

BOOK OF ABSTRACTS

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KEY NOTE SPEAKER 1

HUMAN PHYSIOLOGY IN EXTREME ENVIRONMENTS - HOW DO WE ADAPT THROUGH PHYSICAL ACTIVITY?

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One of the recognized goals of the biomedical sciences is to understand and advance the limits of human survival - to increase the quality as well as the duration of human life has been a goal of science for centuries. To effectively push the boundaries of human survival, we need to know more about human biology and physiology under extreme environmental conditions. A robust and generally recognized definition of what constitutes an extreme environment is missing and current definitions are always somewhat dependent on the perception of the person exposed to such environment. Most of the accepted definitons incorporate either the physiological adapation or technological support or both as necessary prerequisites of an environment being considered "extreme". Several completely novel syndromes associated with extreme environments have been identified lately that require specific, targeted interventions, truly based on deep understanding of the pathophysiology of the disease - with muscle/bone wasting due to microgravity in space being a good example. If successfully addressed, these novel diseases can be considered, to a certain extent, models for other, widely spread conditions and the therapeutic approaches intially meant for narrow groups of patients can serve much wider audience in the end. However, such approach requires functional translational and dissemination research in order to understand how to move the knowledge on the role of physical activity in extreme environments to the common life. Example of good practice of such translational studies will be highlighted and issues related to theoretical frameworks as well as practical issues will be discussed.

KEY NOTE SPEAKER 2

ACTIVE AGEING AND SARCOPENIA

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Sarcopenia was identified in the late 1980s as a condition associated with ageing and the loss of muscle mass during the ageing process. The reduction in muscle mass directly influence the muscle contraction force, activation of muscles and therefore the ability to perform tasks of daily activity. In the ageing population the lack of responses time of the muscles, and the muscle strength results in an impaired ability for self-care. The purpose of this presentation is to understand the development of sarcopenia and how physical activity in the older population is associated with sarcopenia. A literature search was conducted using EBSCOhost, Sabinet, Scopus and Web of Science using the following search terms: sarcopenia, ageing, physical activity, muscle mass, muscle activation and functional performance.

Various mechanisms are hypothesized for the development of sarcopenia. Specific criteria are recommended to define sarcopenia with specific cut points. Interventions to prevent and manage sarcopenia include dietary adaptations and physical activity. A large number of publications on the association between physical activity and sarcopenia with contributing factors are found in the literature. Various researchers have also investigated the effect of a dietary or an exercise intervention or a combined dietary and exercise intervention in older persons with sarcopenia.

In conclusion the current research indicates that more clarity is needed in the identification of the underlying mechanism for sarcopenia symptoms. There is however consensus that active older persons are more protected against sarcopenia than inactive older persons. Resistance exercise interventions report a protective effect on muscle loss in older adults.

Keywords: functional performance, muscle mass, myscle activation, ageing, physical activity.

ANALYSIS OF HUMAN MOVEMENT



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Purpose: Players performance is determinated by skill level in different shot types. Full swing (woods and irons), approach shots (pitch and chip) and putting. Although development of golf skill tests can helped coaches to improve player's performance by individualizations of training process. Based on our best knowledge there is no study involving all golf shot skills and its relation to the player's performance level. The aim of the study was to determinate level of golf skills and their relation to the performance level of elite junior golf players. Methods: 16 elite golf players of junior age (age = 15,6 \pm 1,2 years; height = 175,2 \pm 10,6 cm; mass = 67,5 \pm 13,6 kg; hcp = 5,1 \pm 5,5) volunteered in the study. Each player performed four tests of golf skills – putting test (18 short putts from 0,9m - 2,7m and 18 long putts from 7m - 13m), short game test around the green (10 strokes from the fairway 5m - 30m and 6 strokes from the bunker 20m - 30m), distance control test (15 strokes from 30m - 90m) and combine test (60 iron strokes from 55m - 165m and driver). Performance level was evaluated by handicap. To find out the relationship between tests of golf skills (short and long putts test, short game test from the fairway, short game test from the bunker, distance control test, combine test, driver and middle iron full swing test) and player's performance level (handicap) the Pearson's product-moment correlation coefficient (r) on significance level p =< 0.05 was used. Simple linear regression was used for predicting of variables and multivariate regression was used for controlling age of participants. Results: Significant relationship between player's performance level (handicap) and Combine test (r = 0.79, p = 0.0003), full swing test with middle iron (r = 0.59, p = 0.017), full swing test with driver (r = 0.58, p = 0.0003) 0.018), distance control test (r = 0.57, p = 0.02) and short game test from bunker (r = 0.73, p = 0.001) was found. Conclusion: Results showed that full swing with driver and irons and distance control with wedges are the most important skills for elite players of junior age. We suggest that the combination of distance control test and combine test could be used to determinate the player's performance level. Future research will investigate using of those tests to predict player's performance in upcoming events. Determination of performance in training conditions can be beneficial for recognition of player's strengths and weaknesses, to assess the effectiveness of interventions and for identification of talented golfers.

Keywords: golf, skills, testing, performance, TrackMan

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Purpose: In South Africa, there is a strong cultural tradition of mothers back-carrying their children, sometimes for extensive durations. Research report differences in static lower limb measures, such as at the tibiofemoral angle, femoral anteversion angle and in the tibial torsion angle between back-carried and non-back-carried, Setswana-speaking children. The discrepancies found in static measures, lead to an interest to determine whether the static differences would translate into dynamic differences during gait. The objective of this study was to compare the tibiofemoral angles in the gait of back-carried and non-back-carried children. Methods: Twelve non-back-carried (mean age=8.00±0.95 years) and 14 back-carried (mean age=8.01±0.73 years) participants participated in the study, however, data from only 12 participants in each group were analysed. Lower body kinematic gait analysis was performed at self-selected walking speeds, using the Qualisys Track Manager (QTM, Qualisys AB, Sweden) software and six wall-mounted cameras (OQUS 3+). Reflective markers were placed on each lower extremity at anatomical landmarks, using the CAST (6DOF) protocol. Analysis of knee kinematics was performed in the sagittal-, transverse- and frontal planes, for the left limb only, at left heel-strike (LHS), left mid-stance (LMS) and left toe-off (LTO) gait phases.

Results: Data was analyzed using the Bayesian independent t-test to compare back-carried with non-back-carried data. In three comparisons of LHS in all three planes, the observed data supported H0. However, the Bayesian factor reached values above 1 and below 3 providing inconclusive evidence. It means that the observed data was only one to three times more likely under the null hypothesis that postulated the absence of the effect of back-carry on knee angles. The alternative hypothesis proposed the presence of the effect. The observed data supported the alternative hypothesis while analyzing LMS in sagittal and frontal planes. The Bayes factor was above 0.33. In the transverse plane, the observed data supported the null hypothesis; however, the BF was below 3. These values also yielded inconclusive evidence. Analysis of LTO in the sagittal and transverse planes, the Bayes factor was below 3 and the data supported the null hypothesis, whereas in the frontal plane observed data supported the alternative hypothesis, although the BF was above 0.33.

Conclusions: The observed data yielded inconclusive evidence for either the null or alternative hypothesis. Therefore, there is not strong enough evidence to claim an influence of back-carrying on knee angles (LHS, LMS or LTO). The most significant contribution of our study is that the results of the Bayesian analysis may be used as prior in subsequent studies investigating relationships between knee angles and back-carrying.

Keywords: back-carrying, kinematic gait analysis, knee angles, tibiofemoral joint.

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Purpose: Classical ballet, Slovakian folklore dance, and sport dance training differ in their way how to master the art of dance; however, postural control is essential for the correct execution of complex movements used in all types of dance. The aim of this study was to analyze the differences in static postural control between classical ballet dancers, Slovakian folklore dancers and sport dancers and to analyze the effect of body mass, body height and toe grip strength on postural control.

Methods: 68 dancers, between 17 to 28 years of age, participated in this study: 21 dancers from Slovakian folklore dance group VSLPT Polana Brno (12 females, 9 males), 22 dancers from Brno Dance conservatory (16 females, 6 males) and 25 sport dancers competing at Brno Dance Open 2019 (12 females, 13 males). All participants were asked to stand upright, barefooted, arms along the body, both feet on the Emed-at platform (Novel GmbH, Germany) for 10 seconds with their eyes open to obtain the length of COP line (cm), average velocity of COP (cm/s), the elliptic area (mm²) and numerical eccentricity of the ellipse. The toe grip strength was measured for each foot when sitting using toe grip dynamometer (Takei Scientific Instruments, Niigata, Japan). To analyze the effect of dance style, to grip strength, body mass, body height, and gender on postural control variables, Kruskal Wallis test, and Spearman Rank Order Correlation were used.

Results: A better postural stability measured by the length and average velocity of COP was observed in sport dancers, compared to classical ballet and Slovakian folklore dancers. Sport dancers are used to a greater load on the forefoot and to a special foot roll-of pattern when dancing, which may lead together with a constantly changing environment during competitions to their enhanced postural stability. Despite the differences in dance training and dance footwear of female and male dancers (high-heel shoes in sport and Slovakian folk-lore female dancers, pointe shoes in female ballet dancers), no statistically significant difference in postural variables between genders was observed. Similarly, in analyzed dancers, no effect of age, body mass, and body weight on postural control were observed. The toe grip strength was not observed to affect the postural variables in this study. The greatest toe grip strength was observed in female ballet dancers, despite their younger age. Ballet dance training includes repetitive exercises focused on foot and toes such as battement tendu or demi-pointe and en pointe positions probably resulting in the greater strength of the toes.

Conclusion: In this study, better postural stability measured by the length and average velocity of COP was observed in sport dancers, compared to classical ballet and Slovakian folklore dancers. In analyzed dancers, no effect of body mass, body weight, gender, and toe grip strength on postural control variables was observed. Future studies focused on postural stability changes in non-dancers after a sport dance, classical ballet and Slovakian folklore dance training program would provide additional knowledge about the process how each type of dance enhance the balance and other coordinative skills.

Keywords: postural stability, dance, length of COP, the average velocity of COP, toe grip strength

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In women's artistic gymnastics, the balance beam belongs among the disciplines with the heaviest lower limbs load. The aim of our research was to disclose a lower limbs weekly load volume regarding load asymmetry, and to determine the take-off and landing reaction forces between landing ground and foot in selected gymnastic elements. In 9 female artistic gymnasts of junior and senior category one training week was video-recorded and analysed. The reaction forces were measured using 5 Bertec force plates in one female Czech national team member. Based on the training video recordings 12 jump and acrobatic elements were analysed. Among the total of 422 recorded take-offs and landings 41 % were performed from both legs, (BL), 44.5 % from one lower limb (HL) and 14.5 % from the other lower limb (LL). The maximum reaction force of the landing ground during take-offs was 2.4 BW in average, 3.1 BW in landings. In asymmetrical elements, one leg was loaded three times more (538.3 BW) than the other (174.1 BW) in one training day in total. We recommend to record the load asymmetry in the course of the gymnastic trainings in order to choose and personalise the appropriate regeneration process and compensational exercise.

Keywords: artistic gymnastics, asymmetry, landing, reaction forces, take-off.

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The notion of laterality relates to the preference or dominance as to the side asymmetry of the human body. Preference means that the surer, more accurate, coordinated, and often also stronger side is chosen from the viewpoint of motor manifestations. The stated percentage of the left-handed preference is 10-13%, in some sports (e.g. boxing, hockey, tennis), the proportion of left-handers is higher. The left-handedness is considered an advantage in tennis and the percentage of left-handers among the top female players is even higher (16%). The one-sided load in tennis can result in an overload of certain muscle groups of the playing hand and in development of muscular dysbalances, which can lead to injury. The research objective was to find out the level of anthropometric and strength characteristics and to assess unilateral and bilateral differences in the maximum hand strength of the top Czech female tennis players. The research population was composed of female tennis players in the age of 11.0–12.9 years (n=165, body height: $M \pm SD = 155.08 \pm 7.31$ cm, body weight: $M \pm M \pm 1.31$ 43.86 ± 7.30 kg) who took part in the regular testing of the Czech Tennis Association in 2000-2018. It has been statistically verified that the research data come from the normal distribution of frequencies (chi-square test). It has been found that 87.3% of female players (n = 144) use their right hand as the playing (dominant) one and only 12.7% the left (dominant) hand (n = 21); the share of right-handed female players was significantly higher than that of left-handed female players (in relation 6.8:1). The maximum strength of both hands was measured with the hand dynamometer (Grip D) and the basic statistical characteristics were calculated (strength of the right hand: MRH = $23.11 \pm 4,36$ kp; strength of the left hand: MLH \pm SD = 20.75 ± 4.80 kp). Assessing the effect size of the differences of the strength level between the right-handed and left-handed female players using the Cohen's d has shown only small substantively significant differences in favor of the left-handed female players (MRH \pm SD = 23.28 \pm 4.28 kp, MLH \pm SD = 25.60 \pm 6.45 kp; d=0.42, small). In right-handed female tennis players, medium substantively significant difference of strength in favor of the dominant hand (DH) compared to the non-dominant one (NDH) has been found (MDH \pm SD = 23.28 \pm 4.28 kp, MNDH \pm SD = 20.04 \pm 4.05 kp, d=0.78, medium). In left-handed female tennis players, medium substantively significant difference of strength in favor of the dominant hand (DH) compared to the non-dominant one (NDH) has been also found (MDH \pm SD = 25.60 \pm 6.45kp, MNDH \pm SD = 21.99 \pm 4.71kp, d=0.64, medium). From the viewpoint of the study focus on injury prevention, it is necessary to consider the finding that more than 15% difference between the strength of the dominant (playing) hand and the non-dominant one has been found in 42.50% of right-handed female players and even in 66.67% of left-handed ones to be a warning. In conclusion, it may be stated that substantively significant differences between the strength level of the dominant and non-dominant hands have been found in observed female players in the age of 11.0 – 12.9 years, which may be a potential cause of injury, and it is necessary to pay attention to this fact in training. It is desirable to use bilaterally even training load, compensation exercises, and strengthening exercises of the non-dominant upper extremity.

Keywords: bilateral asymmetry, hand-held dynamometry, laterality, isometric strength.

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Purpose: The aim of this study was to determine the differences between two entity groups in dynamic balance based on different foot morphology. Differences were studied and determined between students with normal feet (NST), and students with flat feet (SST) in dynamic balance in unilateral performance (UIZ) based on their anthropological features.

