased at BR6 (13.6%; $P=.033$), while in VML and BF it was already decreased at BR2 (5.5%; $P=.037$) and BR3 (7.4%; $P=.019$), respectively. In VMO and VML Θ had recovered to BDC at R+30 ($P>.05$) while in BF it was already recovered at R+3 ($P=.32$). The muscle x time interaction for Dm ($P<.001$; $\eta^2=.186$) indicates that the changes in Dm during the study ($P<.001$; $\eta^2=.782$); differed between the three muscles. While the time course was qualitatively similar for the muscles, the magnitude of the rise in Dm was larger in the VML (84.4%) and BF (75.6%) than in the VMO (42.3%) at BR35 ($P=.013$; $\eta^2=.381$). Dm increased already after BR1, BR4 and BR6 in VMO, VML and BF, respectively, and had returned to BDC at R+3 ($P=.050$).

Discussion & Conclusion: Our study showed that TMG can be used to detect early bed-rest-induced muscle dysfunction, before overt atrophy and atrophy-associated architectural changes can be detected with ultrasound. It remains to be seen whether

such early changes are a result of the fluid shift away from muscle during head-down bed rest and/or is a reflection of structural bed-rest induced changes.

References

Pišot, R., Narici, M.V., Šimunič, B., De Boer, M., Seynnes, O., Jurdana, M., … Mekjavič, I.B. (2008). Whole muscle contractile parameters and thickness loss during 35-day bed rest. *European Journal of Applied Physiology, 104,* 409-414.

Pišot, R., Marušič, U., Biolo, G., Mazzucco, S., Lazzer, S., Grassi, B., … Šimunič, B. (2016). Greater loss in muscle mass and function but smaller metabolic alterations in older compared with younger men following 2 wk of bed rest and recovery. *Journal of Applied Physiology, 120,* 922-929.

Šimunič, B., Koren, K., Rittweger, J., Lazzer, S., Reggiani, C., Rejc, … Degens, H. (2019). Tensiomyography detects early hallmarks of bed-rest-induced atrophy before changes in *muscle architecture. Journal of Applied Physiology, 26(4),* 815-822.

THE ACUTE EFFECTS OF VARYING DOSES OF CAFFEINE ON MUSCLE STRENGTH

Pavle Mikulić[1], Jozo Grgić[2], Filip Sabol[1,3] and Sandro Venier[1]

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

[2] Institute of Sport, Exercise and Active Living (ISEAL), Victoria University, Melbourne, Australia

[3] Fitness Academy, Zagreb, Croatia

UDC 796.012.11

Introduction: The use of caffeine is highly prevalent among both the general population and athletes. Research studies examining performance enhancing effects of caffeine generally employ a single dose of caffeine, most commonly a dose of 6 mg/kg. Studies examining multiple doses of caffeine and their effects on physical performance are rare, and the question of the minimal effective dose of caffeine (i.e. a dose that would produce an ergogenic effect with the least pronounced side effects) is still unanswered in the literature. Therefore, we aimed to explore the acute effects of three doses of caffeine (2, 4, and 6 mg/kg) on muscle strength.

Methods: Twenty-eight resistance-trained men completed the testing sessions under five conditions: no-placebo control, placebo-control, and with caffeine doses of 2, 4, and 6 mg/kg. Muscle strength was assessed using the one-repetition maximum (1RM) test in the back squat and the bench press exercises. A series of repeated measures analysis of variance (ANOVA), with Dunnett's post hoc test where a significant main effect was detected, was used to analyze the differences in performance between the conditions. Effect sizes were calculated using Cohen's d.

Results: In comparisons with both control conditions, only a caffeine dose of 2 mg/kg enhanced lower-body strength (d=0.13–0.15). In comparisons with the no-placebo control condition, caffeine doses of 4 mg/kg and 6 mg/kg enhanced upper-body strength (d=0.07–0.09) with a significant linear trend detected for the effectiveness of different doses of caffeine (p=0.020).

Discussion & Conclusion: We observed no clear association between the dose of caffeine and the magnitude of its ergogenic effects on lower-body strength. On the contrary, a dose-response trend was evident for caffeine's effects on upper-body strength. Although caffeine can evidently be ergogenic for muscle strength, from a practical standpoint, the magnitude of its effects on strength is of questionable relevance.

References

Graham, T.E. (2001). Caffeine and exercise: metabolism, endurance and performance. *Sports Medicine*, 31, 785–807.

Grgic, J., Grgic, I., Pickering, C., Schoenfeld, B.J., Bishop, D.J., Pedisic, Z. (2019). Wake up and smell the coffee: caffeine supplementation and exercise performance-an umbrella review of 21 published meta-analyses. *British Journal of Sports Medicine*, doi: 10.1136/bjsports-374 2018-100278.

Grgic, J., Mikulic, P., Schoenfeld, B.J., Bishop, D.J., Pedisic, Z. (2019). The influence of caffeine supplementation on resistance exercise: a review. *Sports Medicine*, 49, 17–30.

