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BOOK OF ABSTRACTS

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OPENING LECTURES

WHY DO WE FUND ELITE SPORT?

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Purpose: The research set out in this paper aims to investigate the evidence underpinning the reasons why elite sport is funded. Since 2012, in the UK, public funding for elite sport increased by 13%, to £347 million in the run up to the Rio 2016 Olympic Games. This increase in funding stands in stark contrast to most social policy under the recent UK Government's economic austerity agenda, especially given the narrow range of direct beneficiaries.

Funding of elite sport is based on a number of value' rationales: increased participation and thus improved health, a 'feel good' factor, the creation of role models for youth and the development of nationhood to name the key reasons. However, academic scholars and policy organisations have struggled to find evidence that supports these perceived benefits.

Method: The research was carried out following a systematic review of literature methodology. A panel of experts was created from those who research and work in elite sport to identify key words and phrases to be used in the research. The search investigated literature from professional, policy and academic sources that has been published since 1996. This date was chosen as this was the point at which the UK began to invest significantly in elite sport.

Results: There is no evidence to support that investment in elite sport leads to sustained increases in participation. Any increases are associated with investment in mega events and are short lived. In some cases, levels of participation fall below pre-event levels. This means that investment in elite sport has no impact on the health of a nation. There is no evidence of a positive impact of elite athletes as mentors. There is some evidence of a 'feel good' factor and the building of nation hood, but this is again associated with the staging of events and only occurs if the national team is successful.

Conclusion: There is no real justification for investing in elite sport and thus there must be an alternative explanation for the ongoing and increasing investment occurring in many countries. A potential explanation is that the money spent is very small in the general scheme of things and thus reducing or removing it is not worth the subsequent outcry from people who are interested in elite sport.

YES I CAN!!

Peter R. Rehor
University of Western States

The challenge for 21st century to our profession is not only to develop faster and stronger athletes in a small population sample, but to enhance habitual, regular aerobic exercise participation in a large segment of the population especially in those in their mature (wisdom) life stage.....

Physical activity and exercise contribute to physiological benefits such as lower risk of cardiovascular disease (CHD), better control of diabetes mellitus, reduced risk of certain types of cancer, and the lower risk of osteoporosis. Physical activity also contributes to psychological benefits such as improving self-esteem and self-concept and reducing depression, anxiety, and stress. Finally, and not widely recognized, the return to active transportation and recreation has a significant ecological impact on the preservation of natural resources, reduction of air and water pollution and environmental sustainability in general.

Despite the overall acceptance of the benefits of physical activity, the majority of people around the world remain sedentary. Recent surveys conducted in Australia, Canada, England, and the United States indicate that only about 10% - 20 % of the adult population of each country could be called “aerobically” active to a level needed for prevention and control of the chronic disease tsunami heading towards the “developed and developing nations”.

This presentation examines physical activity and exercise from the behavioural determinant perspectives, challenging the dominant structure and implementations of programs globally applied by schools, municipalities and government in the US and other technologically developed countries. The new, scientifically based model of exercise adoption and adherence is presented in an easily comprehended mode and entertaining manner, encompassing the author’s 40 years of experience as a researcher and builder of academic and corporate wellness programs in the US, Canada and Australia.

ANALYSIS OF HUMAN MOVEMENT

HUMAN GAIT: THEORY AND APPLICATION

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Introduction: human gait refers to locomotion achieved through the movement of human limbs and can be defined as bipedal. Bipedalism is a specific form of locomotion where an organism moves using its two rear limbs or legs. The form of movement is most often associated with the human race. The evolution of human bipedalism is still a fundamental and unsolved question for many scientist from many fields. Human bipedalism is probably the most influential structural and behavioral adaptation in early hominid development but to this day origins of the evolutionary transition to bipedalism are poorly understood. There are more than 30 different hypotheses and theories, which in their own way try to explain the evolution of bipedalism. All these theories attempt to give the answer to the riddle: have we changed from inside or outside? Has the nature forced us or our brains evolved enough to change us?

Purpose: the purpose of the lecture is to summarize and to show the most relevant theories and facts about this topic. Further, the aim is to show the role of human gait in today's understanding of basic human locomotion. Furthermore, the lecture will show the applicative value of gait analysis with its contribution to science and practice. Gait analysis is used to analyze the biomechanics ability and to quantify the human motion and walking. It can be an excellent tool in the diagnosis and identification of specific locomotor problems and conditions, medical treatments, rehabilitation and injury prevention. This technology can be used for the application such as in clinical and medical diagnostics of normal and pathological gait stereotype. The lecture will present today's most important areas, diagnostic technologies and practical advice and guidance in gait analysis.

Key words: human gait, bipedalism, history, technology of measurement, application, benefits

ACTIVITY VS INACTIVITY, MUSCLE VS FAT IN ELDERLY POPULATION

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Objective: It is well known that physical inactivity is an increasing health problem that has a marked negative impact not only on muscle mass (de Boer, 2008) and function (Rejc et al., JAP, 2014) but also on metabolic balance (Biolo et al., 2008), skeletal muscle and whole-body oxidative metabolism (Porcelli et al. JAP 2010, Salvadego et al. JAP 2011), cardiovascular health and is associated with increased disability and mortality (Janssen, Heymsfield, & Ross, 2002; Metter, Talbot, Schrager, & Conwit, 2002). It is also well known that hospitalization has a negative impact on the health of elderly people (Inouye et al., 1993). This may be partly due to the change in their life habits (Covinsky et al., 2003) but it is definitely due to a large extent to the limitations in physical activity. The aim of present study was to investigate the influence of the level of physical activity, both extremely active and extremely inactive subjects, on body composition parameters with special emphasis on the relationship of lean muscle mass (LMM) and fat mass (FM) in the elderly.

Method: We used a data from two separated studies, both in the framework of the EU project PANGeA: Physical Activity and Nutrition for Quality Ageing. First was aiming to monitored the quantity of PA with GPAQ in three Slovenian towns using a sample of 445 subjects [women N = 284 (64 %), age 66.9 ± 5.1 years, men N = 161 (36 %), age 68.4 ± 5.6 years]. The subjects were divided in two groups (extremely active and extremely inactive) by METs. Second study, from which we used a data, was an experimental bed rest. With two weeks complete inactivity we cause an acute inactivity period for group of elderly subjects (N= 16; 55-65 years). LMM and FM in both studies were measured with bioimpedance.

Results: We found that the extremely physically active elderly had a significantly lower values of FM and significantly greater values of LMM, compared with extremely inactive group. The results of experimental study have shown that acute inactivity increased a fat mass (pre-post), and same changes have occurred but without a significant difference. The results will be presented and explained in detail.

Conclusion: The level of physical activity has definitely a big impact on body composition as one of the factors and indicators of health. The detrimental effect of inactivity on muscle mass in elderly as it emerges from the present work represents a reason to suggest an active life style to the elderly and to avoid or to minimize the period of inactivity during hospitalization. We need to facilitate the introduction of the necessary adaptations to the environment and create the incentives required to help elderly population to be more active and increase the quality of their lives.

VISUAL UNCERTAINTY IN ESPECIAL SKILLS

Czyż S.H.¹, Kwon O.-S.², Marzec J.³, Styrkowiec P.⁴, Breslin, G.⁵

Purpose: The extent of the role vision plays in the emergence of an especial skill remains unknown. Therefore, the main objective of the study was to determine how occluding visual information during performance of the especial skill will affect the presence of an especial skill and its magnitude. We also wanted to further characterize the role of visual context in the emergence of an especial skill.

Methods: Ten male senior basketball players in Poland's 2nd Division, participated in the experiment. Participants represented various positions on the team (e.g. point guard, shooting guard and center). In our experiment we manipulated visual information by asking players to perform free throws under two conditions: (1) Normal viewing conditions and (2) whilst wearing vision blurring goggles (corrective lenses with +4.00 diopters). As such, we selectively manipulated visual information without affecting the participants' explicit knowledge that they were shooting free throws. Participants performed 75 shots for each of the following distances: 2.74 m (9 ft), 3.35 m (11 ft), 3.96 m (13 ft), 4.57 m (15 ft), 5.18 m (17 ft), 5.79 m (19 ft), 6.4 m (21 ft).

Results: A Bayesian statistical generalization model of especial skills was applied to the data. Through the application of the model we characterized the shot proficiency curve, examined how the experimental manipulation affects the parameters for visual noise and especial skills, as well as determining the best fit of the model to the results. We found that shot efficiency was significantly lower in blurred vision conditions, as expected, and that the concave shape of shot proficiency function in normal vision conditions became approximately linear in blurred vision conditions. By applying a recently proposed the generalization model of especial skills, we suggest that the linearity of shot proficiency function reflects the participants' lesser dependence on especial skill in blurred vision conditions.

Conclusions: We found that an especial skill was present in the normal vision condition. In blurred vision the magnitude of especial skill was smaller and it did not reach statistical significance. Surprisingly, the occlusion of visual information increased the noise in motor rather than in the visual system. It may suggest that not one mechanism is responsible for the emergence of an especial skill but the interaction of vision and action. Furthermore, the context in which a free throw is performed appears to be important determinant of whether an especial skill will emerge.

Key words: motor control, expert performance, practice specificity, visual cues

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TREND OF ADAPTATION TO TREADMILL WALKING DURING DIFFERENT PHASES OF PREGNANCY MEASURED BY GROUND REACTION FORCE AND STRIDE DURATION

Marta Gimunová

Purpose: Treadmill and overground gait are from the mechanical point of view considered to be equivalent. Previous studies show that treadmill walking, as an unusual experience, requires one to six minutes of familiarization in young healthy subjects. Treadmill walking may be therefore used in studies of adaptation to unfamiliar gait environment. Pregnancy influences an array of factors affecting gait parameters. As pregnancy progresses altered balance and higher risk of falling were reported. Purpose of current study was to compare the trend of adaptation to a treadmill walking at three pregnancy stages measured by ground reaction force at maximal weight acceptance and push-off phases and by the stride duration.

Methods: Six pregnant subjects participated in this study at three pregnancy stages. Two hundred step cycles measured by Pedar Insole System were obtained from the five minute long treadmill walking at the velocity of 3 km.h⁻¹. These step cycles were divided into five subgroups of forty step cycles, each subgroup was corresponding approximately to one minute of treadmill gait. To assess differences between step subgroups of each measurement Kruskal Wallis test followed by post hoc testing was used. The level of significance was set to 0.05.

Results: Statistically significant changes in subgroups of analysed force and time variables were observed during all pregnancy stages, especially between first, second and fifth minute of walking. These trends are highlighted in the third trimester of pregnancy where statistically significant changes from the first to the second, third, fourth and fifth subgroup were more evident.

Conclusions: Results of current study show altered process of familiarization to the treadmill walking in advanced phases of pregnancy. However, during all pregnancy stages individual human movement variability has a huge impact on statistically significant changes between analysed step groups during the five minute long walking.

Key words: Adaptation, Gait, Ground Reaction Force, Pregnancy, Treadmill

DIAGNOSTICS OF PLANTAR PRESSURE IN PREGNANT WOMEN

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Pregnancy is a specific phase in the course of women's lives, which has a considerable influence on the distribution of plantar pressures which are influenced by several factors: the increasing weight gain, changes in the distribution of body mass, changes in walking stereotype, the shape of the foot. The purpose of this research was to demonstrate and measure changes in plantar pressures, particularly the changes in the values of the maximal pressures and the changes in the values of the total load in selected areas of the foot during and after pregnancy. The article is focused on plantography and its application in a research on the influence of pregnancy and postpartum weight loss on changes in the distribution of plantar pressure during walking. The aim of the study is to identify (diagnose) the development of plantar pressures during pregnancy and after childbirth, demonstrate and characterize changes in load and feet, which are manifested by changes in the values of the maximal pressure and the time integral of pressure in different areas of the foot. The research was designed as a case study. Six pregnant women took part in the research. They used plantographic emed-at platform to monitor the changes in selected plantographic parameters in ten areas of the foot (the hind foot, the midfoot, from the first to the fifth metatarsal, the thumb, the forefinger and other fingers) during pregnancy and after childbirth. The first measurement was carried out as a part of the research into the 15th week of pregnancy. The second measurement was carried out in the period between the 25th and 26th week of pregnancy. The third measurement took place about 14 days before a month when the childbirth was expected. The fourth measurement took place six months after the childbirth. For a description and comparison of the measured values between the measurements of each participant we used histograms and then we analyzed the measured values of the factual significance of Cohen's d coefficient. The results show that during pregnancy the load on the medial part of the metatarsal area and under the thumb, also under the hind foot and in midfoot increases. The increased load of the midfoot causes a decrease of the longitudinal arch. The overall dynamic pattern of gait became slower in case of all participants, this corresponds to the changes of the measured values. During the measurement, a certain part of the load moved from the rear part of the foot forward when in the phase of the reflection at the metatarsal region its medial parts are more involved. In the reflective phase of a step there are more involved metatarsal heads and thumbs (fingers have rather negligible roles). In the impact phase of a step is the hind foot and the midfoot are significantly loaded.

Keywords: pregnancy, plantography, plantar pressure

JOURNAL KINESIOLOGY: INTERNATIONAL JOURNAL OF FUNDAMENTAL AND APPLIED
KINESIOLOGY: THE POSITION AND VISIBILITY IN INTERNATIONAL ENVIRONMENT

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The aim of this paper is to assess the quality of journal Kinesiology by relying on common quantitative and qualitative indicators and to position the journal in regional and international environment. Criteria refer to editorial and publishing policy, coverage by abstracting and indexing services, and high frequency of citation. Kinesiology, although being published for more than 40 years now, has achieved a recognizable level of international visibility in past several years. Although certain improvements can and will be made, like indexation in more databases, Kinesiology shows stable and secure growth making its way in worldwide scientific community.

Key words: scientific journals, kinesiology, journal quality

KINEMATIC AND DYNAMIC ANALYSIS OF SWIMMING TECHNIQUE OF CZECH NATIONAL TEAM IN YEARS 2009-2015.

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Purpose: In majority of top cyclical sports, the performance is primarily dependent on the strength, fitness and technique. For swimming, technique is very important. Due to refraction of light on the surface and swirling water, the coach or the swimmer has a distorted view of only a part of the movement of his/her arms in front of the body. Our research team decided to analyze the speed and acceleration and carry out a kinematic and dynamic analysis in swimming.

Since 2009 up to present, the Centre of Sport Activities (CESA) at Brno University of Technology has been conducting research measurements and analyses of swimming technique of Czech national teams. The senior national team engaged in the Olympic preparatory training and the junior national team (junior and senior) have annually two experimental measurements. Swimmers of the Czech Republic national team from twelve sports grammar schools undergo research measurements once a year.

Methods: Research measurements are organized in swimming pools with a length of twenty-five meters. At first we measure the speed of swimming by arms and legs, and then the interplay swimming style (arms, legs, interplay) using two tachographs of our own design and production. Speed records are printed, both numerically and graphically, and evaluated in detail. Acceleration records are obtained from derivatives of speed measurements; these are also printed. When comparing the records of speed and acceleration, and video-recordings, we obtain the significant information on swimming technique. The acceleration rate in any point of the curve multiplied by the weight of the measured swimmer gives benchmark data, significant for practice, on the inertial forces. Interest is primarily raised in the calculated extreme positive or negative inertia forces. These data are needed to determine the extent of burden required for working out both on the ground and in water. Records of decrease in speed and acceleration accompanied by videos show the points of errors in the swimming technique of arms, legs, and interplay. Speed and acceleration records in the computer are synchronized with videos from three camcorders recording the underwater movement of swimmers. A graphical record of speed and numerical evaluation of swimming speed are performed using the software designed by our research team. This software assesses the average speed, standard deviation of speed, variation coefficient, variance and efficiency of swimming technique. The first information on the results obtained from the measurements, supplemented by video-recordings from underwater camcorders, is rendered to swimmers and coaches immediately after the measurement. Provided that the coach or the swimmer is dissatisfied with the results, the attempt can be repeated several times. This can significantly increase the interest in measurements because immediately during and after the measurement the coaches and swimmers are allowed to begin their work on eliminating the errors in swimming technique.

Results: The individual records of speed and acceleration and movement of swimmers measured by underwater camcorders are stored in the computer memory. Moreover, video-recordings from three camcorders are also stored in the computer entitled Computer (u). Individual video-recordings with clearly visible errors in technique are printed for swimmers. The complete video-recordings are presented to the coaches and swimmers during lectures.

Our research team evaluates and prints the records of speed, acceleration and video-recordings with significant errors in the swimming technique of measured swimmers. The entire measurement is also provided in the form of DVD. All of these materials are forwarded to contractors of research measurements, teachers, coaches, and measured swimmers. Duplicates are archived and used for further statistical evaluations and publications.

Conclusions: Every six months the coaches and swimmers are provided with "Tables on statistical analysis of swimming of national teams in the Czech Republic", which refer to the male and female swimmers with the highest efficiency of swimming techniques in the junior categories (junior and senior) and the senior category. Each swimming style has its own table. These tables are forwarded to the swimmers, coaches, Czech Union of swimming sports, top sports centres, schools and swimming clubs.

Keywords: swimming, analysis, speed, acceleration, efficiency.

EVALUATION OF SPORT TECHNIQUE IN TENNIS BASED ON 3D KINEMATIC ANALYSIS

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Introduction: Sport technique in tennis represents one of the most important factor of sport performance. This study deals with 3D kinematic analysis of tennis shots and with evaluation of sport technique.

Aim: The purpose of this research was using 3D kinematic analysis and obtaining precise kinematic characteristics in chosen phases of tennis shots which are required for evaluation of tennis technique.

Methods: Case study of young male tennis player was tested in twenty attempts in standard conditions. Three, the most interesting forhand shots were analysed precisely. The same ball velocity and the same place were generated by the tennis machine. The age of tested person A.P. was 15 years. We focused on key time moments in the performance of motion during repeated forhand strokes. The first moment was, when time of maximal acceleration of upper tennis racket appeared, the second moment was the time, when maximal speed of upper tennis racket was recorded, the third moment determined time of contact between the tennis racket and the ball, and finally the highest and lowest values of kinematic parameters of all segments of dominant upper extremity (right) were taken into the consideration. These kinematic parameters were chosen: velocity, acceleration of playing upper extremity, center of gravity and upper racket, height, lateral and forward-backward distance of center of gravity, angles in both knees, elbows and body bending. With the help of 3D kinematic analysis and Simi motion software all needed parameters of the body and tennis racket were recorded by synchronised cameras and sport technique was evaluated by tennis experts and biomechanists.

Results: The highest values of acceleration of upper racket during stroke are achieved when the whole kinematic chain of body segments are finished. The best attempt was represented by the highest values of velocity and acceleration of upper racket. Achieved values are: 19,744 m/s and 206,520 m/s². In a very short time later, the contact between the racket and the ball should happen. We are sure that the most important segment of tennis player system is the upper racket place which is responsible for the quality of tennis shot. Many results of velocity, acceleration and angle parameters were achieved, but for evaluation of tennis technique were chosen those, which achieved required values and forhand shot was successful. On the other side, decelerations of the other segments of dominant upper extremity just before the contact with the ball results were needed. The moment of maximal velocity of upper racket appeared nearly at the same time as the contact of the racket with the ball. Acceleration of upper racket at this moment was lower than maximal acceleration recorded little bit sooner. Movement of the center of gravity must be smooth enough and in sufficient range.

Conclusions: Evaluating of sport technique in tennis can be realised very precisely by using 3D kinematic analysis. This study brings also specific values for clasification of forhand shots. They confirm optimal kinematic chain and determine the quality of tennis techniques. These objective results can be helpful for tennis coaches and support their subjective expert evaluation.

Key words: sport technique, tennis, 3D kinematic analysis

ANALYSIS OF MAXIMUM AND RELATIVE STRENGTH LEVELS OF JUNIOR MALE AND FEMALE TENNIS PLAYERS.

Jiří Pačes, Jiří Zháněl, Miroslav Černošek, Tomáš Vodička

The issues of the significance of strength capabilities in sport and tennis are dealt with by many authors. In tennis, the strength of the playing arm primarily manifests in the speed of serve. In the researched age range, major inter-individual and inter-sexual differences were observed and confirmed. Boys exceed girls in somatic and motoric characteristics. Research shows close relation between body weight and physical strength. In junior age this aspect may affect the athletes' performance due to the different progress of their ontogenetic evolution. For objective comparison of inter-individual differences in strength levels, relative strength calculation is used (physical strength/bodyweight ratio). The goal of this paper is level analysis of maximum strength of players' playing hand, comparisons and evaluation of intersexual differences of somatic (body height and weight) and motoric (maximum and relative strength of playing hand) characteristics, and determining the correlation between maximum and relative strength of playing hand and body weight. The research sample (acquired by method of intentional selection) consists of Czech junior male tennis players (n=157) and female players (n=163) in the ages between 13.0 and 14.9 years. The data for this research were gathered during 2000-2010 period by regular testing using hand dynamometer (Grip D, Takei, Japan) within Czech tennis association project. Analysis of acquired data shows normal distribution characteristics (verified by Kolmogorov-Smirnov test). Values of measured statistic characteristic variables in the set of male tennis players (n=157, body height: $V=169.79 \pm 9.27$, body weight: $H=57.05 \pm 9.26$, strength of playing hand: $SH=34.64 \pm 7.53$, relative strength of playing hand: $RS=0.61 \pm 0.10$) and female tennis players (n=163, body height: $V=164.93 \pm 5.80$, body weight: $H=53.57 \pm 6.31$, maximum strength of playing hand: $SH=29.09 \pm 3.84$, relative strength of playing hand $RS=0.55 \pm 0.06$) are characterizing sets of players in terms of levels of somatic and strength characteristics. Using t-test, major statistically relevant intersexual differences between male and female players were proved in all monitored variables. Using value of Cohen d, a major effect was proven in case of maximum strength of playing hand ($d=0.94$), relative strength of playing hand ($d=0.73$) and body height ($d=0.63$); a medium effect was found in body weight ($d=0.44$). Statistically significant relation was proven between the strength of playing hand in a set of male players ($r=0.80$, $r^2=0.64$, i.e. medium effect) and female players ($r=0.55$, $r^2=0.30$, i.e. low effect). Relation between body weight and playing hand was not proven in the set of male players ($r=0.05$, $r^2=0.00$), in the set of female player statistically significant negative correlation was found ($r=-0.36$, $r^2=0.13$, i.e. low effect). In the researched age range 13.0 – 14.9 years, the results show significant intersexual differences between male and female players in all monitored variables. These found facts need to be respected in the training process. A significant relation between body weight and maximum playing hand strength was proven also in sets of both male and female players. These facts combined with low (female players) respectively none (male players) relation of relative strength and body weight prove the suitability of using relative strength as objective evaluation of strength potential in tennis players and in athletes in general.