Methods: The study involved 208 respondents, 13 to 14 years of age (+/- 6 months), i.e. the seventh and eighth grade elementary school boys from the city of Zagreb. The respondents were divided into two groups: the group (1) comprised 107 respondents with normal feet (NST) and the group (2) 101 respondents with flat feet (SST). The study included only subjects with physiological, i.e. flexible lowering of the arches, while those with fixed, i.e. rigid lower arches, as well as those with high arches, were excluded from it. Only the median lowering of the arch was studied. All the results, analyses, discussions and conclusions of the study are based on the results of the dominant leg and the results of the non-dominant leg. Foot morphology, i.e. median lowering of the arch, was assessed bilaterally with the help of technical aids (polarized light podoscope) and was evaluated using the Clark's method. To evaluate the dynamic balance component, the Star Excursion Balance Test (SEBT) was used in UIZ of the dominant and the non-dominant leg. The analyses of the dynamic balance results only used the normalized values of the star test - SEBT (distance/leg length x 100). The study estimated the physical activity level (RTA) of the respondents with the use of the special questionnaire (PAQ-C; The physical activity questionnaire for older children and adolescents) and Body Mass Index (BMI = m/h^2), ITM kg/cm2. Primarily, it was established that there were no statistically significant differences between ITM and RTA at the level of significance (p> 0.05) between the two groups of respondents, confirming that there was no initial difference between the groups.

Results: Based on the set hypothesis and p-value coefficient (p <0.05), that out of a total of 16 dynamic balance variables related to dominant and non-dominant legs statistically significant differences between groups were found in six variables. Based on a circular star test, out of a total of eight directions, variables in which respondents significantly statistically differ with dominant and non-dominant leg are medial (DRONM-DRN-NM), posterior (DRONP-DRNNP) and lateral (DRONL-DRNNL) directions. The respondents with normal feet (NST) showed better results compared to those with flat feet (SST). Namely, this area covers the entire back half of the circular network of the star test. In the front half of the circular network of the star test, i.e. in the anterolateral (DRONAL-DRNNAL), anterior (DRONA-DRNNA), anteromedial (DRONAM-DRNNAM) variables, although the NST respondents showed somewhat better results, no statistically significant difference between the groups was determined.

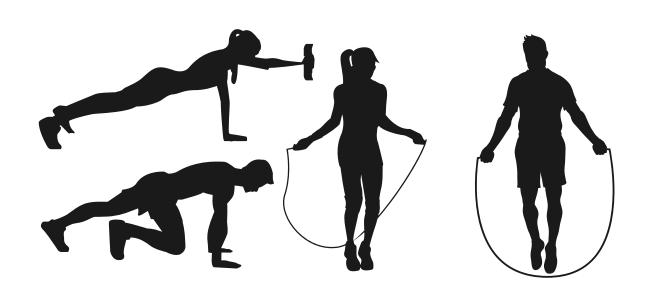
Keywords: normal foot, flat foot, dominant leg, non-dominant leg, dynamic balance

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In the patients suffering from advanced hip joint osteoarthrosis, large muscular groups of weight bearing joints in the area of the lower extremities are weakened due to pain and reduced physical activity. In the persons indicated for TEP, the significantly reduced muscular strength of the lower limb at the preoperative stage is often associated with a subsequent prolonged rehabilitation period, subjectively lower quality of life and a significantly slower return to an active lifestyle. On the other hand, sufficient muscular strength at the preoperative stage materially affects the postoperative period and is a prerequisite for significantly higher degree of self-care, lower level of pain and earlier hospital discharge. For this reason, the preoperative programmes focused on developing muscle strength in the lower limbs are being implemented. Muscular strength of the lower limbs has not been mapped satisfactorily yet at the preoperative stage and therefore the intervention programmes cannot be targeted effectively on the weakened muscle groups. The aim of the research study was to determine preoperative levels of the muscular strength of the knee joint extensors and flexors in a group of the persons suffering from unilateral hip joint arthrosis indicated for TEP (TEP group, n = 18; age: M \pm SD = 58.37 \pm 5.15 years; height: M \pm SD 178.67 \pm 6.39; weight: M \pm SD = 99.41 \pm 17.31 kg) and to assess degree of lateral muscle imbalances between the lower limb indicated for surgery (IS) and not indicated for surgery (NIS). The control group consisted of persons with no orthopaedic complications (NOC group, n = 18; age: 65.98 ± 1.50 years; height 174.80 \pm 6.15; weight 93.51 \pm 16.46 kg, the stronger and the weaker limbs are designated ST and WE in the text, respectively). Determination of the level of knee joint muscular strength was performed by isokinetic dynamometry (Humac Norm CSMI, Stoughton, U.S.A.) at the angular velocity of (60°/s). The significance of effect size differences between mean values was performed using Cohen's d. Analysis of lateral differences in the muscular strength of the NIS limb and the IS limb demonstrated a significantly higher effect size of the isokinetic muscular strength of the knee extensors in the TEP group (d = 0.92) in favour of the NIS limb (IS deficit of 18.08%), whereas in the case of the knee flexors no effect size of differences was found (d = 0.33, IS deficiency of 8.59%). In an assessment of the level of lateral differences of the muscular strength in the NOC group between the extensors (d = 0.43) and flexors (d = 0.35), no effect size was found. Muscular strength deficit of the weaker (WE) limb was 8.16% in extensors and 7.36% in flexors. Comparison of the level of muscular strength of the knee extensors between individual groups (IS limb in TEP group vs. WE limb in NOC group) did not show any effect size of muscular strength differences (d = 0.04). In the case of flexors, the effect size of difference in the muscular strength (d = 0.56) was shown in favour of the NOC group. Comparison of the muscular strength level of the knee extensors (NIS limb of the TEP group vs. ST limb of the NOC group) showed a significant difference in muscular strength (d = 0.68) in favour of the TEP group. Comparison of muscular strength of the knee flexors (NIS limb of the TEP group vs. ST limb of the NOC group) showed a significant effect size of the differences in the muscular strength (d = 0.51) in favour of the NOC group.

Keywords: osteoarthritis, muscular strength, total hip endoprosthesis (TEP).

SPORT TRAINING, NUTRITION AND REGENERATION



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The theory of Relative Age Effect (RAE) works on the assumption that athletes born at the beginning of a calendar year are more successful than athletes born in the end of the year. The athletes born early have a significant probability of a higher level of physiological, morphological and psychological abilities than later born athletes. Several studies show that the RAE was not found in females or it was significantly lower than in males. The research objective was to find out the influence of RAE in WTA Tour TOP100 female professional tennis players (n=500) in 2014–2018. Cohen's effect size (ES) w was calculated to assess the level of the influence of RAE. To assess the differences between the observed and the expected relative age quarter distribution, Chi-Square test (c²) was used. In terms of effect size (ES), a medium influence of RAE has been proven in 2016 and 2017 (w=0.33, resp. w=0.30); a small influence has been proven in years 2014, 2015, 2018 and in the whole observed period 2014-2018. Based on statistical analysis, the influence of RAE cannot be rejected in years 2016 (p<0.05) and 2017 (p<0.05) and also in the whole period of 2014–2018 (p<0.01). The influence of RAE can be rejected in 2014, 2015 and 2018 (p>0.05). The next step was to assess the influence of RAE on the final WTA ranking in 2014–2018. Players have been divided into four intervals: 1–25, 26–50, 51-75 and 76-100 positions. ES has showed the medium influence of RAE in 76-100 positions (w=0.34); only small influence of RAE was found in other positions. Statistical analysis showed that the influence of RAE cannot be rejected in 1–25, 26–50 and 76–100 positions (p<0.05): it can be rejected in 54–75 positions. The results of the research have shown the medium influence of RAE in 2016 and 2017: in the recent years (and in the whole observed period of 2014–2018), the influence of RAE was small. The influence of RAE on the final WTA ranking is also small, except the 76–100 positions.

Keywords: Women's Tennis Association; date of birth; chronological age; talent; rankings.

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INTENSITY OF SOCCER PLAYERS' TRAINING LOAD IN SMALL-SIDED GAMES WITH DIFFERENT RULE MODIFICATIONS

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Purpose: The aim of this research was to make reference to the difference in heart rate values (HR) of soccer players in small-sided games (SSG) with different rule modifications. We assumed that the permitted number of ball touches in small-sided games will significantly affect the internal load of participating soccer players' organism.

Methods: The experimental group consisted of older junior players (U19) from the FC DAC 1904 Dunajská Streda soccer club (n=6). The heart rate values were evaluated on the basis of collected data, which we obtained using sport testers and special software. In order to find out the statistical significance of the difference in heart rate was used the One-Way ANOVA and the Bonferroni post hoc test. The level of statistical significance was set at 5%.

Results: We found out that by the change of the small-sided game's rules, the internal reaction of players' organism to training load was at different level. In the SSG1, where players had permitted one ball contact during the SSG, was recorded the highest achieved average heart rate value of the monitored players' (160.08 ±9.27 beats.min⁻¹). This form of the SSG was the most intense for the players' cardiovascular system. However, there were no significant differences in heart rate values among the different types of the SSGs.

Conclusions: Our recommendation is to employ in the systematic training process small forms of small-sided games (3 vs. 3) with different rule modifications, because by the means of it we can adequately prepare the players for the real competitive match load itself.

Keywords: soccer, training load, heart rate, rule modifications, small-sided games.

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Purpose: The main aim of our research was to determine the internal load of goalkeepers in the soccer training process. The internal load of goalkeepers during the training process is examined according to the achieved values of heart rate. Our goal was to expand the knowledge of the impact of different methodical forms on the goalkeepers' internal load in soccer, thereby support the possibilities of improving their training process. The assumption was that the goalkeepers would achieve significantly different heart rate values in different methodical forms.

Methods: The research group was formed by six elite youth soccer goalkeepers (n = 6) from U16, U17 and U19 categories. In order to evaluate the heart rate was used the POLAR PRO heart rate monitor and the loading zones of goalkeepers were determined by using a program called POLAR Team². Subsequently, the obtained data were evaluated by using the Wilcoxon Signed-Rank Test and Cohen's "r "(effect size). *Results*: The average difference in HR during preparatory exercise and small-sided game was 25 \pm 9 beats.min⁻¹, and the average difference in HR was 35 \pm 12 beats.min⁻¹. During preparatory exercise achieved the goalkeepers' value of HR average 134 \pm 8 beats.min⁻¹ and in small-sided game was HR average heart rate values (z = -2.201, p < 0.05, r = 0.9), which statistically and logically confirmed our assumption.

Conclusion: Monitoring of soccer goalkeepers' internal load in the process of training and improvement of game activities can greatly help the coaches in further planning, optimization and tracking of the training process. Based on our research's results is recommended to monitor and evaluate the internal load intensity of goalkeepers using sporttesters during entire training process.

Keywords: soccer, goalkeeper, internal load, heart rate.

INFLUENCE OF THE INTERVENTION PROGRAM ACCORDING TO PULMONARY REHABILITATION PRINCIPLES ON BREATHING FUNCTIONS OF HEALTHY INDIVIDUALS

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Purpose: The aim of the study is to develop and verify an intervention program based on findings of the subject field Pulmonary Rehabilitation and the application of such programme to a daily program of healthy probands over a six-week period. The authors were concerned with determining whether an intervention program, based on a combination of aerobic load and resistance training, might affect the breathing stereotype and breathing functions in healthy individuals.

Methods: Muscle dynamometer MD03 was used to examine the extent of engagement of individual breathing regions. Breathing functions, or more specifically, the forced vital capacity (FVC) and one-second vital capacity (FEV1), were measured by means of Spirometer Otthon, and the evaluation was conducted using program ThorSoft. The intervention included 6 probands at the age of 21.3 ± 0.8 who exercise regularly. The probands underwent initial and final tests. The data obtained were evaluated and substantial significance was determined using Cohen's d, and the Student's paired t test for dependent selection. Significance value was determined at significance value $\alpha = 0.05$. Data were processed in programs Microsoft Excel 2016 and Statistica 12.

Results: The tested set of probands showed a substantially significant change of value FVC (Cohen's d = -0.13, i.e. a small effect). This change was also statistically significant. As regards value FEV1, a substantially significant change incurred (Cohen's d = -0.23, i.e. a small effect). Likewise, this change was statistically significant. The analysis of breathing movements of the observed group of probands revealed improvement especially in the lower thoracic region (abdominal) following the completion of the intervention program. In resting breathing, a substantially significant (Cohen's d = 2.83, a large effect) as well as statistically significant change was effectuated in this region. In the middle thoracic region, a substantially significant change (Cohen's d = 0.01, i.e. a small effect) incurred; however, there was no statistical change. No substantially or statistically significant changes were obtained for the upper thoracic (subclavian) region.

Conclusion: Our results imply that the aforementioned intervention applied in healthy individuals who exercise regularly hasn't had a positive influence on breathing functions. Though there was a small improvement in the breathing stereotype, the optimum engagement of the abdominal breathing region within the breathing wave as described in specialized literature was not accomplished.

Keywords: breathing wave, breathing regions, breathing stereotype, inspiratory pressure, intervention program, pulmonary rehabilitation.

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Purpose: Many high performance and especially top athletes are still at risk or suffer from total fatigue. Therefore, sports science seeks to develop an objective, sensitive and reliable method of early diagnosis of this fatigue. In our work we attempted to find out whether the new objective method - heart rate variability analysis (HRV) would bring similar diagnostic in young athletes. Already introduced "classical" indicators of HRV, such as spectral performance and its density in the established frequency ranges, are a part of athlete monitoring in the scope of overreaching prevention (Makivić, Djordjević, & Wilis, 2013; Novotný & Novotná 2013; Botek, Krejčí, & McKune, 2017). The aim of the study was to evaluate whether the HRV monitoring could be a complementary diagnostic tool for overreaching / overtraining at young athletes. We set a goal to monitor the heart rate variability parameters at three different phases of the year-long training cycle and to find out whether in one of these phases we could find athletes showing symptoms of overreaching.

Methods: 48 young athletes (33 boys 14.8±1.5 years, 15 girls 14.9±1.7 years) were involved in the study, consisting of 38 boys and 10 girls. There were 15 swimmers (with training volume 9x 1.5-2 hours a week), 12 artistic gymnasts (with training volume 9x 2-2.5 hours a week) and 21 badminton players (with training volume 4x weekly 1.5-2 hours a week). Monitoring was carried out in athletes in three training periods: at the end of the transition period, at the end of the prepared period, at the end of the competition period. Measurements were carried out in the morning. The DiANS PF8 system was used to measure the heart rate variability, the measurements were performed at five-minute intervals: lying-standing-lying. Time and spectral parameters of HRV were monitored (e.g. RR, LF, HF, MSSD, TP, VA, SVB, TS etc.).