Grgic, J., Trexler, E.T., Lazinica, B., Pedisic, Z. (2018). Effects of caffeine intake on muscle strength and power: a systematic review and meta-analysis. *Journal of International Society of Sports Nutrition*, 15, 11.

Spriet, L.L. (2014). Exercise and sport performance with low doses of caffeine. *Sports Medicine*, 44, 175–184.

SECULAR TREND OF NUTRITIONAL STATUS OF PREPUBESCENT SCHOOL CHILDREN: A PILOT STUDY

Dragan Radovanović[1], Miroslav Radunović[2], Marija Abramović[2] and Aleksandar Ignjatović[3]

[1]Faculty of Sport and Physical Education, University of Niš, Serbia

[2]Faculty of Medicine, University of Montenegro Podgorica, Montenegro

[3]Faculty of Education in Jagodina, University of Kragujevac, Serbia

UDC 612.394

Secular trend of nutritional status is one of the important public health markers which could provide an insight into the complex interaction between growth and the environment. The aim of the present pilot study was to identify the differences in the nutritional status of prepubescent school children over a period of ten years.A total of 100 boys, aged 9–10 years, took part in the pilot study. Measurements were performed during September 2008 and again during September 2018. The percentile and z-score for weight, height and body mass index for the chronological age were used to estimate the nutritional status, and the results were also compared with current standards for growth and nutrition of the World Health Organization. The results show that there is no statistically significant difference in the nutritional status of prepubescent school children over a ten years' period. The average values of the nutrition parameters in both measurements are within the range below +1 SD and below the 85th percentile, which indicates normal nutritional status. A comparison of the results shows the absence of statistically significant differences between the two measurements. Although the results of the pilot study differ from the previous studies performed in Serbia and indicate, moreover, that no secular changes can be observed, we believe that continuous monitoring of the nutritional status using standardized methodology is nevertheless necessary. One of the aims of continuous monitoring of the nutritional status is the identification of metabolically healthy obese children. The significance is reflected in the fact that in these individuals treatment results were different, including a markedly better therapeutic impact of physical exercise compared to other obese individuals.

Keywords: secular trend, nutritional status, prepubescent children, obese children.

THE EFFECTS OF AN AEROBIC EXERCISE PROGRAM ON THE BODY COMPOSITION OF ATHLETES (A REVIEW STUDY)

Mima Stanković[1], Kristina Marković[1] and Katarina Nejić[1]

[1]Faculty of Sport and Physical Education, University of Nis

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Regular and systematic aerobic training has numerous and varied influences on health-related fitness levels (HRF), especially the status of the cardiovascular system, body composition, mineral content, and bone density (Asikainen, Kukkonen-Harjula, & Miilunpalo, 2004). Training activities based on oxidation energy processes dominate aerobic training, and enable the replenishing of expended energy by transporting oxygen to the periphery of the locomotor apparatus. Energy sources during aerobic training include carbohydrates and fats. Based on existing research, we can conclude that aerobic training has a positive influence on body composition. That is, the application of aerobic training has a positive influence on the decrease in body fat percentage, increase in muscle mass, and decrease in body mass. The obtained results have indicated that aerobic training is equally effective among participants of various ages, and that these effects do not depend on gender.

Keywords: aerobic exercise, body composition, effect, impact

NO EFFECT OF ACUTE GREEN TEA EXTRACT SUPPLEMENTATION ON SUBSTRATE METABOLISM DURING AEROBIC EXERCISE

Raci Karayigit[1], Azize Bingöl Diedhiou[2], Ayşegül Şişman[3], Nese Sahin[1], and Gulfem Ersoz[1]

[1] Faculty of Sport Sciences, Ankara University, Turkey

[2]School of Physical Education and Sports, Şırnak University, Turkey

[3]Muğla Sıtkı Koçman University, Sport Sciences Faculty, Turkey

UDC 613.2:796

Introduction: Green tea extract ingestion has been shown to increase fat metabolism during exercise, but there is scarce study that investigating the effects of different dose green tea ingestion in females. Purpose is to evaluate the effects of two different (500 mg – 1000 mg) doses of green tea extract on fat oxidation during aerobic exercise

Methods: Thirteen female volunteers (age 23.2 ± 1.6 years; BMI 25.2 ± 2.9 kg/m2; VO2max 44.3 ± 2.9 ml/min/kg) participated in this randomized, double-blind, placebo-controlled, crossover trial. Following to VO2max test, participants were submitted to either placebo (PLA), low dose of green tea extract (500 mg) (LOWGTE), or moderate dose of green tea extract (MODGTE) before 1 hour to %50 Wattmax cycling exercise (30 min) during which expired air was analyzed. Fat and carbohydrate oxidation, RPE, heart rate, glucose and lactate were measured at different time point throughout the test protocol.

Results: Fat and carbohydrate oxidation, RPE, heart rate, glucose, lactate didn't differ between trials ($p>0.05$).