Key words: Hand dynamometer, intersexual difference, maximum strength, relative strength, tennis.

RUNNING ECONOMY AT HABITUALLY FOREFOOT AND HABITUALLY REARFOOT RUNNERS

Vladimir Pospichal, Jan Novotny

Purpose: Running is a worldwide activity. Distance amateur running is one of the most popular activities. Running is a simple, cost efficient solution for many who wish to lose weight or improve fitness level. The popularity of long distance running has increased over the years. Have habitually foot strike patterns lower cardio-respiratory parameters? The research focused on changes in running economy – minute oxygen uptake, heart rate. We have compared two different running techniques. Running with impact on the toe – forefoot and running with impact on the heel – rearfoot.

Methods: The research attended sixteen healthy, injury free, amateur distance runners. Eight habitually forefoot runners and eight habitually rearfoot runners. The average age of hFF runners is 25.25 ± 3.31 years, mean body height is 185.75 ± 5.19 cm, mean body weight is 76.75 ± 4.87 kg and mean BMI is 22.23 ± 0.72 . The average age of hRF runners is 26.50 ± 2.87 years, mean body height is 179.25 ± 2.77 cm, mean body weight is 72.50 ± 3.61 kg and mean BMI is 22.56 ± 0.82 .

The research conducted in laboratory condition on the treadmill. Testing speed was set at 12 kilometers per hour. Duration of the test was 2x12 minutes. Athletes ran one test with impact on the toe and one test with impact on the heel.

Results:

Oxygen uptake

Median habitually FFS – test forefoot: 3.156 ± 0.38 l · min⁻¹; test rearfoot: 3.017 ± 0.42 l · min⁻¹

Median habitually RFS – test forefoot: 3.323 ± 0.31 l · min⁻¹; test rearfoot: 3.106 ± 0.35 l · min⁻¹

Heart rate

Median habitually FFS – test forefoot: 146.10 ± 8.88 bpm; test rearfoot: 144.75 ± 11.62 bpm

Median habitually RFS – test forefoot: 170.87 ± 17.28 bpm; test rearfoot: 167.99 ± 16.20 bpm

Conclusion: In the study we assumed that habitually impact on the ground affect cardio respiratory rate. We assumed that habitually forefoot runners will have better running economy when they run forefoot. Habitually forefoot runners has higher oxygen uptake, when they run forefoot. Difference at habitually forefoot runners between rearfoot and forefoot is 0.139 l · min⁻¹.

The proponents of rearfoot running advocate that human feet are born to run rear on the ground because our ancestors ran for thousands of years without high-technology sports shoes, which were not invented until 1970s. The proposed advantages of rearfoot running include gait changes resulting in a lower collision force, a reduction in running economy, and an increase in movement perception and muscle strength (Shih et al., 2013). In the study Boyer et al, 2014, more than 75% of runners said they were interested in running rearfoot, primarily to reduce chance of injuries in the future.

Key words: Running economy, forefoot, rearfoot, cardio-respiratory, distance run

RELIABILITY ANALYSIS OF THE 94FIFTY SMART SENSOR BASKETBALL

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The 94Fifty Smart Sensor Basketball, manufactured by InfoMotion Sports Technologies, Inc., allows measurement of certain kinematic parameters in the process of shooting the ball (the speed of performing the shot; the angle at which the ball enters into the basket; and the rotation of the ball during the shot), as well as in the process of dribbling the ball (the number of dribbles and control of the ball). This Smart Sensor Basketball is equipped with a number of sensors inside the ball which allows the user direct monitoring of the results on a computer in an appropriate programming interface connected via a Bluetooth connection.

To be more precise, the aim of this study was to compare the results obtained from a 94Fifty Smart Sensor Basketball with the results obtained by video analysis (a DMC-FZ200 Panasonic camera operating at 100Hz; Kinovea software 0.8.15) while examining the following two parameters: the speed of performing the shot and the angle at which the ball enters into the basket.

For the purpose of this study, a total of 80 shots were taken; 40 three point shots and 40 two point shots.

The results (ANOVA) indicate that there are no significant differences (angle: $p=0,10$; speed: $p=0,08$) in the obtained values for the examined parameters in relation to the manner the results were produced - by video analysis or by using the Smart Sensor Basketball.

In addition, there is a statistically significant correlation between the two methods of determining the above parameters (angle: $0,98$; $p<0,05$; speed: $0,96$; $p<0,05$).

Based on the results of this study, the conclusion can be made that the 94Fifty Smart Sensor Basketball has a practical value as it allows obtaining the results in real time, which ultimately provides coaches with an objective confirmation of their subjective assessment. Likewise, the 94Fifty Smart Sensor Basketball can be used for certain scientific research which can ultimately improve basketball practice as such.

Keywords: basketball, jump shot, angle, speed

CHANGES IN EFFICIENCY AND SPEED OF FRONT CRAWL SWIMMING TECHNIQUE OF JUNIOR SWIMMERS AGED BETWEEN 14 AND 19 YEARS OLD - A CASE STUDY

Jan Šťastný, Jaroslav Motyčka, Michaela Bátorová, Miloslav Pašek

Purpose: In our study we focused on evaluating the results of long-term measurements of swimmers in junior categories. In this age group, we expect major changes of swimming technique and an increase of the power capability of swimmers. This stage is important for successful entry into the senior category.

Methods: We have used the results of swimmers who were measured repeatedly three times during a period of measurement with at least one year delay between the measurements. We had a sample group consisting of 4 females aged between 14 and 17 years old +/- 1 year and 3 men aged between 14 and 19 years +/- 2 years. We expected that with increasing age swimmers will increase their speed (H1) and improve efficiency (H2). As a result of better swimming technique. We were also assessing the differences between men and women.

Results: In the case of women we confirmed both the hypothesis of H1 and H2 were correct, while in the case of the men sample the hypothesis of H1 showed to be correct, however hypothesis H2 was inconclusive. Therefore it was not possible to confirm hypothesis H2.

Conclusion: At this stage we are considering to extend the study with a bigger sample group over a longer period of time. As a result of that we could confirm more firmly how the aspects of H1 and H2 impact men and women swimmers.

Key Words: long-term, swimming, speed, efficiency, junior

PLANTOGRAPHY OF CHILDREN OF PRIMARY SCHOOL - COMPARING OF PLANTOGRAMS

Mgr. Jaroslav Vrbas, Ph.D., Mgr. Lenka Máčková

Purpose: The goal of the research is to find out if plantogram formed by putting colour on foot (a terrain method) is comparable with plantogram formed on podoskop (a laboratory method).

Methods: Five chosen terrain methods (Mayer's method, Method segments, Method index, Chippaux – Šmiřák method, Clark angle, The visual – range of Klement) were used in solution of diagnostics of a state of foot arch and visual range created by Josef Klement. I had compared results of individual terrain methods and visual range of plantogram formed by putting colour on foot with results of individual terrain methods and visual range of plantogram formed by podoskop.

Results: More than 63% of similarity between these two differently formed plantograms (a similarity in results of terrain methods and visual range) as a result of measuring and more than 73% of plantograms was identical in visual range (the most important accordance is in shape of plantogram).

Conclusions: The main finding is that plantograms have the same shape in more than 70 % and also that plantograms formed by putting a color on a foot partly don't show or don't show high foot. Both types of plantograms were tested on 30 children (of fifth grade). Five terrain methods (Chippaux–Šmiřák, Method of index, Method of segments, Mayer's method, Clark's angle) and visual range of Josef Klement were used to find a solution. The results of terrain methods and visual range of plantogram formed by podoskop were compared with the results of terrain methods and visual range of plantogram formed by putting colour on foot. Accordance between these two differently formed plantograms is expressed in percentage

Key words: flat foot, normally arched foot, foot arch, plantogram, terrain methods, podoskop.

SPORT TRAINING

BALL GAMES OF THE WORLD, FITNESS THROUGH PLAY

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At Penn State, we define Kinesiology as; The Study, Practice, and Appreciation of the Art, Science, and Culture of Human Movement. Within that broad definition as it applies to sport, all sports have a defined level of fitness and skill that must be achieved for successful play. Naturally for ball sports there must be a balance between skill training and fitness training specific to the sport. The Ball Games of the World Exhibit and narrative/video represents over 20 years of collecting balls for ball sports from all over the world. The exhibit includes balls for over 80 sports, equipment used to play the sport both modern and historical, and posters depicting each game where possible. The narrative/video presentation that accompanies the exhibit includes excerpts that show each sport in action. The video clips represents promotional video from federations where possible, televised game footage, or home video. The exhibit and narrative/video presentation is categorized and include; bowls and bowling games, handball games, bat and bat games, racket and paddle games, football games, ball and raised goal games, volley and net ball games, invasion goal games, and other ball sports. The presentation will give an overview of the exhibit and highlight a number of unique ball sports from around the world.

THE ANALYSIS OF 100 M HURDLES COMPETITIVE ACTIVITY

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The purpose of this research was investigation of 100 m hurdles running event. The main aim was to analyze dynamics of running speed in the 100 m hurdles event. The research was carried out on 13 variables overall; 10 time parameters' variables which included split times at each hurdle and athletes' final running time, athletes' latent reaction time and their age. The basic descriptive statistics and descriptive analysis of individual changes were obtained.

In this study, the different examples of competitive activity structure, which differs depending on results' achievements, are shown. The more the results' achievements are closer by its final running results; the dynamics of track running is more similar. Displayed examples may clearly indicate running details, regarding the successful realization of movements' structure patterns, which make for the better placement in athletes' running times.

The obtained results indicate that the most successful, that is, the fastest athlete, was the one who incrementally increased running speed until fourth or fifth hurdle and successfully maintained that speed for as long as possible. For all athletes, the deceleration phase was after eight hurdle. Latent reaction time as well as running time at first and second hurdle are integral to start acceleration and are important for establishing good running rhythm.

ELECTROSTIMULATION: PART OF THE WARM-UP BEFORE THE PERFORMANCE IN COUNTERMOVEMENT JUMP

Bílý, J., Cacek, J., Kalina, T.

Neuromuscular electrostimulation is one of methods of strength development during which there is no voluntary muscle contraction and there is required an apparatus which sends electrical impulses.

The purpose of this study is to find out if neuromuscular activation by using electrostimulation method, performed before performance as a part of warm-up, is beneficial for performance in countermovement jump.

As participants we chose 10 healthy trained men aged between 21 and 25 years. During warm-up test subjects pedalled on a stationary bike for 5 minutes. Then performed countermovement jumps immediately after electrostimulation (applied on quadriceps femoris muscles) or without electrostimulation or with dynamic stretching. Three attempts were permitted and we recorded the best of them. There were four variants of intervention before performance - with and without electrostimulation and with and without dynamic stretching. Dynamic stretching involved the whole body, contained the same exercises and lasted for 5 minutes. Electrostimulation was applied for 2 minutes with the preset program „Explosive power“ on an electrostimulator.

The results showed that the height of countermovement jump significantly increased after using the electrostimulation method: +1.8 % ($p = .036$) without dynamic stretching and +1.8 % ($p = .036$) with dynamic stretching compared to attempts without electrostimulation.

We found no significant difference ($p > .05$) if we compared performance in countermovement jump after warm-up and electrostimulation and performance after warm-up and dynamic stretching.

This finding suggests that electrostimulation applied before exercise can be beneficial as well as dynamic stretching.

Performances in countermovement jumps after electrostimulation are statistically significantly higher than performances without electrostimulation. However, we can say that the neuromuscular activation via the electrostimulation method (immediately before performance) helps to improve the performance in countermovement jump at least as well as dynamic stretching.

This study provides further evidence of a link between a type of stretching or neuromuscular activation before performance and a level of performance in vertical jump, specifically countermovement jump.

Key words: electrostimulation; electrical stimulation; countermovement jump; warm-up; neuromuscular activation.

THE FREQUENCY OF QUALITATIVE GRADING LEVELS OF DEFENSIVE PLAYS AT WORLD CUP 2014 IN FOOTBALL

Oto Honz

Purpose: There are used various types of analysis of goalkeepers' activities nowadays. In the most of the cases, analysing authors are unanimous in opinion on methods evaluating the quality of a player's performance during the match. They focus on the success of particular playing activities performed during the match. However, these activities are of different frequency of occurrence and types. The goal of the pre-research is to identify, analyse and compare occurrence of qualitative assessment degrees of defensive football activities of goalkeepers playing for winning and losing teams.

Methods: The studied group consisted of 40 goalkeepers, whose teams participated in FIFA World Cup 2014 in Brasil. A method of indirect observation and assessment was used. We evaluated efficiency and quality of implementation defensive playing activities by using 5 grade scoring scale, the most effective result of qualitative grade 1 and the most ineffective actions of qualitative grade 5. The numbers were of absolute and relative values. We also used logical methods when interpreting.

Results: We have used five-point scale to assessment of quality defensive plays. We also used an objectivity comparison Přidal (2001) "three-point scales present the bigger objectivity than five-point scale". According to Buchtel, "five-point scale is better. This scale is detailed to distinguish the quality of an individual playing activities." The objectivity need directly definition of an individual evaluative degrees.

Conclusion:

The qualitative assessment grade 1 have been evaluated 83,1% defensive plays in the file.

The second highest frequency of occurrence defensive plays 12,4% were faulty actions.

The qualitative assessment grade 1 have been evaluated 90% defensive plays by the goalkeepers of winning teams.

The goalkeepers of winning teams had a few faulty actions (5,4%).

The qualitative assessment grade 1 have been evaluated 78% defensive plays by the goalkeepers of losing teams.

The goalkeepers of losing teams made a lot of mistakes than those of winning teams - 19,7% (division is 14,3%).

Key words: football, playing performance, actions of goalkeepers, player's assessment of playing activities, frequency, qualitative assessment degree

BACKGROUND FOR PREPARING EDUCATION CURRICULUM FOR COACHES OF RHYTHMIC GYMNASTICS

Holá Iveta, Chrudimský Jan, Viléma Novotná Viléma

Purpose: The goal of the article is to describe opinions rhythmic gymnastics (RG) coaches on the content of sports preparation, training and education for coaches of girls interested in rhythmic gymnasts aged 7-9 years.

Methods: Evaluation of the study of sixteen semi-structured interviews with experts (on a non-randomized selected group of specialists) was researched according to the method Repertory grid technique (RGT). The investigation by RGT, an analysis of interpersonal and intrapersonal data obtained by conversation between researcher and interviewee expert in RG training process.

Results: The results from the year 2014 documenting the attitudes of qualified specialists in rhythmic gymnastics sports preparation and training. Experts deem most necessary component (RGT element) in the preparation of younger school age rhythmic gymnasts set of exercises for correct body posture. The second is a set of exercises for no apparatus technique and a set of exercises for manipulation skills with hand apparatus. The set of exercises for classical dance (ballet) technique was considered by respondents as more necessary component of sports training that age. But in contrast, a set of exercises for orientation in space, the experts called as the minimum necessary component of sports preparation of young gymnasts. In terms of education of coaches are essential outcomes from categorization of all constructs (opinions of all coaches in research). Experts emphasize for instance about systematic approach to training process, its regularity, permanence and longevity, to training under the supervision of a coach and also unassisted exercise.

Conclusions: A positive effect of RGT methods is obtaining many individual constructs in terms of their uniqueness and attractions. Overall constructs can be evaluated as completely individually and uniquely spoken opinions and ideas of each individual respondent. In summary, the results of the analysis of actual interviews describe the attitudes and opinions of respondents to the training content of RG in Czech Republic. It is also possible to use the results for improving the education of coaches.

Keywords: Rhythmic gymnastics, Repertory grid, education for coaches

COMPETITIVE BALANCE IN PROFESSIONAL SPORTS LEAGUES

Robert Kuchar

Abstract: The paper deals with the competitive balance in professional sports leagues. It focuses on the comparison of two systems: open European and closed North American. Aim is to analyze competitive balance in selected leagues. Open system is represented by the top football leagues of Europe plus Czech Republic and closed by NHL. It specifies what regulatory instruments are adopted. The paper also tries to find answer to question whether competitive balance influences the average attendance.

Key words: Competitive balance, sports leagues, league system, European football leagues, NHL

ARE THERE ANY DIFFERENCES BETWEEN MALES AND FEMALES IN SUCCESS OF TEACHING WINDSURFING

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The purpose of this study is to establish if there are any differences in the success of teaching windsurfing between males and females. The inquiry was conducted on a sample that consisted of 122 male students and 58 female students of the faculty of Kinesiology at the University of Zagreb, enrolled in their third year of study for the academic years 2009/10 and 2010/11.

For the realization of set goals it was necessary to design a quality system of gathering information, which was based on the evaluation of motor knowledge supported by three main technique elements of windsurfing: Start, Tack, and Jib.

Based on experience, it is considered that mastering this kinesiology activity of motor knowledge is best evaluated by these three main elements. Judges have estimated the mastering of the aforementioned technique elements with grades from one to five.

The methods applied for the analyzation of the data are aligned with the goal of the study, based on earlier insights and considered appropriate for this type of work.

By discriminant analysis statistical differences between the success of male and female instruction of the main technique elements of windsurfing have been detected, with the applicable 5 percent deviation in the results.

The difference in the results was influenced by all three key elements of wind surfing technique, while the Start element caused the biggest distinction.

Keywords: males, females, windsurfing, differences, instruction, discriminant analysis

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ANALYSIS OF THE GAME CHARACTERISTICS OF A FINAL JUNIORS MATCH UP TO 14 YEARS AT WORLD JUNIOR TENNIS FINALS (WJTF) IN 2013

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In many ball sports the results of the game analysis are used to obtain feedback for the player and the coach. In tennis, the most frequent method is the analysis of game characteristics - questionnaires for players, match minutes (written or visual) or using various kinds of computer programs. The results of analyses of the most important game characteristics are now available electronically at major tennis tournaments. The most frequently analyzed data are: aces, double faults, first and second serve success, points won after first and second serve, return points won, net points won, breakpoints won, total number of winners, unforced errors and total number of points won. The aim of this research is to perform an analysis of game characteristics of junior's final match up to 14 years at World Junior Tennis Finals in 2013 in Prostějov (WJTF, World Championship teams of boys and girls up to 14 years) and at French Open 2013 (Paris, Roland Garros. Our goal is to determine which game characteristics are important for the match results by juniors and adult players. At the same time, we aim to compare the results of juniors (WJTF) and adult players (French Open). The final match of juniors at WJTF 2013 (USA x Russia, players PKY and PKL) were analyzed from video, the evaluation of observed game characteristics was accomplished according to the uniform methodology developed by tennis experts. Game characteristics of the final match at French Open 2013 (Spain x Spain, the players RN and DF) was obtained from statistical data software database OnCourt. Based on the game characteristics analysis performed by finalists WJTF 2013, it was noted that the winning player PKY was more successful in first serve success, number of double faults, points won after first and second serve, return points won, number of unforced errors and also breakpoints won. Defeated player PKL was successful in net points won and he recorded more aces and winners. The winner of the French Open 2013 player RN was more successful in all above-mentioned game characteristics than his opponent DF. The comparison of game characteristics by the winners of the male (RN) and junior (PKY) finals showed that the player RN achieved higher first serve success, higher number of aces, more points won after first and second serve, more return points won, less number of unforced errors and higher number of winners. The junior winner PKY gained less double faults, more breakpoints won and net points won. The number of unforced errors, winners, points won after first and second serve and return points won can be considered as the most important game characteristics for the results of the game.

Key words: game analysis, match statistics, tennis, sports performance, key characteristics

AGE-RELATED SPRINT PERFORMANCE CHARACTERISTICS OF ELITE MALE SOCCER PLAYERS

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The main objective of this study was to analyze the differences in the parameters for the assessment of sprint performance of soccer players, from beginners to seniors. The study was conducted on Croatian national level soccer players (n=269) classified into thirteen levels of competition with respect to age categories (under = U8 to U18 and seniors= 19+). Soccer players were evaluated on linear sprinting on 20 m (analyzing partial times at 5 and 10 m).

In the anthropometric characteristics, two stages of progressive and continuous growth in height (U8-U10 and U11-U17) were observed, as well as two stages of significant increase in body weight (U11-U12 and U14-U17). The manifestation of sprint abilities mainly follows the curve of growth in height of tested soccer players. Significant differences were observed even in small intervals of just one year (between U9-U10, U12-U13 and U13-U14; $p < 0,05$).

These variations are the result of biological principles that take place in the development stages of the soccer players from the youngest age to the level of senior age as well as of transformation processes caused by training stimuli. This study presents typical values and changes in the parameters of sprint performance status of soccer players through all age categories, with respect to chronological age. The results of this research may enable better selection, monitoring, planning, programming and control of the training process.

Key words: soccer, sprint characteristics, age categories

SPORTS TRAINING WITHIN SPECIAL OLYMPICS FITNESS INNOVATION PROGRAM

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Background and purpose: the basic principle of Special Olympics (SO) sports program is participation in all over the year training and competition. Improvement of fitness is considered as the bases for future sports achievement and improvement of athletes health related fitness variables. Special Olympics Europe/Eurasia with European Union support granted six selected European SO Healthy Athletes programs to innovate fitness of sportsmen with mental disability. *Methods:* the project of SO Czech Republic is focused on the domains: coaches and athletes education in fitness training. The presented article describes case studies of 11 athletes (beginners and advancers), their training achievements in athletic running events (100 – 200 – 400 m) measured during last two years, specially in 2015 year. Running events were chosen as because the natural movement can be minimally polluted with skills (influenced with cognitive limits). *Conclusion:* examples of athletes performance in different age cohorts and different training experience are demonstrated. In conclusion – athletes with mental disability like to be trained and like to participate in competition. It is possible to improve their fitness and good results even in their 40-50 years age.

Key words: mental disability, Healthy Athletes program, fitness, athletic race.

COMPARISON OF THE USE OF INFORMATION TECHNOLOGIES IN NON-FORMAL EDUCATION AND INFORMAL LEARNING OF HANDBALL COACHES IN THE CZECH REPUBLIC AND SLOVENIA

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Purpose: The research was focused on the issues of use of information technologies in non-formal education and informal learning of handball coaches. Information technologies play an increasingly important role in the graduation of the coaching career.

The aim of this empirical research was to analyze the specific forms and methods of the using of information technologies (video channels, social networks, electronic databases, web sites, computer programmes, smart phones, etc.) in non-formal education and informal learning of handball coaches.

Methods: The research was realized in three phases. In the first phase we used a questionnaire of our own design, which was distributed to handball coaches in the Czech Republic. Data were collected from 48 coaches. After the quantitative questionnaire survey were carried out case studies of three selected handball coaches from the Czech Republic. These data were obtained from them through interviews. In the third phase we made the research on coaches in Slovenia. For data collection was used the same questionnaire as for coaches in the Czech Republic, translated into Slovenian. Even in Slovenia I made interviews with selected coaches (in Slovenia with 2 coaches).

