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INVITED SPEAKERS

Almir Atiković (BIH) Faculty of Physical Education and Sport, University of Tuzla.

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Elena Bendíková, (SVK) Department of Physical Education and Sports, Matei Bel University in Banská Bystrica.

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László Csernoch, (HUN) Department of Physiology, Department of Otorhinolaryngology and Head and Neck Surgery, Medical and Health Science Centre, University of Debrecen.

Ivan Čuk, (SVN) Head of Gymnastics and Kinesiology Department, University of Ljubljana.

Miroslav Dutchak (UKR) National University of Physical Education and Sport of Ukraine.

Roman Farana, (CZE) Human Motion Diagnostics Centre, Department of Human Movement Studies, University of Ostrava.

Soňa Formánková (CZE) Department of Sport, Palacky University in Olomouc.

Karol Görner (SVK) Department of Physical Education and Sports, Matei Bel University in Banská Bystrica.

Thomas Heinen, (GER) Institute of Sports Science, University of Hildesheim.

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Michel Marina Evrard, (ESP) National Institute of Physical Education (INEFC), University of Barcelona**.**

Falk Naundorf, (Germany) Institute for Applied Training Science, Department Strength-Technique, Leipzig.

Dymytriy Nikonorov (UKR) National University of Physical Education and Sport of Ukraine.

Oksana Shinkaruk (UKR) Research Institute of the National University of Physical Education and Sport of Ukraine.

Pia M Vinken, (GER) Institute of Sport Sciences, Georg-August-Universität Göttingen.

INVITED LECTURES AND BOOK OF ABSTRACTS

INVITED SPEAKERS

HANDGRIP IN ARTISTIC GYMNASTICS, Ivan Čuk

Faculty of Sport, University of Ljubljana, Slovenia

In artistic gymnastics, (AG) contact with apparatus can be on different body parts. On uneven bars, parallel bars, rings, pommel horse and horizontal bar the most important contact with apparatus is with handgrip, while on floor, beam and vault most used contact is with feet, and hand contact is the second most used contact. Two main documents define handgrip in artistic gymnastics prepared by International Gymnastics Federation (FIG), Code of Points (for Men AG and Women AG) and Apparatus Norms. Besides both documents, next decisive factors are anatomy of hand and biomechanics of element. Code of points with its definition of element difficulty is mostly consistent with anatomy, however it sometimes requires extreme flexibility, and while Apparatus Norms have its lacks as morphologic characteristic of gymnasts are changing, while norms persist constant. Element's biomechanics have impact on handgrip (in some cases were recorded loads on hands over 13G), which can be performed only with use of safeguards. As apparatus are made of different materials (e.g. wood, metal) use of magnesium carbonate on some apparatus is required to minimize moisture, however it raises friction (what is in sometimes in gymnasts' favor and sometimes not). While in contact with apparatus palm skin temperature rise or lower according to all above factors. There are some acute and chronic injuries directly related to handgrip e.g. blisters. Also new apparatus can be developed with better handgrip adjustment.

THE ROLE OF VISUAL PERCEPTION IN THE CONTROL AND ACQUISITION OF GYMNASTICS SKILLS, Thomas Heinen

Institute of Sport Science, University of Hildesheim, Germany

Expert gymnasts are able to perform complex skills, such as a double somersault with double twist with ease. On first sight, such skills are complex and it seems unclear how they are regulated. The theoretical position of perception-action coupling holds the view that when an actor (a gymnast) moves in a particular, yet dynamic environment, he/she grabs up information from the environment, which in turn is used to regulate action in order to achieve a particular movement goal. The coupling between perception and action is influenced by task demands and mental representations an actor possesses. The most dominant information source in perception-action coupling is visual information and it is argued that skilled gymnasts optimize their visual information pickup to best serve the task demands in complex skills. Therefore, gymnasts optimize their gaze behavior as well as the information that is extracted from the environment. Gymnasts seem to regulate complex skills, on the basis of visually perceived environmental cues, whereas different cues may guide different aspects of a particular skill. For gymnastics training this perspective could imply different strategies, such as directing gaze when

performing a particular skill, and/or highlighting specific informational sources from the environment during skill acquisition processes. Theoretical perspectives, empirical evidences and practical implications concerning the idea of perception-action coupling in complex gymnastics skills will be discussed and critically evaluated.

THE POSSIBLE IMPACT AND SIGNIFICANCE OF ASYMMETRIES IN ARTISTIC GYMNASTICS, Maja Bučar Pajek

Faculty of Sport, University of Ljubljana, Slovenia

Gymnastic exercises demand coordination in three space dimensions and time so they are crucially exposed to the possible influence of asymmetry in motor action initiation, performance and finalisation. The symmetry of body may be recognised as a cosmetic component as well as a component of physical abilities. In the Sokol gymnastic organization (one of the main middle Europe's gymnastic societies in the first half of 20th century) special emphasis was laid on equal involvement of musculoskeletal apparatus through distributed employment of exercises for various body parts. There are two critical aspects of possible asymmetric influence: impact on injury risk and impact on results. So far this issue has been understudied.

Does practicing gymnastics promote symmetry in movement and body structure?An important issue regarding the impact of asymmetry in load can be seen from the example of the general structure of balance beam routines as defined by the FIG Code Of Points [2]. Elements are divided into following groups (added number of elements with difficulty, take offs and landing are counted for each figure within difficulty box):

- Mounts – 45 elements – take off with one leg 7, landing with one leg 6;
- Gymnastics leaps, jumps and hops – 35 elements, take off with one leg 17, landing with one leg 22;
- Gymnastics turns – 22 elements, take off (start of turn) with one leg 22, landing (end of turn) with one leg 22;
- Holds and acrobatic non –flight – 18 elements, take off with one leg 18, landing with one leg 12;
- Acrobatic flight - 34 elements, take off with one leg 15, landing with one leg 14;
- Dismounts - 29 elements, take off with one leg 16, landing with one leg 0;

We can see that a big number of elements are defined as one leg take off or one leg landing. At any level of competition in gymnastics the symmetry of exercises is not sufficiently emphasized neither in children, nor in adults. Furthermore, in COP there is no rule or statement on the symmetrical load. So it is evident that current COP and rules do not favour or acknowledge the symmetry of load.

Preferential use of one of the limbs leads to adaptations at morphological, structural and functional levels. The influence of long-term training on anthropometric parametersof rhythmic sports and artistic gymnasts was investigated by Douda et al. [3]and they found significant differences in circumferences between the right and left legs, but surprisingly only in rhythmic gymnasts, not in artistic gymnasts. Another studyassessed theposition of theanterior and posterioriliacspinae. Gymnasts as a group were found to have asymmetrically positioned innominate bones as opposed to non-gymnasts representing thecontrol group. By repeatingasymmetricalphysical activities bilateraldifferencesbetween extremities and bones are expected to enlarge with time.

We have performed a research to study how many elements which asymmetrically load lower extremities are included in balance beam routines of professional female gymnasts.We video-recorded all exercises of qualification round on balance beam at an international competition B World Cup in Ljubljana 2014. We analysed take-offs and landings to define the actions done by left leg, both legs simultaneously, or right leg. A delay of at least 0.01 second in recruitment of one of the lower limbs defined the action as being from a single leg.In the routines of 19 included gymnasts we found significant asymmetry of load: right leg initiated 42.87% of actions (on average 12.47±3.32 per routine), while left leg and both legs initiated 29.08 and 28.05 % of actions (on average 8.58±2.97 and 8.21±3.07 per routine, respectively). The load on right leg was significantly larger compared to left leg and both legs (p=0.002 and 0.003). Only 4 gymnasts (20.8%) loaded left leg more than right leg. It is clear from our results that there is significant asymmetry of the usage of lower limbs at balance beam routines in elite gymnasts.From our results a critical question arises whether asymmetrical load of such a magnitude is acceptable not only for adults, but also children and youngsters. This asymmetrical load may have significant anthropometric, structural and safety impact.