Discussion & Conclusion: Results of this study showed that different doses of green tea extract supplementation don't affect substrate metabolism during low intensity aerobic exercise in females. To increase substrate metabolism during aerobic exercise may require to consume higher dose of green tea extract longer term time period. Future studies should investigate the effects of different doses of green tea extract on substrate metabolism during low and high intensity aerobic exercise in participants differing in aerobic capacity ($VO2_{max}$).

References

Hodgson, AB., Randell, RK., Jeukendrup, AE. (2013). The effect of green tea extract on fat oxidation at rest and during exercise: evidence of efficacy and proposed mechanisms. *Advances in Nutrition,* 4, 129-140.

Türközü, D., Tek, NA. (2017). A mini review of green tea on energy expenditure. *Critical Reviews in Food Science and Nutrition, 57*(2), 254-258.

HIGH DOSE OF TAURINE INGESTION IMPROVES ANAEROBIC POWER IN FEMALES ATHLETES

Azize Bingöl Diedhiou[2], Raci Karayigit[1], Ayşegül Şişman[3] Nese Sahin[1] and Gulfem Ersoz[1]

[1] Faculty of Sport Sciences, Ankara University, Turkey

[2]School of Physical Education and Sports, Şırnak University, Turkey

[3] Muğla Sıtkı Koçman University, Sport Sciences Faculty, Turkey

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Introduction: Taurin is one of the most popular and common ingredients in energy drinks. There are studies in the literature that shows 3 or 6 gr. of taurine ingestion increase long duration endurance performance. There is scarce study that investigating effects of various dose taurine ingestion on sprint performance in female athletes. The aim of this research is to investigate the effects of 2, 4 and 6 gr. taurine ingestion on anaerobic power in female athletes.

Methods: 16 female trained athletes (age:21,32±1,50, height:168,±4,98, weight:62,12±3,45 body fat percentage:21,24±3,12) participated. Following familiarization, participants attended 4 test with randomized, counter balanced, crossover research design. After night fasting, participants completed 5 minutes 60 Watt warm-up and wingate anaerobic test on a cycle ergometer (Monark Ergomedic 894E, Sweden) with ingestion of placebo (PLA) or 2 gr. taurine (LOWTAU), 4 gr. (MODTAU) and 6 gr. (HIGHTAU) 1 hour before test. Peak Power (PP) and Mean Power (MP) were calculated during sprint test, immediately before and after test heart rate (HR) and rating of perceived exertion (RPE), capillary lactate and glucose were measured. PP, MP and RPE were anaylzed with paired sample T-test, HR, lactate and glucose with repeated measures two-way ANOVA.

Results: Low and moderate dose of taurine didn't affect PP, MP, HR, lactate and glucose values significantly compared to placebo ($p>0.05$), but high dose of taurine significantly increase PP and MP ($p<0.05$).

Discussion & Conclusion: This study showed that 6 gr. of taurine ingestion increase anaerobic power performance in female athletes. Low and mod. dose taurine ingestion couldn't constitute enough ergogenic effect to increase anaerobic power performance. These results are in line with literature. Low dose of taurine ingestion didn't increase repeated sprint performance in a study in the literature. Effects of different doses (1-3-6 gr.) taurine ingestion on aerobic power performance can be investigated in the future studies.

References

Waldron, M., Patterson, SD., Tallent, J., Jeffries O. (2018). Waldron, M., Patterson, S. D., Tallent, J., & Jeffries, O. (2018). The effects of an oral taurine dose and supplementation period on endurance exercise performance in humans: a meta-analysis. *Sports Medicine*, *48*(5), 1247-1253.

Warnock, R., Jeffries, O., Patterson, S., Waldron, M. (2017). The effects of caffeine and, taurine, caffeine-taurine coingestion on repeated sprint cycling performance and physiological responses. *International Journal of Sport Physiology and Performance,* 12, 1341-1347.

Interdisciplinary

DUAL CAREER OF ATHLETES – KEY FACTORS OF SUCCESSFUL DUAL CAREER

Nenad Stojiljković[1], Milovan Bratić[1], Emilija Stojanović[1] and Ivana Arsić[1]

[1] Faculty of sport and physical education, University of Niš, Niš, Serbia

UDC 796.4

Introduction: The problem that top athletes face during their earliest careers is to reconcile their sports careers, training and competitions with the responsibilities involved in their education, attendance at schools, colleges, and universities. Due to the excessive burden and the inability to be successful in the field of sports and in the field of education, it is often the case that athletes drop out of education, which in most cases, after the end of their sports careers, creates a serious problem of their integration into society and usual lifestreams. Another case is that athletes give up their sports careers in order to keep up with the requirements of formal education, which results in the loss of the ability to manifest perhaps exceptional athletic talent and have a successful sports career. For this reason, the concept of a dual career athlete is designed to coordinate between the obligations imposed by a sports career and the demands of education. The aim of this research is to present, based on the good practices of EU countries, the key factors for successful management of athletes' dual careers.