Results: In my paper I present the data from the surveys, little commented by knowledge gained from interviews. In the research sample from the Czech Republic was higher proportion of women than in the research sample in Slovenia, the average age did not differ significantly, Slovenian coaches have on average a longer coaching experience and higher education. Slovenian coaches work more with e-learning, video-conferencing and webinars, seeking information more on foreign web sites, on sites EHF and IHF. Czech coaches on the contrary, use in coaching practice materials from the site of their national handball federation more than Slovenian. Paid sources use both groups equally.

Enough domestic resources on CDs and DVDs coaches assess better in Slovenia, on the contrary, foreign sources Czech coaches. With foreign-language materials on CDs and DVDs work more Slovenian coaches than the Czech ones in English and in Serbo-Croatian and Spanish. In the other way Czechs use CDs and DVDs in German, Polish and Slovak increasingly.

Slovenian coaches in all surveyed parts of coaches activities use more tablets and mobile phones than Czech coaches.

Conclusions: Data from surveys show that most coaches use information technology for their coaching, training and related activities ordinary. When I compare the surveyed nations Slovenian coaches are in the using of ICT more advanced than coaches in the Czech republic.

Key words: information and communication technology, coaches, handball, nonformal education, informal learning

SPORT AND THE SOCIAL SCIENCES

COMPARATIVE PHYSICAL EDUCATION – SOME METHODOLOGICAL CONSIDERATIONS FROM SOCIAL SCIENCE PERSPECTIVE

Petr Vlček, Department of Physical Education, Faculty of Education, Masaryk University

Purpose: The study deals with the chosen problems of the methodology of comparative physical education. The goal of the text is to contribute to the discourse about the methodological quality in physical education and sport sciences. The author also attempts to show some possible approaches to the process of the comparative research in physical education and sport based on the problem approach methodology.

Methods: Apart from the brief theoretical and historical issues of the comparative research in chosen social sciences which stand for the basis of the authors further considerations the text presents some principles of comparative research valid also for the research in physical education and sport. The principles are based on the methodology used in chosen social sciences which use the scientific comparative methodology.

Results: The text presents particular steps of the comparative method in physical education and sport research.

Conclusions: The final paragraphs deal with some considerations about the role of descriptive and case oriented studies in the physical education and sport research mainly from the problem oriented scientific approach.

Key words: comparative physical education and sport, methodology, social sciences, problem approach

INTERGENERATIONAL CONTEXT BETWEEN GRANDPARENTS AND GRANDCHILDREN IN THE AREA OF PHYSICAL ACTIVITIES IN COUNTRIES WITH DIFFERENT SOCIOCULTURAL BACKGROUND – PRELIMINARY PROJECT STUDY OUTCOMES

Dagmar Heiland Trávníková, Milena Strachová

Background and Purpose: According to the latest demographic data, contemporary population is facing progressive process of ageing. Recently conducted studies have shown that intergenerational relation and common activities among seniors and their children or grandchildren present a significant factor in both physical and mental fitness of the seniors (WHO, 2011; Hoff, 2007; Uhlenberg, Hammill, 1998). This paper presents preliminary results of a qualitative study, conducted within the international Czech-Austrian AKTION project, delivered at the Faculty of Sports Studies, Masaryk University (02/2015 – 06/2016), which deals with the intergenerational context between grandparents and grandchildren, especially in the area of physical activities. The goal of the study is to monitor the mutual influence between the senior and grandchildren generation in the area of daily physical activity and routine as well as the geographical, political and other factors in the two included countries.

Methods: For the purpose of the study with seniors we use a semi-structured interview conducted with total amount of 50 Czech and Austrian seniors – grandparents (n=50), in order to monitor their childhood memories of common activities with their grandparents as well as their contemporary situation of performing common activities with their own grandchildren. The interviews have been progressed by general data analysis firstly (such as age, sex, nationality, number of children and grandchildren and possible occurrence of a child/grandchild with disability). The second part of the analysis consists of qualitative data progression by means of interview transcript analysis and matching particular key words to significant domains. For the purpose of the study with the grandchildren (11/2015-04/2016), aged ten, we shall use a qualitative projective method of an essay, focusing on a selected grandparent, in relation to activities they perform together. Similarly to the senior interviews, the children essays will be processed by qualitative analysis. Final results of both age groups will be compared in both countries subsequently.

Results: The so far analysed interview transcriptions show that many study respondents follow similar pattern of activities in their childhood, such as commuting to school by bike, helping with the work at home or in the field as many families were dependent on farming. Unsurprisingly, mutual historical life paths have been found in the interrogated Czech and Austrian seniors. The key theme domains in the context of the intergenerational relationships have been stated as relation to parents, emotional situations, events and experiences in the childhood, relation and activities with grandparents and relation and activities with grandchildren. The whole set and subsequent comparison of domains, as referred to by Czech and Austrian senior respondents, is to be completed.

Conclusions: Preliminary project outcomes show that different levels of grandparent involvement in their grandchildren education and personal development exist. However, positive relationship and certain way of grandparent participation on physical activities and meaningfully spent leisure time is positively accepted by both generations. Furthermore, typical repeated family patterns in the area of communication, emotions and relationships may be seen.

Key Words: grandparenting, grandchildren, physical activity, intergenerational relationships, qualitative research methods

THE INSTRUMENTAL REDUCTION AS A “NON-PHANTOM MENACE” FOR MODERN SPORTS

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Purpose: Instrumentality can be examined from different viewpoints. Martin Heidegger sees instrumentality as a symptom of the inauthentic way of being. The loss of authenticity accompanied by instrumental approaches constitutes a very serious problem of modern competitive sports. That is why kinanthropologists should pay their attention on the possibilities how to decrease the growth of instrumentalism in sport.

Method: The paper is written as a theoretical study which comes from the perspective of the philosophical kinanthropology. For this reason the used approach is firstly philosophical. The main applied method here is the phenomenological reduction, according to Edmund Husserl. Three steps of this method – the epoché, the transcendental reduction and the eidetic reduction are used here just in a constructive way. Then a proposal for the construct of the instrumental reduction is laid out. Finally, both the methods of reduction are compared and interpreted.

Results: Some sports and sport disciplines are very instrumental in principle. Hegel’s logical laws of transitions from quantity to quality can explain the rules of the instrumentalization process in sport. Some instrumental features of this process are self-evident and unavailable. The problem comes when the essence is losing. Within this paper the phenomenological reduction is used to explain the problem more concretely. Applying three steps of the phenomenological reduction brings an eidetic invariant. Then the principles of the instrumental reduction are explained and applied. Finally, in one selected case of 100 metres run we can get two different outputs - one after the phenomenological reduction, the other after the instrumental reduction.

Conclusions : The instrumental reduction is connected with the unilateral focus on the output. The positivistic approaches lead to the idea that everything important can be expressed in figures. Majority of everyday situations needs some kind of reduction. The instrumental reduction is one of the most frequent and easiest approaches in sport. The phenomenological reduction can help us to understand that there are more possibilities how to make reduction. The simplest way may not be the best one in each cases. We should be cautious and not to accept the most common and frequent approaches fully and automatically.

Key Words: Authenticity, instrumentality, phenomenological reduction, run.

METHODS OF PERSONALITY DEVELOPMENT IN THE FIELD OF ADAPTED PHYSICAL ACTIVITY FOR PERSONS WITH SPECIAL NEEDS FOR A MORE EFFICIENT LABOR MARKET

Gabriela Janíková, Dagmar Trávníková

The aim of the project is to map the situation of employability for people with disabilities in the labor market. The focus is on the methods and techniques of education for personal development (Czech Republic X Austria on the basis of ongoing collaboration with Dr. Maria Dinold from the University of Vienna). The concept of this research is based on the theory of Lazarová and Kolar (2007) about the methods of personality development. They look outwards on the 4 major areas: 1. path to yourself- focuses on the individual person and his relation to oneself (relaxation and psychomotor games; 2. to the others- is the practice of those social skills that enable a person to improve relations in society (social and psychological training, social "experiment" method); to the self-transcendence- is meant in terms of human development, which is close to the ideal of an autonomous, tolerant and non-ideological-oriented man (active listening, group games); to the profession- is about development of man's relation to the profession and development of skills that are associated with its demands (assertive behavior method, brainstorming, simulation games, stimulant techniques). The target group is the people with disabilities (physical, auditory, visual or mental) in the age of 18-30 years. The key research methods are questionnaires, comparison, interviews and practical application of methods of personal development on the target group of clients. There are 22 organizations that are mapped in the area of Brno. Preliminary results are four meetings with use of appropriate techniques for personal development, especially in the field of applied and non-traditional physical activities. The expected conclusions are development of techniques for their personal growth.

Key Words: people with disabilities, methods and techniques of education, employment, activities, personal development

KINESIOMETRICS THEORY AND METHODOLOGY CONTRIBUTIONS FROM PETR BLAHUŠ ON QUANTITATIVE RATIONAL FOUNDATIONS OF KINESIOLOGY/KINANTHROPOLOGY

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As stated by late prof. Petr Blahuš PhD by himself (2005) and with coauthors (1993, 2010) on several occasions: To avoid a double naming redundancy Kinanthropology is used as a synonym of kinesiology. Kinanthropology is an official, fully accredited scientific branch in the Czech Republic for PhD studies, and Professorship at Charles University in Prague, with its scientific journal *Acta Universitatis Carolinae Kinanthropologica* published in English. In the world, its further approximate synonyms are Human Kinetics, Human Movement Science, Anthropokinetics, and Anthropokinesiology; nevertheless, the currently most frequent term in use is kinesiology. Essential problems of any science are measurement problems which are inside kinesiology addressed through kinesiometrics, its science of measurement.

Succeeding his supervisor and collaborator prof. Stanislav Čelikovski one of founders of human movement science (kinesiology, anthropomotorics) in Czechoslovakia and in the international arena, one of promoters of measurement and evaluation problems and solutions.

Prof. Petr Blahuš continued the line of development cooperating and networking with the others in the world. His regular collaboration with his old friend Roderick McDonald and others he used to invite to Prague opened perspectives. When McDonald's book *Factor Analysis and Related Methods* (1985) was published it was Petr who translated the book into Czech.

Our senior professors and we, their collaborators and successors in the Zagreb school of kinesiology in the 70's, 80's and early 90's, knew about his dedication to his work from his published papers, books and monographs. On the occasion of the 2nd International Conference on Kinesiology in Dubrovnik in 1999, he was in direct contact with what remains from Prof. Konstantin Momirovič's quantitatively well founded kinesiology circle. He became a member of the editorial board of *The International Journal of Kinesiology*. He became a distinguished visiting professor at the University of Zagreb, incorporated directly in a postgraduate (master and doctor degree) studies in the area which we like to entitle mathematical kinesiology. During the academic exchanges and through his visiting lectures he was expressing optimism and new insights in the area. The ideas of coordinating efforts towards a collaboration of individuals who dedicate their work on measurement and evaluation problems on the European level have been lunched. After his passing away (2010) little has been said on his latest efforts. The main aim of this contribution is to address that issue.

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PHYSICAL ACTIVITY IN SOCIOLOGICAL PERSPECTIVE: SEDENTARY WAY TO LIFE VERSUS ACTIVE WAYS OF TRANSPORTATION

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Purpose of contribution is related to fundamental feature of sedentary consumerist society strongly diminishing role and importance of physical activity in everyday life. At the same time sportive physical activity is also very important factor in the process of officiating of the level of healthy and active life style, quality of life and health in general.

Method to study position of physical activity in sedentary society is based on discussion of relevant concepts and consequent presentation of most typical conclusions of sociological research relating to levels of physical activity (inactivity) of Czech inhabitants. Sedentary society is confronted with great decline of physical activity at work, households and in transportation. Active transportation, as an indispensable part of healthy active way of life refers to the most reasonable human-powered transportation – walking and cycling.

Results of great empirical research „Physical activity of Czech population“ concluded that most respondents prefer „inactive ways of transportation“ (cars, public transportation system); only less than one quarter of respondents use active ways of transportation (walking, biking). Men are more interested in biking, women in walking.

Discussion In the Czech cultural setting changing attitude to physical activity as an integral part of everyday active life style is resulting from the changing social structure, in particular the newly establishing middle-class as well from prevalent cultural changes.

Keywords: Physical activity, sport, active way of life, individual transportation.

FOOTBALL FAN BEHAVIOR OF THE TWO MOST SUCCESSFUL FOOTBALL TEAMS IN THE CZECH REPUBLIC

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Football is a phenomenon of the last decades and also due to fans it could become the most popular sport in the world throughout its history. In this context, we realize that the rapid development of sport itself has brought problems and complicated relationships, especially at the professional level. Football fan behavior has been for many years a major cause for concern, not only in the United Kingdom but also throughout Europe, including the Czech Republic. Violent supporter behavior has been identified as football hooliganism and is sometimes referred to as the English disease. The aim of this paper is to identify speeches of fans on the issue which are attending football matches in the Czech Republic.

A survey was performed in 2015 year, with data collected from fans ($n = 78$) aged 23.5 ± 5.6 years old. The paper used quantitative research, methods of analysis, mathematical and statistical methods.

The survey shows that classical fans find a biggest problem with physical aggression, firing of pyrotechnics, vulgar chants etc. The survey also confirms that football supporters and hooligans do not find a problem with the firing of pyrotechnics, vulgar chants, whistling etc. Triggers for their behavior are mostly alcohol or other addictive substances, referee's mistake and aggression from police or security. On the other hand classical fans find the above-mentioned fans' expressions considerably problematic.

Football clubs and organizers look at the classical fan and football supporter primarily as an economic factor. It is important to realize that they are responsible for work with football fans. It is evident that the media play a very significant role in the public's view of football hooliganism. In our opinion football clubs and media should focus on educational broadcasting, promoting fair play and critically evaluating acts of violence.

Keywords: aggression, behavior, fans, football, football hooliganism.

A COMPARISON OF ATTITUDES TO SPORT AND PHYSICAL ACTIVITIES (SPA) AND SPORT BIBLIOGRAPHY OF UNIVERSITY STUDENTS OF SPORT AND NON-SPORT FIELDS

Radka Střeščíková, Zora Svobodová, Věra Večeřová

Objective: The objective of this work is to compare attitudes to SPA and sport bibliography of university students majoring in sport studies to the attitudes of students who study at faculties where physical education is either an obligatory or optional course of their studies.

The positive influence of SPA on the lives of people of all age groups have been the focus of many scientific and popular works. A great deal of research has been carried out into how and why regular and adequate movement affects the physical and mental state of every person. There are a few factors which influence our physical activity. In the course of our lives, we may work with attitudes and motivation and change them based on our current needs and values. Despite this, our primary attitude to sport activities is formed since childhood and influenced by those around us - family, school and friends.

Methodology: Our research utilized the questionnaire "Attitudes to Sport and Physical Activities" from 2005. The objective of questions is to investigate the history and the current attitude of respondents to sport and physical activities, and their opinions on the way SPAs are incorporated into their daily and weekly program of leisure activities (i.e. besides physical education at school). The results collected from systematically and randomly chosen and representative groups of sport and non-sport majors at Masaryk University in 2014 have been then compared.

Results: A total of 1244 respondents all faculties of MU, except for the Faculty of Sport Studies, returned our questionnaire. There were 284 returned questionnaires from students of the Faculty of Sport Studies. The average age of the groups was 21 and 23 respectively. 99.6% of the FSpS students perform sport (of those, 41.9% at recreation level, 45.4% at performance level and 12.7% at top level) in their leisure time (outside the university PE classes) compared to 83.2% students of other MU faculties (of those 85% at recreation level, 13.5% at performance level and 1.5% at top level) while 16.8% of non-FSpS students fail to perform sport in their leisure time. Considering the above numbers, it might be of interest that only 1.5% of MU students identified their PE teacher as the one who most influenced their attitude to SPA. In 2005, the same questions was answered in the affirmative by 7.3% of MU students.

Conclusions: This work has analyzed key factors which are related to the creation and development of attitudes to SPA in university students of sport and non-sport fields. A regular monitoring of the state and the development of attitudes to SPA in this population group yields essential information for the design of suitable conditions for university students to participate in comprehensive physical programs which should slow down the decline in the number of those who actively participate in sport and physical activities in their leisure time.

Key words: sport and physical activities, attitudes, motivation, family, influence

HISTORY OF PHYSICAL EDUCATION INSTRUCTION AT MASARYK UNIVERSITY 1919 -1989; PE HISTORICAL DEVELOPMENT AS REFLECTION OF SOCIO-HISTORICAL DEVELOPMENT OF SOCIETY

Zora Svobodová, Věra Večeřová, Renáta Vychodilová

Purpose: Physical Education (PE) instruction is included at all stages of the whole educational system in the Czech Republic as an important element for each individual to gain, develop and improve physical and locomotive competencies. The tertiary level of education is a specific area, where PE is entirely the responsibility of particular universities. The universities themselves decide about the form of their PE instruction, or whether any form of PE instruction will be provided to their students. Our contribution deals with the beginnings and history of PE instruction at MU from 1922 to 1989. The study observes its development as a reflection of socio-historical status and values of our society.

The sources utilized to compose this study can be divided into two categories. First, the archival references at MU related primarily to teaching PE at the university, such as the instruction organization, teaching plans and goals, as well as to significant personalities and events that influenced the development processes significantly. The other category includes the non-fiction publications and studies referring to the construction of the gym Pod hradem, which is an integral part of the history of PE development at the university.

Methods: The method of processing available historical materials and their analysis in the broader context of different historical periods are involved.

Results: The archive of MU, with precise semestral records written methodically, has been administrated systematically since 1926, which enabled us to portray a detailed outline about the beginnings of PE instructions at the university. This cannot be stated about the recent history, namely since 1974. Only an insignificant amount of documents and records administrated randomly were available and could have been scrutinized. The work here involved the rearrangement of the incoherent materials with political vertones mostly.

Conclusions: The analysis and comprehension of historical relations, attitudes and values can guide us to understand the presence. It can enlighten and clarify the consequences of the decisions and actions that influence and shape it. The assessment and understanding of the broader context, the formulation of our priorities enables us to decide better and more efficiently about the acts in the future. This work aims to describe the history of PE instruction at Masaryk University and to provide the outlook on this issue in a broader socio-historical context.

Key Words: PE instruction, teaching plans, teaching goals and methods, sports fields, homeland defence.

SPORT MANAGEMENT

CONCEPT OF OPEN INNOVATIONS AND ITS INFLUENCE ON HR REQUIREMENTS IN SPORT ORGANIZATIONS

Jana Nová, Masaryk University, Faculty of Sport Studies, Brno

Theoretical Background and Aim of the paper: Concept of open innovation as suggested by Chesbrough et al., 2006, is based on the use of purposive inflows and outflows of knowledge to accelerate internal innovation. According to Nová (2015) in sport organizations the systematic approach is needed for assessing innovation in sport that provides opportunities for business development in all sports sectors. To assure the innovative spirit in sport organizations the implementation of the HR recruitment policy based on the concept of absorptive capacity as defined by Cohen and Leventhal (1990) is needed. Therefore this article investigates to what extent the various sport organizations in Australia are seeking in their recruitments the Human Resources equipped with sensitivity, skills or predispositions towards the innovations and how this requirements are formulated in relation to the different job positions.

Key words: open innovations, sport organizations, HRM, recruitment , skills

Methods: The content/ thematic analysis of the promoted vacancies/ advertisements (job and person specifications) placed on the Clearinghouse portal in various sport organizations during the 6 months period (January – June 2015) has been conducted. Coding method (Strauss a Corbin, 1998) was used so to provide the overview of the most required skills related to the innovation. The Atlas .ti software has been utilized so to categorize, summarize and present the main output as the Network Views.

Results and conclusions: The preliminary results of the study showed that the Australian sports organizations in their vacancy advertisements pay a due attention to the precise and well-structured description of particular job and subsequently person specifications'. Thus majority of the advertisements contains also the well-defined requirements in terms of skills and abilities to innovate the field where the job is organizationally located. This also enables selecting the HR for different position which would assure the absorptive capacity of the sport organizations.

Please note: Full results are not available at the time of abstract submission, but will be presented at the conference

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Adam Blažek, Michal Charvát

Purpose: The aim of the research is to determine the marketing and managerial requirements (aspects) of such organizational structure. Another one is to take a closer look at the content and forms of a marketing plan and the role of the manager in the makings of it.

Methods: After detailed study of relevant literature I decided to validate the theoretical assumptions in the environment of particular organization in the preparing and running of the particular sports event.

In the study itself I used various general methods, e.g. analysis, synthesis and specific marketing methods like structured interview etc.

Results: At the end it can be stated that the theoretical conclusions were fully confirmed practically. Annual success of the international tennis tournament Czech Open is a clear evidence of that.

Conclusions: I have tested general hypotheses practically, within the analysis of the organization of the international tennis tournament Czech Open. I used the method of a structured interview. The research undertaken did confirm these conclusions:

Before the tournament itself there is a very detailed plan which contains time and factual schedule of its progress.

It includes personal responsibilities of all the workers involved in the tournament and their tasks.

The co-worker choice itself is done very carefully. Workers who have already proven themselves to be reliable are preferred. Concerning personal qualities, reliability, flexibility and high work ethic are important.

Where necessary, these workers attend a detailed training (usually positions who are deciding to the progress and quality of the event).

There is a specific attitude of TK PLUS towards their sponsors. That attitude is built in a long term and does not stop just with the tournament. It's based on an individual approach and forming mutual trust between TK PLUS, s. r. o. and the individual sponsors.

The huge success of this international tournament is founded mostly on personal qualities of the company management. It's especially the owner of TK PLUS – PhDr. Miroslav Černošek, PhD. Dr. Černošek is oriented mostly on building close relations with the sponsors. From the sponsors' side he's viewed as a distinctive informal personality and an authority. This mutual relationship is reflecting in creating favourable financial conditions for the tournament. The second significant person is the tournament manager Petra Langrová-Píchalová. This formerly an outstanding tennis pro is hugely respected among players. She has much credit on getting amazing players for the event in Prostějov even despite the time conflicts with other major international tournaments.

At the end it can be stated that the theoretical conclusions were fully confirmed practically. Annual success of the international tennis tournament Czech Open is a clear evidence of that.

Key Words: marketing, marketing planning, management, marketing communication, marketing strategy

GRASSROOTS TRANSPARENCY: TRANSPARENCY AND ATTITUDES TOWARDS TRANSPARENCY IN LOCAL VOLUNTARY SPORT ORGANIZATIONS

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Purpose: Transparency has been gaining attention both in profit and nonprofit sector. In nonprofit sector and particularly in sport, most of studies focus on large organizations with international or national impact. The aim of this paper is to explore transparency in sport grassroots organizations and this aim is decomposed into two objectives. First objective is to find out what information is published by grassroots organizations, and how their transparency meets the criteria of codes of good governance and legal requirements. Second objective is to explore the attitudes towards transparency and identify possible opportunities for increasing transparency and barriers to transparency.