Results: Results of HRV in three periods (HR+rMSSD in lying). Boys: HR (61 ± 8 , 64 ± 7 , 64 ± 8), rMSSD (85 ± 64 ; 80 ± 54 ; 88 ± 59), TS (-0.56 ± 1.53 ; -0.87 ± 1.4 ; -0.42 ± 1.44). Girls: HR (65 ± 8 ; 64 ± 7 ; 65 ± 8), rMSSD (74 ± 37 ; 79 ± 35 ; 83 ± 43), TS (-0.58 ± 1.57 ; -0.72 ± 1.35); -0.18 ± 0.18). Statistically significant differences (at the significance level $\alpha=0.05$) among sports were found in Kruskal-Walls ANOVA by Ranks: boys in LF-standing, HF standing, FV, SVB and TS; girls in HF-lying, HF-standing, rMSSD, TP-lying, TP-standing, FV, VA and TS.

Conclusion: Monitoring of heart rate variability seems to be a good tool for prevention of overtraining even in young age. To monitor heart rate variability, we recommend monitoring these parameters: RR, rMSSD, VA, SVB, TS. Functional age (FA) appears to be a simple and appropriate parameter for trainers to monitor overload rates (prevention of overtraining syndrome).

Keywords: heart rate variability, fatigue, training stress, overreaching, overtraining.

RELIABILITY AND VALIDITY OF THE NEWLY DEVELOPED TESTS OF FOOTBALL SPECIFIC CHANGE OF DIRECTION SPEED AND REACTIVE AGILITY IN YOUTH PLAYERS

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Purpose: Agility is an important determinant of success in football (soccer), but there is a lack of reliable and valid tests applicable in the evaluation of different agility components in youth football players. In this study we evaluated the reliability and factorial validity of the two newly developed tests of agility in male youth football players.

Methods: The sample comprised 44 youth football players (all males, 14-15 years of age) who were tested on anthropometrics (body height and mass), newly developed tests of football specific reactive agility (FS-RAG) and change of direction speed (FS-CODS), one standard test of CODS (20-yards), and sprinting over 20-m distance (S20M). The relative reliability is evaluated by calculation of Intra-Class-Correlation coefficients (ICC), while the absolute reliability was evaluated by calculation of the coefficient of variation (CV). Further, systematic bias was checked by analysis of variance for repeated measurements (ANOVA). The associations between studied variables were evidenced by Pearson's correlation. Finally, factor analysis was calculated to define the factorial validity of agility tests (FS-RAG, FS-CODS, 20-yards).

Results: The newly developed football-specific tests were found to be reliable, with better reliability of FSCODS (ICC: 0.81, CV: 6%), than of FS-RAG (ICC: 0.76, CV: 9%). The ANOVA evidenced significant (p < 0.05) learning effects for FS-RAG, but post-hoc analysis indicated stabilization of the results until the third testing trial. Factor analysis extracted one significant factor under the Guttmann-Kaiser criterion (Explained Variance: 1.93), showing the appropriate factorial validity of newly developed tests in comparison to standard agility indicator 20-yards. Meanwhile, the significant correlations between all agility performances with S20M (Pearson's R: 0.52-0.64; all p < 0.01) revealed that sprinting capacity significantly influence agility performances and that conditioning capacities of youth football players are not yet discriminated.

Conclusion: Results showed appropriate reliability and validity of the newly developed tests of football specific change of direction speed and reactive agility. Therefore, here proposed FS-CODS and FS-RAG can be used as reliable and valid measures of agility components in youth football players. Further studies should evaluate the discriminative validity of the here proposed tests (i.e. identification of position-specific or performance-related differences), as well as reliability in younger players than those studied herein.

Keywords: football, agility, sport-specific tests, reliability, validity.

VITAMIN D STATUS AMONG YOUTH SOCCER PLAYERS; ASSOCIATION WITH CHRONOLOGICAL AGE, MATURITY STATUS, JUMPING AND SPRINTING PERFORMANCE

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Purpose: Vitamin D is known to have a significant role in numerous body-system processes. Specifically, it has an impact on muscle functioning and, therefore sports performance. Children and adolescents have increased need for vitamin D because of its importance in growth and development, and it is evident that they are more susceptible to have vitamin D deficiency. Consequently, vitamin D status is particularly important issue in youth competitive sport. The aim of this study was to determine the prevalence of vitamin D deficiency/insufficiency (measured as 25(OH)D concentration), and the possible associations between vitamin D, with age, maturity status, sprinting- and jumping-performance among youth soccer players. Methods: The sample of participants in this research comprised 62 youth soccer players (age: 15.7±2.2 years). They were divided into two categories according to 25(OH)D levels measured at the end of the winter season: group with inadequate levels of 25(OH)D (vitamin D deficiency/insufficiency [<75 nmol/L]), and group with adequate levels of 25(OH)D (vitamin D sufficiency [>75 nmol/L]). Biological maturity status (maturity offset) was calculated from participants age and height by the following equation: Maturity offset = -7.999994 + (0.0036124 x (age(yrs.) x height(cm)). Performance variables were 10 meters sprint test (S10m) and countermovement jump test (CMJ).

Results: Results showed relatively good 25(OH)D concentrations (78.32±23.39 nmol/L), with prevalence of deficiency (<50nmol/L) in 8.06%, and insufficiency (50-75 nmol/L) in 46.77% athletes. Significant correlations were evidenced between the CMJ and 25(OH)D level (R=0.27, p<0.05), but chronological age was also correlated with CMJ (R=0.64, p<0.05). Further, higher chronological age was found in participants with sufficient vitamin D levels (15.1±2.4 vs. 16.4±1.6 years; t-test=2.43, p<0.05). However, no significant association was evidenced between vitamin D and maturity status.

Conclusion: Vitamin D groups significantly differed by chronological age but not by maturity status, which collectively with correlation between CMJ and vitamin D status indicates that both vitamin D status and performance in youth soccer players is actually influenced by chronological age. Meanwhile, biological age doesn't have a significant physiological influence on vitamin D concentration, while some external factors (i.e. time spent outdoors, parental control, sunscreen usage), should be considered important.

Keywords: Vitamin D, age, maturity, jumping, sprinting, soccer.

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Lateral elbow tendinopathy (LT) is the most common chronic painful condition affecting the elbow in general population. Research has shown that an eccentric exercise program can be effective modality for treating tendinopathies. The purpose of this review was to determine the effects of eccentric contractions (EC) in comparison to other types of contractions and other therapeutic approaches. Searches were performed using the electronic databases Medline, Scopus and Web of Science. The basic selection criterion was a research methodology in which at least one group of subjects used eccentric contractions in comparison to other methods of contractions or therapy. In conclusion, eccentric contractions are useful method of treating LT in 12 weak period. However, it cannot be stated with certainty whether EC exercises are more or less effective than other forms of therapeutic exercises or specific physiotherapeutic techniques.

Keywords: lateral epicondylitis, lateral epicondyalgia, tennis elbow, elbow tendinopathy, eccentric contractions, physical therapy, exercise.

THE EFFECTS OF COMMERCIALLY AVAILABLE ENERGY DRINK ON COGNITIVE PERFORMANCE

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Energy drinks are frequently purported as a non-alcoholic beverage food commodity to improve cognitive function and concentration and as such is marketed especially on vulnerable populations such as professional drivers, students, managers. We aimed to explore the dose-effect of commercially available multi-ingredient beverage on cognitive performance. Twenty adult university students, caffeine-deprived received two 500 ml non-alcoholic, glucose-free, multi-herbal extract drinks differing in ingredients dose: DRINK₁₀₀ (Guarana, 395 mg, Lecithin, 90 mg; Schisandra, 55 mg; Ginseng, 45 mg; Matcha green tea, 45 mg; Gingko Biloba, 45 mg), threefold higher concentration dosage (DRINK₃₀₀) and ingredients-free, flavoured-matched placebo (PLA) in a double-blind, three-way cross over, randomized order, separated by a 7-day wash-out period. Cognitive functions, autonomous nervous system activity, and specific mental performance were assessed. Drinks were consumed in the late evening (20 p.m.). Standardized psychomotor vigilance task (PVT) to detect reaction time, lapses and the total score and spectral analysis of heart rate variability (software driven, standing/lying down with ~ 300 beats recorded in each position, relative change in total power score between consecutive measurements was used) took place immediately prior and 60, 120 and 180 min post-drink consumption (post-drink) Thirty minutes of the cognitively demanding task (continuous manual text transcription) was commenced immediately and in 90, and 150 min post-drink. Total word counts were used to asses mental performance changes. The ecologically valid methodology was used to mimic typical students time of drink consumption. During the 60min post-drink, the level of alertness decreased independently of the drink category, however, DRINK₃₀₀ increased correct: lapsus ratio in 120 min and this remained elevated until the end of testing. No effect of \overline{DRINK}_{100} over PLA on vigilance was present. \overline{DRINK}_{300} led to an increase in autonomic nervous system activity after drink administration in 60-90 minutes post-drink in contrast with the decline observed in PLA. This corresponds with an increase in the number of words transcripted in the corresponding time in DRINK₃₀₀, however, not sustained in 180 min post-drink. We demonstrate a dose-dependent effect of caffeine-containing non-energetic beverage on cognitive and autonomous nervous system performance. The effect appears to be evident immediately (< 30 min) post-drink, but only beverage containing guarana equivalent to 120 mg of caffeine reduce cognitive performance impairment in a later time (~ 180 min).

Keywords: boosting beverage, caffeine, autonomic nervous system, alertness.

THE IMPACT OF CORE EXERCISE AND MYOFASCIAL RELEASE IN THE INITIAL PART OF TRAINING ON THE PERFORMANCE AND PREVENTION OF INJURIES IN FOOTBAL PLAYERS.

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Introduction: One of the basic processes to improve stability and prevent injuries in sports is warming up. The aim of our study is to verify the impact of the initial part of the training unit (warm-up) on the stability and performance of a football player.

Sample: The research study was carried out on 37 football players in U-19 and U-17 categories in the football club - JUPIE Marek Hamšík football school. Probands were divided into two groups. The test group consisted of 19 U-19 football players (average age 17.2 ± 0.87) and the control group consisted of 18 U-17 football players (average age 15 ± 0.5).

Methods: Both groups underwent an initial measurement consisting of Y balance test and performance tests - ball slalom, agility test. Test group footballers underwent our intervention, consisting of myofascial release and core training, which was added to the introductory part of the training unit. The study lasted 4 weeks.

Results: Probands of both groups achieved a statistically significant improvement in the Y balance test. When comparing the performance tests, the test group achieved a significant improvement in the agility test (p = 0.0024) and slalom with the ball (p = 0.0159) and the control group in the agility test (p = 0.0182). The improvement in the ball slalom test in the control group was not statistically significant (p = 0.1798).

Conclusion: Our study confirms a significant effect of "core exercise" and "myofascial release" in the initial part of training. However, the benefit was also achieved in the control group, except for the slalom test with the ball.

Keywords: postural stability, Y balance test, core training, myofascial relaxation, football.

BREATHING PATTERN DURING LOAD AND ITS CHANGE DUE TO INTERVENTIONAL PROGRAM OF BREATHING EXERCISE

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Purpose: The correct breathing pattern in resting breathing is connected with the overall physical health, whereas the breathing pattern affects the performance in endurance sports. The principle of breathing economy consists primarily in the involvement of diaphragm as the main muscle in breathing. The paper is engaged in the breathing stereotype in resting breathing and breathing under load. The objective of our paper is to verify whether it is possible to influence the breathing stereotype by applying a two-month intervention breathing program.

Methods: The paper examines changes in the resting breathing stereotype and the breathing stereotype during load in adolescent, healthy runners. The intervention was attended by twenty probands, who underwent initial and final tests of the breathing stereotype at rest and in submaximal load. Eleven of them were members of an experimental group and the remaining nine constituted a control group. The experimental group included seven boys at the age of 16.1 ± 1.3 , with height 173.2 ± 6.5 cm and weight 56.8 ± 4.6 kg, and four girls at the age of 16.5 ± 0.5 , with height 161.7 ± 3.1 cm and weight 54.3 ± 2.3 kg. The breathing stereotype was measured using muscle dynamometer MD03 before and during a spiroergometry test conducted on a bicycle ergometer. The data obtained were evaluated in terms of substantive (Cohen's d) and statistical significance ($\alpha = 0.05$).

Results: The breathing intervention resulted in positive changes in the breathing stereotype at rest and under load. At rest, the engagement of the abdominal segment increased by 16.2%, that of the thoracic segment and subclavian segment decreased by 3.6% and 12.6%, respectively, when compared with the initial test. In the submaximal load, the engagement of the abdominal segment increased by 4%, and there was a decrease by 2% for both the thoracic and subclavian segments in comparison with the initial test. The control group showed no significant changes in the engagement of the individual segments of breathing muscles.

Conclusion: Our results prove that a two-month interventional program of breathing exercises, aimed at activation of the diaphragm and other breathing regions, has a substantial influence on the breathing stereotype both at rest and in the submaximal load.

Keywords: breathing, breathing pattern, breathing exercise, load, diaphragm.

David Marko

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Purpose: A choice between a running or bicycle ergometer is not possible in every laboratory. Significant differences may appear in measuring results of ergometers with different load specificity. The objective of our paper is to determine a difference in values measured during a spiroergometry test on a bicycle ergometer and a running ergometer in adolescent endurance sportsmen, with different specializations, for mountain cyclists and middle- and long-distance runners.

Methods: The experiment involved 10 cyclists and 10 runners at the national top level. The cyclists and runners were divided in two groups: one half of the tested group completed the first test on a running ergometer and the other on a bicycle ergometer. The test on the other ergometer was taken after three days' time. The progressed load test up to "vita maxima" was used for both ergometers. The examined parameters included values VO_2max , V_T , VE, BF, HR_{max} and WR_{max} . Results were evaluated in terms of both statistical and substantial significance. Statistical significance was ascertained by means of t-test at the level α =0.05. Cohen's d was used to evaluate substantial significance.

Results: The results showed substantially significant differences for runners in all examined parameters. A substantially significant difference in measurement results of cyclists was discovered for parameters VO_2 max, V_T , VE and WR_{max} . In runners, the mean of values for the most important parameter VO_2 max reached 60.6 ± 4.24 ml.min-1.kg-1 when running, and 56.0 ± 5.34 ml.min-1.kg-1 when cycling; values reached by cyclists were 56.6 ± 5.16 ml.min-1.kg-1 when running, and 61.30 ± 4.47 ml.min-1.kg-1 when cycling. The only parameter not to correspond with the sportsmen's specializations was V_T , as it revealed larger values on a bicycle also for runners.

Conclusion: Results confirmed the correspondence between the load specificity according to the ergometer selected and the specificity of sports pursued. It was proven that it is necessary to select a suitable type of appliance for determining VO₂max according to the sports pursued.