Methods: Data on the manner of organizing the dual career of athletes were collected from scientific papers that have the subject of their career as athletes as their subject of research, as well as from published manuals and brochures giving instructions on the ways of organizing the dual career of athletes.

Results & Discussion: Based on the analysis of the literature of dual career of athletes, it can be concluded that successful management of sports careers and education is possible only when there is good communication and cooperation between education representatives (professors, teachers, administrators of educational institutions, schools and faculties), representatives of sports federations and clubs (national Olympic committees, sports federations, sport clubs), as well as representatives of the executive and legislative government bodies who are able to influence the creation of articles of laws and regulations that will enable successful athletes to acquire education despite numerous obligations. Contemporary educational methods such as distance learning, interactive online courses and mentoring with student-athletes can have a great benefit to their efforts.

References

Lupo, C., Guidotti, F., Goncalves, C. E., Moreira, L., Doupona Topic, M., Bellardini, H., ... & Capranica, L. (2015). Motivation towards dual career of European student-athletes. *European Journal of Sport Science,* 15(2), 151-160.

Guidotti, F., Cortis, C., & Capranica, L. (2015). Dual career of european student athletes: a systematic literature review. *Kinesiologia Slovenica,* 21(3), 5-20.

Ryba, T. V., Ronkainen, N. J., & Selänne, H. (2015). Elite athletic career as a context for life design. *Journal of Vocational Behavior*, 88, 47-55.

EDUCATION MODEL FOR PARENTS OF ATHLETES IN ACADEMICS (EMPATIA): STATE OF ART.

Antonio Tessitore[1], Mojca Doupona[2], Masar Gjaka[1] and Laura Capranica[1]

[1]University of Rome "Foro Italico", Department of Movement, Human and Health Sciences, Rome, Italy

[1]University of Ljubljana, Department of Sport Sociology, Faculty of Sport, Ljubljana, Slovenia

UDC 796/4.012

Introduction: The European Parliament (2017) and the European Commission (2007; 2012) strongly recommend a balanced combination of a higher education with sporting career (e.g., dual career - DC). Among the several DC actors (Capranica & Guidotti, 2016) providing student-athletes a supportive entourage, parents play a relevant role (Condello et al., 2019), despite they might be not adequately equipped or might perceive themselves unprepared for this role. To develop a DC parenting education, the European Commission supported the Collaborative Partnership "Education Model for Parents of AThletes In Academics (EMPATIA, 590437-EPP-1-2017-1-SI-SPO-SCP)" aimed to develop an online multilingual DC parenting programme, thus implementing the EU Guidelines on Dual Careers of Athletes (European Commission, 2012).

Methods: A consortium of ten European university and sporting institutions from six Member States (France, Ireland, Italy, Malta, Portugal, and Slovenia) engages in: 1) collection of evidence-base information on the role and needs of DC parenting by means of a systematic literature review (SLR); 2) collection of eminence-base information and development of a European DC parenting conceptual framework by means of focus groups and concept mapping; 3) definition and implementation of a DC parenting education programme.

Results: From a database of 438 papers, only the 15 involving DC parents as subject were included in the SLR. Eminence information derived from 115 DC parents participating in national workshops, and 489 DC parents engaged in a concept mapping sorting 80 relevant factors for DC parenting education: 25 related to the sports entourage; 23 to information on DC-related policies and services; 22 to the athletes' needs; 17 to the academic entourage, and 8 to the educational resources to DC parenting, respectively.

Discussion & Conclusion: This innovative demand-driven approach provided a significant guidance to the creation of an effective DC parenting education programme tailored for parents living in different settings and contexts.

References

Condello G, Capranica L, Doupona M, Varga K, Burk V (2019) PLoS ONE 14(10): e0223278.

Capranica, L., & Guidotti, F. (2016). http://www.europarl.europa.eu/RegData/etudes/STUD/2016/573416/IPOL_STU(2016)573416_EN.pdf.

European Commission (2007). http://www.aop.pt/upload/tb_content/320160419151552/35716314642829/whitepaperfullen.pdf

European Commission (2012). http://ec.europa.eu/assets/eac/sport/library/documents/dual-career-guidelines-final_en.pdf.

European Parliament (2017). http://www.europarl.europa.eu/sides/getDoc.do?type=TA&reference=P8-TA-2017-0012&language=EN&ring=A8-2016-0381

DIMINISHED WALKING PERFORMANCE AFTER PROLONGED BED REST

Uroš Marušič[1,2]

[1] Institute for Kinesiology Research, Science and Research Centre Koper, Koper, Slovenia (EU);

[2] Department of Health Sciences, Alma Mater Europaea – ECM, Maribor, Slovenia (EU)

UDC 796.032.2

Introduction: Prolonged physical inactivity or immobilization after sports injuries and/or surgery could lead to serious cognitive and motor dysfunction that prevent rapid recovery and lead to future falls. Previous research has shown that gait control provides the demand for cognitive centres of the brain and that dual-task assessments may indicate an increased risk of falling or a protection strategy to prevent falls. The aim of the present study was to evaluate the locomotory performance after 10 days of complete physical inactivity/bed rest.