Methods: A survey design of the research was carried out in two phases. In the first phase, a document analysis of web pages and social networks was conducted using the sample of sport grassroots organizations in Olomoucký region (n=183). The sample comprised all organizations associated by regional governing body – Czech Sport Union. In the second phase, semi-structured interviews were carried out with representatives of six organizations which were selected to represent organizations of all sizes.

Results: Results show that almost 70% of grassroots organizations have their own web pages what makes significant increase in comparison with previous studies. However, the prevalence of web pages itself does not ensure transparency and generally low transparency was classified. Social network activity was also analysed because in many cases, social network (mainly Facebook) is the main communication channel of the organization. The role of social network in transparency was scarce. Individual components of transparency are analysed in the paper, and particularly financial transparency constitutes a problem. Interviews revealed two main clusters of motives for publishing governance information (external pressure and direct benefit) and two main clusters of obstacles for disguising information (inertia and fear).

Conclusion: Our paper revealed significant increase in number of grassroots organizations using web pages as a communication tool. Nevertheless, higher usage of web pages is not reflected by transparency of the organizations. Overall transparency of the grassroots organizations was classified as low. Opportunities to improve transparency and barriers to transparency were identified and propositions for sport government bodies and local authorities were suggested as practical implications of the research. Results of the paper also help to develop the theory of transparency by identification and clustering of the motives and barriers of transparency.

Key words: Transparency, Grassroots organization, Sport governance, Sport grassroots, Sport governance.

TEACHING OF SUBJECT „PROJECT MANAGEMENT IN SPORT“ AT THE FACULTY OF SPORT STUDIES AT MASARYK UNIVERSITY

Pavel Mrnušík

Project management can be defined as a way of coordinating human resources in order to achieve certain goals according to specified requirements. Main task of project management is to ensure smooth realisation of the project. This can be achieved by application of project management's methods which help us to be prepared for all difficulties that may appear during the realisation itself. Therefore without any doubt we can say that project management and its methods can be applied to various areas of human life, including sport and physical activities as well. This article focuses on educational process of university course named "Project management in sport" which is designed for students of master's studies of Sport management programme at the Faculty of Sport Studies at Masaryk University.

The purpose of this article is to present main goals of the university course to its readers. Among all the goals we can consider passing of professional knowledge and skills as the most essential one for becoming experts on realisation of projects either in a profitable organisation or non-profitable organisation. Reaching this goal requires cooperation between Faculty of Sport Studies, Faculty of Economics and Administration and especially managers with real life experience. Moreover the text characterises the basic methods of project management and their application in specific projects designed by students of this study programme. These students' projects very often include topics, such as organising sports events, reconstructions of sports centres or formulation of marketing strategies, on which students are showing the infinite amount of usage of project management methods.

Key words: project management, university course, student's projects, teaching,

THE LEGACY OF MAJOR INTERNATIONAL SPORTING EVENTS IN THE CZECH REPUBLIC

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The aim of this paper is to compare legacy of two winter major sporting events hosting in the Czech Republic as were FIS Nordic World Ski Championship Liberec 2009 and IBU World Championships Biathlon 2013 Nové Město na Moravě and find what link left in the region and the state.

Theoretical background. Several scholars have been studying the stadium phenomenon and the legacy of major sporting events in terms of economic effects mainly from USA. This paper is based on the work of European authors, especially Holger Preuss and Arne Solberg. Problem legacy of sporting events is part of the EU Strategy for the European sport. Emphasis is placed on the fact that investments in mega sports events has a legacy as particularly positive effects of tangible and intangible factors both in the region and locally.

Methodology which is based on the relation as a compare between positive and negative effect of these mega sport events in the sphere of social, economic, including environmental protection.

The results of the study show that is positive legacy of the biathlon, especially in the areas of social, where started the huge positive publicity in the Czech neglected sport. In contrast, the Nordic World Ski Championships in Liberec Czech public with a negative legacy to tarnish the reputation of the city, region as the result of the negative media campaign.

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HEALTHY LIFESTYLE, ACTIVE AGING

COMPARISON OF PHYSICAL ACTIVITY AND HEALTH STATUS IN THE SPECIFIED FOCUS GROUP OF POPULATION OF MIDDLE-AGED AND OLDER

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Purpose: The aim of this study was to analyze and compare data on the physical activity (PA) and health status of the adult population in the Czech Republic. This data was obtained in two stages, over a period of 6 years. Investigation was carried out in 2005 (1234 respondents, 693 women, 541 men) with an average age of 47.0 years, and then in 2011 (1171 respondents, 681 women, 490 men) with an average age of 47.7 years. Identification of differences occurring in both specific surveys and among surveys carried out within the time interval.

Methods: The following data collection methods were used: a structured questionnaire focused on the area of somatic and socio-demographic data, self-reported health status questionnaire and the quantitative analysis of physical activity. Data were consequently sorted and processed using descriptive statistical methods.

Results: During the six-year study interval, there were recognized changes in the somatic characteristics of the studied population (improvement of more than 4% of females of normal weight and, contrarily, similar deterioration of males in the zones of overweight and obesity). Number of individuals "without any health problems" had increased from 11.4% to 17.7% between 2005 and 2011, the most common reported problem being the pain in the lumbar spine. In both surveys, more than half of the individuals lacked sufficient physical activity (PA). Walking was reported as the most practiced PA, whilst the only PA which popularity increases with age, is medical gymnastics.

Conclusion: The weekly amount of PA performed by the respondents did not fundamentally change within the 6 years interval; however the structure of activities differed. The physical activity of more than half of the respondents in both surveys can be considered as insufficient. Changes in BMI and health perception have been reported. Contrary to the assumption, no contraindications associated with higher time allotment of PA have been diagnosed.

Key words: Physical Activity, Questionnaire, Health condition

PHYSICAL ACTIVITY AS A MEANS OF IMPROVING THE QUALITY OF LIFE IN CANCER PATIENTS - A PILOT STUDY

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Physical activity (PA) is one of the most natural behavior of human beings. Nonetheless, representative survey data show that 35% of the European adult population is physically inactive. On the other side, there is evidence, that physical activity is associated with decreased risk of some kinds of cancer – colon, endometrial, breast cancer. For example insufficient physical activity levels are thought to cause 9% of breast cancer. In cancer survivors, physical activity has shown positive effects on body composition, physical fitness, quality of life, anxiety and self - esteem. But there is lack of evidence linking increased physical activity to prolonged cancer survival. Even if there is a strong evidence about beneficial contribution of PA in primary and secondary prevention of cancer according to Scientific commission of the National Federation Sport and Cancer, there are some unsolved issues about the effects of physical activity in oncology. The main unsolved issue deals with the modalities of PA.

The pilot study deals with optimization of prescription of PA in breast cancer survivors. It includes type of exercise, duration of session, intensity and frequency and its impact on chosen physiological parameters.

15 breast cancer survivors was enrolled to 6 months intensive PA program leaded by staff of Faculty of Sports Studies. Frequency of sessions was 3 x weeks, the duration of each session was 60 minutes. The type of PA was 1x harmonization exercises and 2x aerobic activities. The intensity of PA in aerobic sessions was assessed according to spiroergometry load test of each individual. For evaluation of positive impact of physical activity on physiological parameters following tests were made: Spiroergometry load test, body composition by bioimpedance measurement, test of activity of autonomous nerve system, isokinetic dynamometry. All the tests were made in the beginning, after 3 months and in the end of intervention.

The results shows that combination of harmonization exercises and aerobic activities seems to be very effective means to reduce the negative effect of cancer treatment.

CHANGES IN EATING HABITS AND SELECTED PARAMETERS OF FEMALE BREAST CANCER PATIENTS AFTER 6 MONTHS OF PHYSICAL ACTIVITY INTERVENTION

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Breast cancer is the most occurring oncological illness in European and North American women. According to the Statistical Yearbook of the Ministry of Health, malignant breast tumor is the most frequent malignant disease in women in the Czech Republic and the incidence is increasing. In the Framework of Specific research at the Faculty of Sports Studies, there is an ongoing project of physical intervention. Subjects are 14 women with breast cancer (age 32-58). The intervention consists of 60 minutes of aerobic physical activity 2-times a week and 60 minutes of body-mind exercise once a week. Subjects undergo following exercise diagnostics: measurement of body composition on InBody 230, examination functions of the autonomic nervous system, isokinetic dynamometry measurements, analysis of nutritional status and dietary interventions. We made two analyses of their nutritional status yet – in the beginning of the programme and after 6 month. In results, we can see, that in most cases, there was no significant interference in diet of the followed subjects during the intervention – notable changes occurred after the diagnosis and treatment, eating habits of the patients were stable.

REDUCTION OF BODY WEIGHT IN CHILDREN BY APPROPRIATE DIET AND PHYSICAL ACTIVITY

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There was 51 research children (16 boys and 25 girls), who stayed sanatorium for children with different kinds of disorders include for children suffering from overweight or obesity. The program for the reduction of body weight contained rehabilitation procedures, strengthening physical fitness, regular workouts in a gym, games in the open air and walking. A special diet was composed for children suffering from obesity. Together with the physical activities, the aim of the diet was to reduce body weight of obese children.

At the beginning and at the end of the cure, basic anthropometric parameters were recorded for each child. At the end of the stay, the children's body weight was measured. The results proved that the program for reducing body weight was successful for all children. Boys lost in average 4.61 ± 1.68 kg, girls lost in average 3.65 ± 1.33 kg.

THE INFLUENCE OF THE SHORT-TERM MOVEMENT INTERVENTION ON THE QUALITY OF LIFE OF WOMEN IN THEIR MIDDLE AGE

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Purpose: Nowadays many individuals with overweight in their middle age suffer with the pain of musculoskeletal system. This pain is indirect indicator of the functional disorders of musculoskeletal system that can lead to decrease in the overall quality of life (QOL).

The QOL of an individual and his/her state of musculoskeletal system is influenced by the range of bio-psycho-social factors. From the point of view of optimization of the state of musculoskeletal system we find the individually adapted proposal of the movement intervention to be crucial, next to the precise diagnostics.

The aim of this work is to describe the influence of the short-term complex (movement and educational) intervention on the perceiving of the QOL of the women with overweight in their middle age. Our research sample was consisted of 23 women.

Methods: The QOL was evaluated pre- and post- the application of the complex program with the questionnaire Quality of Life Enjoyment and Satisfaction (Q-LES-Q). In the Czech Republic this questionnaire was validated for diagnostics of depressive disorder and it is appropriate to determine influences of targeted intervention. It contains 92 questions divided to 8 domains (Physical health/activities, Feelings, Work, Household duties, School/course work, Leisure time activities, Social relations and General activities). Questions are responded on the five point Likert scale (from Not at all to All of the time).

For the statistical evaluation we used the program STATISTICA 5.5. To compare the change within all domains pre- and post- the intervention we chose the statistical method Wilcoxon test that is used for evaluation of changes between two dependent random samples.

Results: In every domain the certain changes appeared in perceiving the QOL. We can say that also short-term complex intervention can be positively projected in all domains of life. Within statistical evaluation we noticed changes on the different level of significance in all evaluated domains, except the domain "Work". The changes in this domain were not significant probably because of the fact that our short-term intervention took place during the weekend. Statistical significance on the level $\alpha=0.01$ manifested itself markedly in the first domain of the questionnaire "Physical health/activity". The second statistically significant change appeared on the domain "Feelings" and the third one was in the last domain "General activities".

Conclusions: When implementing the short-term complex intervention we recommend to adjust it to all clients, who take place in it. The program of the stay should be adjusted to state of their musculoskeletal system. The crucial activity that was used in our suggested program was Nordic walking, because it influences both physical and psychical part of the individual. Observed positive changes confirmed the suitability of the suggested movement and educational intervention for the influencing the QOL of women in their middle age. We are aware of the fact that achieved positive effect does not have to be permanent. It would be appropriate to keep the motivation of individuals in the long term.

Key Words: hypoactivity, overweight, vertebrogenous difficulties, middle age, movement intervention, quality of live

MOTOR COMPETENCY AMONG CZECH PRESCHOOL CHILDREN WITH REGARDING TO GENDER

Jakub Kokštejn

Purpose: To report a level of motor competency through fundamental motor skills (FMS) and to find a possible gender differences in FMS in preschool children 4-6 year old.

Methods: A total sample of 284 children (4-6 years old; 126 girls and 158 boys) participated in this cross-sectional study. The test of the Movement Assessment Battery for Children (MABC-2; 2nd edition) was used for the assessment of FMS motor competency using a total test score (TTS) and also a score of three subtests of MABC-2 test (Manual dexterity-MD, Throwing and catching-AC, Balance-BAL). For interpretation of statistical significance Mann-Whitney U test was used for finding the gender differences in each year of age between 4-6 year old children.

Results: Four-year-old girls performed significantly better in TTS score, manual dexterity and balance subtests of MABC-2 test than boys. We found no gender differences in TTS in five and six year old children. However six-year-old boys performed significantly better in subtest of throwing and catching (AC). According to TTS score, the trend of increasing motor competency level across all age periods (4, 5, 6 years) was observed in boys while in girls we found conversely decreasing level in TTS score across age.

Conclusion : The decreasing level of FMS motor competency level across age in girls is concerning. Special focus should be paid to improving of throwing and catching skills in girls because of its important role in many sport games and activities. Early motor skill programmes with gender specific approach should be encouraged especially by teachers to help children master a basic motor skills from area of throwing and catching.

Key words: Preschoolers, gender differences, motor skills, MABC-2, standard score.

SENIOR TOURISM ON THE EXAMPLE OF MEMBERS OF THE 'FAN' ASSOCIATION FOR SPORT PROMOTION IN WROCŁAW, POLAND

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The article refers to the functioning and development perspectives of senior tourism based on the opinion of two senior sections members of an association dedicated to sport promotion. A short presentation of the association activity is followed by an analysis of the survey responses. The research was performed among 68 seniors. The questions concerned four main topics: the respondents' personal status and physical condition, the preferred forms of recreational activity, the main purposes of travelling and tourist motivations, and, finally, the most important factors inhibiting the responders' tourist activity. The group was also asked to assess the tourist offer existing on the local market in Lower Silesia, and especially to emphasise factors that should be changed.

Key words: senior tourism, tourist motivations, tourism development inhibitors, tourist offer

THE MOTIVATION FOR THE MOVEMENT EDUCATION OF GROUP OLDER'S PERFORMANCES FOR THE WORLD GYMNAESTRADA 2015

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Purpose: Large group performances of Czech Association Sport for All (CASfA) for the World gymnestrada (WG) is a program of movement education for adult athletes (gymnasts). Preparing for the Gymnestrada is a multiannual process of physical preparation culminating with performance at the international event. The three-year preparing and training process is aimed at creating an optimal content of physical literacy due to age to acquire new gymnastics skills and obtain the necessary level of physical fitness. Participation of gymnasts in group performance meets their specific personal needs. Evaluated by Maslow's hierarchy of needs (pyramid) are called as a category of higher order.

Methods: In large group performance for WG 2015 attended 344 athletes from Czech Republic, of whom 64% women and 69% men accounted for older gymnasts aged 50-80 years. Motivation for movement education was established through a questionnaire created by the application of individual aspects (components) Maslow's hierarchy. The questionnaire contained 12 questions circuits. Responses were expressed at the five-point scale divided into five-year periods by age of gymnasts. From the response rate was created score.

Results: The questionnaire was completed by 65% of respondents. The most important motive for participation was the most commonly reported answer by athletes: I like the group exercise with the music, I like the atmosphere of this exercise (for 8 age groups, average score 4.64). Just a second, the answer was: I like to perform in group exercise, I feel good in the team with fellows and friends (for 7 age groups, average score 4.70). The third answer reached a high response to movement self-fulfilment (average score 4.54). Gymnasts age above 70 years chose in most cases evaluation within a maximum of 4-5 - agreeing with satisfaction with the program of physical activity and with their participation.

Conclusions: Based on the evaluation of the results of the questionnaire can be found that athletes participation in the preparation and public appearance of large group performance for WG is for gymnasts not only movement education program, but also fulfil of their social needs, the possibility of making friends and feeling of belonging to the selected group. Cooperation in the group and movement coordination among participants is filled with the needs of recognition and appreciation, satisfaction with their own mastery of physical abilities and skills. Declared agreement with fulfilling the needs of self-realization is also significant. Every practitioner contributes to the final success with their own performances with positive and creative expression of movement. It turns out that the large group music movement composition for the WG and its preparation process of performance can be a good motivation for movement education of older athletes and can meet and bring physical, psychological, social and aesthetic needs of gymnasts.

Key words: Movement education, group performance, motivation, gymnastics

SPORT AND DANCE WALKER

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Key words: Walker, Seniors, Dance, Aging

Introduction: Aging – a process which goes through each person in a different way. (Korte, 2012; Mietzel, 2012) The walker project wants to counteract against the dismantling of cognitive and physical abilities, and to allow above all varied movement training also for physically limited seniors. This walker differs in many respects from the normal walker. Firstly, the senior stands in the device, and has a greater freedom of movement. Secondly, the risk of falling is minimized by this standing position, and the frame construction, there is a greater sense of security. Thirdly, the variety of exercises in this device is greater, and fourthly the walker allows movement in all directions.

Method: For a first evaluation, a study will be conducted in summer of 2015 with physically and mentally limited seniors at the age of 60 to 95 years. To make a comparison, there will be an intervention group and an inactive control group. Over a period of three months, seniors will learn various dances and perform versatile movements. This method will improve their coordinative, physical, and cognitive abilities. The

following test procedures are used before, at half time, and after intervention:

- 1)Cognition: Montreal Cognitive Assessment, Number Connection Task, Verbal Fluency Task;
- 2)Psychology: Depression scale, Life satisfaction, Falls Efficacy Scale;
- 3)Physiology: Berg-Balance-Scale, Pulse values, Electromyography.

Results: It is used a pilot study which will indicate the first trends. We assume that the intervention group compared to the control group will show better results in the tested parameters.

Discussion: The Question arises, to what extent the dance training can counteract the aging process of mentally and physically limited seniors?

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ANALYSIS OF FITNESS LEVEL OF SCHOOL-AGE CHILDREN IN THE CZECH REPUBLIC

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Purpose: In connection with the Sazka Olympic multi-event competition there was implemented nationwide testing of more than 40,000 children at the age of 6-15 years in the school year 2014/2015.

Methods: Physical fitness was assessed through 8 motor tests and somatic characteristics with 2 indicators (body height and weight). Results were analyzed in three main areas:

1. Comparison of fitness development - boys vs. girls
2. Comparison of small and large settlements (less than 20,000 vs. above 50,000)
3. Comparison of regions

Results and conclusions: In the first area girls exceed boys more in the following events: stork stand (balance) and a sit and reach (flexibility), boys exceed girls in the other abilities: T-Run (agility), 60 m run (speed), basketball throw (explosive power), long jump (explosive power) 500/1000 m run (endurance). For power endurance – truncated sit-ups in the first grade girls exceed boys and in the second grade the ratio is reversed.

In the second area the level of fitness by children living in the big cities was significantly higher in comparison with children from the small municipalities.

In the third area we found significant differences in fitness between individual country regions.

Key words: testing, small and large settlements, boys vs. girls, comparison of regions

EFFECTS OF A DANCE VS. FITNESS TRAINING ON BRAIN PLASTICITY, BALANCE PERFORMANCES AND ATTENTION IN HEALTHY SENIORS

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Purpose: Aging leads to alterations in higher-order integrative neural structures, like the parietal and prefrontal cortices which are also crucial for various cognitive processes including attention. These changes are also known to result in age-related balance difficulties. Recent investigations suggest that physical training with additional demands on working memory and spatial perception abilities is superior to aerobic training. Dancing poses higher cognitive demands, so we speculated that dancing in seniors has the potential to increase volumes of brain regions associated with balance and attention more than repetitive physical fitness exercises.

Methods: 57 healthy subjects (65-80 years) were randomly assigned into a dance (DT) and a traditional fitness training (FT). Both groups practiced twice a week, 90 minutes for 6 months. Magnetic resonance images (3T) were analysed using voxel-based-morphometry implemented in SPM 12. Balance was evaluated using the Sensory Organization Test and attentional parameters were assessed using a computerized test battery.

Results: DT led to significant increases in gray matter volumes in the cingulate and temporal cortex, while FT increased gray matter volumes mainly in the cerebellum ($p < .001$). Regarding balance abilities DT demonstrated significant improvements in the somatosensory ($p = .048$), the visual ($p < .001$) and in the total equilibrium score ($p = .006$). FT led to positive changes only in the visual ratio ($p = .042$). Concerning attention, DT reduced reaction times ($p = .014$) and error rates in divided attention ($p = .039$); and improved processing speed ($p = .020$). FT induced improvements in processing speed only ($p = .046$).

Conclusions: Multimodal stimulation and continuous learning associated with dancing seems to be more effective than traditional repetitive fitness exercises in inducing neuroplasticity. The brain regions which increased with DT are known to be involved in memory and multisensory integration but also seem to relate to balance and attention performance, which is underlined by additional correlation analyses. Although the cerebellum increased with FT and is also involved in balance, the improvement in balance performance was less pronounced in the FT group. Although DT seems to improve balance and attention performances much more compared to FT, between-group comparison failed. Nevertheless, the results of this study confirm for the first time the positive effect of a dance training on structural brain changes in seniors. Also a qualitative high-graded fitness training can slow down age-related declines in attention and balance. Training programs for senior citizens should be created diversified to achieve maximum effects on neuroplasticity.

Key Words: Dancing, Balance, Attention, VBM, Seniors

PHYSICAL DEVELOPMENT AND GENERAL MOTOR PERFORMANCE OF PRESENT PRIMARY SCHOOL BOYS POPULATION IN RUZOMBEROK.

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In 2014-2015 there were tested in several Ruzomberok schools children from maternity, primary and secondary schools. This contribution deals with boys from primary schools (age 6 – 11). We used two somatic tests body height (BH) and body weight (BW) and reduced Eurofit test battery for general motor performance level evaluation: sit and reach (SR), standing broad jump (SBJ), sit-ups in 30 s (SU), bent arm hang (BAH), shuttle run 10 x 5 m (10x5), endurance shuttle run (ENDU) and 2 kg medicine ball throw (MBT). These parameters we compared with Slovak population results mostly from former period 1994-95 and 1987 in case of MBT. Differences were evaluated by parametric un-pair test on 1% and 5% significance level. There were involved 469 boys from Ruzomberok 1st to 5th classes. In somatic parameters we learned that in test BH present Ruzomberok schools boys are on 1% significantly smaller level than former populations. In case of BW there were mostly found none significant differences with former populations; it seems that Ruzomberok boys are slightly of higher BW. In tests of general motor performance can be seen that there is a great difference between former populations comparing present Ruzomberok boys. Only in test BAH are Ruzomberok boys slightly better in all classes. In all other tests are better former population boys, mostly on 1% significance level. The greatest difference seems in the test endurance shuttle run.