Keywords: VO₂max, runners, cyclists, adolescents, ergometer.

PREDICTING FUTSAL SPECIFIC CHANGE OF DIRECTION SPEED AND REACTIVE AGILITY; ANALYSIS OF SPECIFIC CORRELATES IN TOP-LEVEL PLAYERS

Ivan Zeljko¹, Miodrag Spasic², Damir Sekulic²

Purpose: Change of direction speed (CODS) and reactive agility (RAG) are important qualities in futsal, but studies rarely examined the predictors of these conditioning capacities in players of advanced level. This study aimed to evaluate predictive validity of certain anthropometric and conditioning capacities in evaluation of futsal specific CODS and RAG in top-level players.

Methods: The sample comprised 54 male players from Croatia and Bosnia and Herzegovina, members of teams competing at the highest national rank, including national champions for the 2017-2018 competitive season in both countries. The variables comprised set of predictors (body mass, body height, triceps skinfold, reactive strength index [RSI], sprint 10 m [S10M], and broad jump [BJ]; and four criteria: futsal specific CODS and RAG, performed with and without dribbling (CODS_D, CODS_WD, RAG_D, RAG_WD). To identify the association between variables Pearson's correlation and multiple regressions were calculated.

Results: Observed predictors explained statistically significant (p < 0.05) percentage of variance for all four criteria (Rsq: 0.28, 0.30, 0.23 and 0.25, for CODS_WD, CODS_D, RAG_WD, RAG_D, respectively). Body mass was significant predictor in all multiple regression calculations (Beta: 0.35-0.51), with poorer performances in heavier players. In both performances which involved dribbling, significant predictors was RSI (Beta: -0.27 and -0.31 for CODS_D and RAG_D, respectively), with superior performances in players with better RSI. The S10M and BJ were not identified as being significantly related to studied RAG and CODS performances in multiple regressions.

Conclusion: Study confirmed specific influence of studied predictors of futsal specific CODS and RAG with consistent negative influence of body mass on studied performances. Almost certainly this can be explained by specifics of RAG and CODS execution. Specifically, tests are performed over relatively small distances, with several changes of direction, which clearly mimic the futsal specific performances. Although sprint performance is often observed as important determinant of CODS and RAG, herein we did not confirm its predictive validity in explanation of futsal specific CODS and RAG. Future studies should evaluate other potentially important predictors of these capacities in futsal.

Keywords: prediction, multiple regression, conditioning capacities, pre-planned agility, non-planned agility.

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DIFFERENCES IN SELF-ASSESSMENT OF PREPAREDNESS OF WRESTLERS BEFORE COMPETITION

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Purpose: Main goal of this research was to establish differences in self-assessment of preparedness of Greco-Roman wrestlers in different age groups before a competition.

Methods: The sample of subjects consisted of Greco-Roman wrestlers (n=223) divided in three age group (cadets n=76; juniors n=69; seniors n=78). Self-assessment of preparedness determine immediately before official weighing (approximately 16 hours before official weighing) using a survey questionnaire on the Likert scale of 1 to 5. Descriptive statistic parameters were present. Wrestlers success is determined by analysis of official bulletin from national championships. Correlation between self-assessment of preparedness and success was determine by linear regression analysis. Statistically significant differences between the groups were determined by Mann-Whitney test.

Results: The large number of cadets (35.5%) estimate a completely prepared for competition compared with juniors and seniors who are more in carefully self-assessment of preparedness. Juniors (42.3 %) estimate that are ready enough 43.5 % seniors as medium ready for a competition. Furthermore, results of linear regression indicate relation (R=0.203; p=0.002) self-assessment of preparedness and success of Greco-Roman wrestlers. Also, statistically significant differences between cadets and juniors (p=0.033) as well as between cadets and seniors (p=0.001) in variable self-assessment of preparedness for the competition were confirmed.

Conclusion: Statistically significant relation between self-assessment of preparedness and success indicate that wrestlers with high level of self-assessment of preparedness have a better success as well as self-confidence on wrestling competition. Difference between age groups of Greco-Roman wrestlers in variable self-assessment of preparedness emphasize importance of realistic and achievable goals in young age groups of wrestlers. Setting unreal goals can lead to frustrations or giving up of wrestling practice. Therefore, individual approach is very important for mental preparedness of young wrestlers before competition, especially setting and realization of real goals. In this way, positive experience from a competition will be raise the level of self-confidence in young age wrestlers.

Keywords: wrestling, Greco-Roman, focus, self-confidence, motivation, success.

EFFECTS OF IMMEDIATE MECHANOTHERAPY AND INTERMITTENT CONTRAST WATER IMMERSION ON SUBSEQUENT CYCLING PERFORMANCE

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Purpose: Finding the balance between the training, the competition, and recovery is a crucial component for maximal sports performance. A huge range of sport recovery methods is presented as an important part of training programs. In recent years, there has been an increasing interest in using the contrast water immersion and massage and its effect on subsequent muscle function. Recent studies have shown that the contrast water immersion affects the maximal force, which can be useful for subsequent repeated performance. This study aims to investigate the differences between using immediate mechanotherapy and contrast water immersion on cycling performance.

Methods: Eight physically active male participants (age 27.1 ± 2.32 years; body mass 77.38 ± 5.43 kg; body height 1.78 ± 0.05 m; body fat 10.12 ± 2.23 %; VO_{2max} 47.92 ± 7.16 mL·kg⁻¹·min⁻¹) volunteered and gave written informed consent to participate in this study. Participants completed three trials, each separated by one week. Each trial consisted of two "all-out" exercise bouts (30-20-10 s) against the load resistance of 0.07 kg/body weight. Three minutes recovery phase was between the "all-out" exercise bouts (1W/kg; a pedal rate of 70–75 rpm). Following this, the selected recovery strategy was applied for 24 minutes (PAS-passive recovery, MT-massage therapy, CWI-contrast water immersion). The effect of recovery was assessed through changes in performance parameters, blood lactate concentration, and blood gases analyses.

Results: The results obtained from the analysis showed positive statistical significance difference between using PAS vs. MT (p = 0.03133) and PAS vs. CWI (p = 0.04416) for peak power. Interestingly, there were similar differences in fatigue index when we had compared PAS vs. MT and PAS vs. CWI. A decrease in lactate levels overtime was the highest for CWI.

Conclusion: The results of this study indicated that CWI and MT could be considered as a useful method in sports recovery. The results of this research support the idea that passive recovery is not a good way of recovery, especially when the athletes expect subsequent performance. Future trials should assess the impact of water temperature and different massage techniques on performance and also for subjective feelings of athletes.

Keywords: anaerobic performance, blood lactate, sports recovery, massage therapy.

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PURPOSE: The aim of this work was to identify strength differences and derived strength characteristics between healthy and injured soccer players.

METHODS: Monitored group consists of professional young soccer players (n=40, age=20.7±1.6 years). Isokinetic strength tests (flexors, extensors of knee) for both the dominant and non-dominant lower limbs were performed before the season to determine pre-season screening of peak torque, bilateral (Q:Q, H:H) and unilateral strength ratio (H:Q) in the players. Subsequently, the players were monitored during the season and divided into "GROUP" according to injury in anterior cruciate ligament rupture (ACL), hamstring strain (HAM) and healthy players (CONTROL). If the injury occurred, we looked back at its strength characteristics and the strength ratio between the extensors and flexors of the knees and whether some differences between groups are relevant as well as between injured and uninjured leg (main factor "LEG").

RESULTS: The results showed an insignificant effect of the main factor GROUP on the muscle strength of the knee extensors ($F_{2.80} = 1.581$, p = 0.211, $\eta_p^2 = 0.041$). The bilateral ratio between the extensors and flexors of the knee was insignificant (p = 0.672). The interaction of the major factors compared (GROUP vs. Bilateral Ratio) was also not significant ($F_{2.80} = 1.581$, p = 0.213, $\eta_p^2 = 0.041$). The results of the analysis did not show a significant effect of the observed main factors on the size of the unilateral ratio of the follow-up groups (GROUP: $F_{2.80} = 0.552$, p = 0.578, $\eta_p^2 = 0.015$, LEG: ($F_{1.80} = 0.162$, p = 0.688, $\eta_p^2 = 0.002$, GROUP * LEG: $F_{1.80} = 0.086$, p = 0.771, $\eta_p^2 = 0.001$).

CONCLUSION: Based on the findings of this study, we conclude that bilateral as well as unilateral asymmetries are not directly related to hamstring injury and ACL rupture in the season, but the study limit may be a lower number of injured players. Study was supported by GA19-12150S.

Keywords: asymmetry, isokinetic, knee, lower limbs.

DIFFERENTIAL EFFECTS OF HIGH-FREQUENCY VS. LOW-FREQUENCY SWIMMING PROGRAMS IN RECREATIONAL SWIMMERS

EFFICACY OF SWIMMING PROGRAMS IN RECREATIONAL SWIMMERS

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PURPOSE: Swimming has many positive effects on health, functional capacities and morphological features, but there is an evident lack of studies examining the optimum training frequency in novice/recreational swimmers. The aim of this study was to analyze the differences between a short-period swimming program (32 sessions, 8 weeks, 4 sessions per week; PR8W) vs. a long-period training regimen (32 sessions, 16 weeks, 2 sessions per week; PR16W) in recreational swimmers.

METHODS: The participants were 175 male (PR16W: 91 participants and PR8W: 84 participants) and 80 female students (PR16W: 39 participants and PR8W: 41 participants) who had basic swimming background. Five swimming variables were observed: 25, 50 and 400-meter front crawl (25mC, 50mC and 400mC, respectively), 100-meter medley (100mM), 25-meter butterfly for females (25mB) and 50-meter butterfly for males (50mB). The factorial ANOVA for repeated measures (group x measurement) was used to analyze changes over the observed period.

RESULTS: Both groups significantly improved all swimming capacities regardless of gender (F-test in males: 54.27, 149.26, 71.35, 50.34, and 177.11 and in females: 60.47, 68.86, 97.94, 51.74, and 103.77 for 25mC, 50mC, 400mC, 50/25mB, and 100mM, respectively, all p < 0.05). Only one significant group x measurement interaction was evidenced (F-test: 11.58, p < 0.05), with better improvement in the 400mC exhibited by the female students in PR8W than in PR16W.

CONCLUSION: The investigations of the study indicate that both programs have a positive impact on swimming abilities regardless of duration. A more intensive swimming program has been found to improve swimming capacities related to aerobic-endurance and swimming-speed to a greater extent than a swimming program with a longer duration. Therefore, shorter and more intensive programs are recommended to improve swimming capacities.

Keywords: swimming, training, aerobic endurance, anaerobic endurance, intensity.

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Purpose: The aim of this observational study is to determine the way in which the period of performing physical activity affects sleep quality and duration based on objective measurement.

Methodes: This investigation is a part of the CRO-PALS study. For the purpose of this investigation, 123 adolescents (mean age=15.6 years, SD=0.4) with objective data on both sleep and physical activity (PA) were included in the analyses. To objectively measure sleep and PA we asked the participants to wear the SenseWear Pro3 Armband™ (SWA) activity and sleep monitor (BodyMedia Inc) for 5 consecutive days. PA was divided according to intensity in 2 categories; 4 to 7 METs was categorized as moderate physical activity, while physical activity of intensity greater than 7 METs was categorized as vigorous physical activity. Four periods in the day were examined (6-12 a.m., 12-6 p.m., 6-9 p.m. and 9-12 p.m.). The sleep parameters examined were: total sleep time as an indicator of sleep quantity, and sleep efficiency and sleep onset latency as indicators of sleep quality. The hypothesis that there is an association between the period of physical activity with sleep was tested by multilevel modeling for repeated measures with different activity parameters or a part of the day as independent variables and individual sleep parameters as dependent variables. All models included interaction between sex and physical activity in a period of the day. Significant interactions were observed only for physical activity in the period 21-24h and sex for sleep onset latency and these analyzes were repeated within a male and female sex separately.

Results: Physical activity was not associated with total sleep time or sleep efficiency in neither of the periods of the day examined (p=0,09-0,88). Conversely, physical activity performed after 9 p.m. was accompanied with longer sleep onset latency in girls (p<0,001), but not in boys (p=0,81). This particularly refers to vigorous physical activity, with every 30 minutes of PA followed by 35 minutes longer sleep onset latency.

Conclusion: Girls should avoid vigorous physical activity after 9 p.m. in order not to prolong sleep onset latency.

Keywords: exercise, sleep, school age children, pediatric population.

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Global popularity of soccer has led to implementation of scientific and technological knowledge in its everyday use. One of such things that has been expanding in recent years is the application of various technologies for monitoring running performance during trainings and matches. The aim of this study was to evaluate match running performance of professional football/soccer players during official matches by using global positioning system (GPS) technology, and to compare it among playing positions. One hundred and one match performance of "Hajduk" team in 14 matches of Croatian Football League season 2018/2019 were used for this study. The activities of the players were monitored using GPS technology (Catapult S5 and X4 devices, Melbourne, Australia) with a sampling frequency of 10 Hz. Total distance covered, distance in different speed categories, total and high intensity accelerations and decelerations were analyzed for players in five different playing positions: central defenders (n=26), full-backs (n=24), midfielders (n=33), wingers (n=10), and forwards (n=8). Additionally, playing positions were compared by InStat index, regular performance indicator which is calculated on the basis of unique set of key parameters for each position (12 to 14 factors). Average total distance covered during match was 10.3 km, with forwards covering largest (11.2 km) and central backs covering smallest average distance (9.8 km). Playing positions differed significantly in high intensity running (F-test=20.43 and 19.17, p < 0.01 for 20-25 km/h and >25km/h, respectively). The side positions (wingers and full-backs) covered highest-, while central defenders covered lowest-average distance (901, 760, and 376 m, respectively). The wingers had highest number of high intensity accelerations and decelerations (>3 m/s²; F-test=11.26 and 17.41, p<0.01, respectively). Central defenders had largest number of average accelerations and decelerations (>0.5 m/s²; F-test=11.26, and 17.4, p<0.01, respectively). InStat index was not correlated with data obtained by GPS measurement. Results from this study indicate that running demands differ depending on playing positions so these findings should be applied in creating training plan and program. Future studies should evaluate data from multiple teams for getting more applicable findings.

Keywords: running performance, football, accelerations, decelerations.