What is the possible impact of asymmetry on the injury risk potential? Niu, Wang, He, Fan and Zhao [5] analysed biomechanical asymmetry between the dominant and non-dominant limb during double-leg landing. They concluded that the non-dominant ankle has a more effective protective mechanism regarding excessive joint motion and that the dominant ankle joint is at a greater injury risk during drop landing. In athletes, the non-dominant leg showed greater cortical bone mineral density than the dominant leg which is used for mobility or manipulation whereas the non-dominant leg lends support during the actions of the dominant leg. It is generally well known that greater bone mineral density is protective against fracture risk.The lateral differences in body structure are not only limited to bone but also ligaments may show side differences. Bohm et al [9] measured mechanical and morphological Achille's tendon properties of the non-dominant and dominant leg by means of ultrasound, magnetic resonance imaging and dynamometry. The Achille's tendon of the dominant leg featured a significant higher Young's modulus and length but a tendency toward lower maximum strain compared with the non-dominant leg. The tendon cross-sectional area and stiffness were not significantly different between sides.

Concerning injury causes Lund and Myklebust found that 84 % of the injuries occurred in the landing phase of the gymnastic skills and most frequently the ankle was injured. The majority of competition injuries (approximately 70 %) resulted also from either landings or dismounts. Some above-mentioned authors reported the same causes without percentages. Most injuries occurred on floor exercise (32.1 %), beam (20.7 %), and bars (17 %). These studies do not, however, evaluate which side of body was affected, whether it was an injury that occurred during performing symmetrical or asymmetrical elements and whether the dominant or non-dominant limb was injured.

What is the possible impact of asymmetry on results? Čuk and Marinšek highlighted the asymmetric activity of the lower limbs when the jump element execution was not technically perfect. In such cases landing on both legs was associated with uneven load distribution. Even elements which are supposed to be performed with both legs simultaneously can have a significant asymmetrical load on lower limbs. This often happens in elements with turns. In general, not many data on this topic is present in the scientific literature and further work should be done to reveal the possible impact of asymmetry on the performance and success in artistic gymnastics.

From the above considerations it is evident that the problem of asymmetry is understudied in artistic gymnastics. We are mainly concerned with the impact on injury risk and the impact on results. There is significant body of evidence showing that the Code of Points predisposes to the asymmetry of load and the current artistic gymnastic practice executes it abundantly. Concerning the injury risk we propose that further research should incorporate laterality data and associate this data with the asymmetry of load. Concerning the general performance and success in element performance a thorough biomechanical and epidemiological studies for separate elements and routines may reveal the possible benefit of increasing symmetry in improving the results. We propose that the problem of asymmetry should not be neglected in the future scientific work in artistic gymnastics, a practice turn from the current situation which could benefit the future developments in this sport.

THE IMPORTANCE OF FUNCTIONAL DIAGNOSTICS IN PREVENTING AND REHABILITATING GYMNAST INJURIES WITH THE ASSISTANCE OF THE TENSIOMYOGRAPHY (TMG) METHOD: A CASE STUDY, Almir Atiković[1], Mitija Samardžija Pavletić[2], Muhamed Tabaković[3]

[1]University of Tuzla, Faculty of Physical Education and Sport, Tuzla, Bosnia and Herzegovina
[2]University of Primorska, Applied Kinesiology, Koper, Slovenia
[3]University of Sarajevo, Faculty of Sport and Physical Education, Sarajevo, Bosnia and Herzegovina

The tensiomiography assessment offers information, in the time domain, regarding the following parameters: maximal radial deformation or displacement of the muscle belly (Dm), contraction time (Tc), reaction time (Td), sustain time (Ts) and relaxation time (Tr).

Four muscles were chosen on both lateral sides regarding the artistic gymnastics the participant are involved in: Biceps Femoris (BF), Erector Spinae (ES), Gluteus Maximus (GM), Rectus Femoris (RM). The testing sample in this survey was taken from Croatian Republic's senior representative, who won third place in the floor routine at the ECh for juniors in 2012 and eight place for seniors three years later 2015.

The testing and measuring took place after he injured the lumbar region of the spinal cord and after a four month long prevention exercise program. After the first two stages of measuring the differences can be found in: BF:-7%; ES:+17%; GM:-8%; RF:+11%. Generally speaking, an dependent t-test did not found significant differences in between in first and second measurment point ($t=1.941$, $df=39$, $P<0.059$).

This approach can be used to investigate high level athletes who are in the process of training for muscle recovery, as a result of skeletal muscle injury.

PERFORMANCE-ENHANCING METHODS IN GYMNASTICS TRAINING, COMPETITION AND RECOVERY – A SPECIAL EMPHASIS ON ELASTIC TAPING, Pia M. Vinken

Georg-August-University Göttingen, Germany

Several methods and techniques such as active and passive warm-up and cool-down-techniques, massage, water immersion, myofascial release as well as taping and bracing are commonly applied to support athletic performance, recovery and. Whereas the implementation

of these methods and techniques is widely common and accepted in gymnastics training and competition, their effectiveness and verification should be outlined in this presentation.

Thereby, a special emphasis is given to the effectiveness of elastic taping: Whether elastic taping is supposed to support muscle and joint. However, when it comes to task- and application-specific effects of elastic taping on athletic performance of healthy, active athletes, elastic taping may have on the one hand a comforting and load-tolerating performance supporting effect, whereas on the other hand some elastic tape applications may have a performance decreasing effect on other parameters of athletic performance.

One superior effect of elastic taping seems to be a differentiated sensory perception of the taped body area, which may function as a supporting and/or prophylactic tool when an athlete believes in its postulated effects, however, this effect could mask performance-decreasing and/or -unchangeable effects may impact overall athletic performance.

EFFECT OF TECHNIQUE SELECTION ON ELBOW LOADING AND MOVEMENT VARIABILITY DURING THE ROUND-OFF IN GYMNASTICS, Roman Farana

Department of Human Movement Studies, Pedagogical Faculty, University of Ostrava, Czech Republic

Chronic elbow injuries from tumbling in female gymnastics present a serious problem for performers. This research examined (a) how the biomechanical characteristics of impact loading and elbow kinematics and kinetics, change as a function of technique selection; and (b) based on a within-gymnast analyses this study aimed to examine of the variability in elbow joint kinematics and kinetics of expert gymnasts in the execution of the round-off with different hand position. Seven international level female gymnasts performed 10 trials of the round-off from a hurdle step to flic-flac with “parallel” and “T-shape” hand position. Synchronized kinematic (3D automated motion analysis system, 247 Hz) and kinetic (two force plates, 1235 Hz) data were collected for each trial. Wilcoxon non-parametric test and effect size statistics determined differences between the hand positions examined in this study. Within gymnast variability was calculated using biological coefficient of variation (BCV) discretely for ground reaction force, kinematic and kinetic measures. Variability of the continuous data was quantified using coefficient of multiple correlations (CMC). Group BCV and CMC were calculated and T-test with effect size statistics determined differences between the variability of the two techniques examined in this study. In conclusion, the T-shape hand position reduces vertical, anterior-posterior and resultant contact forces and a decreased loading rate indicating a safer technique for the round-off. Significant differences observed in joint elbow moments highlighted that the T-shape position may prevent overloading of the joint complex and consequently reduce the potential for elbow injury. Moreover, expert gymnasts displayed higher movement variability in the elbow joint peak abduction angle and adduction moment during the T-shaped hand position compared with parallel hand position whilst performing the fundamental RO skill. This may potentially lead to reducing abduction load and consequently protect the elbow joint from overload and biological failure due to repetitions of the same motor tasks.

COORDINATIVE TRAINING IN GYMNASTICS ON THE STAGES OF COMPREHENSIVE AND DIRECTED SKILLS IMPROVING, Vladimir Lyakh

University of Physical Education in Krakow, Poland

The question of the importance of coordination training (directed development of coordinated motor abilities – CMA) in Gymnastics on the different stages of sports improving is not in doubt among neither theoreticians nor practitioners. At the same time, this important section of gymnasts' training remains one of the least explored.

Consideration of gymnasts' CMA development questions in theory and practice.

Analyses of literature resources, method of expert evaluations, surveys of specialists in CMA development problems and gymnastics coaches (n>20).

On the basis of the conducted research the following aspects of the problem will be covered:

- The aim and goals of the coordinative training in Gymnastics;
- Concepts of the coordinative training in sport;
- The place of general and special coordinative training in the sportsmen' training system;
- The leading CMA determining success in gymnastic exercises training;
- The main provisions of sports training in Gymnastics.