Present researchers often confirm these results that in physical development stopped so called secular trend. Present boys are smaller, but their BW is the same or slightly higher. So they must have higher body mass index. It is sure that negative trends in somatic parameters also influence negatively general motor performance. Present Ruzomberok boys level in motor performance is far worse from former Slovak populations.

Key words: primary school, physical development, general motor performance

PHYSICAL ACTIVITY OF ADOLESCENT GIRLS IN DIFFERENT TYPES OF HIGH SCHOOLS

Pavel Trochta

The thesis deals with the physical condition of the adolescent girls and their attitudes towards the physical activity on different types of secondary schools. The research focuses on attitudes of adolescent girls to physical activity at school and during their leisure time. 12 high schools from Zlín region got involved in this study. High schools were divided into 3 groups. Grammar schools, schools specialized in business and schools specialized in health. Each group is characterized by similar types of school. All groups were represented by 4 particular high schools from Zlín region. A structured questionnaire was designed at first. To determine relative and absolute rate of attitudes obtained results were analysed. The research reveals that 42% of all involved adolescent girls are dissatisfied with contents of physical education. Most of adolescent girls simultaneously agree and understand that physical education should be part of curriculum. The most preferred physical activity is fitness training. 82% of all participants responded that fitness training should be more often included into contents of physical education. Outdoor and alternative activity together with ball games tend to be very popular too. It's also obvious that popularity of particular sport is connected with individual motivation of participants. This research shows that the most of adolescent girls do sport or physical activity because of the fun or because of their desire to have better physical condition or nicer body. These 3 motivation factors achieved on average 79% from all types of high schools and are the most significant. In short results suggest that adolescent girls understand the benefits and importance of physical activity. The research also reveals girl's dissatisfaction with form of physical education. It could be claimed that solution is inclusion of fitness training into contents of physical education. This type of activity tend to be close to adolescent girls and corresponds to their lifestyle.

Key words: adolescence, physical education, school environment, female sports, motivation, femininity, masculinity

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Purpose: The aim of this paper is the introduction of a project, which is executed within the frame of the Masaryk University Development Fund, and whose goal is to design and open a new course called Rollpilates lectured at the University Sports Centre department at the Faculty of Sports Studies.

Methods: An exploratory and descriptive approach to comprehend relevant complex research problems in the field of the fascia oriented training, stretching and Pilates methods with the support of the practical training experience are used.

Results: The course, which is lectured both in Czech and English language, will be integrated into the study programme within the compulsory and optional forms of PE at the University Sports Centre department in the spring term 2016. An interactive educational material is designed where the detailed programme of the course is described and explained. The content of the course involves the Pilates exercise method employing foam rollers. The system is enhanced with the fascia oriented training, which is a new form of exercise based on different stretching forms, whose goal is to enrich the general training process, PE and exercise activities and where the whole neuromyofascial complex can be affected and trained. The appropriate and adequately pointed fascia oriented training enables the rearrangement, rehydration and release of the fascial network. The training also restores and balances natural physiological functions of the network. To disseminate and propagate the ideas of the course programme, the material is displayed at the Information system of Masaryk University.

Conclusions: Although the application and utilization of the course is still in progress, we believe that the course and its content respond to a growing university students' concern in a modern and interactive conception of the movement activities based on the remedy exercise forms and their interest in new trends in the field of sport and PE. The fascia oriented training influences the condition of both the connective tissue and the muscle system, accelerates rehabilitation processes after injuries and is a vital part of the prevention against injuries. Thus it improves the quality of life in each individual and brings positive impact to human health and mental balance.

Key Words: rollpilates, stretching, Pilates, fascia-oriented training, fascial network

SPORT MEDICINE

THE RELATIONSHIP BETWEEN PHYSICAL ACTIVITY AND BODY MASS INDEX IN ADOLESCENCE: THE PAHL STUDY

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Physical inactivity is a global health problem to human life. Physical inactivity is found to be associated with excessive fatness. The purpose of this study was twofold; to determine the physical activity and BMI status and also to investigate the relationship between physical activity and BMI among adolescents' learners in the Tlokwe local municipality. A total of 289 (111 boys and 173 girls) adolescents aged 15 years from the PAHL study are participants in the study. Height and weight were measured according to the standard procedures by the International Society for the Advancement of Kinanthropometry. Subsequently, body mass index (BMI) as a measure of body composition was calculated as $\text{body mass/stature}^2$ (kg/m^2). Additionally, adolescents were categorised into three groups namely underweight, normal and overweight according to the standard references. PA was assessed using a short form of the International Physical Activity Questionnaire (IPAQ). For the purpose of this study total PA was categorised as low, moderate and high. Of the total group 29.4% showed low PA and 30.4% high PA. 16.2% of the boys and 43.2% of the girls participated in low PA, whilst 43.2% and 38.7% were in high PA for boys and girls respectively. In the total group 29.1% were underweight and 26% overweight. Boys were more underweight (34.2%) than girls (26.6%). The prevalence of overweight was 17.1% in boys and 32.4% in girls. Negative but non-significant relationship was found between physical activity and BMI in the normal and overweight groups respectively ($r = -0.05$, $p = 0.61$; $r = -0.04$, $p = 0.78$). Thus, the study indicates that relatively high BMI was negatively associated with physical activity. It can be concluded girls exhibited highest percentage of inactivity and overweight than the boys. In addition, relatively high BMI was associated with physical activity. From the Biokineticists point of view, the need for strategic physical activity intervention programs and wellness programs are urgently required.

Keywords: physical activity; body mass index; adolescence, sedentary, obesity

EVALUATION OF REHABILITATION EFFECT WITH 3D SCANNING MEASUREMENT IN FLATFOOT DIAGNOSIS IN CHILDHOOD

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Purpose: Flatfoot diagnosis in childhood belongs to the most frequent diagnosis in the orthopedic and physiotherapist clinics. The aim is to establish the suitable parameters for foot arch description from point of 3D perspective. The aim of this research is to evaluate the influence of rehabilitation on the flatfoot diagnosis in childhood using a new 3D profilometry scanning method.

Methods: The research group consisted of 8 participants with the flat foot diagnosis (3 girls and 5 boys), aged 6.6 ± 1.5 years. Three palpable points were marked on foot of each probands being in the sitting position in neutral position of hock joint: 1. metatarsophalangeal joint, os naviculare and malleolus medialis. Each leg was scanned in sitting and one leg standing positions. The measured parameters were: the arch height without loading and in loading (represented by height of os naviculare) and longitudinal arch angle. This measurement was performed before and after rehabilitation intervention. Rehabilitation interence was performed twice a week 45 minutes, total number of therapies was 10.

Results: All datas came from standart normal distribution (tested with Kolmogorov-Smirnov test). To compare datas before and after rehabilitation the paired t-test was used. Statistical analysis of data showed statistically significant changes of all parametres after the intervention ($p < .05$).

Conclusion: This is the first study, which describes the possibility of using 3D scanning method for diagnosis and evaluation of therapy effect in flatfoot diagnosis in childhood. This study shows positive effect of rehabilitation of children flat foot. This effect was measured with 3D profilometric scanning methods. This technology can reveal foot arch information in all planes and by that improve the quality of foot arch deformity diagnosis.

Key words: foot arch, 3D scanning method, flatfoot, children

POSTURAL CONTROL AND FALL PREVENTION IN THE ELDERLY

Ondrej Kolarik

In terms of human development a child evolves most in the first 16 months in context of postural skills. The child has to discover a fascinating repertoire of skills from developing balance on limbs, coordination of eye - hand - mouth, crawling, turning, walking on all fours, sitting, standing, walking and they have to do it their own way. On what principles is postural control built and how can age reduce this ability. Age induced damage of postural control system have mostly affects of motor skills of an individual and often ends with immobilization or fall induced trauma and subsequent loss of mobility. The purpose of this presentation is to inform about the importance paid to the prevention of falls in the elderly. There are already studies that provide information about how effective way of preventing falls, now it is up to us to put into practice.

Methods: Comparative research and meta-analysis. To our research we use databases MEDLINE, EMBASE, Scopus Library, web of science and several clinical trial registries were searched for randomised and non-randomised clinical trials of rehabilitation or sport intervention in elderly people with information about falls in last year. Results will use in this presentation and dissertation work.

Results: There are many factors that affect the Balance or postural skills, such as genetic factors, external influences leading to structural damage, mechanical, and biological changes regarding sensors. But the effects of many of them we can use physical activity to slow down, to prolong active age of man, without unnecessary complications.

Conclusions: Exercises therapy should be focusing on Balance, strength in lower limbs, gait training and cognitive function. Intervention program should be composed like individual and group therapy, amend by exercises at home.

Key words: postural control, balance, stability postural skills, age effect, elderly people

INJURIES IN WINDSURFING SPORT

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Purpose: The purpose of this research was to figure out injuries in windsurfing sport, their reasons and prevention.

Methods: Together 161 windsurfers in three different groups A,B,C (based on sport discipline and sport performance) were asked in 2 questionnaires about their injuries (body region, type of injury and number of injuries). Sport performance, sport load, technical skills and process of regeneration were taken into the consideration as well. Age varied from 20.8 to 43 years. Injury rate was calculated in all tested groups (number of injuries/athlete/year).

Results: Windsurfing load intensity reaches a high level, as evidenced by the values (heart rate in beats per minute) obtained during training and competition monitoring. While in training, the maximum value is approaching the value of 200 beats per minute, with the addition of mental stress during competition was recorded highest value of 214 beats per minute. Crossing the threshold of 200 beats per minute is becoming common in many competitors. The complex readiness for sport performance is an important prerequisite for prevention against injuries. In group C it was found a significant relationship between sports performance and regeneration, which proved to be very beneficial. While the total loading time has proved to be statistically insignificant, number of training units and adequate regeneration to sport performance was highly significant at the $p = 0.05$. Three groups differed by discipline and levels of physical and technical preparedness achieved following values: 92 injuries (group A), 47 injuries (group B) and only 15 injuries in group C. The most injuries appeared in lower extremities (group A, 42%) and in upper extremities (group B, 52% and group C, 53%). Injury rate represents the number of injuries per athlete per year. The following values were found: 2.63/athlete/year in group A, 1.04/athlete/year in group B and 0.63/athlete/year. The frequency of various injuries, their type and location are given in tables 1-6.

Conclusions: The number of injuries in windsurfing depends on the implementation of the disciplines where funboarding is much more risky than raceboarding. Next addition is related to the level of fitness and coordination preparedness, while important is the level of technical skills. Last but not least as substantial showed quality and quantity of the regeneration process, and adequate rest.

Key words: injuries, windsurfing, sport loading, prevention

SODIUM BICARBONATE, CAFFEINE, AND THEIR COMBINATION DOES NOT ENHANCE REPEATED 200-M FREESTYLE PERFORMANCE

Michal Kumstát, Ondřej Šimko, Tomáš Hlinský

Purpose: Ingestion of sodium bicarbonate (NaHCO_3) before short-term, high-intensity exercise has previously been found to enhance performance in repeated exercise bouts. The benefits of caffeine ingestion before high-intensity exercise appear to be limited. Not much is known about potential synergy between both supplements. The aim of this study was to investigate the effects of NaHCO_3 , caffeine, and their combination on repeated 200-m swimming freestyle performance.

Methods: Seven elite male freestyle swimmers ingested NaHCO_3 (0.3 g/kg; B), caffeine (3 mg/kg; C), a combination of both (B+C), and placebo (P, lactose) on 4 separate occasions. A supplementation was orally administered in a double-blind randomized research manner 90 min before completing 2 maximal 200-m freestyle time trials (TT_1 and TT_2) separated by 15 min.

Results: Significant differences ($p < 0.05$) were observed for performance in TT_1 between B+C $128,57 \pm 4,92$ s vs. B $131,76 \pm 3,85$ s ($p = 0,009$) and B+C vs. P $132,44 \pm 4,13$ s ($p = 0,02$) and in TT_2 between B $134,29 \pm 5,28$ s vs. C $131,27 \pm 3,69$ s ($p = 0,04$). However, no significant treatment effect was observed in the drop-off in performance time between B, C, B+C and P. The reduction in performance in TT_2 compared with TT_1 was found to be greater when B and B+C were ingested in comparison to P. This likely corresponds with the gastrointestinal discomfort observed in all supplementation trials.

Conclusions: These findings suggest that the ergogenic benefit of taking B, C or combination for repeated 200-m swimming performance is to be questioned. The practical outcome appears to be limited, since supplementation of substances with potential ergogenic properties brought rather harm (greater performance reduction) to trivial effect in comparison to placebo. A small performance increase is mainly attributed to poor gastrointestinal tolerance of dietary supplements.

Key Words: dietary supplements, ergogenic aid, swimming, gastrointestinal distress.

THE ROLE OF PHYSIOTHERAPIST IN SPORT

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Purpose: This article aims to explain the role of the physiotherapist in sport in the care of acute sports injuries and optimization of movement stereotypes. These two roles are completely different and have their own characteristics. The health aspect is one that is neglected in professional sports. Physiotherapist's role in the preparation of athletes this may change. However, it is necessary to make a compromise and besides quality also to ensure freedom of movement.

Annual training cycle: To understand the importance of kinesiotherapy in sports training is required to inform the periodization of the annual training cycle in the sector of sports. This training cycle is divided into four parts. There are preparatory, pre-competitive, competitive and transitional period. The most important part of the annual training cycle is a preparatory period. Within it athlete undergoes greatest training block. The aim is to gradually develop all fitness, technical and psychological requirements.

Sports physiotherapy in acute injuries: The role of physiotherapist in acute injury is to accelerate healing processes in the body of an athlete. In this situation conflict can occur as a sportsman and his coach due to different perceptions of health and competitive relations. Due to excessive motivation and desire to compete may athlete and his trainer want to rush rehabilitation. There is a place for the education of the current status and ongoing healing processes in order to avoid impairment, or more serious consequences. Physiotherapist should work in order to support self healing process.

Sports physiotherapy in optimization of movement stereotypes: If the physiotherapist wants to change movement patterns is needed to know the periodization of training cycle. Work on changes of movement stereotypes can lead to impair of technical skills and a temporary drop in athletic performance. A good time for inclusion of kinesiotherapy is in the transitional period. Sometimes we can place it after the main peak of the season, if other races are not so important. Some athletes implement the kinesiotherapy in the whole training programme. They realize that it is a good investment in the future health and serves to eliminate the impact of professional sport.

Conclusions: It was suggested that rehabilitation in sport can play a high role in preparing athletes. But it cannot substitution the whole training programme. It serves as a complement of training programme to improve performance. Also it eliminates health risks of unilateral overload. From experience with top sport we can say that this opportunity is not used with czech athletes and sports clubs mostly due to bad economic situation. Raise awareness of this possibility is also one of the tasks of a physiotherapist, who in his practice deals with the care of athletes.

Key Words: physiotherapist – kinesiotherapy - sports physiotherapy – training cycle – acute injuries – movement stereotypes

DOPING IN CZECH ADOLESCENTS: PREVALENCE AND ATTITUDES

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Purpose: International research shows that performance enhancing drugs (PED) represent a serious problem both in competitive and leisure sports, including adolescent sports. However, to our knowledge, no recent representative studies of doping in adolescents are available in the Czech context. The aim of the present study (conducted with a support of World Anti-Doping Agency) is to explore the prevalence of doping in the Czech adolescents, their attitudes toward doping, and related demographic factors. *Methods:* 2851 Czech adolescents (mean age = 16.2) participated in the questionnaire survey. The respondents completed a battery of questionnaires assessing their experience with doping, attitudes towards doping, and related demographic factors. On this basis, we measured the prevalence of doping in various subgroups of the participating adolescents, their attitudes towards doping, and the relationship of the reported doping use and doping attitudes with demographic variables. *Results:* We found that Czech adolescents reported relatively high level of doping in comparison with international studies: 8 % of respondents reported that they had at least one-time experience with doping, and more than twice this number (16.9 %) reported that they were offered doping at least once. In general, respondents reported negative attitudes towards doping but, at the same time, relatively positive attitudes in comparison with results of international studies. Use of doping was reported significantly more frequently by men, students of vocational schools, and students of sport schools. The highest prevalence of doping (12.3 %) was observed in elite athletes, followed, somewhat surprisingly, by leisure athletes. Doping was most frequently offered to elite adolescent athletes and competitive athletes: 25 % of elite athletes reported that they were offered doping at least once. *Conclusions:* Our results suggest that doping represents a risk behavior prevalent in a relative large portion of Czech adolescent population and should become a focus of further research studies and preventive programs.

Key words: doping, performance enhancing drugs, adolescence, attitudes, risk behavior

EFFECT OF ALTERNATING HOT AND COLD WATER IMMERSION IN REGENERATION OF ATHLETES

Ivan Struhár, Lenka Dovrtělová

Purpose: Water immersion methods are often used by coaches and trainers to intensify the recovery after sports training or competition. Athlete's regeneration is key component of successful achieving of maximum potential of subject. Despite the fact of recovery importance, there is a huge group of athletes who systematically plan sport training without adequate recovery time. Subsequently, it is difficult to maintain expected performance during long periods of time and it can lead to reduction of muscle function for several days, overtraining or even burnout syndrome. These impairments provide a real effort to enhance the potential of recovery with aim of being able to complete required performance in day of training or competition. The main purpose of this study was to point out of using alternating hot and cold water immersion in regeneration of athletes.

Methods: A literature search was conducted using ScienceDirect and Medline databases using the words muscle fatigue, cryotherapy, contrast water immersion, sport training and delayed onset muscle soreness.

Results: Numerous regeneration strategies are used in order to enhance the ability to recover after the strenuous exercise. Water immersion methods especially alternating hot and cold water immersion are one of the legitimate training tools. Anecdotal evidence from coaches and athletes support the real subjective impact on post-exercise recovery.

Conclusions: Popularity of alternating hot and cold water immersion cannot be used by all athletes in general way. Components, which are most stressed during the sport activity, are different for endurance and speed training. Coaches must firstly identify key factors which lead to the appropriate recovery and then to create relevant post-exercise recovery protocol. In addition to the finding key components of regeneration in each sport discipline, the factors like duration of immersion, temperature of water, the degree of immersion, number of alternating hot and cold water immersion cycles, the depth of immersed part of body in water (the depth of immersed part correlates with hydrostatic pressure), body position during therapy (sitting, standing, or lying down) or body's ability to adopt to therapy cannot be underestimated. More scientific research is needed to elucidate clear understanding post-exercise recovery protocol.

Key Words: Cold therapy, Water contrast, Muscle soreness, Post-exercise, Recovery, Sport training

EFFECT OF DIETARY NITRATE SUPPLEMENTATION ON PLASMA NITRATE/NITRITE IN PHYSICALLY ACTIVE MEN

Štulrajterová, L., Stejskal P.

Purpose: Beetroot juice (BJ) has been reported to improve certain aspects of exercise performance, which may be linked to increased nitric oxide, which blood levels are connected with plasma nitrates and nitrites. The purpose of this study was to investigate the effect of dietary nitrate supplementation by BJ on plasma nitrate/nitrite.

Methods: In two separate experiments, eighteen healthy males, who were active in sporting activities, volunteered to participate in this study. BJ supplementation or placebo (PL) were taken 6 days in a row. Blood samples were taken in 4th, 5th, and 6th day, 2 hours after (first experiment) or 4 hours (second experiment) BJ or PL consumption.

Blood samples were drawn from vena cubiti, after a five-minute rest in the half-sitting position into S-Monovette lithium heparin tubes (2.7 ml). Plasma samples were separated in a cooled centrifuge. Nitrate and nitric plasma levels were determined by a commercially available nitrate/nitrite colorimetric assay kit (Cayman Chemical) in samples stored at -80°C.

Results: Levels of plasma nitrates were in all experimental situations (4th – 6th day) and in all measured subjects higher after BJ supplementation in comparison to PL ($p = 0.0007 - 0.00002$). On the other side, plasma nitrites have not changed significantly after BJ consumption. 5th and 6th day of BJ supplementation 2 hours before testing, average of plasma nitrites and plasma nitrites were lower in most of subjects in comparison to PL. BJ supplementation 4 hours before testing showed increase of plasma nitrites in all experimental situations and in most of subjects. However difference was not significant in all measured days ($p = 0.670; 0.145; 0.056$).

Conclusions: Our data indicates that ingestion of BJ significantly increased plasma nitrates, but plasma nitrites have not been influenced significantly. Certain differences have been ascertained depending on time consumption. The authors discuss the possible causes of these results.

Key Words: nitrate supplementation, plasma nitrates, plasma nitrites, beetroot juice

RELATION BETWEEN SEXUAL ACTIVITY, SEXUAL BEHAVIOR AND SPORT PERFORMANCE.

Petr Vajda

Sexual abstinence before exercise is ingrained. Present knowledge in these fields is inconsistent. This paper aims to relate combat sport performance and sexual activity. The main goal is to describe the subjective perception of the impact of sexual activity on the sport performance and potential changes in sexual behavior associated with increased training and competition loads at combative sports athletes and describe the sexual behavior the athletes have in combative sports.

Data was collected through anonymous questionnaires from 67 athletes actively competing in combative sports over 18 years old and older. Competitive level of the athlete covers all levels including regional to national team. The result shows that the frequency modification of sexual habits before and during competitions at the period when the burden rises to a competitive level. Frequently mentioned changes in sexual activity before the competition, was reduced frequency of sexual activity or abstinence. In the research the athletes indicated that in a 47% they feel some changes during the sports performance connected to sexual activity and an 83% perceive changes in the psychological component of their performance. In the psychological component are changes in most cases positive, but in the opposite in physical component are changes more negative. The group of athletes which were part of the research exhibited an increasing appetite for sexual activity and numerous of sexual partners than the average population in Czech republic.

In light of the results it can be presumed that there is some influence of sexual activity or abstinence on combative sports athletes' performance, even though some research shows the opposite opinion. The knowledge of this influence is incomplete and needs another review. Mainly in research effect of sexual abstinence on sport performance.

Key words: Athletic Performance, sexual abstinence, habits, questionnaires, athletes.

MARTIAL ARTS AND COMBAT SPORTS IMACSSS SYMPOSIUM

THE MEANING OF SELF-DEFENCE: AN EXPERT DEFINITION. A CONTRIBUTION TO THE THEORY OF SELF-DEFENCE AND COMBAT

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Background and aim: The theoretical perspective outlined is taken from the Humanistic Theory of Martial Arts and the anthropology of martial arts. The aim of this study is to describe and attempt to explain the rapid growth in self-defence arts in the West today and to consider the forms in which they are manifested.