Methods: Ten healthy young volunteers (average age = 23 years) successfully completed 10 days of horizontal bed rest. Gait speed parameter was obtained with the 2D OptoGait system (Microgate, Italy) under self-selected and fast paced walking condition.

Results: Ten days of horizontal bed rest had no significant impact on the self-selected gait speed ($p=0.190$). In contrast, bed rest significantly decreased gait speed in fast paced walking condition ($p=0.009$).

Discussion & Conclusion: Our results showed that 10 days of bed rest are long enough to affect the locomotory function in healthy adults. Moreover, the effects are larger in tasks that require more attentional resources (higher complexity tasks). The results can be used for the future development of effective countermeasures for rehabilitation and/or space flight purposes.

Keywords: bed rest immobilization, falls, microgravity analog, dual-tasking

SPORT AND PUBLIC SPACE

Milan Žvan[1], Klemen Krejač[1] and Milan Čoh[1]

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

UDC 796/798

Introduction: Space is a fundamental category of living and existence. The space is roughly divided into public and private, real and abstract, political and civil-social. When it comes to sports, training and events are at the forefront, but sport, with its effects, is also a relevant factor for other dimensions of space. For example, the most credible indicator of sports culture is the extent of public space for exercise and free movement (exercise facilities and open areas, parks, swimming pools, promenades, cycle paths). The article deals with the issue of the availability of adequate exercise and exercise space in urban areas and addresses some new findings after the International Conference Sport and Public Space, held in September 2018 in Ljubljana.

Methods: Descriptive methods were used for the study and basic statistics were done. Current data were reviewed from organisations and public information.

Results: The results show that there is not enough public space specifically targeting sport for public. The trend is less and less physical movement, which is reflected in more and more overweight people and people with related health problems. The phenomenon of hypokinesia is a worldwide problem today.

Discussion & Conclusion: As this factor is the subject of several professions and occupations (urban planners, builders, contractors, operators, etc.), this enhances their scope and the function of space remains in the domain of the sports profession. Adequate space, in addition to exercise habits, is a fundamental pillar of sports culture in everyday life. The key question is how to ensure an adequate standard of square footage of public space for exercise and exercise purposes in relation to population, similar to the standards already established for living and working space. This is also important from the perspective of sustainable development.

References

Barton, H., & Tsourou, C. (2013). *Healthy urban planning*. Routledge.

Gill, D. L., Hammond, C. C., Reifsteck, E. J., Jehu, C. M., Williams, R. A., Adams, M. M., ... & Shang, Y. T. (2013). *Physical activity and quality of life. Journal of Preventive Medicine and Public Health*, 46(Suppl 1).

Sugiyama, T., Leslie, E., Giles-Corti, B., & Owen, N. (2008). Associations of neighbourhood greenness with physical and mental health. *Journal of Epidemiology & Community Health,* 62(5), e9-e9.

Telama, R., Yang, X., Viikari, J., Välimäki, I., Wanne, O., & Raitakari, O. (2005). Physical activity from childhood to adulthood: a 21-year tracking study. *American journal of preventive medicine,* 28(3), 267-273.

THE REACTION STYLE IN CONFLICT SITUATIONS AS A COPING STRATEGY DURING ADAPTATION OF PHYSICAL EDUCATION TEACHERS

Polina Tsonkova[1] and Dimitrinka Tsonkova[1]

[1] St. Ciril and st. Methodius University of Veliko Turnovo, Bulgaria

UDC 159.9:796.015

The aim of the study is to establish the typical style of reaction in conflict situations of physical education and sport teachers as a preferred coping strategy during their professional adaptation and to analyze the influence of factors such as gender, age and pedagogical experience on this process. A complex methodology, at the center of which is the psychological testing with the help of a Questionnaire for self-evaluation over the style of coping with conflict Thomas-Kilmann Conflict Mode Instrument-TKI has been applied. The characteristic features of the five possible behavior styles of the teacher have been outlined. The pedagogical advisability of each of them has been explained. A comparative analysis of the quantitative results has been made, providing information for the degree of expressiveness of the different scales of possible coping strategies. From the carried out analysis it has been established that the age and length of the pedagogical experience of the analyzed teachers are not an essential factor for their reactions style, while the factor of gender has a significant influence, demonstrated by the values of Contingency Coefficient. The main conclusion is that physical education teachers should be prepared to understand and accept philosophically the inevitability of conflict situations and to be able to respond correctly, which is inherently a part of its current pedagogical adaptation.

Keywords: physical education, conflict, physical education teacher, coping strategy, reaction/responce style.