JUMPING PROFILE IN COMPETITION ARTISTIC GYMNASTICS, Michel Marina Evrard

National Institute of Physical Education, University of Barcelona, Spain

To propose a precise jumping performance profile of elite gymnasts, we compared the factors influencing jumping performance between 76 well-trained gymnasts and 91 moderately active subjects. The jumping tests performed on a contact mat were: squat jump (SJ) with progressive loads of 0, 25, 50, 75 and 100% of body mass, counter-movement jump (CMJ), counter-movement jump with arm swing (CMJA), and drop jumps (DJ) performed from 20, 40, 60, 80 and 100 cm heights. The parameters used to assess the jumping performance were flight time (FT, ms), contact time (CT), flight-contact ratio (FC), FT normalized to body mass (FTbm, ms/kg), Bosco expression (BE), estimated elastic component (EC) and arm participation (AP). When using FT to estimate the F-v curve through SJ with overloads, similar results were observed among males. Nevertheless, when FT was normalized to body mass (FTbm), the F-v curve showed the advantage of female gymnasts in particular over their control group when overloads were above 50%. Larger differences between gymnasts and their control groups were observed in CMJ and CMJA, with FTbm instead of FT.EC and AP can be considered as suitable complementary parameters of jumping performance in gymnasts. In DJ male gymnasts scored similar FT to their controls, whereas female gymnasts had significantly longer FT compared to their peers. The gymnasts obtained significantly shorter CT than their control groups, whereas their FC ratios were significantly higher and increased when the height of the drops was close to 60 cm. FT is the less discriminating factor distinguishing gymnasts' DJ performances. Considering CT, FC and BE results all together could better profile the gymnasts' plyometric performance rather than taken separately.

THE USE OF HYPEROXIA TO ACCELERATE RECOVERY AFTER SPECIFIC LOAD IN ARTISTIC GYMNASTICS, Juraj Kremnický, Soňa Kremnická

Department of physical education and sport, Matej Bel University, Banská Bystrica, Slovakia

The research was realized by the form of case study. The research deals with the use of inhalation of concentrated oxygen in the regeneration interval during anaerobic load in Artistic Gymnastics. The aim of research´s realization was to diagnose the impact of inhalation of concentrated oxygen (hyperoxia) on the recovery´s duration on reaction of heart rate and the level of the lactate in capillary blood during intensive specific load of elite gymnasts.

The experiment was realized on three professional gymnasts (members of nation team of Slovakia) during training sessions. The specific load consisted of floor exercises and pommel horse exercise (max repeat double leg circles). During the experiment´s realization, the heart rate of gymnasts was continuously monitored. One minute after each specific load and also after 3,7,15 and 23 minute recovery, we applied measuring of the lactate levels in capillary blood. The experimental factor was anonymous inhalation of concentrated oxygen respectively air (in form of placebo) during the rest. Gymnasts regenerated after each specific load by the form of inhalation of concentrated oxygen or placebo.

Diagnostics´ results after specific load of all professional gymnasts suggest on decrease of anaerobic cover after oxygen´s inhalation and faster lactate´s remetabolisation when comparing with placebo´s inhalation. It was also exhibited the decrease of heart rate with oxygen´s inhalation when comparing with placebo´s inhalation. It was confirmed during the recovery after the floor exercises and also after participating max repeat double leg circles on pommel horse.

According to these information we can consider that that the inhalation of hyperoxic mixture was an appropriate method to accelerate the recovery after specific load of elite gymnasts.

RESEARCH FOR NATIONAL TEAM SUPPORT IN ELITE ARTISTIC GYMNASTICS, Falk Naundorf, Stefan Brehmer, Thomas Lehmann, Ilka Seidel

Institute for Applied Training Science, Leipzig, Germany

The lecture is focused on different parts of scientific support of the German national teams in artistic gymnastics. Foundation of all research questions is the analysis of international competitions (especially Olympic Games and world championships) in gymnastics. Based on the results of analysis of current performances of the best gymnasts in the world and the success or deficit of German national team research tasks were agreed between the German gymnastics federation and the Institute for Applied Training Science. Most of the tasks were applied for junior and senior national team.

- Biomechanical Analysis of difficult elements to compare parameters between international top gymnast and national gymnasts (especially on vault, horizontal bar, uneven bars)
- Development of Measurement and Information Systems (Feedback Systems: Instrumented horizontal bar, uneven bars and vault table to measure forces and synchronized video recording)
- Applying the Measurement and Information Systems in national training camps (give athletes feedback on their current technique to learn new elements or make the performance of elements better)
- Diagnostic of strength and other basic requirements for successful gymnastics

- Measuring of run up velocity on vault
- Analysis of training loads
- Preparation of illustrative material (continuous pictures, video, animations) to support motor learning
- Transfer of knowledge to coaches (presentations in coaches education workshops)

The presentation reflects not only the way of working in Artistic Gymnastics but shows the basic approach of the Institute for Applied Training Science in different kind of sports.

WHAT IS THE FUTURE OF GYMNASTICS IN PHYSICAL EDUCATION – EXPERIENCES FROM EDUCATIONAL INSTITUTIONS IN DENMARK, Finn Berggren

Gerlev Physical Education & Sports Academy, Denmark

The gymnastic history in Denmark is unusual as gymnastic already became compulsory in the schools from 1814.

Even gymnastics have kept a strong position in the physical education curriculum during 200 years then the last 20 years have changed the picture.

The traditional gymnastics have changed dramatically from Olympic style gymnastics to Team Gymnastics and the present and the future will maybe be influenced by the grassroot movement PARKOUR.The development and future will be influenced by following aspects:

A new pedagogical approach to gymnastics
A new style of motivating equipment
A playful approach
A strong influence by Parkour and new kind of activities
A Health Perspective instead of educational and personal development

PHYSICAL ACTIVITY IN RELATION TO SELECTED DETERMINANTS OF ADOLESCENTS' HEALTH, Elena Bendíková, Pavol Bartík

Department of Physical Education and Sports, Faculty of Arts, Matej Bel University, Banská Bystrica, Slovakia

As a result of the insufficient physical activity, the number of secondary school students with major or minor health issues is increasing. This paper presents a pilot observation of a selected health determinant relating to the body weight of students, in particular the physical activities of their exercise regime. The observed group consisted of 96 third- and fourth-year female students of secondary schools from the city of Liptovský Mikuláš. Diagnostics of the primary indicators of the somatic nature as well as other determinants were implemented in 2014, with the help of primary care physicians, based on standardized medical and pedagogical diagnosis, and personal medical history. The results demonstrate that already at such a young age, these students have minor health problems occurring of various combinations, as well as increased body weight (27.84 %) and obesity (5.76 %), which probably resulted from their sedentary lifestyle combined with other risk factors.

INSTRUMENTALITY AND VALUES INAESTHETIC SPORTS, Irena P. Martínková

Faculty of Physical Education and Sport, Charles University in Prague, Czech Republic

This paper discusses the theme of instrumentality in aesthetic sports(such as, for example, gymnastics and figure skating) and its impact on values that these sports yield for athletes who practise them.

Firstly, instrumentality within sport is identified (i.e. various kinds of relationships of means and ends), which leads to the distinction between purposive and aesthetic sports. While it is claimed that aesthetic sports are less instrumental than purposive ones, it is still possible to find various instrumental relationships in them. I shall present these instrumental features in aesthetic sports and then I shall discuss their consequences for values that arise for athletes in these sports before presenting their ethical implications.

SPORT IS NOT ART (INCLUDING AESTHETIC SPORTS, SUCH AS GYMNASTICS), Jim Parry

Faculty of Physical Education and Sport, Charles University in Prague, Czech Republic

Firstly I offer an account of the aesthetic as an attitude – as a way of perceiving an object that is value-neutral, non-purposive, and can be taken towards any object whatsoever.

I then define 'art' in terms of the aesthetic – art objects are aesthetic artefacts that embody meanings.

Next, I distinguish between purposive sports and aesthetic sports. Purposive sports are clearly not art, even though they can be the subject of art. And neither are aesthetic sports since, although they are aesthetic artefacts, they do not allow for the expression of a view on life issues – on human meanings. So: sport is not art.

HOW THE AGE OF OLYMPIC MEDALIST HAS CHANGED IN THE PAST FIFTY YEARS. A GENDER BASED STUDY, László Csernoch, Nikoletta Kith, Ildikó Balatoni

Department of Physiology, Faculty of Medicine, University of Debrecen, Hungary

Legal endurance training methods, sport outfits, sport instruments, and how the different sport centers are equipped have undergone dramatic changes in the past half century. During our investigation we were aiming to see whether all these advances influenced, if yes, in which direction, the age of the Olympic medalists. These are of special interest since professional teams readily use physiological, mechanical, psychological, and nutritional training when preparing the participants in recent Olympics.