Material and methods: Three complementary qualitative research methods were used: long-term participant observation, a content literature analysis, and that of competent judges/expert courts. These were considered along with a broad thematic discourse of sources and studies. There was only one question put to the self-defence experts: What is the meaning of self-defence, its substance and manifestation in Western countries today? Responses came from three European experts two are the holders of 10 dan the highest rank in *goshinjutsu* (the art of self-defence), and the third has wide experience as a bodyguard. Direct quotations are included, as are an analysis of sources (books, videos, organizational documents), and scientific studies.

Results: The results are presented in three parts: definitions; experts' opinions, and discussions. The basic canon, of real combat, self-defence techniques and of tactics used by participants are used. Experts point to the need for specialist training. The effectiveness of self-defence requires: fairly high versatility in training in, and selection of, really effective techniques; appropriate teaching methods, and psychological knowledge. Only the ability to fight a variety of distances and positions, and the selection of appropriate techniques can ensure victory in actual combat (a real fight).

Conclusions: The meaning of self defence is recognized in a variety of ways and it manifests itself differently. The extreme commercialized version of this is often the only product for sale. This is sometimes the main understanding of martial arts training as well.

Key words: fighting skills, self-defence, *jujutsu*, effectiveness, real fight

FOUR-YEAR STUDY OF INJURIES IN POLISH TAEKWON-DO NATIONAL CHAMPIONSHIPS FOR SENIORS

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Purpose: We analyzed types and frequency of injuries in polish taekwon-do national championships for seniors during years 2012-2015.

Methods: Each physical trauma which required care from medical personnel was considered an injury. We analyzed medical documentation of four polish taekwon-do national championships for seniors which covered 394 sparring matches of 828 competitors who were exposed to injuries(A-E). Injury ratio was calculated according to the following formula: $(\# \text{ injuries} / \# \text{ competitors exposed to injuries}) \times 1000 = \# \text{ number of injuries per 1000 competitors exposed to injuries (A-E)}$, Confidence Intervals (CI) – 95% considered.

Results: Altogether we recorded 106 injuries, where 13 was the minimal number of injuries recorded in a single championship, and 53 was the maximal number of injuries recorded in a single championship. The average injury ratio proved to be 102.5/1000 A-E (from 66.7/1000A-E; 95%CI 64.1-69.3 till 217.2/1000 A-E; 95%CI 210.4-224.0). Dislocations, twists and fractures were not recorded. Cases of epistaxis (43%) and contusions (33%) were the most frequent. We recorded only one case of concussion. Head (54.3%) and legs (23.6%) proved to be the body parts which suffered the most.

Conclusions: The vast majority of recorded injuries proved to be minor, whereas major injuries, which could potentially cause prolonged disability, were recorded very rarely. Employment of head guards reduced the number of injuries significantly.

Key Words: taekwon-do, injuries, senior competitors,

COORDINATION-RELATED SUCCESS FACTORS IN GRECO-ROMAN WRESTLERS AGED 17-18

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Purpose: The purpose of the study was to identify coordination-related factors that condition achieving high sports results by wrestlers aged 17-18.

Material and methods: Thirty-one Greco-Roman wrestlers (M age = 17.8 yr., SD = 0.6, years of training = 6.1 yr., SD = 0.9) took part in the study. All the participants were divided into two groups. The first group included medallists of Polish Junior and Senior Championships, whereas the other one consisted of the winners of the 5th-8th places in the above-mentioned competitions. Five coordination motor abilities (CMAs) were assessed with the use of seven tests. The CMAs included kinaesthetic differentiation, motor adjustment, movement coupling, static and dynamic balance as well as quick (simple and complex) reaction.

Results: Competitors with higher sports achievements demonstrated higher levels of the CMAs. Significant differences were observed in quick reaction, movement coupling and kinaesthetic differentiation. The biggest difference was noted in complex reaction.

Conclusions: Coordination-related success factors revealed in the study will make it possible to comprehend the area of wrestlers' coordination better and come up with practical applications for further use in training. It will help wrestlers to train more effectively and achieve an elite level more quickly.

Key words: wrestling, coordination motor abilities, sports success

THE PEDAGOGICAL PROCESS OF TAEKWONDO

John A. Johnson, Ph.D.

Purpose: The purpose of this paper is to illustrate the three-stage, pedagogical process of Taekwondo education.

Methods: Previous research on the Korean martial art concepts known as *musul* (무술; 武術; martial technique), *muyae* (무예; 武藝; martial artistry), and *mudo* (무도; 武道; martial way) were examined in Taekwondo literature. In addition, martial art educational literature revealed an overall stratified learning process for skills which correlates to this new etymological understanding of *musul*, *muyae*, and *mudo*. When approached etymologically, the terms also indicate a pedagogical process nearly identical to previous research on skill-based learning.

Results: The literature review of the Korean concepts of *musul*, *muyae*, and *mudo* were found to be esoteric and lacking in practical value to average Taekwondo practitioners. However, an etymological examination of the terms indicates that they illuminate the pedagogical process found in Taekwondo practice. The *musul-muyae-mudo* process is thus educative in nature and, like other attempts to describe and explain skill acquisition, elucidates how Taekwondo skills and knowledge are learned, adapted, and then adopted into daily life routines.

Conclusions: This paper redefines the Korean terms *musul*, *muyae*, and *mudo* etymologically to elucidate Taekwondo pedagogy. By doing so, it illustrates the hierarchical development of Taekwondo education, and may be the first time the *musul*, *muyae*, and *mudo* concepts have been discussed without nationalistic intentions. It also explains why Taekwondo has more than one *Do* (도; 道; *Dō*), or “way,” since the art can be approached from a plethora of viewpoints including—but not exclusive to—Taoist, Buddhist, or Confucian perspectives. Most importantly, Taekwondo education is demystified, so students can now comprehend what they are learning and how they are developing during practice.

Key Words: Taekwondo, pedagogy, skill acquisition, *musul*, *muyae*, *mudo*

THE FLOW EXPERIENCE IN QIGONG AND ITS IMPACT ON QUALITY OF LIFE

Mgr. Jindřiška Kohoutková

Introduction: This paper presents a proposal of research design to examine flow experience in Qigong exercise. We know that experiencing flow is a very subjective phenomenon as we talk about the state of mind of an individual. Subsequently, we observe the effect of experiencing flow state in Qigong on quality of life of the practitioners.

We expect that regular exercise of Qigong will induce flow experience during the exercise and that it will have positive changes in the quality of life of the practitioners.

Methods: In the first part, we studied theoretical knowledge of the phenomena flow, qigong and quality of life. The literature study was also done to obtain the proper tools for the research. To collect the data we chose the method of reasoning and comparison. In the second part, we collected all the tools available and based on research done in this area (flow in sports) we selected tools that correspond with our intention and compiled the research design. In the third part, we focused on the qigong centers where the research can be done. We determined the criteria on which we selected the centers matching our requirements.

We also chose the form of distribution of the questionnaires and the way to carry out the interview.

Conclusion: Based on the research done to select the proper tools to assess flow experience we chose to use 2 standardized questionnaires (The Flow State Scale-2 (FSS-2) measuring intensity and Dispositional Flow Scale-2 (DFS-2) measuring frequency of the state. These versions of questionnaires are adapted to sport environment. To obtain more detailed data about the flow experience, qigong and quality of life we decided to use method of in-depth interview. The interview is divided into 4 parts (personal anamnesis, flow experience, qigong and quality of life). The interview is based on the study of Yang Yang et al. (2011).

Expected research group will consist about 50 participants (1. Participants who attend regular classes of Qigong in the Czech republic and 2. Participants who attend regular classes of Qigong in other western countries). The selected centers are those which focus on body-mind-spirit integration during the exercise. The data collection will be done during the period of 6 months via sending the electronic link with the questionnaires placed in the internet. The interview part can be done personally if not possible via electronic devices (skype).

Key words: Qigong, flow experience, quality of life

THE CONNECTION BETWEEN MARTIAL ARTS AND ROUGH & TUMBLE PLAY (RTP)

Martin Lykkegaard, senior lecturer at Gerlev P.E. and Sports Academy and external lecturer at University of Southern Denmark.

Purpose: Develop and consolidate Martial Arts as a subject in physical education in Denmark. Hereby also show what play and games in Martial arts may be contributed to the curriculum of physical education regarding children's development of motoric skills and risk management. Discuss the connection between martial arts and RTP.

Method: Literature study of Ellen Beate Sandseter publications, discussions with collagues, as well as 9 years of experience.

Result: There is an important connection between Martial Arts and Rough and Tumble play that contributes to form and develop Martial Arts as a subject in physical education in Denmark.

Discussion: This study tries to discuss a terminology and model to understand children's Rough and Tumble Plays (RTP). The Norwegian researcher Ellen Beate Sandseter has an evolutionary perspective on children's risky play. One of her categories of Risky Play is RTP. Sandseter's research helps us to understand why and how children some times fight with each other. But also how adults deal with children's fighting in a smarter way. If children learns to fight in RTP they can learn coping skills, that improves the way they master situations they feared before, which is very important for their development og motoric skills and self-esteem.

Conclusions: The literature, research and discussion we have had in Denmark have made it clear that RTP is an important part of the curriculum of Martial Arts as a university subject. It also opened up perspective as how to combine children's play with martial arts, technical and tactical skills.

Key Words: Rough and Tumble play, Risk management, development of Martial Arts as an educational subject.

EDUCATIONAL BACKGROUND OF SECURITY BODIES IDENTIFICATION IN THE STUDY PROGRAMME OF APPLIED SPORT EDUCATION OF SECURITY BODIES

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Applied Sport Education of Security Bodies (ASESB) is a unique study programme at Masaryk University in Brno. The aim of this paper is to analyse theoretical background for graduate competency, according to learning outcomes in ASESB. For this study methods of content analysis, learning objectives analysis, and exploration were used. The theoretical background comes from the cycle of conflict and legal principles of using police force, as well as from science of kinanthropology. In ASESB all three educational dimensions are developed. Learning outcomes build on cognitive domain and through psycho-motoric domain the affective one is fostered. Self-defence is understood as a key competence, and it is incorporated into a broader idea of self-protection.

Key words: academic degree, self-protection, safety education, combat sports

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POSTER SECTION

ACCURACY IN REPRODUCTION OF MOVEMENT RANGE AND PRESSURE FORCE IN SPORTSMEN

Ziemowit Bańkosz, Katarzyna Pawlaczyk

Purpose: The aim of this research was to evaluate and compare an accuracy of hand pressure force and range of supination - pronation reproduction in male sportsmen: table tennis players, footballers and boys who did not practice any sport.

Methods: The research was conducted on 30 male subjects: table tennis players (10), footballers (10) and control group (10) in the age of 12 (SD=1). The subjects took part in six tasks aiming to present the levels of proprioceptive ability. Four of the tests enabled the assessment of the precision of recreating pronation and supination of the forearm at the elbow joint. The next two tasks evaluated the force components and assessed the precision of recreating of hand pressure force. The level of kinesthetic differentiation was assessed on the basis of six indices, four related to spatial, and two to force components. The research was done twice during the year: in December (research 1) and in May 2015 (research 2). Sportsmen took part in regular sport training (at least 3 times a week) between two sessions of research. Statistical analysis of the results was performed with Statistica for Windows software. After descriptive statistics were calculated, the Kruskal-Wallis one-way analysis of variance was made to compare the examined groups.

Results: Analysis of results showed the small differences between the groups in first research and more significant in second one. Sportsmen showed more significant improvement in accuracy of reproduction than non-trained group, especially in tasks of supination and pronation of forearm of dominant limb.

Conclusions: The results pointed out the significance of proprioceptive ability in football and table tennis. It can be considered, that the research methodology used in present work may serve in monitoring training progress in these sports.

Key Words: proprioceptive ability, sport, table tennis, football, reproduction of movement

METRIC PROPERTIES OF MINDSET IN SPORT SCALE ON THE SAMPLE OF URBAN ADULTS

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The concept of fixed and growth mindset describes beliefs of the role of abilities and effort in person's success. The concept was developed by Carrol Dweck and she proposed six-item questionnaire to measure it (Dweck, 1999; 2006; 2012). To obtain the instrument with improved metric properties, thirty-questions version of the scale was developed (Balent & Bosnar, 2014); it was applied to the sample of students of kinesiology and showed Cronbach alpha coefficient of 0.799. The aim of this work was to check appropriateness of Mindset in sport scale in measuring general adult population. For that purpose, the scale was applied to the sample of 445 urban adults of both genders, aged 22 – 65 years, with mean age of 40,02 years. On this sample, summative total scale score has Cronbach alpha coefficient value of 0,832, and average inter-item correlation of 0,12. Kolmogorov – Smirnov test for normality of the total score distribution was not significant ($d=0,4219$, $p>0,20$). Validity of the scale was examined by correlating total result with examinees estimation of proportion of effort and ability in sport success, showing correlation coefficients of -0,41 and 0,41, respectively. The results of analysis of metric properties show that Mindset in sport scale (Balent & Bosnar, 2014) is suitable instrument to be used in the population of urban adults.

Martin Bugala, Masaryk University, Zdenko Reguli, Masaryk University, Michal Vít, Masaryk University

Police forces acting as law enforcement officers often find themselves in confrontation with citizens who do not respect the rule of law and thus violate legal regulations. This confrontation may in some cases result in a physical conflict. In accordance with Sec. 52 of Act no. 273/2008 Coll. on the Police of the Czech Republic the police may apply restraint devices in these situations. The use of restraint devices may, however, lead to injury of on-duty police officers due to the level of violence present and inadequate training of the police. **The aim** of the study is to find out the various types of injuries in resolving physical conflict while using restraint devices. **Methods** The work is conceived as descriptive and qualitative – quantitative in nature. The design of the paper is therefore mixed. For data collection the questionnaire titled Solution of Conflict Situations and Circumstances of Assaults (SoCon) was used. For data analysis the qualitative analysis employing a three-stage coding was applied. The coding was inductive, meaning there were no categories created prior to the research with all of them emerging during the data analysis. Quantitative data were analyzed on the basis of descriptive statistics and frequency was expressed in percentage values. The research sample formed a representative sample of the Municipal (Patrol) Police of the South Moravian Region. It consisted of 262 persons in total (205 M and 57 W). **Results** 21% of those surveyed did not encounter physical aggression. The rest of the respondents reported experience with physical aggression of the following frequency: 21.76% of respondents once a year, 19.08% of respondents once a month, 10.69% respondents once a week and 5.73% of respondents on a daily basis. The most commonly occurring injuries include bruises, scratches and abrasions, luxation (shoulder, finger), fractures (nasal septum), lacerations (face). Despite not being serious in nature, these injuries hinder the smooth progress of the application of restraint devices as well as point to the need to increase the training of law enforcement officers. **Conclusions** The acquired knowledge may be utilized both in the creation of defence strategies and to enhance training in restraint devices application. Furthermore, the results may be used to define attack zones applied by the attacker against the police officer. Such information can enrich the training of the police and thereby reduce the risk of resolving conflict situations involving violence and decrease the injury rate in the application of restraint devices.

Key words: Municipal police, physical attack, physical aggression, injures, restraint devices, conflict situation, resolution of physical attack

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SOME BIOMECHANICAL CHARACTERISTICS OF SLALOM TURN DURING RACE OF ELITE ALPINE SKIERS

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The aim of this study is to determine the relationship between speed of passing through ski gates and variables of geometry of skiers' body during slalom race for the top alpine skiers. The parameters were recorded at the World Cup Race Snow Queen Trophy on 30 top alpine skiers participating in the second run. The Ariel Performance Analysis System was used to calculate the 3D kinematic data. We determined the distance of elite skiers' lines of skiing from the fall line and tried to establish whether the competitors with a shorter line of skiing in the gate setting achieve higher velocities and consequently better race results. The most significant correlation ($r=0.95$) was observed between the distance of outside ski boot and ski gate and projection of center of gravity to outside ski boot distance. Mentioned correlation is a result of skiers' effort to find an optimal position between outside ski and projection of center of gravity relative to the ski gate. Statistically significant and positive correlation ($r=0.65$) observed between distance of skiers' center of gravity and ski gate and distance between center of gravity and outside ski boot explains how greater distance of outside ski boot from ski gate required greater deflection of skiers' body toward center of turn in order to optimize the trajectory passing through the gate. Correlation of skiers' speed at gate and investigated variables of geometry of skiers' body was not overall statistically significant. The absence of significance between position of center of gravity, ski boots and velocity might be explainable by undemanding configuration of ski slope at filmed slalom turn and superb technical performance of investigated alpine skiers. Use of more advanced technology might be more appropriate for the investigation of subtle differences in the race performance among top alpine skiers.

Key words: slalom discipline, kinematic indicators, center of gravity

DIFFERENCE IN STRENGTH BETWEEN WOMEN WHO PRACTICE PILATES AND AEROBIC

Josipa Radaš, Vinaka Sesar, Gordana Furjan-Mandić

The study of differences in strength between women who practiced Pilates and Aerobics conducted on a sample of two groups of 28 women (20 – 50 years old). They all regularly practiced three times a week for 60 minutes. The tests which are used for estimated motor ability strength are: tests for the estimated strength of arms and shoulders (push ups), abdomen („hundred“) and legs (endure in squat beside wall). The measurements were conducted in fitness center with the intention to define differences between pilates and aerobic in terms of the women. The results were analysed using descriptive analysis and *t-test* for independent samples. It has found out that there are statistically significant differences in test for the estimated strength of arms and shoulders, in favor of the aerobics, while in tests for the estimated strength abdomen and legs there is no statistically significant differences between two groups.

Since this is not a representative sample, results cannot be generalized.

Key words: classic aerobic, pilates, women, strength

HEALTH EXERCISES AND SITUATIONAL PREVENTION FOR SENIORS

Roman Grmela

Purpose: The aim of the project was the organization of a suitable training programme and an example of situational prevention for seniors.

Methods: The project focused on the social interaction between elderly and young people. The main focus was laid on the transmission of knowledge and abilities from the situational prevention area concerning seniors, and on carrying out actual exercises from the health sport education. The participants of the project were the pupils of the Security and Law Academy Brno and the clients of The home for elderly people, Brno, Koniklecová.

Results: The project enabled the meeting of teenagers and elderly people, it strengthened their social behaviour and contributed to creating and keeping positive relationships based on mutual respect, tolerance and empathy. The project offered further possibility to develop the key competences of the pupils which correspond to their studies.

Conclusions: The project contributed to searching ways of preventing problems between different generations, it also taught the pupils not to be influenced by prejudice and stereotypes when approaching elderly people. Furthermore, the project helped the elderly people learn about basic recommendations concerning risky situations. The quality of the seniors' lives was improved by exercising.

Key words: situational prevention, seniors, corrective exercises

REVIEW: COMPARISON INTERVENTION PROGRAMS FOR IMPROVE FUNCTIONAL ABILITY FOR OLDER ADULTS

Petra Janíčková, Michaela Juránková

Ageing is often accompanied by a reduction of physiologic and functional abilities and also by the loss of muscle mass and strength. From numerous of studies is derived, that this effect begins approximately after the fourth decade of human life and it is indicated by 1% loss of muscle mass per year. Loss of muscle mass and strength during the ageing may increase the risk of chronic diseases such as osteoporosis, arthritis and overall deterioration of locomotion. In order to keep joint mobility, overall agility, muscle strength and coordination experts recommend regular exercise.

This review compares actual researches applying intervention programs aimed at improving selected physical parameters, improving physical fitness and choosing the ideal exercise protocol.

We used 25 articles for our comparison, which fulfilled certain criteria. Researches were performed with representative sample of 15-200 people (60 years or more). Volunteers were divided into at least two groups (experimental and control group). The minimum duration of the intervention program was four weeks with a frequency of 2-3 per week and 90 minutes. Most authors use for the intervention program force or endurance type of training, possibly combination with one of these workouts.

These results suggest that participation in regular exercise programs causes significant improve in upper and lower- body strength, flexibility and overall functional ability. Functional ability is defined as physiological capacity to perform normal everyday activities safely, independently and without undue fatigue.

Authors indicate, that an ideal exercise program needs to consist of two types of exercise to improve the components of functional fitness. One type should be aerobic exercise, and the second type could be chosen from balance or strength training.

THE EFFECT OF EXERCISE INTERVENTION ON SELECTED INDICATORS OF PHYSICAL FITNESS AND BODY COMPOSITION OF WOMEN IN SENIOR AGE.

Michaela Juránková, Dita Hlavoňová, Petra Janíčková

Loss of skeletal muscles occurs during the aging and it is accompanied by decreasing of muscle strength. This phenomenon we can observe from about fortieth year of life, when 5% of muscle mass is replaced by fat tissue within one decade. Decrease of muscle strength is more significant and faster at seniors after 65 years. When the muscle mass is reduced, it can affect a human locomotion, because biggest losses are in the area of lower limbs. We assume due to an appropriately selected intervention exercise program, it can improve selected parameters of physical fitness and overall body composition.

The research aim of the project was to prove the positive significance between application of chosen intervention exercise program and physical fitness and body composition of women in senior age.

Tested sample was represented by women in senior age (60 years and more). Women were divided to control and experimental groups. Both groups undergo the input and output diagnostics to find a level of physical fitness and body composition. The diagnostic was performed shortly before and after intervention by using bioelectrical impedance method on Inbody 720 device and by selected motoric tests („chair stand test“ and „1- mile walk test“), which are based on the standardized fitness test.

An intervention exercise program lasted 8-week and was supervised two times per week, 60 minute, with a 10-min warm-up and 10-min cool-down period. 1x aerobic training with control of level heart rate: 20 min per session with intensity 60% of heart-rate reserve. After the 2st week, the duration of training intensity were raised every 2 weeks (increases of 5 min duration, 5% in heart-rate reserve).

1x strength training: Dynamic exercises were performed in a circuit, organized as a row of 6 exercise stations. In the 1st and 2nd weeks, unloaded exercises with 14 repetitions were performed. The repetitions were decreased to 8 repetitions in a set and 2 series. Weight training began at 50% of the predicted 1RM and was gradually of 10% (adjusted every 2 weeks) of the predicted 1RM.

At the end of intervention program we could observe statistically significant improve in the area of monitored parameters of experimental group and positive significance was proved among application of chosen intervention program, body composition and physical fitness.

Key words: Women, intervention program, aerobic training, walking, strength, senior, physical activity, body composition

EFFICIENCY TRAINING PROGRAM FOR NON-SWIMMERS

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Purpose: The aim of this paper is to verify the theoretical goal of successful implementation of training program for non-swimmers, defined by percentage of students who complete 25 m at the end of the course or shift that made the score scale of 1-11. The theoretical goal is that minimum 80% of the course participants swim 25 meters (grade 11). Furthermore, all participants should make a shift to a scale score of 6 classes.