SPORT AND SOCIAL SCIENCES



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Non-profit organisations play a critical role in many societies because they fulfil the needs in areas that are not covered by public or private sector. The main purpose of all non-profit organisations is not generating income and, in most cases, the income from their own activities is not enough to survive. Therefore, they are forced to look for additional ways of funding and are dependent on them. These types of financial resources can be divided into two main groups - internal and external resources. Income from own activities and membership fees can be an example of internal resources. Subsidies from the state or municipalities, sponsorship money and donations are part of organisations' external resources. The main purpose of this paper is to reveal the influence of difference types of financial resources of non-profit sport organisations on their strategy. The article applies general findings for non-profit organisations from the paper of Stone, Bigelov and Crittenden (1999) on "Research on strategic management in non-profit organisations" on the organisations from sport area. Funding and financial resources are one of the determinants influencing the stages of a strategic process: formulation, content and implementation. This paper focuses on these determinants and describes the influence of different types of financial resources on non-profit sport organisations' strategy by reviewing range of studies on the strategic process and funding of non-profit organizations that are applicable in sports. The article summarizes different findings and issues that have been described and published in the pre-reviewed academic journals with no restriction on the date of the issue. Furthermore, the paper discusses implications for future research in this area.

Keywords: non-profit sport organisations, strategy, financial resources.

DEVELOPMENT OF EMOTIONAL SKILLS AMONG 15-16-YEAR-OLD ADOLESCENTS IN PHYSICAL EDUCATION CLASSES

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Background. The aim of this study was to investigate the effectiveness of the 16 weeks educational program of emotional skills in physical education classes on development of emotional skills among 15–16-year-old adolescents in physical education classes. Study hypothesis – the application of 16 weeks educational program would allow expecting more developed emotional skills among 15–16-year-old adolescents in physical education classes.

Subjects and methods. Participants in the study were 51 pupils of the ninth grade (15.15 \pm 0.36). Experimental group consisted of 25 and the control group of 26 adolescents. The measures of emotional skills were evaluated using Emotional Intelligence Questionnaire – Short Form (TEIQue - SF), Social Emotional School Readiness Scale (BUSSESR), and self-confidence methodology, developed by Stolin (Пантилеев, Столин, 1989). Educational experiment was used as a method to verify the efficiency of the educational program. Repeated measures (RM) multivariate analysis of variance (2 \times 2 (Group \times Time) MANOVA) was used in order to analyse the effects of the educational program.

Results. After the 16-weeks educational program (structural physical education classes), a significant improvement was found in emotional skills scores for the experimental group compared with the control group, which had a statistically significant effects: adolescents in the experimental group had more developed self-awareness (F (1,49) = 5.86; p < .05; η_p^2 = .11), self-confidence (F (1,49) = 5.28; p < .05; η_p^2 = .10) skills, and the abilities to express emotions (F (1,49) = 5.95; p < .05; η_p^2 = .11) in physical education classes. These results indicated that the structural physical education classes had a positive influence on adolescents' emotional skills.

Conclusions. It was found that during the 16 weeks educational experiment the applied measures of educational impact had a statistically significant effect on the components of experimental group 15–16-year-old adolescents' self-awareness, self-confidence skills, and the abilities to express emotions in physical education classes.

Keywords: emotional skills, educational program, adolescents, physical education classes.

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The issue of the Relative Age Effect (RAE) has been monitored in the field of sports for more than 30 years. Its theoretical framework is based on the premise that, during the pubescence period, the athletes born at the beginning of the year experience earlier biological acceleration affecting a higher level of physiological, mental, morphological or psychological attributes than their later-born peers. A number of publications show that this temporary advantage often manifests itself in elite competitions at junior level, but gradually disappears during the transition to professional senior competitions. The aim of this work was to find out the level of RAE in elite 100 ATP tennis players (ATP Rankings) in 2016–2018. To assess the RAE influence, the Chi-Square (c²) test in the variant of Goodness of Fit was, due to the categorical character of research data and large sample size, used for the assessment of the conformity of expected and observed frequency distribution. To assess the effect size (ES, since it is not a random representative selection of elements of the research set) of the c² test values, the Cohen's w value calculation was used. Odds ratio (OR) was used to assess the chance of players from the Q individual quarters to get among the best 100 players. The results show that, in terms of effect size (ES), the effect of birth date in all the Top 100 players is small (w = .22) during the entire observed 2016–2018 period; the influence of RAE is therefore dismissed. The ES in the individual years is again small (w = .21-.25); the RAE influence is also dismissed. In analysing the effect of birth date, the mean rate of effect size was found in tennis players in positions 1 to 25 (w = .46) as well as tennis players in positions 51 to 75 (w = .37); the RAE influence therefore is not rejected. Only a small measure of effect size was found between positions 26 to 50, resp. 76 to 100 (w = .21-.25); the RAE influence is rejected. There has not been any statistically significant difference found between the observed and expected distribution of birth date between the observed quarters of the year (odds ratio test, p > .05), thus it has not been proven that tennis players from any of the $Q_1 - Q_4$ quarters had a better chance to get among Top 100 tennis players. It can be concluded that the professional senior tennis had not shown the RAE influence to the extent usual in junior categories during the observed period of 2016–2018.

Keywords: biological acceleration, birthdate, sports talent, professional, ATP Rankings.

PHILOSOPHICAL PHICAL SOME SELECTED HISTORICAL AND ASPECTS 0 F THE KALOKAGATHIA ARETĒ IN THE PRINCIPLES 0 F AND MIRROR 0 F MODERN SPORTS

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This paper focuses on two important principles of ancient Olympism. One of them is kalokagathia, and the other is aretē. The phenomenon of kalokagathia is often mentioned as one of the main principles of the modern Olympic Games, as well. Unfortunately, we can meet this principle in its narrow way of understanding. This approach presents a focus on a high rate of both physical and mental performance. However, the original meaning of kalokagathia was based on the interconnection of beauty and goodness. There are also some other ways how to understand this phenomenon. The aretē principle is based on the ancient understanding of virtue. Coming from the ideas of Plato and Aristotle, aretē cannot be separated from wisdom.

The main part of the paper is devoted to some possible ways how these two principles were (or could be) applied into the sphere of human movement in the past times. The authors notice the system of modern sports, especially its structure and ethical values (including contemporary Olympic Games), and they argue some contradictions which can be noticed if we want to apply the two principles mentioned above in the world of modern sports. Via using the philosophical discourse, we could understand better that some ideas about applying these principles in the sphere of modern sports cannot be fulfilled. There are some logical reasons why they cannot work in the system which is based on the values significant for modern sports. Some possibilities of how to keep these principles at present models of sport could still be found. However, it is necessary to describe and identify the problems of modern sports. It is necessary to focus on the values which were real in the past, but which are (at least partly) illusory these days.

Some historical milestones of the modern Olympic Games (like abolishing the art competitions after 1948) can help us to understand the historical context of the sport value-system from a bit different point of view than it is usual for the journalists and sports officials. This approach can transcend limits of thinking about kalokagathia and aretē sentimentally (as the 'flatus vocis') towards the real possibilities how these two principles could be applied even in the changed rules of the world of modern sports.

Keywords: alternative understanding of Olympism, aretē, fair play, kalokagathia.

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The main topic of the paper is the analysis of a state of physical education in primary and secondary education in Czech republic. The paper is engaged in an issue of the pupils (and their legal representatives) approach to the physical education as well as of the curricular grounding of the physical education. The next viewpoint is an analysis of a general social and individual value of physical education with the respect to a quality of life of a certain individual. As the last but not the least thing is that the paper evaluates current attitudes to the physical education. The main goal of the paper is to delimit main problems to which the physical education in the Czech primary and secondary education currently is facing. Partial goals are on one hand to uncover less obvious problems of the physical education, on the other hand point out the causes of a current sdtate of physical education and whether above mentioned problems are influenced by one another. The last partial goal is to offer a possibilities of a solution of the certain state. The methodological background of the paper has a qualitative character, while the main method is the content analysis when the inductive approach prevails. A reason for using this method is the fact that this is a start working on the topic. Further there we use also elements of the grounded theory and due to the interpretation of gained data we use also the phenomenological approach. The paper finds out that the physical education is currently facing to more serious problems when some of them markedly overlaps the sphere of the physical education and their solution is not committed only to the sphere of physical education. Among the other things, these problems consequently influence by a negative way the quality of life of the Chech population. Further, the paper delimits concrete problems of physical education which are influenced by one another. Finally, the paper offers possibilities of solution of a current negative evolution.

Keywords: Physical Education, Society, School System, Problems, Framework Education Programme.

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The aim of this article was to find out the views and attitudes of teachers of the fifth and sixth grades of elementary schools in Banska Bystrica on gymnastics. The research group consisted of total number of 25 physical and sport education teachers, 11 male and 14 females from eleven schools. We used our electronical questionnaire to find out the opinions of the teachers. We studied the opinions on teaching the gymnastics but also material equipment at elementary schools. In average we found out positive attitude of teachers toward gymnastics. The teachers consider the existing material equipment at elementary schools in Banska Bystrica to be sufficient.

Keywords: gymnastics, opinions, physical and sport education.

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The paper is rooted in the exploration of broader complex context of the phenomenon of physical motion and sportive activities in contemporary sedentary society. It is at that time the topical problem of pointed parenting styles that is freshen and enliven in the context of educational support aiming to active life orientation, including regular sportive activities. The specific accents and educational methods of parenting are playing crucial role in this respect at the level of authoritative, authoritarian, liberal and neglecting styles. Parenting styles prefiguring motivation of children to regular sportive activities and responsible attitude to life. And such process is going under way of socialization factors and impacts, bringing up to date the sociological links and context of mutual relation to motivation of children and youth to sport also in the context of organizational sportive activities out off the family. Nowadays we face forming socialy and culturaly determined relation child - parents - trainer (coach). Like this relation yields in the context of the climate of consumerist postmodern society adoring top elite athletes. Such cultural milieu forms potential conflicts of interests of motivation, experience and pointing separate participants of such "triangl". Given situation aim our effort to the crucial topic of parental responsibility as well as to growing educational and socializational importance of trainers and coaches. During the synergic process are pervaded practical aspects of the importance of age and motivation; but parental role is in this respect utterly essential and indispensable. Parental role is growing when parents play modeling role by way of mutual sportive activities with childrens. Thus, as it is in the essey substantiate with relevant research pieces of information and empirical data on parental role in motivation of children to regular physical activity and sport.

Keywords: physical activity, parenting, sport, trainers, children, socialisation.

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Purpose: Bodybuilding becomes more visible and acceptable within mainstream society thanks to social media, which is promoting, and developing grooving interest in bodies, fitness and active lifestyle. However, this is concerning knowing that according to the latest world anti-doping agency report bodybuilding is one of two sports with the highest number of Anti-Doping Rule Violations (ADRVs) committed by athletes. This study aimed to evaluate doping attitudes and correlates of doping attitudes in top level body builders.

Methods: Study included 27 competitive bodybuilders form Croatia. Variables were collected by a previously validated Questionnaire of Substance Use (QSU). Statistical procedures included means and standard deviations (for parametric variables), frequencies and percentages (for ordinal and nominal variables). Spearman's correlations were calculated to determine associations between studied variables.

Results: The most positive attitudes are found towards injectable anabolic steroids (mean \pm standard deviation; 4.07 \pm 1.54), followed by fat burners (3.78 \pm 1.45), growth hormone (3.78 \pm 1.67), oral anabolic steroids (3.59 \pm 1.25), and estrogen blockers (3.54 \pm 1.24). Significant correlation was identified between: (i) result achieved in bodybuilding (RBB) and alcohol consumption, (R=-0.51 p<0.05) (ii) RBB and subjective knowledge on nutrition (R=0.58, p<0.05), (iii) RBB and subjective knowledge on doping (R=0.62, p<0.05).

Conclusion: It is well known that bodybuilding is highly contaminated with doping, the fact that there is a lack of correlation between self-perceived competence and objectively evaluated knowledge on nutrition is alarming due to the possible "anchoring effect". It actually means that there is a probability that athletes with high self-perceived knowledge will be "anchored" by their self-rated knowledge on a topic. Even though objective knowledge is not correlated with attitudes towards doping substances, it is important to properly educate athletes who are in the misconception of their true knowledge.

Keywords: bodybuilding, doping, knowledge.

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Nowadays, similar to worldwide trends, running has become very popular in the Czech Republic. Since the mid of 1990s, the business sector has become very active in this area. Private companies organise many road races for the public, including participation of top level runners (i.e. Prague International Marathon). In 2016, within the framework of the international project IRNIST, we realised an empirical descriptive study of the Mattoni ½ Marathon in Ústí nad Labem, a middle size town. The IRNIST questionnaire was used. Analysing data on 491 runners (of 2,238 runners who have finished the race) we found that the most important reasons for participation in the race were: to challenge him/her self (55.9%), amusement (50%), fitness (38.3%), improving own health (35.3%) and relaxation (30.5%). It seems that these recreational athletes are well aware of the benefits of their running and more than ¾ of them participate in events like this half marathon regularly. It can be also explained by the socio-economic status of respondents where 56.9% of runners have a university education, one third advanced secondary education; and 63% earn more than the average salary. These results raise the issue if the privatization and commercialization of running for the masses does not cause limit for sport participation for all.

Keywords: half-marathon; sport participation; socio-economic status; IRNIST.

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Purpose: The aim of our research was to analyze the interest of students of Masaryk University (MU) in sports courses in mandatory physical education. The University Sport Center (USC) of the Faculty of Sports Studies provides mandatory physical education at MU. Students are required to have two credits in physical education (PE) within their bachelor's degree and long master's degree. They can choose both a semester lesson or in a form of block lessons that take place on Friday or weekend, as well as multi-day summer or winter training courses.

Methods: We created a questionnaire for our research. The subject of the questions was to find out if the students were familiar with the offer of USC-organized sports courses and, if not, what is the cause of this ignorance or nescience. We also looked at their preferences for sports courses, what activities they would prefer on the course. We were also interested in student satisfaction with the offer of PE courses and with the obligation to attend these courses. The results were processed by basic statistics and data analysis.

Results: A total of 1608 students from all MU faculties answered our questionnaire. The questionnaire survey was conducted in the spring semester of 2019 in semester teaching, both in mandatory and in paid form. We found that 67% of students do not know the offer of summer and winter training courses. The biggest problem why they don't know the offer is the lack of interest in these activities. Among the activities that are interesting for them and would like to run them on summer courses are water sports, especially river rides, hiking, sightseeing, mountain hikes, cycling and rock climbing activities. Furthermore, we found that 95% of students are satisfied with the offer of PE courses. 91% of students see positively the obligation to attend PE at universities, 44% of them would like PE for 3 semesters or more.

Conclusion: Physical activity plays an important role in student life. For a young person who wants to be a university educated expert, movement, health, and vitality have an irreplaceable function. From the results of our investigation we can conclude that students are aware of the influence of active sports in their lives, agree with the organization of PE within their university studies and want to actively participate in physical education. Exceptions are sports courses, which they are not interested in, or have no idea that they exist. Based on the results, we will look for ways to promote both summer and winter courses, so that students can be informed about the offer (cooperation with MU faculties and rectorate) and then we will find ways to make the courses more attractive for students.