From the Olympic sports those individual events were selected into the analysis which do not require any specific technical instrument that could influence the outcome of the competition significantly, and, furthermore, where a better physical and psychological fitness is likely to be behind the better result. An internet-based database was used for data assembly and a statistical software for analysis.

From 4 sport categories– swimming, fencing, athletics, and pentathlon – 34events were included into the study. The age of all female and male Olympic medalists of these events at the

time of the competition was compared including all fourteen Olympics since 1960 (Rome). Our results show statistically significant changes in the age of the Olympic medalists in certain events. While this tendency is usually and increasing one, a decreasing tendency has also been observed.

There are differences between the different sport events and between the genders within an event in respect how the age of the Olympic medalists has changed in the past half century. Due to these differences in the overall tendency in age it is likely that sport-event specific factors underlie the observations, the study of which requires further investigation. Nevertheless, the average age seems to converge to a defined value in all events tested.

HOSTILITY SYNDROM AS A DISTINCTIVE PROFILE OF THE SPECTATORS OF SPORTS EVENTS, Karol Görner[1], Janusz Zielinski[2], Adam Jurczak[3]

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[3]*Institute of Social Sciences, Academy of Physical Education In Krakow, Poland*

The purpose of the research is an attempt to state the difference In the increase of hostility In two groups of football matches spectators: football fans and hooligans. The study covered 120 respondents, where 50% were the hools, currently known as pseudo fans – the basic group – acting under the banner of Rzeszowian football clubs and the same number of Rzeszow University students who admit to be football fans – the sample group. The respondents were studied with the Scale of Interpersonal Relations (SUI), which allowed us to diagnose the style of functioning in a society and discriminate the personality disorder. Significant for this research, it was possible to define the level of hostility syndrome along with its components among the representatives of these groups. A set of behavioral features typical for this syndrome varies in specific study groups. Socially it exposes, depending on its intensity, among the participants of sports events in the form of specific behaviors. Some of them can be classified as those violating the personal sphere of other spectators, while others fall into the group which, according to the generally accepted standards, manifests the sports successes or defeats of their "beloved" club. Calculating the significance level p for the pairs created in the profiles of the basic and sample groups confirmed the existence of significant differences in their scales of interpersonal relations.

SPORT SESSION

THE IMPACT OF LENGTH, WIDTH AND FLAT FOOT ON BALANCE, Ana Kašček, IvanČuk, Suzana Pustišek, Vedran Hadžić, Maja Bučar Pajek

Faculty of sport, University of Ljubljana, Slovenia

The aim of this study was to find out if the foot morphologic characteristics impact on maintenance of balance position by athletes. Morphologic characteristics of the foot are

described with length, width and flat of the foot. 122 sport students registered in the first class in study year 2011/2012 at Faculty of Sport in Ljubljana were participating in this study. The flat foot was defined with Clark‘s method. The balance was measured with Biodex stability system (BSS) (Biodex Medical Systems Inc, Shirley, NY) under conditions: the hardness of the supporting surface = 4, we made 3 recurrence and 20 second balance maintained. We have calculated the correlation coefficients (Pearson, Kendall's tau b and Spearman's rho) and regression analysis for dependence stability indexes (Overall stability index (Osi), Anterior/Posteriorstability (A/Psi), Medial/Lateralstability (M/Lsi)). Results for the right leg, within the error of 5%, are pointing on the influence of the foot’s length on all three of the stability indexes (Osi: p = 0,001, A/Psi: p = 0,001, M/Lsi: p = 0,006). Results for the left leg are also showing on the influence of foots length on Osi (p = 0,035) in A/Psi (p= 0,027), while M/Lsi (p= 0,073) there is none. Flat foot has no influence over stability indexes.

INTER-RATER RELIABILITY IN EVALUATING MEN'S TRAMPOLINE ROUTINES AT EUROPEAN CHAMPIONSHIPS 2014, Bojan Leskošek[1], Ivan Čuk[1], Cesar J.D. Peixioto[2]

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Inter-rater reliability of judging of men's trampoline routine at European Championships (EC) 2014 in Guimarães, Portugal were analyzed. 66 men, of whom 4 and 15 does not complete all 10 jumps in their exercise with special requirements and voluntary routines, competed in qualification round. Old, classic format of scoring, where the execution score is sum of the scores of individual judges (discarding lowest and highest score) was compared with new format, where only the median scores of each jump are summed for the final score. Intra-class correlation (ICC) coefficients for both absolute agreement (ICC(A)) and consistency (ICC(C)) model and Kendall's coefficient of concordance W were computed. For the classic scoring format, extremely high reliability was found with all ICC coefficients above .99 and Kendall's W above .97 in both exercise with special requirements and voluntary routines. In new scoring format reliability of individual jumps was much lower with ICC coefficients around .90 and W coefficients around .70. Although Pearsonian correlation coefficients between old and new format scores were high (r=.965 and r=.997 for exercise with special requirements and voluntary routines, respectively), there were some important differences in rankings of competitors between old and new scoring format (Spearman rank correlation rho=.94 and rho=.96 for exercise with special requirements and voluntary routines, respectively). The results suggest high reliability of judging trampoline routines. However, any changes to scoring format should be implemented with caution.

GROUP ACROBATIC ROUTINES – »TEAMGYM«, Karmen Šibanc

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TeamGym is a sport discipline which originates from Scandinavia. It dates back to the past,but the first official European Championship was organized in 1996. The sport began to spread quite quickly and today it is well known all over the world. Compared to Artistic Gymnastics, TeamGym is based on the teams overall performance and is known only as a team

sport. The competition consists of three apparatus – Floor, Trampet and Tumbling. On each apparatus the team performs a routine to music. It is about the performance of the whole team, which is marked on the gymnastic routine and series of acrobatic elements. This will give the team a total score. The competition is for Men, Women and Mixed Teams which consist of 8 to 12 members. On the Trampet and Tumbling the team performs three different rounds of acrobatic elements. Each round is performed by 6 members of the team. The Floor Program consists of a choreographed routine that is based on different gymnastic elements where the whole body is engaged and must fulfil different requirements. TeamGym should be represented to Gymnastics Teachers, Coaches, Gymnasts, and also to people of other sports. Development of TeamGym in Slovenia started 20 years ago with good success at international competitions, but then the activity in TeamGym almost completely TeamGym is a team sport that follows trends and global development. The way the group works, way of its actions, progress and its appearance is based on a fact that all team members work as one. It is about the fact that this sport follows the world trends of encouraging teamwork.disappeared.

REACTION TIME AND MOVEMENTS FREQUENCY ABILITIES OF RHYTHMIC AND ARTISTIC GYMNASTS, Tatiana Poliszczuk[1], Dmytro Poliszczuk[2], Daria Broda-Falkowska[1], Ewa Jankowska[1]

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Gymnastic exercises are characterized by complex movement structure, performance usually takes place in a very short period of time but with the large muscular effort. Frequent changes of body segments position require gymnasts quick reaction and precision movements at high frequency.

The aim of the study was to compare reaction time and movements frequency abilities of Rhythmic (RG) and Artistic Gymnasts (AG), (aged 14-19 years) taking into account the age category and the specificity of sport discipline.

The study was performed among 41 highly trained athletes aged 14-19 years. Contestants were divided into two groups - according to sport discipline: 24 rhythmic gymnastics and 17 artistic gymnastics, - due to the age category: juniors, seniors. Training experience of the study participants ranged between 6 and 13 years. The study used two Vienna Test System (VTS): RT Reaction Time (S1) and MLS Motor Performance Series (Subtest Tapping).

RG group achieved better results in motor time test compared with AG ($p < 0,05$). At the master level AG are characterized by higher movement frequency than RG ($p < 0,001$). Similar results were found in reaction time test, motor time test and movements frequency test among the two groups of juniors.

In gymnastics in the case of the movements frequency and motor time the high level of one ability determines increasing the level of the second ability. The study found that tested abilities have improved with age and training experience among all study participants.

The study was supported by MNiSW Grant No. AWF – DS-175.