Methods: The sample consisted of 95 male and 82 female students from 1st grade of elementary school in Varaždin, Croatia. Lessons for non-swimmers were conducted at the swimming pools in Varaždin. The lessons were held 15 days, from Monday to Saturday for one hour. On initial testing these students did not reach required knowledge of swimming, which consists of swimming across 25 meters. For the assessment of knowledge of swimming is applied scale of 11 rating, where 11 rating means swimming across 25 meters.

Results: The research results indicate that 70% of the female students achieved a rating 11 after a program of 15 hours, which fulfilled the criteria for swimmers, while the average progress of a 5.51 rating on a scale score of 1-11. This improvement was statistically significant ($p < 0.01$). Only 6 female students failed to progress to grade 6 or more.

More than 73% of male students satisfied the criteria for swimmers (grade 11) while the average progress of the students was 5.47 for classes. Progress on a scale score between the final and initial assessment is statistically significant ($p < 0.01$). Only 5 male students failed to progress to grade 6 or more.

Conclusion: Considering the analyses of the results, it can be said that training program for non-swimmers should increase up to 18-20 hours in order to achieve a theoretical set goal.

Key Words: non- swimmers, criteria, program

WHOLE BODY VIBRATION PHYSIOTHERAPY KNEE OSTEOARTHRITIS (GONARTHROSIS)

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Purpose: The purpose of this paper is to compare the efficiency of a conventional physical therapy with the results of a modified therapy by the whole body vibration in the conservative osteoarthritis treatment among the female patients who suffer from a mild to a moderate knee osteoarthritis.

Methods: The research included the sample of 31 female participants, who were treated at the Orthopaedics and Physical Therapy Ward of the County Hospital Bjelovar and the Medical

Rehabilitation Centre “Daruvar Spa” in Daruvar. All the participants were 50 to 60 years old. The research was conducted within the period of 3 weeks.

The participants were divided into two groups: the group of 16 female patients was taking the conventional physical therapy, while the group of 15 female participants was taking the modified physical therapy by the whole body vibration. All the participants were subjected to an isokinetic testing using the Biodex system 3, before and after the rehabilitation. All the participants filled a questionnaire: the WOMAC Osteoarthritis Index, which included subjective replies on the participants' knee condition, It was filled in before and after the completed rehabilitation.

The data processing was performed by application of STATISTICA for Windows, Version 9. Central and dispersive parameters were calculated for all variables. In order to determine significant differences among the results from two points of time for the same participants' sample, the t – test was used for the dependent samples. By using the t – test for independent samples and by univariate analysis of variance it was tried to establish if there were any statistically significant differences between two different samples of participants.

Results: The analysis of the collected data after the initial and the final isokinetic testing using the Biodex System 3 showed a positive movement in almost all tested variables for both groups of participants. There was no significant difference among the participants who were subjected to the conventional physical therapy and the participants who were subjected to the physical therapy by the whole body vibration.

By analysing the results received based on the Womac questionnaire it was shown that there was an improvement of the subjective evaluation of the participants in both groups and that this difference was statistically significant.

By analysing the results received based on the SF 12 questionnaire, that includes the subjective evaluation on health degree and quality of the participants, it was shown that after the completed rehabilitation there was an improvement of the subjective evaluation on health degree and quality of the participants in both groups and that this difference was statistically significant.

Conclusion: The results after this research showed that, apart from the conventional physical therapy, the modified physical therapy by the whole body vibration among the female patients suffering from a mild to moderate knee osteoarthritis, can be equally effective.

Key words: knee osteoarthritis, the whole body vibration, physical therapy

THE INFLUENCE OF DYNAMIC BALANCE ON EVALUATION EXERCISE ON BALANCE BEAM ON THE FEMALE UNIVERSITY STUDENTS

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The purpose of this study was to determine the influence of dynamic balance on exercise performance on the balance beam. The sample consisted of 58 second-year female students from the Faculty of Kinesiology. Dynamic balance was estimated with a test on the Swedish bench. The test consisted of the Swedish bench, 5 wood shafts 1 meter long and two mats. In this test for the evaluation of dynamic balance, the task was walking (regular step on full feet and on tiptoes with arms raised overhead) on inverted Swedish bench from one side to the other without falling. The task was completed when both feet touched the mat placed on the other side of the bench. Time, and number of steps were measured during the execution of task. Walking on the full feet and on tiptoes was performed three times, and the value for average time and number of steps needed to finish the task was taken. Grades of exercise and all elements on the balance beam were taken for analysis. Statistica for Windows 10.0. was used for data analysis. Results of descriptive indicators of performed tests shows the average grade of exercise on the balance beam (Mean = 3.55), standard deviation (St.Dev. = 1.10). The average number of steps on full feet was Mean=5.75, (St.Dev. = 0.98). Average time of walking on tiptoes was Mean = 3.13 sec, (St.Dev. = 0.92). The number of steps required for walking the bench on the tiptoes is Mean = 6.92 (St.Dev. = 0.92), while the average time of walking on the tiptoes is Mean = 4.52 sec, (St.Dev. = 1.97). Results have displayed that female students walked on Swedish bench faster and with less steps on full feet, than on tiptoes, which shows that they are more stable during the execution of a task on full feet than on tiptoes. The correlation coefficients (r) indicate that there was a statistically significant correlation at level of statistical conclusions error ($p < 0.05$) between variables, number of steps on full feet and time of walking on the full feet ($r = 0.73$). The number of steps on tiptoes and time of walking on tiptoes ($r = 0.54$). Results of multiple regression analysis have shown that independent variable (number of steps at full feet) explains 10.3% of the dependent variable, or grades of exercises at the level of error of 5%, while other independent variables did not affect grades of exercise on the balance beam. Therefore, from the obtained results it can be concluded that female students who are faster, and walked over the Swedish bench with less steps (full feet and tiptoes), have higher grades from the exercises on the balance beam.

Keywords: dynamic balance, artistic gymnastic, balance beam, students, walking, exercise

THE RELATIONSHIP BETWEEN LABORATORY AND FIELD ENDURANCE TESTS IN YOUNG SOCCER PLAYERS

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The purpose of this study was to compare the results of VO₂max values achieved in spiroergometry laboratory test and derived VO₂max values based on the results of field endurance yo-yo intermittent recovery test.

20 young football players-males (19.2 ± 0.7 y, height = 179.5 ± 4.1 cm, weight = 72.0 ± 5.4 kg) participated in the study and all completed one laboratory and one field experimental test. Each laboratory test consisted of running graded exercise test to exhaustion (standardized ramp test) where oxygen consumption was measured. Each field test consisted of standardized yo-yo intermittent recovery test (level 2), where running distance was measured. Based on specific estimating formula VO₂max was in yo-yo test derived. VO₂ values of laboratory and field tests were compared.

The VO₂max didn't significantly ($p > 0.05$) changed in field test compared with laboratory test.

The value of correlation coefficient (r) between running distances in yo-yo tests and VO₂max values in laboratory tests was 0.89. Index of determination ($r^2=0.79$) explains the relationship between these two variables on the level of 79%.

Analysis of collected data has demonstrated strong positive correlation between VO₂max values in both laboratory rump and field yo-yo tests. Based on this result yo-yo intermittent recovery test can be used as a suitable alternative to laboratory spiroergometry test in VO₂max setting of young male football players. This study can be also used as a source of information about possible use of specific endurance tests in soccer as well as a background for further studies of this issue.

Key words: yo-yo test, endurance, soccer, spiroergometry

STIMULUS OF NEUROMUSCULAR ACTIVITY DURING INCREASING LOAD

Lukáš Olejníček

Purpose: We study stimulus muscle activation in two groups of runners middle and long distance during one year training cycle. First group with the program of strength training, second group is control. The practical outcome of this work is to determine whether the power of endurance training for runners stayers may alter the characteristics of complaints of muscle activity during the training process and whether it has an effect on the characteristics of the muscle impulses at a specific load fatigue. With the help of surface electromyography we can access the physiological processes that are related to the formation of movement and producing power.

Methods: Research was made a deliberate selection of probands for experimental (8 probands) and control (5 probands) group, which consisted of regularly-training middle and long distances runners (only male from 18 to 32 years old). Both groups makes first test before the preparatory season, during the preparatory season undergoing experimental group intervention programme, the control group will train normally. The second test of both groups will be held after the preparatory season.

The test consists of five laps of running submaximal efforts of 400 m with rest intervals of 90 seconds. During the test are placed on the proband EMG electrodes to measure stimulus of muscle activation such as amplitude, frequency, and time series. For kinesiological analysis of selected physical structure is a noninvasive method used surface electromyography (De-Luca, 1997). We monitoring muscle groups important for running. Sensing the electrical activity of muscles is performed by a mobile 16-channel EMG telemetry system, Wave Plus. The device has 16-bit resolution and sampling frequency of 2,000 Hz. Bio potentials are recorded using surface electrodes with Ag/AgCl sensor.

The intervention program: Training program will be included strength training twice a week for 6 months, which is the length of the preparatory season (48 training units).

Results: A pilot survey with three probands verify time and organizational demands for complex testing, including anthropometric measurements and bioelectrical impedance. It was also a control that electrodes hold on legs during the test.

We have found: 1) sensor must be stick with flexible tape. Electrodes holding well throughout the test, but the sensors are heavier and have a smaller adhesive area than the electrodes,

2) it was verified that the placement electrodes by Konrad (2005) on the selected muscle is sufficient even during fast running,

3) we need 90 minutes for one individual test,

4) to gain experience with the type bonding, positioning sensors and electrodes for stable earnings record of the test.

Conclusion: We identified conditions, time-consuming and organization required for test. Testing is real, although time consuming, and for technical reasons and battery life is possible test maximally 2 probands per day. Rain, increased air humidity and strong wind make testing impossible.

Key words: Muscle activation, athletics training, strength, sEMG, bioelectrical impedance.

ANALYSIS OF THE BODY COMPOSITION OF THE WOMEN VOLLEYBALL PLAYERS DURING THE SEASON

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The aim of the study is to analyze body composition (BC) of female volleyball players from top performance junior league in Czech Republic. Due to consultation with realization teams of VK KP Brno we have verified empirical observations of coaches who described variability in BC during preliminary and performance part of the season.

Methods: Research sample consist of 18 female players of team VK KP Brno in age interval 14–19 years. They were tested six times in the autumn part of the season 2014/2015 every month in the beginning of training week 30 minutes before the training unit. For the study we process data from three measuring (before preliminary, after preliminary and after performance part of the autumn season) from 12 players who have participated in all this measurement.

By the bioimpedance analysis (Inbody 230, Biospace) we observed BMI, PBF, body mass, trunk mass, muscle and fat component of higher and lower limb and trunk.

Wilcoxon Rank Sum Test is used to compare differences between the values obtained before the preliminary part, after the preliminary part and after three months of performance part of the season. All statistical computations were performed using R software (R Core Team 2013).

Results: During the preliminary part (31 days) we diagnose slight increase of body mass that was connected with decrease of total body fat percentage and increase of weight of the total muscle mass component.

During the performance part (95 days) we observe ongoing trend of body mass increase. But during this interval was described trend connected with increase of body fat mass in all measured body parts.

Specifically after the preliminary part we diagnosed as a significant difference ($p < 0.05$) increase of percentage of total fat mass ($p = 0.0266$). After the preliminary part of the season was find significant difference described increase of body mass (0.0462), increase of body fat in left upper (0.0313) and right upper (0.0429) limb together with increase of trunk mass (0.0379).

Conclusion: On the basis of results we confirm the empirical assumption that after the preliminary part of the season is the slight increase of body mass connected with muscle mass component boost and higher intensity of training even lead to trunk fat reduction. Unfortunately during the performance part of the season we observe increase of body fat in all measured components that is responsible for higher body mass of the players. Muscle mass component is during the performance part at a standstill or even decline.

We assume that trend could have a root in dietary habits of the players (time stress, late evening eating) such in lower energy expenditure during the performance part of the season (in relation to preliminary part). Nevertheless causality of that statement is not investigated in this study.

Key words: volleyball, body composition, bioimpedance, In-body

ANTHROPOMETRIC CHARACTERISTICS AND STANDING LONG-JUMP PERFORMANCE OF ELITE SOCCER PLAYERS WITH RESPECT TO CHRONOLOGICAL AGE

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Introduction: In modern soccer, top-class players have to adapt to the multifactorial requirements of the game. The game has developed to become faster and consists of many explosive activities as sprinting, jumping, kicking, accelerations and decelerations. It has become necessary for determining the level of explosive characteristics of young players in order to better talent identification and selection procedures as well as planning and programming of training process. Hence, the objective of this study was to examine the basic anthropometric characteristics and standing long-jump performance of elite soccer players, from beginners to seniors.

Methods: The study was conducted on national level soccer players (n=269) classified into thirteen chronological age categories, from U8 to U19, and seniors (19+). Body height and body weight were measured for determining the basic anthropometric status. Standing long-jump test was used for assessment the horizontal component of explosive power.

Results: In anthropometric characteristics, two stages of progressive and continuous growth in height (U8-U10 and U11-U17) were observed, as well as two stages of significant increase in body weight (U11-U12 and U14-U17). The highest range in body height between U11 and U12 (9cm; $p<0,05$) and also between U14 and U15 (6,9 cm) was noticed. Statistically significant differences in body weight were found between U11 and U12 (7,1 kg; $p<0,05$), U14 and U15 (9,8 kg; $p<0,01$) and U16 and U17 (9,7 kg; $p<0,01$) The manifestation of explosive power mainly followed the curve of growth. Statistically significant difference between U15 and U16 were found (43,2 cm; $p<0,01$).

Discussion: Our data showed two phases of rapid increase in body height. Due to the smaller sample of subjects in the categories, it is possible to conclude that the peak height velocity occurs between U14-U15, which is in accordance with previous research (Malina, Bouchard & Bar-Or, 2004). Enormous progress in jumping performance occurred one year after peak height velocity, what is related to the maturing of the nervous system and improved coordination of arm and leg muscles, increased body mass and muscle performance (Reilly, Bangsbo & Franks; Malina, Bouchard & Bar-Or, 2004). The results of the present analysis demonstrate that coaches should pay attention to the development of the players, taking into account the holistic approach during their growth and maturation.

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SCORING OF THREE SINGLE NUCLEOTIDE POLYMORPHISMS IN ELITE SOCCER PLAYERS

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Purpose: The aim of this paper was to investigate the relationships between three single nucleotide polymorphisms (SNPs) in ACTN3, ACE and ADRB3 genes and playing positions in elite soccer players of the Croatian national selection and the national championship winner.

Methods: We examined 44 top-level Croatian soccer players (4 goalkeeper, 13 defense -fullback, 15 middle field and 12 forward attackers). Depending on the polymorphisms on the above mentioned genes the subjects obtained the indices between 0 and 6; 0 being “no strength type” and 5 being the highest “strength/explosiveness type”. We looked into the relationship between the aerobic and anaerobic components of the position at which the player plays and the obtained indices.

Results: As the sample comprised only 4 goalkeepers their genetic strength indices were as follows: 2 goalkeepers type 6, 1 goalkeeper type 5 and 1 goalkeeper type 4 which strongly indicated the genetic tendency of the goalkeepers towards the explosive/strength activities. Among other players we should emphasize that only 1 player (2%) in middle field was type 2 while 28% of the others were type 3, 40% type 4 and 30% type 5 which lead us to believe that even though the soccer is highly demanding aerobic game it still requires a big amount of explosive strength and speed so the endurance type genotypes are not largely present among top level soccer. The Spearman rank correlation showed a significant but weak correlation between the playing position and the strength genetic index ($p < 0.05$) meaning that fullback and attack positions had higher indices, being more explosive whilst the midfielders showed lower indices, e.g. tendency toward endurance.

Conclusions: An interaction of three polymorphisms (ACE and ACTN-3 and ADRB3) might be related to the position at which the soccer player plays but it probably does not have a high usefulness selection of the younger soccer players as the positions are attributed later in career. Larger scale studies and more genes analyzed would give better insight in the significance of the genetic predispositions for soccer players.

Key Words: SNPs, ACTN3, ACE, ADRB3, soccer

THE INFLUENCE OF CHRONIC ANKLE INSTABILITY ON POSTURAL STABILITY

Jana Řezaninová, Hrazdira Luboš, Svoboda Zdeněk, Moc Králová Dagmar

Chronic ankle instability (CAI) is the result of neural (proprioception, reflexes, muscular reaction time), muscular (strength, power, and endurance), and mechanical mechanisms (posttraumatic ligamentous laxity). Evaluating postural stability is one method of assessing sensory deficit after injury. Postural stability is commonly measured as postural sway, the amplitude that a person sways away from his or her center of balance (Mattacola & Dwyer, 2002).

Purpose: To identify subjects' changes in postural stability of double/single-leg stance in athletes with chronic mechanical ankle instability between injured and uninjured leg.

Methods: Twenty young athletes (mean (SD) 27,4 (6,1) with chronic ankle instability (CAI) were examined. Individuals with CAI have a history of ankle sprain (greater than 1 year prior) without mechanical laxity.

Diagnosis was based on clinical musculoskeletal ultrasound examination - Anterior Talar Drawer Test and Talar Tilt Test. The patients were examined in held-forced positions under local anesthesia. Scans were taken in dorsal or ventrolateral cuts, we measured the distance between bone edges of the posterior edge of tibia and talus (the difference had to be more than 3 mm in comparison to the contralateral side).

FootWork Pro Pressure Plate (49 by 64,5cm forceplate) measured COP and max pressure of each foot. Measures of centre of pressure excursion in frontal and sagittal planes (anterior-posterior excursion, medial-lateral excursion), 95 % confidence ellipse (AREA, covered 95 % of the points of the COP diagram) were calculated during 30-second trials of static double-leg stance and 3 x 10-second trials of static single-leg stance.

We used Fisher post hoc procedure (ANOVA) for identify specific differences. The level of significance was set at $p < 0,05$.

Results: We found not significant difference in postural stability in patients with chronic ankle instability (N = 20) in 30s double-leg stance test between injured and uninjured leg.

Confidence ellipse of the center-of-pressure area and COP excursion in sagittal plane were in one-leg stance test in patients with chronic ankle instability significantly higher on injured leg than on uninjured leg.

Table 1: Double - leg stance test

Parameter	Injured Leg		Uninjured Leg		p^*
	Mean	SD	Mean	SD	
Area COP	1,00	0,67	1,20	0,93	0,454
AP excursion	2,17	0,75	2,49	0,83	0,207
ML excursion	0,52	0,24	0,56	0,29	0,695

Table 1: One-leg stance test

Parameter	Injured Leg		Uninjured Leg		p*
	Mean	SD	Mean	SD	
Area COP	5,16	2,01	4,01	1,06	0,029
AP excursion	3,20	0,68	2,74	0,41	0,015
ML excursion	2,09	0,55	1,87	0,33	0,139

* p = result of ANOVA Fisher post hoc test

Conclusion: Alterations in postural stability could be caused by posttraumatic ankle ligamentous laxity or by deficit in the afferent input arising from articular deafferentation (failure of mechanoreceptors residing in the ankle ligaments and capsule). Instrumental postural stability testing on stable force plates is useful for identifying deficits that are associated with an increased risk of ankle sprain that occur in athletes with CAI.

Key Words: lateral ankle ligaments injury, postural stability

References:

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EDUCATING SCHOOL CHILDREN THROUGH OLIMPIC GAMES

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The project Educating school children Through Olympic games is imagined as a process of teaching Olympic games with a purpose of stimulating and developing creativity as well as knowledge and skills, which are the purpose of this project.

Using different education contents in creative workshops (art, music, acting) and sport competition we tried to enrich each child personaliry.

Children working in teams are making new friends, developing tolerance, communication skills and team learning, which means they are deeply involved in the process of socialization as a main step in everyday life.

The project includes lot of different contents where everyone can choose different activity to develop his/hers possibilities and knowledge.

This is modern and atractive way of working which provides many-sided and contemporary nursery school with a main purpose to develop children's personality and skills.

Key words: education, child, creativity, tem work, sport.

EVALUATION OF METHODOLOGY OF SELF-DEFENCE FOR PEOPLE WITH DISABILITIES USING A WHEELCHAIR

Jan Šenkýř, Alena Skotáková, Jitka Čihounková, Jindřiška Kohoutková

The society currently is very responsible in its approach to the integration of people with disabilities, whether in the form of providing services, improving mobility in public areas and the creation of jobs. A person with disabilities using a wheelchair has the opportunity to attend many public places, events and institutions for improving personal social life. In contrast, however, victimization and vulnerability is higher for people with disabilities. This fact inevitably results in a specificity and difficulties in a self-defence situation.

The aim of this paper is to inform about the project of the Faculty of Sports Studies “Evaluation of methodology of self-defence for people with physical disability using wheelchair” number ROZV/20/FSpS/05/2015.

The methodology is based on the theory of conflict, and it is focused on the initial stages of conflict resolution (i.e. pre conflict phase and verbal communication). Methodology and course are integrally balanced by theoretical training and practical exercises and it is focused on the person using a mechanical wheelchair. Evaluation is carried out in two phases. There is a questionnaire before and after the course of self-defence, and model mugging (scenario training) which is recorded and the video is subjected to expert analysis.

The main objective of the project is therefore a thorough analysis of the needs of the people with physical disability using a wheelchair in relation to the conflict situation and their subsequent satisfaction during the course.

Key words: crime, person with disabilities, vulnerability, secure, abuse

THE RELATIONSHIP BETWEEN PROFESSIONAL AND PERSONAL LIFE OF SPORTSPERSONS

Katarína Šimková

The qualitative research uses grounded theory that deals with the relationship between the professional and personal lives of professional sportspersons. The concept of this topic is based on findings of Gould and Dieffenbach (2002) on how sport influences personal and mental development of individuals doing sports. The aim of the work is to gain deeper knowledge about the role of sports in the lives of sportspersons, to describe process they have to go through in their career, and which aspects of sport do they carry into the life stage after terminating their sport career. The research data consist of 15 professional sportspersons over the age of 24. The statements are gathered via semi-structured interviews which are anonymous, and registered as audio recordings with informed agreement of the respondents. The findings show that sport is a place for self-realisation, has positive influence on the quality of life, partakes on building the character, and also partially represents the meaning of life. Simultaneously, sport has some negatives that also represent an influence in one's life (not enough preparation for another career, possible addiction to sports, limitations to social life). The results point to the importance of sports, especially with regards of the overall development and that is why there should be means that would provide motivation for young people and creation of programmes that would make it possible for them to practice either professional or recreational sports.

Key words: quality of life, character, self-realisation, addiction

THE CONCEPT OF DIAGNOSTIC COMPETENCE OF PHYSICAL EDUCATION TEACHERS

Eva Valkounová

One of the aims of education of future teachers is to develop their pedagogical competencies. Our research is focused on the determination of the level of diagnostic competence of future physical education teachers. Diagnostic competence of future physical education teachers, is evaluated on the basis of the work with electronic learning environment called Videoweb Physical Education (Videoweb PE). Videoweb PE is based on the analysis of video records which were recorded during physical education classes. There are questions and tasks created for each recorded video and future physical education teachers have to solve them. This process generates data, which are then decrypted by qualitative analysis by MAXQDA 11 software. Decryption is done on the basis of the category system of diagnostic competence which is based on the stages of the process of diagnosing. Successive analyzation of decrypted data determine the level of diagnostic competence of future physical education teachers.