DIFFERENCES IN VISUAL REACTION TIME IN CHILDREN AND ADOLESCENTS INVOLVED IN OPEN SKILL SPORTS

Stefan Marković[1], Milivoj Dopsaj[1, 2], Vesna Vuković[1], Nikola Majstorović[1], Nenad Koropanovski [3], Anton Umek [4]

[1] University of Belgrade, Faculty of Sport and Physical Education, Belgrade, Serbia

[2] South Ural State University, Institute of Sport, Tourism and Service, Chelyabinsk, Russia

[3] University of Criminal Investigation and Police Studies, Belgrade, Serbia

[4] University of Ljubljana, Faculty of Electrical Engineering, Ljubljana, Slovenia

UDC 796.01-053.6

The aim of this paper is to define differences in visual reaction time in relation to age and the type of the presented visual task. The sample in this research consisted of a total of 120 participants of which 52 boys and 68 girls. The sample was divided into the following subsamples in relation to the age of the participants: <= 9, 9-12, 12-15, 15+ years. It was determined that mean simple visual reaction time (SRT) was at the level of 177.75±22.98, 171.58±20.76, 157.42±26.59 and 143.38±18.96 ms, respectively. Mean go/no-go reaction time (GNRT) was at the level of 298.47±54.31, 272.95±49.07, 242.09±68.23 and 216.89±33.71 ms, respectively. Mean choice reaction time (CRT) was at the level of 378.58±67.83, 336.47±59.00, 291.11±67.35 and 257.70±41.13 ms, respectively. Results of ANOVA have shown that these differences were statistically significant at a general level for all three types of reactions (SRT – F=11.770, p=0.000, GNRT – F=10.053, p=0.000, CRT – F=17.466, p=0.000) and Tukey HSD test has revealed statistically significant partial differences. This research has confirmed previous findings regarding differences in visual reaction time in different RT tasks and in relation to the age of the participants involved in open skill sports. The presented results reflect the processes of development and maturation of neuro-visual, cognitive and motor potential of the human body during childhood and adolescence.

Keywords: children, adolescents, reaction time, development, reaction time task

DIFFERENCES BETWEEN THE PROFESSIONAL AND THE AMATEUR FOOTBALL PLAYERS IN THE PERCEPTION OF COACHING BEHAVIOR

Aleksandra Aleksić Veljković[1], Dušanka Djurović[2], Katarina Herodek[1] and Uroš Stevanović[1]

[1]Faculty of Sport and Physical Education, University of Niš, Serbia

[2] Faculty of Sport ana Tourism, Novi Sad, Serbia

UDC 796.332.01

The aim of this study was to investigate the differences between professional and amateur football players in the perception of coaching behavior. The sample included 75 football players, 50 professional rankings (Mean age 23.58 ± 3.55 years) and 25 amateur rankings (Mean age 24.00 ± 3.74 years) who had voluntarily participated in the research. The main data collection tools have included the personal information form and the Leadership Scale for Sport. The data was analyzed by way of SPSS 20.0 and, more specifically, by means of descriptive statistics and T-test for the small independent samples. The findings have reveaed that along all the dimensions of the questionnaire there was a statistically significant difference at the level of r <.005, except in the case of the Instruction scale, where the difference was at the level of r <.05. The sample has shown that athletes have different perceptions of the coach behavior, which can be further indicative of the coaches of professional and amateur competitive rank having a different approach to athletes training.

Keywords: instructiveness, democratic and autocratic behavior, social support, positive feedback

SELF-EFFICACY AND INTERPERSONAL ORIENTATION IN THE PREFERENCE FOR THE TYPE OF SPORT AMONG STUDENTS OF FACULTY OF SPORT AND PHYSICAL EDUCATION

Neda Karaleić[1]

[1]Faculty of Philosophy, University of Niš, Niš, Serbia

UDC 796.077.5

The main aim of this research was to determine whether self-efficacy and interpersonal orientation influence on the subject's preference for the type of sport-collective or individual. The survey was conducted on the sample of 149 people, 109 of which being male and 40 participants were female. The results in this study showed that there is no statistically significant difference between the subscales of the Interpersonal orientation (Need for people, Friendship, Distrust, Social isolation) and General self-efficacy with the preference for the type of sport among the students of the Faculty of Sport and Physical Education in Niš.