THE IMPORTANCE OF MORPHOLOGICAL FEATURES AT THE STAGE OF INITIAL AND TARGETED SPORTS TRAINING IN FEMALE SPORTING GYMNASTICS, Wiesława Pilewska, Robert Pilewski, Agnieszka Barczewska

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The aim of the study was to answer the following questions: What are the characteristics of female gymnasts' somatic build at the stage of the initial and targeted training? Does somatic build, at different stages of sports training, determine the achievement of sporting success and do the possible determinants change collaterally with the stages of sports training?

The study involved 18 girls at the age of 8–20, practicing sporting gymnastics at Bydgoski Klub Sportów Gimnastycznych "Zawisza".

Anthropometric measurements of somatic characteristics – width, length, perimeter and weight – were conducted. The obtained results were subject to anthropology-specific classifications and a statistical analysis.

In the majority of cases, girls practicing sporting gymnastics presented parameters of weight, body height and BMI index characteristic for younger age groups. 94.4% of gymnasts were characterized by proper body weight. Among the researched group: 94.4% had a short torso, wide shoulders (88.8%), narrow pelvis (94.4 %), short upper limbs (77.8%) and short lower limbs (94.4%), stocky shoulders (61.1%) slender lower arms (100%), slender thighs (72.2%) and shanks (100%). 94.4% of girls were characterized by leptosomatic body build. Somatic build was related to the sports level that changed collaterally with the stages of sports training. The values and indicators of selected morphological features have shown that the level of sport performance has changed collaterally with particular stages of sports training.

AEROBIC AND ANAEROBIC METABOLISM IN YOUNG MALE GYMNASTS, Piotr Sawicki

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One of the aim of the study was to describe physiological factors in young boys participating in the artistic gymnastic training process and to evaluate differences between the levels of aerobic and anaerobic efficiency in this group as compared to the control group.

In the present study took part young male gymnasts (G) participating in the training process since 6 years (n=12, 11-12 y.o.) and control group (n=12) boys participating in the physical education classes (K). Aerobic efficiency was evaluated using Wingate test (30 sec) for upper arms. The test was executed on hand ergometer (Monark). Adjusted load was defined on the level of 50g/kg of body mass. Aerobic efficiency was defined using gradual effort to exhaustion for lower limbs on the pedaling ergometer with simultaneous breathing gases analysis (Oxycon Pro). Statistical analysis was done using t-Student test (S-10).

In the examination of anaerobic efficiency for upper arms parameters: work, mean power and peak power were higher in the G group as compared to the K group, while power decline (%) appeared to be lower. The test to exhaustion showed that G group achieved lower results comparing to K group , the values were respectively: 48.32ml $\cdot$ kg$^{-1}\cdot$ min^{-1} and 56ml $\cdot$ kg$^{-1}\cdot$ min^{-1} ($p\leq0.05$).

The present study demonstrated that aerobic metabolism predominate in the control group compared to gymnasts. Early specialization in young male gymnasts showed advantage of anaerobic metabolism with simulations decreasing the “proper” aerobic metabolism

development. Executing Wingate test using upper arms in gymnasts group was more convenient and precise according to anaerobic efficiency.

METHODOLOGICAL REFLECTIONS OF PUBLISHED ARTICLES IF FIELD OF RHYTHMIC GYMNASTICS, Ruzena Popovic

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Former Yugoslavia is a country from which many studies on Rhythmic Sports Gymnastics (RSG) have originated. Between 1950th and 1991st at least 150 papers were published in official Serbo-Croatian language. Examined papers were subdivided in two periods (1950-1975, and 1976-1991). The published papers from the third period (1992-2015) are mostly examined in this study, which contain about 30 manuscripts. In the first period, many of published papers studied aspects of the harmonious development of the body achieved through participation in some kind of rhythmical activities. In the second period, a significant percentage of published papers examined the relationship between some segments of anthropological status of female athletes and their subsequent success. The main goal of this study was to systematically analyze and synthesize the published papers in the area of Rhythmic Gymnastics, from the aspect of applied methodology. There were reflected several methodological problems, evident from this analysis. Those most problematic contained issues of gender, social role, the heterogeneous nature of the athletes, the varying definitions of women in sport and the state of psychometric prognosis and measures instruments, available in the field of study, as well as the applied statistical procedures. In conclusion the differences and problems of individual approaches to the solving of research problems in the field of study (RG) are examined and interpreted from a comparative perspective.

COMPARISON OF NEUROMUSCULAR CHARACTERISTICS OF YOUNG AND OLDER GYMNASTS DURING HANDSTAND, Bartłomiej Niespodziński[1], Andrzej Kochanowicz[2], Jan Mieszkowski[1]

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Gymnasts can perform handstand in early ages of their training carrier but mastering it takes time and it is essential skill to many other gymnastic exercises. Such training changes in handstand expertise should manifest in neuromuscular coordination expressed as specific muscle activation.

To evaluate and compare muscle activity during handstand position of young and elite adult gymnasts and to compare agonist/antagonist torque ratio between them.

15 young prospective male gymnasts (13.9±0.7 yrs) and 12 elite adult male gymnasts (23±3 yrs) have undergone assessment of muscle activity using Noraxon TeleMyo DTS surface electromyograph during 10 second handstand on the AMTI force platform. Muscle activity was expressed as peak and mean percent values of maximal isometric voluntary contraction (%MVIC) obtained on Biodex System 4 isokinetic dynamometer.

As it was predicted normalized torque for each joint, was higher in older gymnasts, however, with age and training experience ratio of glenohumeral joint significantly increase for the advance of extensors. For elbow joint and wrist joint such relation do not differ.

In case of muscle activity, adults showed less % activity than younger ones. For mean values it was 0.17±0.07 compare to 0.32±0.19 %MVIC and 0.04±0.02 compare to 0.10±0.05 for triceps and biceps brachii muscles, respectively. Regarding the peak values, significantly higher values for young gymnasts was also seen for trapezius descendens, deltoideus medius and anterior, which was 34, 39 and 53 percentage points, respectively. Only latissimus dorsi muscle showed the opposite: 34 percentage points higher values for adult gymnasts in peak %MVIC.

Intermuscle torque relations in glenohumeral joint differs from young to adult gymnasts, but in elbow and wrist not. Muscle activity of adult gymnast during handstand is lower in compare to young ones, but opposite in case of latissumus dorsi. During handstand carpal flexors are the most active muscle group among young and adult gymnasts.

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EDUCATION SESSION

ANALYSIS OF TEACHERS-PUPILS INTERACTION DURING GYMNASTICS WARMING-UP IN PROCESS OF PE TEACHERS' EDUCATION - CASE STUDY, Jan Chrudimský, Iveta Holá, Viléma Novotná

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Warming-up is an integral part of every lesson of physical education and in teacher's preparation. Knowledge of developing, organizing and leading warming-up are considered as basic didactic competences of PE teachers. In spite of different movement content of warming-up according to focus on following part of PE lesson (gymnastics athletics, swimming or sports game) we are able to find a common pattern of teacher´s behaviour during warming-up leading. By our paper we are concerned with analysis of teacher´s and pupil´s behaviour during warming-up during lessons with gymnastics movement content.

Evaluation of didactic interaction of teacher (teaching student) – pupils ware realized through modified method of Analysis of didactic interaction – MADI. Intentional sample of synchronized sounds and video records of warming-up of students of physical education were analysed.

The results reflect that the most frequent forms of teacher behaviour during leading worming-up and also with musical accompaniment is instruction and correction. From list of teacher´s communication is it verbal communication and verbal communication linked with movements.

Records reflect usability of MADI like as instrument for evaluation of learning outcomes future PE teachers, as well as instrument for feedback providing about quality and content of student didactic performance.

GYMNASTIC LITERACY COMPONENTS VERIFIED THROUGH REPERTORY GRID TECHNIQUE – CASE STUDY, Iveta Holá, Jan Chrudimský, Viléma Novotná

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The purpose of cultivating physical literacy is to acquire fundamentals movements creating suitable "movement pattern" from the aspect of the quality of movement expression and physical education. Basic preparation in rhythmic gymnastics (RG) aims gradual development of motor abilities and sports skills on the principle of comprehensive foundation based on theory and professional practice. Acquired competence can be used to transfer them to specific gymnastic skills in the acquisition of gymnastic literacy.

The correspondence between the published scientific theory of training and experience of coaching was verified using Repertory grid technique (Repertory grid interview). Along the semi-structured interviews with selected rhythmic gymnastics experts was achieved large number of same personal constructs (opinions), which documented the topic.