Keywords: Sports courses, mandatory physical education, students.

SPORT PARTICIPATION SHOULD NOT BE OBSERVED AS PROTECTIVE AGAINST SMOKING AND DRINKING IN ADOLESCENCE; CROSS-SECTIONAL CLUSTER-BASED ANALYSIS IN CROATIAN SOUTHERN REGIONS

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Purpose: Sport participation in adolescence is frequently observed as being protective against consumption of psychoactive substances (e.g. cigarettes and alcohol), but limited number of studies directly examined this problem while simultaneously observing consumption of cigarettes and alcohol. The aim of this study was to evidence the possible associations which may exist between different factors explaining participation in sports, and consumption of cigarettes and alcohol in adolescents from Croatia.

Methods: The sample comprised 436 adolescents from coastal regions in Croatia (202 females) aged 15-17 years who were tested by previously validated closed structured questionnaire on sport factors (experience in sports [four point scale from "never participated" to ">5 years"], sport competitive achievement [four point scale ranging from "never competed" to "national/international competitive achievement"], number of sport training sessions per week [four point scale ranging from "didn't participate" to "sometimes even twice a day"]), cigarette smoking (four point scale ranging from "never smoked" to "more than 10 cigarettes per day"), and alcohol consumption (measured by Alcohol Use Disorders Identification Test – AUDIT). Cluster analysis calculated on the basis of cigarette smoking and AUDIT results was used to form homogenous groups (substance misuse clusters – SMC). The Kruskall Wallis analysis of variance (KWA) was calculated to identify the differences between SMC in studied sport factors.

Results: Four SMC were formed indicating: (i) high alcohol + high cigarettes (SMC1: n = 42), (ii) high alcohol + low cigarettes (SMC2: n = 115), (iii) low alcohol + low cigarettes (SMC3: n = 226), and (iv) low alcohol + high cigarettes consumption (SMC4: n = 53). When calculated for total sample of participants, the KWA revealed significant differences among SMC, with significant post-hoc differences between SMC1 and SMC3 in all sport-factors (H test: 9.5-to-17.5, p < 0.01), and higher values for all sport-factors in SMC1, but this was clearly influenced by greater number of boys in SMC1 (>80% of all SMC1 members). Gender-specific KWA did not reveal significant differences among SMC in studied sport factors.

Conclusion: Study results do not support the theory of protective effects of sport participation against substance misuse in adolescence. Even more, there are some indices that sport participation may be observed risk factor for consumption of cigarettes and alcohol in this age group. Social acceptance of smoking and drinking in sport-society in the region is probable reason for relatively high rates of substance misuse in adolescents who are actively involved in sports.

Keywords: substance misuse, predictors, sport participation, tobacco, alcohol.

IS FINANCIAL DEMANDS STILL A LIMITING FACTOR OF YOUTH PARTICIPATION IN CZECH ICE HOCKEY?

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This paper aims to find out whether the financial demands on the family budget when preparing young players in ice hockey still create a barrier to the entry of new young players into the sports industry. In the Czech Republic, ice hockey is the most popular sports sector for spectators, but it is one of the more expensive sports sectors. In the last two years, there has been a significant increase in wages and the financial situation of families has improved and this limiting factor could lose importance. The methodology of the paper is based on the faculty project MUNI / A / 1451/2015 and its solution was carried out for the period 1/2016 - 12/2016 and is based on secondary data analysis, a questionnaire and structured interviews. In the first phase, the questionnaires revealed that families of young hockey players are among the financially better-situated families. In the next phase, focused on pupils of schools in the Hradec Králové and Pardubice regions aged 13-16 years, the questionnaires and interviews were investigated by factors limiting the entry of young people into organized sport with a focus on ice hockey. The results show that the main factors include the decisive influence of the family on the choice of the sports sector, the lack of parents' time associated with their child's participation in training and matches, and the related finance is receding into the background.

NOVEL CONCEPT OF SCHOOL PHYSICAL ACTIVITY RECOMMENDATION: SUPPORT FOR HEALTH BEHAVIOR IN SECONDARY SCHOOLS

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Purpose: The aim of the study is to establish the existing and introduce innovative school physical activity recommendation for children and youth in Central European region and globally.

Methods: The research results involved 3860 boys and 5237 girls from 98 schools in the Czech Republic and 3052 boys and 3329 girls from 104 schools in Poland aged 15-19 in the years 2009-2017 at secondary schools. International Physical Activity Questionnaire – long form and ActiTrainer accelerometers were used to indicate the subjective and objective levels of PA.

Results: Research results showed that boys averaged in school 2,846 \pm 1,853 steps (474 \pm 296 steps/hour) and girls 2,633 \pm 1,671 steps (433 \pm 246 steps/hour). Our recommendation is to take at least 500 steps/hour (or at least 3000 steps/school time). Average school MVPA time (\geq 3 METs) in boys was 15.2 \pm 14.0 min and they spent 17.8 \pm 28.7 min in \geq 60% HRmax. Girls spent 12.0 \pm 11.4 min in MVPA (\geq 3 METs) and 19.3 \pm 28.9 min in \geq 60% HRmax. We recommend reaching 20 min of MVPA (\geq 3 METs or 60% HRmax) in school time and at least once a day HRsubmax/max during PA. SPA should represent at least 25% of school time.

Conclusions: School physical activity (SPA) is an essential part of daily physical activity (PA), the basis of the development of lifelong PA, fitness and the guarantee of the acquisition of physical and health literacy. Adopting SPA recommendations can refine the requirements for changes in PA and lifestyle at secondary schools. The proposed SPA recommendations should be used for positive changes in the educational process and in the school lifestyle.

The first author has completed the disclosure form and declares: the presented work had financial support from Czech Science Foundation (No. 13-32935S); the authors had no financial relationships with any organizations that might have an interest in the presented work in the previous three years; no other relationships or activities that could appear to have influenced the presented work.

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The White Book of Sport uses the definition of "sport" adopted by the Council of Europe (2007): "All forms of physical activity which, through casual or organized participation, aim at expressing or improving physical fitness and mental well-being, forming social relationships or obtaining results in competitions at all levels. "In this paper, the authors emphasize the characteristics of mental well-being, for which it is essential to know the psychological characteristics of the participants in the sport. A sample of 40 boys, a member of the Split-Dalmatia County tennis clubs, aged 11.95 \pm 1.45 years (AS \pm StDev), was subjected to the JUNIOR EPQ psycho test for the purpose of establishing a personality trait as part of the training condition. Using statistical statistics package 13 (TIBCO Software Inc. (2017)), scatterplot was obtained between two personality traits: neuroticism (N) and extraversion-introversion (E). In such scatterplot, the lower score limits were interpolated at E 14 and N 10 (Eysenck & Eysenck, 1994) and using the Galen-Kant-Wundt scheme a four temperament picture was presented. In the quadrant of sanguine (stable extraverts (ES)) 17 young tennis players, or almost the half of the total sample, were projected. Choleric (extrinsic neurotic (EN)) are 13. Phlegmatic (introverted stable (IS)) are 6 and four melancholic (introvert neurotic (IN)). Summed up, extraverted (17+13) make 75% of the observed sample. This result is in line with the many assertions that extraversion is particularly fond of sporting activities. Differences in these personality traits are "closely related to the inherited degree of autonomic nervous system, as well as the degree of excitation and inhibition of the central nervous system" (Eysenck & Eysenck, 1994). In conclusion, every child has the right to have a positive effect on the sport in order to create physical fitness and mental well-being. That is why it is very important for those who manage the sporting process to have valid information on the physical and psychological status of the individual.

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Football is not only a sport but also a socio-cultural and economic phenomenon in many countries. It is included in the top European, World and Olympic competitions, including football for people with disabilities (Para, Deaf, IBSA, Inas, SO). Referees in the Czech Republic are asked for this activity in practice, and they must do so - without the quality of knowledge, skills or attitude. Based on the analysis of data from the field, the communication gives an overview of the referees 'education system with regard to the perception of the phenomenon of the handicapped sport, describes the key matches and differences between the referees' positions in the main federations (Para, CP, Deaf, IBSA, Inas, SO). In conclusion, the communication presents the results of a pilot survey focused on the interest in additional training of football referees in this respect and conclusions for practice.

Keywords: referees education, sports federation of sports people with disabilities.

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The presentation deals with perspectives on the concept of motor competences in the Czech PE curriculum. The issue is set in the current situation of PE curricular development in the Czech Republic, as the emphasis on the development of competencies as a learning output is there significantly promoted. Different concepts and approaches, however, are applied in the designed form of the curriculum and, above all, they are not being implemented and evaluated in the current teaching practice. The BMC-EU project, in which the Czech Republic is actively involved, creates an important opportunity to launch a debate with the Czech expert public on PE competencies. Measurement of selected basic motor competences in the Czech Republic using the MOBAK 1-2 test instrument is presented. Feedback on the course of the measurement is the starting point for further discussion on the concept of motor competences in the Czech Republic. In conclusion, several problematic areas are presented, related to the motor competence in the PE curriculum and its acceptance by representatives of the teaching profession.

HISTORICAL DEVELOPMENT OF THE MOBAK TEST BATTERY AND SELECTED RESULTS OF EUROPEAN COUNTRIES IN THE BMC-EU PROJECT.

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The overarching aim of the contribution is to introduce BMC-EU project as a support option for an active and healthy lifestyle in children. The Collaborative Partnership "Basic Motor Competencies in Europe – Assessment and Promotion (BMC-EU)" consists of three progressive project phases. (1) The assessment of the basic motor competencies in 13 partner countries. (2) The development and implementation of a support-toolkit for teachers. (3) The implementation and dissemination of the project results. The presentation of the project development and the main objectives are complemented by selected measurement results (n = 6811) of the partner countries and the Czech Republic.

Keywords: MOBAK; BMC-EU; motor competencies; primary school.

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Overall health, including physical, social, and mental health, is one of the highest values of human life. Despite the continuous effort of the majority of the people who try to protect this value, there are still many external as well as internal factors such as psychical burden or frustration that can disrupt the smooth functioning of human beings and their social, private, or public life. This article deals primarily with one of the most serious contemporary civilization problem, which is stress. It contains a basic definition of the stress concept as well as the other closely related terms (psychical burden and frustration) and points out both negative and positive aspects of stress concerning the human organism. The authors summarize the possibilities of reaction to stress in relation to human personality characteristics. They are also focused on the options of prevention and solution of negative aspects of stress. Further, the article identifies the three ways how to eliminate those aspects, such as proper diet, sports activities, and active rest. In the last part, the authors also describe individual approaches in detail, present the basic principles of their operation in the fight against stress, and provide examples of the practical application of anti-stress measures.

Keywords: psychical burden, frustration, stress, proper diet, sports activities, active rest.

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ACTIVE AGEING AND SARCOPENIA



INFLUENCE 0 F MUSIC-BASED MOVEMENT THERAPIES 0 N MOTORIC A N DCOGNITIVE ABILITIES AND OUALITY LIFE FOR SENIORS WITH AND WITHOUT DEMENTIA

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Introduction: The increase in dementia and the lack of treatment options - predicted in the context of demographic change - call for new strategies to counteract the decline in cognitive and motor skills. Recent individual research results show that physical activity in combination with music can have positive effects on the ageing process (Marks & Landaira, 2015). The aim of this study is to develop music-based exercise programmes for seniors with/without dementia and to evaluate them using cognitive/motoric tests.

Method: 42 subjects (83.6 ± 7.05 years), selected by therapists and caregivers, performed 3 different music-based concepts over 12 weeks (2 x weekly, 60 min each): Strengthening with the Body-Spider* (15w, 8m, 7 Dementia(D)), dance intervention with the sport/dance rollator (12w, 12D) as well as coordination and strength training (4w, 3m). The following tests / investigations were used in pre-post design: CERAD, TMT, drop stick, chair rising, hand dynamometer, balance test and gait analysis. The quality of life was assessed using the NOSGER II. The motivation recording took place in each movement unit with the modified DMPT.

Results: All participants were highly motivated. On the basis of the recording, the movement concepts could be modified for specific groups or individuals. This concerns the execution of the exercises regarding the use of e.g. speech, acoustic signals & tempo. Changes regarding cognitive and motor abilities as well as the quality of life are explained.

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Introduction: Dementia diseases are an increasing problem of modern society. Early diagnosis can help in delaying the progression of the disease by initiating preventive and therapeutic steps. However, the current indicators can diagnose dementia relatively late. The aim of our project is the application of neuronal, hemodynamic and cardiovascular parameters in order to develop a multimodal measuring system for an accurate mental health monitoring. The present study has a preliminary character for this project and deals with ultraslow brain waves: DC (direct current) potentials. They are measured below the conventional EEG frequency spectrum (<0.5 Hz). Some studies have shown that a cognitive load causes DC shifts. The aim of this study was to investigate the relationship between the resting DC potential and the reaction time in cognitive tasks of elderly people. We hypothesized a faster reaction time with higher negativity of the DC potential, as a negative DC shift reflects increased cortical excitability, which could be conducive to processing speed.

Methods: 207 subjects from 60 to 85 years participated in the study. The DC potential was measured with the system "Omegawave" (Espoo, Finland) in a supine position at the point F_{pz} . Subjects were told to close their eyes and stay as calm as possible. The measurement lasted for nine minutes and the last value was used as the resting value. Subsequently, the subjects completed a cognitive test battery, which also included the tasks "2-back" and "stroop". The correlation analysis between the DC potential and the reaction times was done by Pearson correlation. The test was one-sided as a negative correlation was assumed (the larger the negative shift, the lower the reaction time). Statistical significance was taken as p < .05.

Results: The correlation analysis did not reveal significant correlations between the resting DC potential value and the reaction times in the cognitive tasks. 2-back and stroop displayed p-values of .327 and .134, respectively.

Discussion: Previous studies have shown that the frontal DC potential reflects processes preparing the cortex for cognitive tasks. However, in these studies slow cortical potentials were measured during a stimulus was presented. In our work we investigated whether the general activity level of the CNS, indicated as resting DC potential before the cognitive tasks, has significance for the cognitive performance. Regarding the methodology used here, this hypothesis must be rejected. We are currently investigating the possibility of using EEG, HRV and fNIRS simultaneously. Multimodal measurements turn out to have improved classification accuracy of the cognitive health status and could serve as means for detecting a cognitive decline as precursor of dementia. We are looking for applying these three systems as composite predictor of a cognitive decline.