Keywords: self-efficacy, interpersonal orientation, sport, students

RELATION BETWEEN HAND GRIP CONTRACTILE CHARACTERISTICS AND SIMPLE FAST ARM MOVEMENT MEASURED BY IMU SENSORS

Milivoj Dopsaj [1, 4], Tina Umek [2] and Anton Kos [3]

[1]Faculty of Sport and Physical Education, University of Belgrade, Belgrade, Serbia

[2]Faculty of Sport, University of Ljubljana, Ljubljana, Slovenia

[3]Faculty of Electrical Engineering, University of Ljubljana, Ljubljana, Slovenia

[4]Insititute of Sport, Tourism and Service, South Ural State University, Chelyabinsk, Russia

UDC 796.012

Fast and simple movements are the main form of movements in all sports. The aim of this paper is to determine the relations between contractile and kinematic characteristics of simple, rapid movements of the dominant arm. The research involved 38 subjects, students of the University of Belgrade and Ljubljana (19 males and 19 females). Measurements of the contractile characteristics of the hand were performed using a standardized Hand Grip test by application of tensiometric dynamometry. Measurement of the kinematic characteristics of the maximally fast arm motion was performed using the adapted "Hand tapping test" and an IMU sensor. In the tested group of men, a statistically significant correlation was found between three pairs of variables, and in the group of tested women group between five pairs of variables. The results have shown that the maximally fast hand movements are statistically significantly influenced by the contractile ability of the absolute maximum force generation and that in the tested men's and women's group the correlation structure of the pairs of variables differed in the two examined spaces.

Keywords: muscle force, muscle explosiveness, rapid movement, acceleration

STUDENTS ON THE MARKETING OF PERSONAL QUALITIES OF SPORTING CELEBRITIES WITH PUBLIC PRESTIGE

Elena Kantcheva[1]

[1]St. Cyril and St. Methodius University of Veliko Tarnovo, V. Tarnovo, Bulgaria

UDC 796.005.2:005

The definitive role of personal qualities and professional skills of sporting celebrities with public prestige determine the public attitude to a certain service or product in the area of sports and physical education. Once established the good image and popularity have a great potential to give impetus to the development of any sport organization (club) or any specific mark. They can become the main driving force for people engaged with sporting activities, either in school or in a sporting center or club. Such environment gives the feeling of stability, quality and success. The purpose of this study is to answer some questions about the model of distinguished performer of certain public role or function, by making reference to the hypothesis that consumers of sporting activities are in demand for marketing messages which are given special attention. The aim of study is the opinion of people engaged in sports on the factors that influence the quality of their performance and drive higher their prestige in society. Subjects consists of 126 successful teachers of physical education and sports, coaches and sport participants. The study was conducted by using the classical research methods: questioning and marketing-oriented inquiry - focus group discussion – by means of a structured questionnaire including 4 main segments - image (the qualities of successful sporting celebrities), social status, personal dynamic characteristics and terminal values, each containing at least six open-end and closed-end questions. The study cites mathematical statistical data and makes use of the comparative analysis to process the results. In general, the inquiry showed that the inquired participants in the study regarded the mentioned factors very important and determinative for their public prestige. It may be summarized that people engaged with physical education and sports give consideration to the selected factors and believe that such particulars influence the establishment of overall public prestige and attitude. It is recommended to conduct such inquiries among sporting participants on regular intervals and to use the results of such inquiries as a reference point to measure the feelings and problems in that sector.

Key words: Sport, physical education, marketing, image, student.

GENDER DIFFERENCES IN SPORTS MEDIA REPORTING ON BASKETBALL AT THE OLYMPIC GAMES 2016.

Nebojša Ranđelović[1], Milan Kostadinović[1], Marina Malobabić[2] and Danica Piršl[1]

[1] Faculty of Sport and Physical Education, University of Niš

[2] Neurology Clinic, Clinical Center Niš

UDC 796.323

This paper aimed to gain new insights into how and to what extent the domestic media reported on basketball players at the 2016 Rio de Janeiro Olympic Games and to identify differences between the reporting sources. The sample of the research material is based on the Serbian media in the electronic edition Politika, Kurir, Večernje Novosti, as well as the portal of RTS media public service, from 05.08.2016 to 21.08.2016. The data included information on the number of articles dedicated to male and female basketball players, the number of words in the text, the number of photos and gender of the actors in the photos, active or passive representation of male and female basketball players on and off the field, camera angle, emotions in photographs and exposure level of the athletes bodies in the photographs. If one considers the distribution by sources of text, it can be seen that the largest number of articles in the period under review was published by KURIR and the least by RTS and that in all sources there was a significantly higher number of articles on athletes. Percentage of the total number of articles, sources allocated space to the athletes, and concerning female athletes, this difference is greatest with RTS. In terms of the number of photographs, POLITIKA and KURIR had in their articles an approximate number of photographs devoted to male and female athletes. The most unfavorable ratio (28-1 for the benefit of male athletes) was recorded by the public media service RTS, while in VEČERNJE NOVOSTI, the ratio was 2-1, also for the benefit of men. Overall, the findings of this research show that there is still an imbalance in the way male and female athletes are portrayed by media and that there is a need for some changes in this area.

Keywords: basketball, Olympic Games, Serbia, media, content analysis.