The experts, in view of the gymnastic literacy agreed on the fact that its largest foundation in RG practice has a set of exercises for body posture, a set of exercises without apparatus and a set of exercises to develop manipulation skills. The smallest significance has (by experts) set of exercise for physical fitness and set of exercise for orientation in space.

The stage of gymnasts´ development should emphasize the positive experience of motion over the importance of competition results and emphasize the cultivation of physical and gymnastic literacy over senseless drill and countless repetition of movements.

EVALUATION OF TEACHERS' ACTIVITIES BY THE METHOD ADI, Kristýna Hubená, Irena Čechovská, Jan Chrudimský

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Tutorial of physical education is subject of investigation a long time. The most often are researches focused upon physical loading of pupils during lesson and time utilization for pupils' active movements. Today is already essential area of investigation also forms of interaction among teacher and pupils.

Determination of interactive pattern of teachers and pupils behaviour is contribution for description and analysis of appearances during lessons of physical education. Obtained finding contribute not only to education of future teachers, but they may be background for increasing effectiveness of one´s own didactic process. The first attempts for analysis of didactic interactions are discovering in 60s of last century. During 80s happen to fundamental forming of method of Analysis of Didactic Interaction (ADI). Method was successfully used in different learning subjects, including physical education. Today is ADI utilized continually with modification for PE e.g. Modified Analysis of Didactic Interaction – MADI.

Contribution of ADI/MADI is connected with possibilities to quantified teacher's and pupils' activities and behaviour during PE lessons and also for build up analysis of their bilateral interaction. Results are the amount of objectification education reality through categories which represent teachers and pupils activities. Methods is for processer very elaborate, time-

consuming, drilling of evaluator is demanded and also in light of uniform approach by encoding observed behaviour is difficult.

FUNDAMENTALS OF MUSIC-MOVEMENT COMPOSITIONS (GROUP PERFORMANCES) FOR WORLD GYMNAESTRADA, Viléma Novotná, Iveta Holá, Jan Chrudimský

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World Gymnaestrada is opportunity for international confrontation of various concepts of Gymnastics for all and approaches to creating music-movement compositions. Sport for All presents the group performances that affect the lifestyle of large amounts of athletes. In our creative work, we pay attention to the theoretical aspects of the creation and effectiveness of the created physical education program.

Motivation of athletes to participate in World Gymnaestrada and subjective assessment of the group performance were repeatedly collected through a questionnaire. The severity of exercises during group performances was measured through monitoring of heart rate in relation to the theoretical value. Criteria of creating performance quality were writing over the years defined analysis and observation of our and foreign performances.

The biggest motivation for gymnasts is their participation in the World event with a unique atmosphere, wishes to practice in a team and feel the performances together. The values of heart rate during the performances showed a higher level of physical fitness of gymnasts compared with the general population. For creative work in group composition were defined principles: unity, gradation, contrast, repetition, variety and phrase.

For further development and improvement of the performances we identified two basic assumptions: implementation of the principles in the creating of composition and sport concept and contents of Gymnastics for all.

PLACE AND CONTENT OF GYMNASTICS LESSON UNITS CLASSES IN SCHOOLS WITH GENERAL EDUCATION IN RUSSIAN FEDERATION, Vladimir Lyakh1 Larisa Glinchikova2

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In physical education programs for pupils of all classes in former USSR and currently in Russian Federation a significant place have Gymnastics lessons with elements of Acrobatics.

Within 73 hours for mastering the core material throughout the academic year, there are 18 hours allotted for Gymnastics lessons from 1 to 11 classes. In addition, Gymnastics material can be developed and improved during variative part of program (by choice of teacher, pupils, school).

The report attempts to:

1) consideration of place and content of Gymnastics lesson units classes with elements of Acrobatics, recommended in programs for schools with general education in Russian Federation for pupils of primary (1 – 4 classes), basic (5 – 9 classes) and secondary (10 - 11 classes) school;

2) discussion of real situation with gymnastics lessons conduction in schools of Kaliningrad region of Russian Federation.

THE INFLUENCE OF GYMNASTICS PROGRAM ON ANTHROPOLOGICAL CHARACTERISTICS OF FIRST-GRADE STUDENTS, Sunčica Delaš Kalinski, Mirjana Milić, Ana Kezić

Faculty of Kinesiology, University of Split, Croatia

The aim of this research was to identify the influence of the kinesiological treatment, enriched with artistic gymnastics skills, on different anthropological characteristics of first grade students. One hundred and two first-graders were involved in the study, with chronological age of 7±0.5. They were divided in two groups: experimental (76) and (26) control. Both groups attended physical education class 3 times a week for 45 minutes during 6 months but according to different program. Both groups attended current curriculum program but experimental group also did some gymnastics skills (selected due to the material conditions of the school). Level of motor abilities and anthropometric characteristics have been measured in the beginning, after three, after six months of applied treatment and 7 weeks after finishing the treatment.

Through this period of time, there was an increase of numerical parameters of morphological variables, however, not significant. Statistically significant differences between the groups were found in different motor variables in different measurement points. Identified differences suggest that the influence of the applied gymnastics treatment in the earlier stages is only visible in the variables that, given the inborn coefficient, have the greatest ability to change (variables that hypothetical estimate flexibility). Upon cessation of the treatment differences in these variables between samples have not been established. The variables that have a higher coefficient of innateness, differences between samples were determined in subsequent measurement points.

Given the well-known positive effects of similar treatments, it can be concluded that the time of implementation of the experimental gymnastics program was too short to determine significant differences in a number of variables between groups.

HEALTH SESSION

RISK FACTORS FOR EATING DISORDERS IN GYMNASTS: PILOT STUDY, Aleksandra Aleksić-Veljković[1], Dejan Madić[1], Dušanka Đurović[2], Kamenka Živčić Marković[3], Katarina Herodek[4]

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Numerous studies in recent years suggest that in athletes from the aesthetic sports there is a high risk of developing eating disorders. Because of the seriousness of the consequences of these disorders, early detection is essential in order to prevent progression. The aim of this study

is to determine whether there are risks of eating disorders development in active and former gymnasts, and compare them to the control group of non-athletes.

The study involved 19 gymnasts (mean age 17.6±2.5 years, BMI 20.5±2.7), 32 former gymnasts (mean age 28.5±7.6 years, BMI 22.7±3.5) and 32 females (mean age 31.7±6.6 years, BMI 24.1±3.5). All respondents completed the Eating Attitudes Test (EAT-26).

The results of ANOVA analysis showed that there were no statistically significant differences between groups ($p > .005$) in total results in the EAT-26. However, the maximal value in each group exceeded 20 points, and for the questions about the behavior that indicates disorders, 5 to 10% of respondents gave answers that indicate problem in behavior related to nutrition and necessary consultations with a specialist. There were statistically significant differences between groups in Oral control subscale ($p=.024$). The active gymnasts had higher prevalence of behavior that can cause higher risk of developing eating patterns.

Based on the results of this transversal study and previous researches in this area, we will start monitoring programs and strategies for maintaining or losing weight in active and former gymnasts, and provide them necessary informations about proper nutrition, as well as other preventive treatments.

ANTHROPOMETRIC PROFILE OF GIRLS AGED 9-13, PRACTISING AESTHETIC SPORTS, Daria Broda-Falkowska, Tatiana Poliszczuk

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Besides performance technique judges' evaluation is also influenced by aesthetic values in aesthetic sports. In most sports disciplines proper body build dictates not only general but also special physical effectiveness and additionally aesthetic look during a presentation in competitions.

The goal was to characterize and compare somatic build of contestants in chosen aesthetic disciplines.

The research covered 103 girls aged 9-13 who haven't achieved age at menarche yet. The research was divided into five groups: rhythmic gymnasts [RG] (n=21), acrobatic gymnasts [AG] (n=21), figure skaters [FS] (n=21), sports dancers training modern dance [SD] (n=21) and control group [CG] (n=21).

The Health-Carter body build and BMI indicator evaluation methods were employed.

AG were much shorter and possessed smaller index of mesomorphy rating ($p<0.001$) than the rest of the girls. RG characterized by the lowest body mass and the lowest influence of endomorphy ($p<0.05$) and BMI indicator, which value was located in the lower limit of normal. The comparison of average results of body mass and height proved similarity between the groups SD, FS and CG. FS characterized by bigger massiveness than contestants of the rest of aesthetic disciplines. SD somatic profile indicates their similarity in body build to girls who did not train. Dancers characterized by the biggest endomorphy in comparison to the rest of tested contestants of other disciplines.