Key words: diagnostic competence, physical education teachers, diagnosing process, Videoweb TV, video records, categorical system.

ADAPTATION OF OMSAT-3* QUESTIONNAIRE INTO CZECH LANGUAGE

Michal Vicar

Purpose: Purpose of this paper is to document the process of adaptation of Ottawa Mental Skill Assessment Tool-3* questionnaire (OMSAT -3*, Durand-Bush, Salmela & Green-Demers; 2001) into Czech language and to describe its basic dimensions – mental skills. OMSAT -3* is an instrument originally devised in Canada. It represents a world-widely used tool to assess the mental skills of athletes. It comprises of 48 questions and focuses on 12 mental skills divided into three groups. Its two-level structure was confirmed by a factor analysis. Therefore it takes into consideration the following attributes: fundamental skills, including goal setting, self-confidence or commitment, psychosomatic skills, such as stress reaction, fear control, relaxation or activation, and cognitive skills, including focusing, refocusing, imagery, mental practice and competition planning.

Methods: Double process of translation and retranslation accompanied with two pilot studies was used in the process of the adaptation of the questionnaire. Equivalence of the original and new version was assessed via semiotic units and semiotic meaning. Afterwards it was distributed within 206 athletes (130 men and 76 women, average age – 17,66 years), competing on international, national or regional level to evaluate the basic psychometric parameters. The following types of sports were included: handball, volleyball, soccer, judo, horse riding, rafting, basketball, skiing, cycling and floorball. Respondents were recruited mainly from local and university sport clubs in the town of Olomouc, Czech Republic, and its environment.

Results: 1st Czech version of OMSAT-3* was created. Reliability as internal consistency of the Czech version was assessed. Its values in 7 out of 12 scales were found satisfactory (Cronbach's alpha > 0,7) whereas 5 scales showed inadequate values.

Conclusion: 1st Czech version of OMSAT-3* showed unsatisfactory reliability as internal consistency to be accepted. Next steps in the process of standardization of Czech version were proposed.

Key words: Mental skills, adaptation of method, sport talent, translation, retranslation.

DOES CORRELATE EXPLOSIVE STRENGTH AND SPRINT ABILITY OF CZECH YOUNG FOOTBALL PLAYERS?

Jan Vích

In modern football is everything faster and faster. It requires that abilities of players have to be as good as possible. Football, as a typical intermittent-type sport, incorporates various explosive motions such as sprinting, kicking, jumping and changes of direction. Therefore the most important abilities are speed and explosive strength. The purpose of this research was to examine the relationship between speed and explosive strength of young football players. To determine speed ten meters sprint was used whereas to measure explosive strength vertical jump was used (with countermovement). Fifty-seven male football players participated in this study. Their age was between 15-18 years and they were divided into three groups by age (U16, U17 and U19). All of the participants played for FC Zbrojovka Brno, Czech Republic. All players had participated in their regular endurance, sprint and specific football training programme of 5-6 days per week. To prove the hypothesis correlation analysis was made. It was found that relationship is not statistically significant ($p < 0,05$). Therefore hypothesis was disprove. Than correlation analysis for each group was made. In groups U16 and U17 there were no statistically significant relationships ($p < 0,05$). Only in group U19 was proved that relationship between ten meters sprint and vertical jump is statistically significant ($p < 0,05$). This measurement suggest that explosive strength affects speed only in group U19. It can be explained by different body composition, physiology or training process of older players.

Keywords: football, strength, explosive strenght, vertical jump, sprint, speed

CONNECTION BETWEEN MOTOR ABILITIES AND DANCING SUCCESS OF THE FACULTY OF KINESIOLOGY STUDENTS

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Faculty of Kinesiology university of Zagreb

The aim of this research was to establish the connection between motor abilities of the students at the Faculty of Kinesiology and their success in dancing. The sample was made up of 85 Faculty of Kinesiology students who have finished the programme of the course Dance. The variables' sample used to assess how successful the students in dancing are, have been the marks of 5 competent experts in the field of dancing, which have been given to the subjects after performing each dance (5 folk and social dances) on the basis of the video recording. When choosing the dances, plan and programme of the course Dance, structural analysis of each dance, diversity of the rhythms and pace as well as ethno-choreographic determination of the folk dances were taken into consideration. The variables' sample used to assess motor abilities consisted of the results gained by measuring motor abilities, for which influence on dancing success had already been confirmed in previous research - coordination, rhythmic structures realization, balance, movement frequency, flexibility and explosive strength. It was established statistically relevant connection of the predictor set of students' motor abilities and total success in dancing criterion ($R=0,67$), the predictor set and success in folk dances criterion ($R=0,67$) and the predictor set and success in social dances criterion ($R=0,62$) ($p<0,01$). The predictors with the greatest contribution to the connection of the predictor set and the total success in dancing and success in folk dances are unrhythmic drumming (Mkrbub) and side steps with a 360° turn (Kus360), used to assess motor ability to realize rhythmic structures and coordination. The connection of the predictor set and success in social dances has been mostly contributed by the rhythmic structures realization assessment test - unrhythmic drumming (Mkrbub). To conclude with, the students with the higher level of rhythmic structures and coordination will be more successful in performing dancing structures.

Key words: students, motor abilities, dance success

ISOKINETIC STRENGTH OF THE SHOULDERS IN YOUNG ELITE TENNIS PLAYERS

Tomáš Vodička, Jindřich Pavlík, Martin Zvonař

Purpose: Analysis of epidemiological studies in tennis players shows a high prevalence of shoulder and elbow overuse. Incidence of shoulder injuries among elite junior players range from 10 to 30%. The high incidence of overuse shoulder injuries in elite junior tennis players is often attributed to both the high repetitive stresses inherent in the game, as well as muscular imbalances humeral rotators. The purpose of study was to assess isokinetic strength of the shoulders in young tennis players.

Methods: Subjects were recruited from various tennis clubs in the Prostějov area, who practiced 5 days a week. They were assessed on a Cybex Humac Norm. The velocities selected for bilateral testing were 180°, 210° and 300°.sec⁻¹. The range of motion used to generate the data was 0° to 90° external and 0° to 65° internal rotation. A 3-way Side (of the body) x Movement x Angular Velocity Anova with repeated measures on the second and third factors was used to assess the differences between right and left shoulder extension and flexion by angular velocity within gender.

Results: In the boys, there was no Side x Velocity x Movement interaction ($\omega^2 = 0.008$, 95% CI: 0.000 – 0.425; power: 0.583) and neither was there one for the girls ($\omega^2 = 0.005$, 95% CI: 0.000 – 0.404; power: 0.304), but both results were not clear. In the girls, there was a clear significant Velocity x Movement interaction ($\omega^2 = 0.568$, 95% CI: 0.554 – 0.872). The simple effects analysis showed shoulder extension at 180°/s ($17.61 \pm 4.96 \text{ Nm}\cdot\text{s}^{-1}$) to be higher than shoulder flexion ($10.55 \pm 4.60 \text{ Nm}\cdot\text{s}^{-1}$) ($d=1.499$, 95% CI: 0.362–2.635).

Conclusion: Although a 3-way interaction was expected per gender, this was not found. It is suggested that with age, this will occur.

Keywords: Isokinetics, pre-pubertal, children, strength

THE COMPARISON OF THE STRATEGIES USED BY PATIENTS IN CHRONIC PAIN THERAPY AND PEOPLE PERFORMING TAEKWONDO - A PILOT STUDY

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Introduction: The assumption was made that the mental condition has an impact, playing an active role in treatment and martial arts on the method of interpretation of the information that comes from the inside of the body and the surrounding social environment. The undertaken problem has its practical and scientific dimensions. That is why the activities are directed towards such a type of research that will contribute to the data base useful in active actions against the limits resulting from experiencing pain.

Material and Method: The present paper compiles the results of research conducted in two groups that are considerably different with respect to physical fitness. Among independent variables (controlling) we can mention: age, sex, degree in taekwondo, length of practice (in years), frequency of practice a week (usually, on average how many times one participates in trainings). Can these two realities, i.e. people of high functional fitness that practice taekwon-do and patients who attend pain therapy, exchange experiences that promote health and recovery? The sample group is composed of the people who use pain treatment programme; some of them regularly (systematically), some ad hoc. Taekwondo group are the people who attend trainings with different frequency (between once a week and more than five times a week) and different length (between one year and over 12 years) with different status.

Some of the training attendants are also patients, after injuries, who want to regain fitness.

Results and Conclusions: Pain management is influenced by many factors (proactive attitude and low degree of being preoccupied with the problem of pain). Among them an important role is played by the plane of biological and psychological conditionings, the characteristic of a nervous system (e.g. high reactivity), upbringing, life experiences (including intermittent pain experience), emotional situation. Studies will be continued.

Key words: taekwondo; Chronic pain; Strategies of coping with pain; Psychological factors; Proactive

SATELLITE SYMPOSIUM ON SPORT INJURIES

FUNDAMENTALS OF SPORTS INJURY EPIDEMIOLOGY / ESTABLISHING AN INJURY SURVEILLANCE

Eric D. Zemper, PhD, FACSM; Director of Research, Statewide Campus System, College of Osteopathic Medicine, Michigan State University, USA

This presentation will introduce fundamental concepts of epidemiology, the basic science of preventive medicine, and how it is applied to sports medicine, specifically the epidemiology of sports injuries. Also discussed will be the fundamentals of designing and implementing a sports injury surveillance system. While the methods of classical epidemiology were developed to study communicable diseases, in recent years epidemiologic theory and methodologies have been applied to a broader range of subject areas, including sports injuries. The basic tools of classical epidemiology include the calculation of rates of incidence and prevalence. In sports medicine the incidence rate is predominantly used, and the modifications of the standard epidemiological incidence rate equation for use in sports injury epidemiology will be presented. The importance of using a common metric in reporting sports injury rates will be discussed, focusing on the use of incidence rates per 1,000 Athlete-Exposures as the preferred method of reporting. One of the primary tools in applying epidemiologic theory and methods to the study of sports injuries is the use of the techniques of injury surveillance. A well-designed sports injury surveillance system must collect data on more than just the numbers of injuries that occur in a designated population of athletes. The collection of this data for the numerator of the incidence rate equation usually is the easiest part. The complexity arises in collecting the vital data needed for the denominator of the equation, the exposure data. The presenter will draw upon his experience in designing and implementing several sports injury surveillance systems for a variety of sports to present recommended approaches to collecting valid sports injury data, including the importance of establishing a definition of a reportable injury, selection of a representative sample, designing data collection forms, finding local personnel to collect and submit injury and exposure data, and the advisability of keeping the data collection system as simple as possible.

EPIDEMIOLOGY OF FENCING INJURIES - DATA COLLECTION AND PREVENTION IMPLEMENTATION

Peter A. Harmer

1) Willamette University, Salem, OR USA, 2) Medical Commission of the Fédération Internationale d'Esgrime

Fencing is one of only four sports to have been contested in every Olympic Games of the modern era. However, until recently, few useful data of the risk and characteristics of injury associated with competitive fencing have been compiled. The lack of accurate data has subjected fencing to unwarranted publicity about the danger of participating in the sport based on very rare incidents of penetrating wounds caused by equipment failure. Two large-scale, long-term epidemiological studies that were designed to avoid methodological weaknesses of previous research on this topic confirm that the risk of time-loss injury in fencing is very low. The combined sample involved more than 145,000 participants, ranging in age from 8 to over 70 and both males and females for all 3 disciplines. The data were collected over a total of 9 years from both national (5 years) and international competitions (4 years) and found the risk of a time-loss injury at ~ 0.28 per 1,000 athlete exposures. The most common injuries that result in withdrawal from competition are sprains and strains (approximately 56% of all injuries), with the main areas injured being the ankle and the knee (accounting for approximately 40% of all injuries; 20% each). Fencing-specific injuries (i.e., lacerations and penetrations), which tend to be the primary injuries ascribed to fencing by the uninformed public, are even more rare and generally minor. Only 9 were recorded in the 9 years of analysis of competitions (approximately one in 61,400 bouts), with 90% being minor injuries to the hand.

Based on analysis of the data related to these penetrating hand injuries (including cases collected outside of the two major surveillance systems), various prevention strategies were considered. The process of developing and implementing a prevention approach involved forces (social, financial, political) outside of the scientific approach that are critical for researchers and other stakeholders to consider. Protocols such as the Translating Research into Injury Prevention Practice (TRIPP) framework now represent an essential step in using epidemiological information in a meaningful way.

COMPETITION INJURIES IN JUDŌ

Willy Pieter

Purpose: To review the epidemiology of injuries in judō as reported in the literature as well as conference proceedings and unpublished reports. The main focus will be on injury incidence, distribution, type and mechanism in adult men and women.

Methods: Electronic databases and the ancestry method were used for relevant published articles in English, German and French. The search included publications since 1960 and involved both peer-reviewed publications, international presentations and proceedings as well as unpublished theses where available. The search terms used were: judo, martial, injuries, epidemiology and risk.

Results: The first prospective investigation on judō injuries was done in 1960. It was reported that German elite judōka incurred an injury rate of 17.42 per 1,000 athlete-exposures (A-E) (95% CI: 13.48 – 21.36) for men*. The most recent investigation showed that the males have a 10.87% (95% CI: 7.47 – 15.55%) risk of getting injured and the females, 12.42% (95% CI: 8.10 – 18.58), which is not statistically different from each other. British research found the upper extremities in females (18.87/1,000 A-E, 95% CI: 3.77 – 33.97) did not incur more injuries compared to the lower extremities (6.29/1,000, 95% CI: 0.00 – 15.01). Male judōka were not at a higher risk of sustaining an injury: OR = 1.04 (95% CI: 0.78 – 1.37, CLR: 1.76). In absolute terms, Brazilian judōka incurred more sprains (26.36%, 95% CI: 19.03 – 35.26) than strains (14.55%, 95% CI: 9.16 – 22.33) but the difference was not statistically significant. Regardless of type of injury the major mechanism was reported to be standing techniques.

Conclusion: Future research on judō injuries should consider including mechanisms as well.

*There were no competitions for women at that time.

Key words: judo, injury, type, mechanism

*Calculated based on information provided by the authors.

COMPETITION INJURIES IN T'AEKWŎNDO

Willy Pieter

Purpose: To review the epidemiology of injuries in t'aekwŏndo as reported in the literature as well as conference proceedings and unpublished reports. The main focus will be on injury incidence, distribution, type and mechanism in adult men and women.

Methods: Electronic databases and the ancestry method were searched for relevant published articles in English, German and French. The search included publications since 1980 and involved both peer-reviewed publications, international presentations and proceedings as well as unpublished theses where available. The search terms used were: taekwondo, martial, injuries, epidemiology and risk.

Results: American male t'aekwŏndo athletes sustained an injury rate of 127.36/1,000 athlete-exposures (A-E) (95% CI: 79.32 – 175.40) and their female counterparts of 90.09/1,000 A-E (95% CI: 50.61 – 129.57), which was not significantly different. Australian counterparts incurred an injury rate of 79.3/1,000 A-E (95% CI: 22.8 – 275.4) for men and women combined. Iranian male competitors sustained an injury rate of 19.10/1,000 A-E (95% CI: 11.12 – 27.08). Compared to their colleagues competing at the 1999 World Championships, the former recorded a statistically significantly lower injury rate but the latter were not at a higher risk: OR = 0.61, 95% CI: 0.41-0.91, CLR = 2.20, although the result is not as precise. American male university t'aekwŏndo athletes incurred an injury rate of 235.85/1,000 A-E (95% CI: 143.40 – 328.30) and their female counterparts a rate of 333.33/1,000 A-E (95% CI: 144.73 – 521.93). At the 2012 Olympic Games, t'aekwŏndo was reported to sustain most of the injuries with male athletes at a higher risk (RR=1.9, 95% CI: 1.1 – 3.5), but the result was not as precise (CLR: 3.2). The most often occurring injury type in females was the contusion: 56.36/1,000 A-E (95% CI: 44.91 – 67.82). The major injury mechanism was delivering a roundhouse kick in the men: 46.51/1,000 A-E (95% CI: 20.20 – 72.83) and receiving one in the females (35.09/1,000 A-E, 95% CI: 0.70 – 69.47). The roundhouse kick led to a higher resultant linear acceleration (RLA) than the hook punch in boxing: 130.11 ± 51.67 g vs. 71.23 ± 32.19 g, which was statistically significant: $d = 1.39$, 95% CI: 0.00 – 20.41. However, the difference was not clear, which is attributed to the small sample size. The t'aekwŏndo headgear that was approved by the WTF/KTA has been found to fail the ASTM standards for martial arts headgear safety. Improving safety equipment that is currently used in t'aekwŏndo is recommended.

Conclusion: Epidemiological studies have shown t'aekwŏndo to be a high-risk activity. Since headgear will not offset the occurrence of head injury, it is recommended to review the contact rules for young athletes whose brains are still developing.

Key words: taekwondo, injury, type, mechanism

EPIDEMIOLOGY OF TRACK AND FIELD INJURIES

Eric D. Zemper, PhD, FACSM; Director of Research, Statewide Campus System, College of Osteopathic Medicine, Michigan State University, USA

A brief overview of the research literature on the epidemiology of injuries in the sport of athletics, or track and field, will be presented, followed by a discussion of some of the complexities of collecting injury and exposure data for this multi-faceted sport.

EPIDEMIOLOGY OF INJURY IN SKIING - CURRENT STATUS AND FUTURE DIRECTIONS

Peter A. Harmer

Willamette University, Salem, OR, USA

Snow-based sports, often grouped under the general heading of skiing, represent some of the largest participation activities in the world. It is also clear that many have significant potential risks due to highly variable environmental conditions and terrain, speed, equipment, and level of experience. From the standpoints of both protecting participants and supporting the growth of these sports, epidemiological investigations are critical. However, these sports present considerable challenges to injury research, including the range of actual activities (e.g., Alpine, Nordic, snowboarding) and specific events (e.g., downhill, slalom, giant slalom, Super G, cross-country, jumping, ski cross), whether practiced recreationally or competitively, in groomed areas or “off piste”/backcountry, by beginners or advanced participants. In addition to the myriad of combinations of these elements that make identifying risk, and more importantly risk factors, difficult, the lack of standardized reporting protocols (e.g., who collects the data) and the extremely variable definitions of reportable injury and exposure (e.g., injuries per 1,000 skier days vs. mean days between injuries) currently used in research in this area means firm conclusions are elusive. To address some of these issues, the Fédération Internationale de Ski (FIS) established its own injury surveillance system in 2006 in conjunction with recognized sports epidemiologists. Although this system is relatively narrow in scope, focusing on elite skiers, and very labor intensive, requiring individual interviews with the athletes, it represents an important paradigm shift in sports epidemiology. Previously, epidemiological studies have been primarily initiated by individual researchers, generally disconnected from each other and often only loosely connected to previous work. Having the FIS instigate the system and direct the research questions means a coherent and cohesive research program that can systematically explore the underlying issues that affect skier safety and propagate and initiate effective prevention programs.

EPIDEMIOLOGY OF INJURY IN ARTISTIC GYMNASTICS

Dennis Caine, Willy Pieter

Purpose: To review the epidemiology of gymnastics injury as reported in the literature.

Methods: The primary reference sources for this study were the electronic database SCOPUS, the world's largest database of peer-reviewed coverage of Medline, SPORTDiscus, and CINAHL. The literature search was limited to published, peer-reviewed reports since 1975 and involved the following search terms as well as extensive cross-referencing: gymnastics, injury, epidemiology, injury risk factors, and injury prevention.

Results: Much of the existing epidemiologic literature on injury in gymnastics focuses on artistic female gymnasts, with only a few cohort studies addressing male gymnasts, rhythmic gymnasts, and trampoline gymnasts. The following generalizations arise from the extant literature on the epidemiology of injury in women's artistic gymnastics:

Injury rates are relatively high compared to other sports, both at the club and college levels.

The rate of injury has been shown to be greater in competition than training: RR=2.5, 95% CI: 1.5, 4.8; CLR: 1.22

The most commonly injured body region is the lower extremity (e.g., knee, lower leg, ankle), likely reflecting the high proportion of injuries associated with landings and dismounts. Ligament sprains and muscle/tendon strains are the most common injury types.

Although there tends to be a greater proportion of acute injuries, overuse injuries appear to be increasingly common at advanced levels of training and competition.

An increased frequency of injury following periods of decreased training and during weeks just prior to and during competition.

The risk of serious injury such as internal knee derangement is higher during competition than training among college-level gymnasts.

Although most injuries are relatively minor, the severity of injury is higher among advanced- and college-level gymnasts.

Catastrophic injuries occur infrequently; however, the clinical incidence at the collegiate level appears to be relatively high compared to other sports.

Preliminary analysis of risk factors suggests the following may be associated with increased risk of injury : periods of rapid growth, history of previous injury, excessive life stress, and advanced levels of training and competition.

There is a paucity of research designed to assess the effectiveness of preventive measures.

Conclusion: Given the life-changing impact injury can have on gymnasts, the paucity of well-designed epidemiological studies of Olympic women's gymnastics injuries is disturbing. The importance of establishing denominator-based injury surveillance in obtaining an accurate picture of injury risk and severity and as a basis for testing risk factors and preventive measures cannot be overemphasized. We feel there is an ethical imperative for gymnastics governing bodies, both nationally and internationally, to provide incentive and guidance for epidemiological research in all forms of Olympic gymnastics.

Key words: gymnastics, injury, risk factors, prevention

MOVEMENT VARIABILITY – SCIENCE AND PRACTICAL APPLICATION

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In the last 20 years concepts related to the dynamic systems theory have influenced the way we think about movement, movement variability and noise or error of data. Variability in movement is a natural and normal phenomenon that influences our lives, our physical accomplishments and our health. Motor skills in the healthy populations are associated with an optimal amount of movement variability, while in the unhealthy populations motor skills are less than optimal. As exercise is prescribed as an intervention, a clear understanding on what movement variability is, how it gets influenced and how it can be manipulated should be a priority so audiences' goals can be met.

This paper reviews the literature related to movement variability in the human adult, what its relationship is to performance, what its relationship is to injury, how this variability impacts different populations and how the concepts related to movement variability can be manipulated so performance or return to performance can be improved. Exercise recommendations are being brought forward for these populations. This paper does not cover the theoretical background of movement variability, the relationship between movement variability and child development nor is the focus on how movement variability is measured.

Key Words: dynamic systems theory, movement variability, variability, performance

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