SPORTS BASED METAPHORS AS ALL-AROUND INFUSION

Danica Pirsl[1]

[1] University of Nis, Faculty of sport and physical education, Serbia

UDC 796.032.1

The use of sports metaphors to convey business lessons both within and outside the classroom is a common phenomenon. The sports metaphor, however, is prone to misuse and can often inadvertently exclude large segments of the student population. To address these issues, we put forth an innovative and novel pedagogical approach that attempts to capitalize better on the shared meanings between athletics and certain business practices. Using the sports of tennis, football and basketball, we demonstrate how sports metaphors can be responsibly used to aid in the understanding of business lessons, such as managerial decision making. The research methods used were standards models of extracting metaphorical and literal meanings. Thus metaphor identification system relies on distributional clustering. The data to test the identification module were extracted from the metaphor corpus created by Shutova and Teufel (2010). Their corpus is a subset of the BNC (Burnard 2007). The context-based probabilistic model is used for paraphrase generation of metaphorical expressions and the selectional preference model for theur literalness detection. The key difference between the two models is that the former favors the paraphrases co-occuring with the words in the context more frequently than other paraphrases occurances, and the latter favors the paraphrases co-occuring with the words from the context more frequently than with any other lexical items in the corpus. The system thus incorporates the following components: 1. a context-based probabilistic model that acquires paraphrases for metaphorical expressions from a large corpus; 2. a WordNet similarity component that filters out the irrelevant paraphrases based on their similarity to the metaphorical term (similarity is defined as sharing a common hypernym within three levels in the WordNet hierarchy); 3. a selectional preference model that discriminates literal paraphrases from the metaphorical ones.

Keywords: sports metaphors, distributional clustering, use and misuse of metaphors, communication, memory triggering

DIFFERENCES IN COGNITIVE ABILITIES AND PERSONALITY TRAITS BETWEEN HANDBALL PLAYERS AND GENERAL POPULATION

Petar Mitić[1], Nenad Stojiljković[1], Ljubomir Pavlović[1], Novica Gardašević[2] and Gordana Jović[3]

[1] Faculty of sport and physical education, University of Niš

2 Faculty of Physical Education and Sports, University of East Sarajevo

[3] OŠ „Mirko Jovanović", Kragujevac, Serbia

UDC 796.332:032.2

The main goal of this paper was to identify differences between handball players and the general male population in cognitive characteristics and six personality traits. The study sample consisted of 14 handball players who play for HC „Železničar" Niš in the 2019/20 season. All subjects completed a battery of cognitive tests KOG-3 (Wolf, Momirović & Dzamonja, 1992) and HEXACO-60 personality test (Ashton & Lee, 2009) with six domains: Honesty-Humility, Emotionality, Extraversion, Agreeableness, Conscientiousness and Openness to Experience. The results showed that handball players are better at cognitive functioning and have a less pronounced Openness to Experience trait.

Keywords: handball, cognition, personality traits

UNDERLYING MECHANISMS OF ATTENTIONAL FOCUS INSTRUCTIONS

Reza Abdollahipour[1]

[1]Department of Natural Sciences in Kinanthropology, Faculty of Physical Culture, Palacký University Olomouc, Olomouc, Czech republic.

UDC 796.01

Introduction: Advantages of an external relative to an internal focus of attention for motor performance and learning of different motor tasks have been shown in different motor tasks. Yet, the underlying mechanisms of these benefits is unclear. In the past years, some researchers have proposed that an external focus of attention may enrich perceiving visual information from environment, suggesting that vision might have a mediating role for the benefits of an external relative to an internal focus of attention.

Methods: We investigated the influence of attentional focus instructions and vision on motor performance and learning of different types of motor tasks.

Results: The results of our experimental studies have shown that the availability of vision does not mediate the extent to which an external attentional focus influences the performance of different motor tasks in healthy adults and individuals with visual impairments.

Discussion & Conclusion: Therefore, an external focus of attention contribute to successful movement outcomes by strengthening the coupling of performers' goals and their movement actions, which is independent from vision. Most recent studies propose that differences in functional connectivity of brain motor networks, and differential organization and integration within primary motor cortex seems to be responsible for facilitating goal-action coupling.

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References

Abdollahipour, R. & Land, W., Cereser, A. & Chiviacowsky, S. (2019). External relative to internal attentional focus enhances motor performance and learning in visually impaired individuals. *Disability and Rehabilitation. https://doi.org/10.1080/09638288.2019.1566408*

Abdollahipour, R., Psotta, R., & Land, W. (2016). The influence of attentional focus instructions and vision on jump height performance. *Research Quarterly for Exercise and Sport, 87*, 408-413.

Kuhn, Y. -., Keller, M., Lauber, B., & Taube, W. (2018). Surround inhibition can instantly be modulated by changing the attentional focus. *Scientific Reports, 8*(1) doi:10.1038/s41598-017-19077-0

Kuhn, Y. -., Keller, M., Ruffieux, J., & Taube, W. (2017). Adopting an external focus of attention alters intracortical inhibition within the primary motor cortex. *Acta Physiologica, 220*, 289-299.

Wulf, G., & Lewthwaite, R. (2016). Optimizing performance through intrinsic motivation and attention for learning: The OPTIMAL theory of motor learning. *Psychonomic Bulletin and Review, 23*, 1382-1414.

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