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A number of natural youth movement activities, e.g. running, walking, jumping, climbing trees, overcoming natural obstacles, throwing and catching a ball has a declining tendency in the current European cultural space. The results of the research will contribute to the knowledge of the level of basic motor competencies and qualifications of children in the 1st and 2nd class of primary school in the Slovak Republic. Primary data on the basic motor competencies and qualifications of the examined group (n = 307, \bar{x} age = 7.58 years, $s_d = 0.69$) were obtained by the MOBAK 1-2 battery (Herrmann et al. 2018). The significance of all differences, for example, between boys (n = 156, age $\bar{x} = 7.62$ years, $s_d = 0.68$) and girls (n = 151, age $\bar{x} = 7.55$ years, $s_d = 0.70$) was evaluated by Student's T-test for two independent files. The results of statistical processing of primary data were assessed by logic methods. First class boys (n = 97) achieved significantly better performance in basic motor competency object movement ($\bar{x} = 5.17$, $s_d = 1.79$) compared to their female peers (n = 88, $\bar{x} = 3.52$, $s_d = 1.78$). Girls of the 2nd grade of elementary school did not achieve statistically better performances in the movement qualifications throwing, balancing and rolling in comparison with the 1st graders of the same gender. Knowing the level of basic motor competencies and qualifications of Slovak elementary school children enables to national and European educational and cultural authorities to redesign the content of physical and sport education lessons with the intention of their improvement.

Keywords: basic motor competencies and qualifications, children of 1st and 2th grade elementary school, MOBAK test battery.

CENTRAL OBESITY AND PHYSICAL ACTIVITY RISK BEHAVIORS IN EARLY SCHOOL-AGE CHILDREN, CROSS-SECTIONAL REPRESENTATIVE COHORT STUDY IN CROATIA

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Introduction: Physical activity (PA) in childhood is an important determinant of body build and consequent overall health status but various determinants of PA are rarely studied in relation to body built indices in early school-age children. The aim of this investigation was to determine whether children who exhibit PA risk behaviors differ in their waist circumference as a measure of central obesity

Methods: This study uses data from the Childhood Obesity Surveillance Initiative (COSI) 2015/2016 in Croatia. The study was conducted in accordance with the COSI-Protocol of the WHO/Europe on children 7-9 years. Sampling was conducted randomly at the national level with class as a sampling unit and the final sample size being 5591 children (response rate 79%). Children's anthropometric measures were taken in schools by trained examiner teams using standardized equipment. Additional data on children's sociodemographics and lifestyle habits were gathered from their parents and schools using standardized forms. PA-risk behaviors included five measures: (i) using inactive transportation going to and from school, (ii) going to a sports or dancing club <2h/week, (iii) actively playing outside <1 h/d, (iv) screen time \geq 2h/d, (v) sleep duration <9h/d]. Differences in waist circumference between children who exhibited certain PA risk behaviors as opposed to those who didn't were tested using Mann-Whitney tests.

Results: Mean waist circumference was 61.51 cm. The highest mean waist circumference was found among children who actively play outside for less than 1 hour a day, 63.32 cm. When looking at the number of exhibited PA risk behavior, the highest mean waist circumference was found among children who exhibited 3 out of 5 PA risk behaviors, 63.17 cm. A statistically significant difference in waist circumference was found in 2 out of 5 observed PA risk behaviors – children who actively played outside for less than 1 hour a day (p<0.001) and those who spent more than 2 hours a day in front of the screen (p<0.001) had a higher waist circumference than children who didn't exhibit those behaviors. No difference was found in regard to using inactive transportation going to and from school, sleeping less than 9 hours, and going to a sports or dancing club for less than 2 hours a week. When looking at the number of risk behaviors, children who had exhibited 3 or more risk behaviors had a higher waist circumference than those with 2 or less (p=0.007).

Conclusion: Results indicated specific associations between various determinants of PA and waist circumference as a measure of central obesity in early school-age children. Findings should be directly translated into development of age-specific educational programs where parents should be informed about importance of specific PA-determinants in this age-group.

Keywords: central obesity, physical activity, children.

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Moderate and systematic physical activity during pregnancy is not only safe, but it also brings numerous health benefits, such as metabolic acceleration, lower risk of hypertension in pregnancy, prevention of swelling due to water retention within the body, reduction of premature birth, it also shortens and facilitates the childbirth and lower the risk of postpartum complications improves well-being and accelerates return to original physical condition after the child is born. Rather than regular exercises, however, it is a physical inactivity that brings risks. Some women are aware of this and they keep various physical activities during the pregnancy, on the other hand there exists a group of pregnant women who are afraid of doing exercises at all. This study attempts to define what are suitable activities during pregnancy, and find the reasons for pregnant women to perform and also not to perform physical activities. Survey was carried out in a group of pregnant women, the information concerning their attitude towards physical activities have been obtained by a questionnaire method. Questionnaires were anonymous and were submitted by 107 pregnant women. Results revealed that 63.6% of women spent their leisure time during pregnancy in an active way. Most of them reported that they are sufficiently informed; they mainly used the Internet to seek information. Pregnant women typically perform their pastime physical activity at home, alone (usually with DVD) or outdoor - walking alone or with a dog, which is even more beneficial, since the dog gives a brisk pace of the walk. Concerning the frequency of physical activity, most women stated the frequency of 2 – 3 times a week. Women, who do not perform any physical activity at all, usually refer to lack of time and energy, frequent nausea, back aches and other health problems. Some women feel like doing an activity, but to perform it, they would need a stimulus and/or more information on suitable activities for pregnant women. Some women also pointed to lack of information concerning proper physical activities during pregnancy, hence they are afraid that choosing the wrong type or intensity of exercise they might injure either themselves or their unborn child.

Keywords: pregnancy, information, physical activity, leisure time, healthy lifestyle.

THE IMPACT OF DIFFERENT TYPES OF PHYSICAL ACTIVITY ON WALKING AS AN ESSENTIAL EVERYDAY MOVEMENT IN OLDER ADULTS

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Introduction: Due to an international trend of aging population we see an increased attention paid to studies dealing with the factors that have positive or negative impact on successful aging. Previous research shows that higher level of physical activity and thus increased physical fitness significantly affect the quality of aging. One of the major problems in the elderly is the risks of falls. This age group is at high risk of injuries caused by falls. Analyses of aspects related to the falls revealed the significance of lower muscular tension, previous experience of falls, bad stereotype of walk, impaired balanced abilities, etc. Purpose In this study we focused on the impact of different types of physical activity on walking as an essential everyday movement.

Methods: Forty-four older adults (M_{age} 69,09 years, SD 4,25, 22 male and 22 female) were randomly assigned to four groups, three training groups and one control group; resistance training group, proprioceptive training group, endurance training group. The group consisted of older adults without a history of malignant disease during their life and without regular physical activity. All groups were tested on timed 10-meter walk test (10MWT), the 3-m backwards walk (3MBW) and the 6 minute walk test (6MWD) at baseline, after 12 weeks and after 14 weeks (2 weeks after finishing intervention program). The 10MWT was used to assess walking speed over a short distance. The 3MBW is test-close related fall risk. The 6MWD is a sub-maximal exercise test used to assess aerobic capacity and endurance. The distance covered over a time of 6 minutes is used as the outcome by which to compare changes in performance capacity. Differences was founded by non-parametric ANOVA.

Results: The results revealed differences between the types of exercises and the sustainability of the acquired skills. Results indicated significant improvements in gait speed in all exercise groups. Subsequent measurements after a 14-day off indicated a slight deterioration trend in all groups. The resistance group showed the best results in the walk-back test. This group was the only one to maintain its standard also after 14-days off. All groups, including control, showed an improvement in aerobic capacity and endurance (measured by 6MWD). We found out differences among groups only after 14-day off.

Conclusion: Our study confirmed the usefulness of performing targeted physical activity in older adults. It has been shown that resistance and proprioceptive training play an important role in the prevention of falls.

Keywords: resistance training, proprioceptive (balance) training, endurance training, prevention of falls, older adults, gait.

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PURPOSE: Adequate physical activity (PA) of elderly is currently an intensively discussed topic.

In urban agglomerations, physical activity for this population group is often implemented as a variety of intervention programs. The question is whether some of the normal work activities in the countryside can provide sufficient amount of physical activity? And whether this activity is suitable for elderly?

In our study we want to verify whether viticulture can be an interesting and suitable alternative of physical activity for elderly.

METHODS: Our research is designed as a case study based on one-year observation. Subject of the observation was 65 years old man living in South Moravia region (CZE). Observation was realized from spring to fall 2017. Descriptive statistical methods were used for quantitative analysis and energy expenditure during work activities was set up according to the work of (Ainsworth et al., 1993) and (Novotný, 2003)

RESULTS: During one year (March – October), the observed person made 36 visits to the vineyard. Mean of the visit duration was more than 2,5 hours and mean energy expenditure was 4663 kJ (1114 kcal) per visit. Within one year he has realized 20 different types of operations based of various abilities: endurance, strength-endurance, flexibility and balance. Some of the operations also needed fine motor skills.

CONCLUSIONS: Our study shows that viticulture could be an interesting activity for elderly. It brings a sufficient amount of PA, which is also quite diverse (from strength to fine motor skills). Moreover, the material results of this activity serve as a suitable motivational factor for regular implementation of vineyard care. However, the disadvantage of a given PA is its seasonal character (March – October) and the risk of overloading during long-term activity.

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DETERMINANTS OF CHANGES IN PHYSICAL ACTIVITY LEVELS IN LATE ADOLESCENCE; PROSPECTIVE ANALYSIS IN URBAN COMMUNITIES

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Purpose: Physical activity levels (PA-levels) significantly decline during adolescence, and sport participation during childhood and adolescence is frequently emphasized as protective factors of PA-decline. However, there is a lack of studies which specifically examined sport-related factors and its influence on changes in PA (PA-changes) in adolescence. This study aimed to prospectively observe sport factors as: (i) correlates of PA-levels and (ii) predictors of PA-changes in the period between 16 and 18 years of age among urban adolescents from Bosnia and Herzegovina.

Methods: The sample of participants comprised 324 adolescents (44% females) who were prospectively observed over two testing waves: (i) baseline, when participants were 16 years old; and (ii) follow-up, 20 months later (18 years of age). The variables were collected by previously validated questionnaires including questions on predictors (sociodemographic variables and various sport factors [current/former/ever participation in individual and team sports, experience in sports, competitive result achieved]), and criteria (PA level obtained at study baseline and follow up, measured by Physical Activity Questionnaire for Adolescents [PAQ-A], and difference between PA-levels at baseline and follow-up). The t-test was used to compare PA-levels. The associations between variables were evidenced by: (i) Spearman's rank order correlations (between predictors and PA-levels), and (ii) logistic regression analysis (between predictors, and PA-changes observed as binomial criterion [PA-incline vs. PA-decline] - excluding those participants who reported active sport participation at study baseline).

Results: The PA-level significantly declined over the study course (t-test: 6.60, p < 0.01). Sport-related predictors were significantly associated with PA at baseline (Spearman's R: 0.33-0.45, p < 0.01), and PA at follow-up (Spearman's R: 0.32-0.45, p < 0.01). Meanwhile, there was no significant correlation between studied predictors and differences in PA-levels between baseline and follow-up. Also, logistic regression did not reveal any significant influence of predictors obtained at study baseline and PA-changes observed as binomial criterion (PA-incline vs PA-decline).

Conclusion: While studied sport-related predictors significantly influence the PA-levels in the age of 16 and 18, with the higher level of PA among those adolescents who are actively involved in sports, sport-participation do not predict changes in PA-levels over the observed period of life. Knowing the influence of PA on overall health status, future studies should provide additional details on possible predictors of PA-changes in adolescence.

Keywords: physical activity, adolescents, sport participation, changes, logistic regression.

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STRENGTH AND CONDITIONING TRAINING



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Introduction: The activities of security forces and armed forces depend on two parameters: psychological level and physical fitness. These two components are the main parts of the selection procedure. Physical fitness is a topic to be discussed, especially in regard to security forces or armed forces (Bonneau, Brown 1995; Sörensen et al. 2000). Physical preparation fundamentally affects the performance of a policeman or a soldier and it is associated with stress management and service interventions or combat tasks (Gershon et al. 2008; Darryl 2000). This research is focused on physcial fitness ot the army forces. Futher this research is important not only because it should result in expanding the portfolio and knowledge enriching study fields, such as the Special education of Security Bodies (SESB) and Applied Sport Education of Security Bodies (ASEBS) at the Faculty of Sports Studies of Masaryk University, but it also aspires to be of great contribution for security forces or armed forces themselves (Bugala, Reguli, Čihounková 2015; Reguli, Bugala, Vít 2016).

Aim: The aim of the study is to find out the physical fitness level of the Army forces of the Czech Republic. *Methodology*: Research design as descriptive and quantitative. The data of the physical fitness test was collected from the individual Army forces of the Czech Republic in the last 4 years (2015, 2016, 2017, and 2018). The quantitative data were analysed on the basis of the statistical methods. After executing the basic statistical and normality tests, we focused on ANOVA. The total number of respondents was in 776. The ratio between genders was 698:78

Results: After comparing physical fitness tests with Sit UP, Press Up, Pull Up, Stay in Pull Up, Cooper Test, and Swimming 300m over the past four years, there was no significant change in physical fitness. All disciplines had almost the same value except for the exercise with the name Stay in Pull Up. This exercise is for women. Fifteen women were tested in 2015, twenry-five women were tested in 2016, twenty-eight women were tested in 2017 and only ten women were tested in 2018. The small number of women, who tested is caused by the fact, that women are not as common in Army as men.

Conclusion: We can say that the emphasis on the physical performance in Security and Army forces is still up to date. We did not notice any significant differences between the years 2015, 2016, 2017 and 2018 tested. Thanks to this finding, we can state that there is a continuous maintenance of physical fitness in the Czech Republic's army.

Keywords: Army forces, physical fitness, physical fitness tests, security forces performance.

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The aim was to find out, compare and evaluate the efficiency of take-off preparation for selected indicators of motor performance in athletes in the category of younger pupils. The monitored group consisted of 5 girls (average age 12.4±0.22 year) and 4 boys (average age 12.9±0,12 year) regularly participating in the training process three times a week. During 8 weeks in the racing period, take-off preparation was applied in the training process, consisting of two different batteries of take-off drills. The take-off preparation took place two to three times a week, taking into account the participation of athletes in the race. We performed the following tests to determine the efficiency of the take-off preparation to change the level of motor performance in selected indicators: 50 m run, 20 m cursory run, standing long jump, vertical jump with countermovement without arm swing and repeated vertical take-off drills without arm swing in 10s. We found that in the output measurement, the athletes of monitored group achieved an improvement in motor performance in tests for explosive power of lower limbs and the maximum running speed tests. We confirmed that in just 8 weeks, at a frequency of two to three training units per week, there may be significant changes in performance in the tests: vertical jump without countermovement, repeated jumps for 10 s, standing long jump, 50 m run and 20 m cursory run. The results indicate that the program of take-off drills, which the athletes underwent at least 79 %, had a positive effect on performance increase in the explosive power of lower limbs and in running speed.