Aesthetic disciplines contestants body build is conditioned by the selection for the specific sport. Despite preferring slim body build, tested girls grow up correctly.

The study was supported by MNiSWGrant No. AWF – DM-42.

SUBJECTIVE ASSESSMENT OF KINESIOTHERAPY AS AN ELEMENT OF COMPREHENSIVE REHABILITATION PROCESS OF SUBJECTS WITH LOWER SPINE PAIN, Wioletta Łubkowska[1], Mirosława Szark-Eckardt[2], Żukowska Hanna[2], Justyna Połeć

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Spinal pain has triggered interest in many fields of medicine, such as orthopedics, neurology, rheumatology, and rehabilitation. Despite ongoing development of surgery techniques, a major role is played by fitness improvement treatments, which need to be promoted.

The aim of the research was a subjective assessment of kinesiotherapy as an element of comprehensive rehabilitation process of subjects with lower spine pain.

This paper has an empirical character. The research was conducted amongst a randomly selected group of 60 patients of Independent Public Health Care Unit in Choszczno, Poland (rehabilitation at an outpatients' clinic), aged 20-51. All of them were subjected to a series of 10 kinesiotherapy treatments. The research used diagnostic polling method and the following techniques:survey and implicit interview.

The research proved that after completion of 10 treatments, the subjects noticed a significant improvement of their health. Kinesiotherapy helped return to an active professional life for those who were forced to resign or suspend their work. Subjects reported that 10 kinesiotherapy treatments were enough to notice their effectiveness in lumbar spine pain reduction. Kinesiotherapy treatments resulted in a reduced usage of painkillers.

.There is evidence of positive impact of physical exercise on treatment results and beneficial effects in patients with spinal pain. Proper education aimed at changing bad habits and advising how to care for spine may be a powerful way to fight for health.

VOCATIONAL QUALIFICATIONS OF THE EXERCISE SPECIALISTS FOR PRE- AND POSTNATAL PHYSICAL ACTIVITY – A RESEARCH PROJECT CONCEPT, Aneta Worska, Anna Szumilewicz

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Research over the past 30 years have shown that regular physical activity during pregnancy has a multidirectional positive impact on the health of pregnant women and their babies. Nevertheless, the authors from different countries observe insufficient level of prenatal physical activity. As the reasons for this phenomenon they list among other things: lack of information among women on the exercises during pregnancy and lack of social support. Exercise specialists are supposed to play the most important role in providing information and professional support in the design of physical activity programmes for different populations. However, our pilot study has demonstrated that they are not prepared to conduct exercise sessions with pregnant clients.

Our aim is to present the concept of a research project focused on the analysis of the exercise specialist's qualifications to implement exercises in pregnancy. Presented will be the research methodology and expected results in the context of the European Qualifications Framework and the international educational standards of the Europe Active (former European Health and Fitness Association).

THE INCIDENCE OF THE RECTUS DIASTASISAMONG PREGNANT WOMEN PARTICIPATING IN TWO DIFFERENT EXERCISE PROGRAMMES – A RESEARCH PROJECT CONCEPT, Natalia Rajkowska, Anna Szumilewicz, Stanisław Sawczyn

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The abdominal muscles are essential to keep the abdominal viscera, good posture, stabilize the pelvis and are involved in the movements of the trunk. During pregnancy, women should pay special attention to exercising abdominal muscles. Due to inter alia the growing uterus, changes in the curvature of the spine and the effect of pregnancy hormones they are heavily stretched. An adverse effect of this can be the separation of the rectus muscles, so called the rectus diastasis. The ethiology of this condition is unknown. The imbalance in the abdominal wall in the medium and long term may cause low back pain and lower the quality of life.

The popularity of this topic is very low. Reviewing the international guidelines on exercise in pregnancy we didn't find any information on how to perform specific exercises for the prevention or treatment of the rectus diastasis.

We aim to present the research project concept on the incidence of the rectus diastasis among pregnant women participating in two different exercise programmes. The first programme is based on the standard set of strengthening exercises recommended for pregnancy. In the second one we include the abdominal exercises that might prevent the appearance of the separationin the abdominal wall, based on their biomechanical analyses. We will present the research methodology and expected results of the project to be used in preparing new international guidelines for prenatal exercise programmes design.

COMPARISON OF THE EFFECT OF RELAXATION CAUSED BY SENSORY DEPRIVATION TECHNIQUE AND THE TECHNIQUE OF BREATHING CONTROL ON CHANGES IN BODY TEMPERATURE CAUSED BY THE VISUALISATION PROCESS, Monika Naczk[1], Zasada Mariusz[1], Zdzisław Sybilski[2]

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Visualization is the process of using the imagination to achieve what we intend. The visualization training as a relaxation technique is a creative activity aimed at forming habits. In contrast to dreams it is a conscious action, which distinguishes it from a vision or hallucination. The session in the deprivation chamber introduces a person in the state of equilibrium between the left and right hemisphere of the brain, stimulating the alpha state. According to H. Kampf the visualisation is the most effective in the alpha state, because a human has the ability to focus a greater amount of attention (predominant frequency waves are from 8 to 13 Hz, which, being present in the stand-by state, give a deeper state of consciousness).

To determine the effectiveness of the visualization process to increase body temperature in the left upper limb of subjects after a relaxing session in the deprivation chamber and subjects undergoing relaxation techniques using breathing control.

The study monitored a group of 34 people aged from 17 to 27 years. They were people actively involved in sport who have not been previously subjected to a process of visualization. The subjects were divided into two groups: the experimental group (the subjects did a session in the deprivation chamber) and the control group (the subjects underwent the relaxation process

using breathing control technique). The study was conducted in the laboratory conditions, in an enclosed, separated from any disturbing external factors. The temperature measurement in the left upper limb lasted 10 minutes.

The studies have shown a very significant relation between the susceptibility to suggestion and the ability to control body temperature among people who have previously been in the deprivation chamber. The individuals who were subjected to relaxation by the technique of controlled breathing, did not reveal any changes in the ability to regulate the body temperature.

The change in body temperature as a result of visualization and the intensification of changes due to the relaxation method, proves the effectiveness of the relaxation method caused by deprivation in sport training aimed at forming the habits connected not only with the technical training.

THE EFFECTIVENESS OF THE GYMNASTICS AND DANCE IN FORMING THE PHYSICAL EFFICIENCY OF THE MEDICAL STUDIES FEMALE STUDENTS,

Agnieszka Perzyńska, Tomasz Zegarski

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Gymnastics and dance is now one of the most modern forms of physical activity. In recent years we observe rapid development of modern aerobics, the most important of is the growing interest of women in all ages. Making this type of physical activity and exercise-aerobic is one of the many forms of movement forcing people to exercise.

Evaluation of the effectiveness of individual exercises gymnastics and dance in the level of physical fitness and an analysis of the reasons that medical school students take this form of physical education classes. The specific objectives are to know the definition of gymnastics and her subdisciplines, as well as the definition of dance and its types; determine which gymnastics exercises and dance are the most useful for physical education classes, and also to evaluate the level of physical activity of students and evaluation of physical and mental well-being before and after school facility.

The study involved 50 students of the first year of medical studies at the Medical College of L. Rydygier Nicolaus in Bydgoszcz by Copernicus University in Torun. The research tool was an original questionnaire, conducted in 25-29.05.2015. The survey include twelve questions about gymnastic and dance exercises.

The survey involved respondents attend on fitness classes as part of physical education at the university. More than half of the surveyed students chose the fitness classes because their priority was to improve the physical fitness for simple schemes of gymnastics and dance. The students are aware of how the gymnastics and dance exercises effect on their physical and mental health - the main motive for taking this type of physical exercise was to improve the well-being and the struggle for slim body.

The obtained results prove that the forms of gymnastics and dance as part of physical education are positively received by the students. Classes are conducted in a theoretical and practical manner, and hence the girls understand basic commands to perform the choreography and they are able to give a satisfactory repeat the steps to the music. During the academic year the most useful and most liked exercises were speed- endurance exercise in the form of aerobics. The most effective turned out to be endurance- speed exercises, and the least stretching exercises.

VARIA

ASSESSMENT OF THE RELATIONSHIP BETWEEN MAXIMUM FORCE AND FORCE SENSE IN LOWER EXTREMITIES

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Adequate level of muscle strength determines correct posture, fitness and good sports results. Strength exercises have been used for a long time for the purpose of correcting and rehabilitating the motor system at different stages of human development. A drop in muscle strength triggers adverse changes in the body significantly reducing physical fitness. Due to on-going civilisational, technological and information development of the human environment, man's motor abilities must be rationally stimulated and improved especially as regards their coordination rather than just fitness. Each motor task requires a certain amount of "force input". Most human activities need not only maximum but also optimal force, i.e. the kind of force which is necessary to carry out a motor task efficiently and accurately. Consequently, the authors of the present study decided to analyse how much the level of maximum force in lower extremities is related to the sense of the amount of force used (so-called force sense).

The study was carried out on 54 students of the University School of Physical Education in Wrocław. Maximum force (Fmax) and force sense of lower extremities were established with the use of a specialist device called "extremity muscle force characterograph". The study started with the subject generating maximum force with the left and right lower extremities one after the other which was followed by a single trial (with vision analysis) carried out to determine 50% of maximum force (50%Fmax as the so-called model). Subsequently, the subject was to recreate 50%Fmax from memory in five trials (without vision analysis) for the left and right lower extremities separately. The data gathered were analysed with commonly used statistical tools. Basic calculated parameters were the following – arithmetical mean, standard deviation, coefficients of variation as well as minimum and maximum values.

The results are presented in relative values of the parameters assessed. Mean value of force sense obtained by subjects with the left lower extremity amounted to 43.28 N, the same figure for the right extremity being 58.33 N. Mean value of maximum force (Fmax) obtained with right lower extremity was higher (897.17N) compared to the same value for the left extremity (769.94N), but the difference is not statistically significant (P=0,8). The highest value of maximum force obtained was 1308N for the left lower extremity and 1530N for the right one. The lowest values of maximum force generated by subjects were 294N and 216N for the right and left lower extremities respectively. The strength of correlation between variables of maximum force and force sense in the left lower extremity amounted to 0.38. Correlation for the right lower extremity stood at the same level – 0.37. Obtained results are not statistically significant (p>0,05).

It can be concluded that an increase in maximum force generated with the left and right lower extremities will cause an increase in force sense in both extremities. The results obtained in the study are a great inspiration for the authors motivating them to keep on reflecting on the problem and carry out a long-term experiment employing different methods of strength training.

*Research project N RSA1 001551 Development of muscle strength in persons practicing combat and strength sports in the context of their changing morphological structure

POSTURAL STABILITY LEVEL IN JUDO PRACTITIONERS, Jarosław Maśliński, Kazimierz Witkowski, Wojciech Cieśliński, Tomasz Śliz

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One of the aims of judo is to gain advantage over the opponent by taking him/her down to the mat. In order to create the best possible mechanical conditions to do the throw, the contestant tries at all costs to cause the opponent to lose balance. In consequence, the opponent will be unbalanced (*kuzushi*) and his/her defence against the throw will be less efficient. An unbalanced opponent is not, however, a 'dead' opponent. His/her task is to defend him/herself against the unbalancing. The balance maintenance also depends on, among other things, the morphological features of the contestant, including: the body mass, the body height, the thelion height (i.e. nipple height) and the area where the contestant is grappled during the throw. The grapple height influences the lever-arm used to induce the unbalancing, and the lever-arm, in turn, influences the torque.

The study was made on 84 active judo practitioners aged 15–42 years from Wrocław-based judo clubs. Two tests were used to measure the balance. The dynamic balance was measured during a march on a purposefully designed truss. The static balance was measured using the Flamingo Balance Test.

The study results show that the level of dynamic balance increases in the studied subjects along with their age and their experience as sports practitioners. The level of static balance does not show that correlation with the calendar age.

The study results strongly suggest that dynamic balance increases in direct relation to the age and practice experience of athletes. The relation is reversed in case of the static balance, which may be a consequence of changes in body proportions of the group of juniors under the study caused by their growth. Considering the balance improvement related to the practice experience of athletes, the utilitarian values of judo practice should be emphasised as they may have a considerable impact on our daily life.

THE APPLICATION OF AUGMENTED REALITY (AR) TECHNOLOGY TO IMPROVE THE TECHNIQUES OF JUDO, Wojciech B. Cieśliński[1], Kazimierz Witkowski[1], Jarosław Maśliński[1], Roman Kalina[2] Sławomir Kownacki[3]

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This article describes the role and meaning of AR technology in teaching and developing judo techniques.

The aim of this research is an elaboration of a AR implementation model in judo teaching techniques – perspective of biomechanics of movement, psychology and sports pedagogics.

The subject of this research is the process of judo techniques teaching and the AR system functionality.

The objects of research are children learning judo and adults improving themselves individually (master level).

It is assumed hypothetically that "illustrating reality" with the use of AR increases learning attractiveness, deepens the effect of mental and imagination training.

Augmented reality – is an information technology that allows connection of real and computer world.

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CHANGES IN SPECIAL FITNESS EFFICIENCY OF TEN-YEAR-OLD TENNIS PLAYERS IN THE ANNUAL TRAINING CYCLE, Tomasz Waldziński, Ewa Waldzińska

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Dynamic development in tennis involves great progress in methods of management of tennis training process. In the field of theory and practice of sport training the way of showing physical fitness was distinguished, that is general and special physical efficiency. It is believed that the general efficiency constitutes a base to form special efficiency, and their mutual proportions are different in other sport disciplines.

The test was conducted on a group of thirty competitors at the age of ten practising tennis in the podlaskie province. Participants of the examinations were divided into two groups according to sex. Changes in special efficiency were noticed in both groups under influence of training in the annual training cycle.

In the group of tennis players dynamic progress in abilities in steering the ball and strength of tennis blows was noticed.

CORRELATION BETWEEN BODY ESTEEM AND MOTIVATION IN GROUP OF PROFESSIONAL SWIMMERS AND ATHLETES, Aleksandra Budzisz. Monika Nawrocka

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The aim of the research was to determine the correlation between the motivation scale and the body esteem scale. Researched group consisted of people who are highly trained in swimming and track & field (both females and males). The research was conducted on a group (N=77) of athletes (N=42) and swimmers (N=35) selected during training camp of the Polish sports association team.

Body Esteem Scale (BES), which was created by S.L. Franzoi, S.A. Shields, 1984, and translated into Polish by M. Lipowska, M. Lipowski, was applied for the research. This method

makes it possible to determine subjective esteem of one's own body. The scale consists of 35 items in 3 subscales, different for females and males.

Motivation was measured with Sport Orientation Questionnaire, which was created by D.L. Gill and T.E. Deeter, 1988. The scale is made of 2 subscales - goal and win, each one consists of 6 items designed to measure goal motivation, and win motivation.

Research showed that from the perspective of Items and discipline, which was not divided by gender resulted in statistically significant low correlations (R=0,30-0,50) among athletes and swimmers. After narrowing the figures to gender, the statistically significant correlation became stronger (R=0,50-0,70).

The demonstration of the research tool assumes the possibility of investigation of mutual dependency in the terms of gender-dedicated subscales. This method indicated significant correlation between female swimmers in subscale of sexual attractiveness, and the goal orientation, as well as the win orientation (R=0,61-0,73).

WHAT CAN COGNITIVE SCIENCE BRING TO GYMNASTICS? WHAT CAN SPORT BRING TO COGNITIVE SCIENCE?, Sławomir Kujawski

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Neuroscience develops various theories considering move pattern acquisition, changes in neural system due to physical training. Information from this field can help with scientific description of most effective forms of physical training. Knowledge about neural system functioning contributed to create new forms of rehabilitation. Moreover, some researchers investigated cognitive profiles of sportsmen. Scientists wanted to prove differences between sportsmen on various level of performance in tasks such as reaction time and cognitive inhibition. As a result, to maximize sportsman performance, cognitive training for sportsmen could be developed. Noteworthy, embodied cognition and the extended mind theory can be used as useful tool to describe sportsmen cognition.

On the other hand, sports has own role in developing new techniques in clinical neuroscience.

Shift of perspective on human from a mind - body dichotomy to embodied mind with its close relationships with body and environment resulted in new field of researches in neuroscience.

Effects of physical activity on increasing cognitive functioning in elderly people is well established. Moreover, gymnastics seems to be valuable tool to bring help to elderly who are in fall group risk.