Keywords: maximum running speed, take-off preparation, sport preparation explosive power of lower limbs.

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In the beginning the author mentions the main reasons why he chose to aim his research at the development of the isokinetic diagnostic and training equipment which would be used in armwrestling. In the results, he states that all diagnostic-training equipment is made od three parts. The most important is measuring system made of TENDO IsoForce (sensoric unit) and Force Gauge (microcomputer). The second very important part is portable adjustable construction which is used for power transfer from armwrestler hand on the IsoForce lever. The last part is standardized armwrestling competition table. It brings the information about what data we can obtain with the help of the equipment and what we can set on the microcomputer Tendo Force Gauge. Later he describes in detail that we can exercise on the IsoForce: isokinetic exercises without excentric muscle contraction, isokinetic exercise joined with additional excentric muscle contraction, isometric exercises. He explains that it was inevitable to create portable adjustable construction which allows performances of all needed movements for armwrestling and it has to meet various criteria. In the results the author decribes in detail all the advantages of IsoForce: the possibility of diagnostics of force abilities in isometric and isotonic muscle mode, the control of process of convalescence after injury, training availability, motivation and competiveness, multifunctionality, variety in training process, the possibility to set the movement speed, safety. He also informs about attesting: the Wrist flexion with winding attachment, Test with ECCENTRIC HANDLE for the finger and wrist strength in isometric mode, Test of imitation of technique bottom sideways (pulley from above), Test lateral pronation with belt. He states if the individual test was attested or if the modification is needed. He concludes that he sees a big potential of TENDO IsoForce for armwrestling needs and he informs about his plans for improvement of this equipment so that it can also be used in fitness and for commercial purposes. At the same time it should be universal, portable and affordable. The software that contains graph describing the force increase, can be considered as a big asset. He adds that is inevitable to work on the diagnostic battery made for armwrestling needs and to attest the relationship between the achieved results in tests and in a match.

Keywords: IsoForce, isokinetic dynamometers, testing, strength abilities, armwrestling.

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In the opening the author describes the current situation in an armwrestling training. Based on the experiences and the study of literature he states that in practice there is almost no systematic guided training with a sparingpartner at a table. He perceives this as a problem. He points out the mistakes seen at the armwrestling training. In the results he presents his own program system HAST where he describes the individual traning parameters. They are important for a quality training program with a sparingpartner at the armwrestling table. He describes mainly training volume, intensity, exertion(RPE), pace, time under tension and a rest. Training volume is based on Prilipin chart. Within the determination of intensity he points out the fact that it is not possible to determine it in a simple way as it is in the dumbell training and he focuses on the term effort. In armwrestling, the effort is possible to follow with the help of RPE scale from 1 to 10. He clears out its usage in practice and for better understanding he bring the chart where the relationship is between maximum, repetitions and RPE. He also highlights the importance of pace which is not solved in armwrestling while it significantly influences time under tension and the training effect. As to the rest time he points out a few studies which inicates that for improvement of maximal strength - 3 minutes is the optimal length of rest. He points out the often mistakes made at the armwrestling training and he proposes the suitable solutions based on the scientific studies about the strength training. In the discussion he describes in detail the key parts of HAST and the experiences he had while realizing this program with his trainees. He highlights the important part of sparingpartners and he describes the activities during the table training. He brings the model training with four amwrestling specialized exercises where he states all the parametres which are important for quality table training program and which are a base for HAST system. He gives pictures describing some of the specialized armwrestling exercises with a sparingpartner at the table. He concludes that the similar training system should be a part of the preparation of armwrestlers and at the same time he adds that the scientific attest is needed while the practice shows his difficulties but also effectivity.

Keywords: specialized training, RPE, exercises with a sparingpartner, parametres of training.

THE EFFECT OF KINESIO TAPING ON THE RESULT IN THE STANDING LONG JUMP

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This paper draws attention to a short-term experiment that aims to elucidate the effect of kinesio taping of the musculus triceps surae on performance in the standing long jump. We therefore dealt with an area that has not yet been sufficiently explored. For this reason, our aim was to determine and evaluate the effect of the application of kinesio taping on muscle strength in the standing long jump and to make a comparison with the results without the use of kinesio taping. The musculus triceps surae was selected for testing. Thus, we assume that the application of facilitation kinesio taping to the musculus triceps surae will influence the probands' performance in the standing long jump. The experiment was performed with a group of n = 20 young probands, athletes aged 16.25 (\pm 0.76), without prior injury. In this context, we realise that we cannot generalise the results to cover the entire population, especially to injured individuals or after an accident.

Keywords: fitness preparation, kinesio taping, standing long jump, testing.

THE IMPACT OF CORE EXERCISE AND MYOFASCIAL RELEASE IN THE INITIAL PART OF TRAINING ON THE PERFORMANCE AND PREVENTION OF INJURIES IN FOOTBAL PLAYERS

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Introduction: One of the basic processes to improve stability and prevent injuries in sport is warming up. The aim of our work is to verify the impact of the first part of the training unit (warm-up) on the stability and performance of the footballer. Probands: The research work was carried out on 37 football players in the category U-19 and U-17 in the football club - JUPIE football school of Marek Hamšík. Probands were divided into two groups. The test group consisted of 19 U-19 football players (age average 17.2 ± 0.87), the control group consisted of 18 U-17 football players (age average 15 ± 0.5).

Methods: Both groups underwent input measurement consisting of Y balance test and performance tests – slalom witj ball, run 5x10m. Subsequently, the test group footballers underwent our intervention, myofascial release + core training, which was added to the opening part of the training unit. The study lasted 4 weeks.

Results: Probands of both groups achieved a statistically significant improvement in the y balance test. When comparing the performance tests, they achieved significant improvement in the test group – run 5x10m (p = 0.0024) and slalom with the ball (p = 0.0159) and in the control group – run 5x10m (p = 0.0182). The improvement in slalom with the ball test in the control group was not statistically significant (p = 0.1798).

Conclusion: We have shown a significant effect of core exercises and myofascial realease at the beginning of the training unit. However, the benefit was also achieved in the control group, except for the test - slalom with the ball.

Keywords: postural stability, Y balance test, core trening, myofascial realease, football.

THE LEVEL OF EXPLOSIVE STRENGTH OF LOWER LIMBS OF SLOVAK REPUBLIC REPRESENTANTS IN SWIMMING

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The aim of the study was to detect current level of explosive strength of lower limbs. Results were compared with the best individual personal performance which is evaluated through FINA points. 10 male and 14 women junior representants in swimming (n = 24; height = 178.7 ± 7.59 cm; weight = 67.5 ± 7.76 kg) and 10 men and 8 women senior representants in swimming (n = 18; height = 179.8 ± 5.54 cm; weight = 72.6 ± 8.32) from Slovak republic participated on testing. The explosive strength of lower limbs was measured by standing broad jump and by diagnostic device Myotest where CMJ and SJ tests were used. The results were compared by Pearson correlation coefficient with the best point performance of particular proband. The average height of junior representants in SJ test was 33.0 cm and of senior representants was 40.9 cm. The average height of junior representants in CMJ test was 36.0 cm and the value of senior representants was 45.9 cm. The average value of junior representants in standing broad jump test was 220.0 cm and in senior representants was 269.3 cm. Senior representants achieved better results in all tests. The average point performance in junior representants was 708.0 points and in senior representants was 761.7 points. Percentual difference between groups was detected in tests at the value from 18.1% to 21.6% and the difference in FINA points was 7.1%. Pearson correlation coefficient showed on high and medium values on statistical significance of 1% between tests of explosive strength, although, it showed the low values between the explosive strength tests and value of FINA points. The explosive strength of the lower limbs is one of the factors of sports performance that affect swimming performance. However, its level of impact needs to be verified by further research.

Keywords: comparison, Jump height, junior representants, swimming performance, senior representants, testing.

The research was realized by VEGA 1/0621/19 "Optimalization of training and competitive loads in endurance sports".

THE EFFECT OF ISOMETRIC HIP ADDUCTORS FORCE ON CHANGE OF DIRECTION SPEED OF PROFESSIONAL ICE-HOCKEY PLAYERS

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Introduction: Ice-hockey is a sport that requires high acceleration of players for optimal performance. The speed of sports players is influenced by several factors. The aim of research was to determine the effect of the isometric muscle strength of hip adductors on speed with directional changes in ice-hockey players

Methods: The sample consisted of 15 members of the Slovakian national ice-hockey team, the average age was 27 years, the average height was $186.46 \text{ cm} (\text{SD} \pm 5.04)$, the average body weight was $90.87 \text{ kg} (\text{SD} \pm 5.91)$. Players completed a GroinBar Test of 60° to determine the isometric force of the hip adductors. We used the 5-10-5 test to determine the speed with directional changes. The 5-10-5 shuttle consists of rapid directional changes in a linear plane. It is commonly used as an assessment in differents sports. The 5-10-5 Shuttle Drill, also known as the Pro Agility Drill, is a great tool for working on your agility and short-distance explosiveness.

Results: In the research sample consisted of professional hockey players was measured a low degree of correlation (r = 0.006) between isometric muscle strength of the hip adductors and the speed with the directional changes in the 5-10-5 test. The average ice-hockey player's adductors strength was 476.83 N (SD \pm 88.50) and the average time achieved in the 5-10-5 test was 4.984 s (SD \pm 0.15). We also found low degree of correlation between right adductor force and right side of 5-10-5 test (r = 0.047) as well as left adductor force and left side of 5-10-5 test (r = 0.067).

Conclusion: Research shows a very low degree of correlation in ice-hockey players between the hip adductor strength in the GroinBar Test 60° and the speed with the directional changes in the 5-10-5 test.

Keywords: isometric strength hip adductors, speed with directional changes.

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Purpose: Hypoxic training is frequent part of preparation of endurance athletes, but in a last years is a lot of polemics about effects of hypoxic training on the haematological parameters analysing in athlete's biological passport. The aim of the research was to detect the effect of three different methods of hypoxic training (high altitude training, intermittent hypoxic training, sleeping in hypoxic tent) on haematological parameters which are analysing in athlete's biological passport. Methods: Three types of hypoxic preparation were compared. The ensemble contained of 7 long-distance men race walkers (age 27.4 years (SD \pm 3.6); body height 177.0 cm (SD \pm 8.1); body weight 63.1 kg (SD \pm 5.3). Results: We detected statistical significant increase in haemoglobin level about 12.57 g.l⁻¹ (p<0.05) after staying in high altitude, increase about 11.69 g.l⁻¹ after sleeping in hypoxic tent and increase about 8.58 g.l⁻¹ (p<0.05) by influence of intermittent hypoxic training. The same trend was detected in reticulocytes where the increase of number (%) of reticulocytes after high altitude training was about 0.23 % (p<0.05), increase after sleeping in hypoxic tent about 0.43 % (p<0.05) and increase after intermittent hypoxic training was about 0.45 % (p<0.05). When comparing off-score value, the resulting differences were not confirmed statistically. The effect of training in high altitude caused the increase of off-score about 5.52 (p>0.05), the decrease of off-score after sleeping in hypoxic tent was about 1.8 (p>0.05) and the decrease of off-score by intermittent hypoxic training was about 5.46 (p>0.05). Conclusion: Participation of hypoxic preparation can significantly influence parameters in athlete biological passport. According results of our research, we assume that all methods of hypoxic training can affect haematological parameters analysing in athlete's biological passport (haemoglobin, reticulocytes).

Keywords: hypoxic training, haematological parameters, athlete's biological passport.

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Purpose: Nowadays, not only the research but also coaching is focusing on decision making in basketball. Decision making is critical in basketball, especially in relation to offensive skills (with ball). Generally, the players have to decide what to do with the ball (make an appropriate decision) and in the shortest time possible. From this point of view, the study aims to identify the factors which can affect the decision making of offensive skills of female basketball players.

Methods: Eight semi-professional female basketball players participated in this study. Basketball players played five competitive games in the second division. During all games, the heart rate was monitored. Decision making was assessed according to Basketball Offensive Game Performance Instrument (BOGPI) and categorized as appropriate and inappropriate. For this purpose, the notational analysis was used. Based on previous research, the four main factors were set as independent variables. Each of these factors was categorized. The first factor was the intensity of load (<85%, 85-95%, and >95% of HR_{max}), second factor was ball possession duration (0-8 s, 9-16 s, and 17-24 s), third factor was game period (1st quarter, 2nd quarter, 3nd quarter, and 4th quarter), and the fourth factor was defensive pressure of an opponent (low, medium, and high). Objectivity was verified by the method of inter-rater agreement, and reliability was using intra-rater agreement. The influence of factors on decision making was expressed by binary logistic regression. Method of backward stepwise selection was used to find predictors of inappropriate decisions and to find the best model.

Results: Two regression coefficients in the final model were statistically significant. First was ball possession duration, and the second one was defensive pressure of the opponent. When the shot clock is running up the chances for inappropriate decision increased. The same situation is for defensive pressure; chances for inadequate decision are higher when the defensive pressure is medium or high.

Conclusion: Based on these findings, the coaches should take into consideration these factors when preparing individual training sessions.

Keywords: basketball, decision making, logistic regression, offensive skills.

PHD SECTION



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Recent technological advances in the field of mass spectrometry have enabled the measurement of hundreds to thousands of chemical entities within a single sample. Alongside computational developments facilitating compound identification, the chemical composition of samples can be determined in a manner less biased than previously possible. Nowadays, these holistic approaches are commonly applied to human biological samples (e.g. urine, blood, saliva, sweat, faeces, semen etc.) for metabolic characterisation; providing a snapshot of physiological state. Furthermore, recent initiatives are expanding the analytical scope towards routine measurement of exogenous and exogenously-derived compound, including environmental pollutants and performance-enhancing substances. The conceptual framework of these emerging approaches will be described and their current capabilities and limitations discussed in line with anticipated developments for health research.

EFFECT OF A 3-MONTH EXERCISE INTERVENTION ON PHYSICAL PERFORMANCE, BODY COMPOSITION, DEPRESSION AND AUTONOMIC NERVOUS SYSTEM IN BREAST CANCER SURVIVORS: A PILOT STUDY

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Purpose: Breast cancer patients are at increased risk of developing comorbidities such as lymphedema, sarcopenia, osteoporosis and cardiovascular disease after breast cancer treatment. These complications contribute to a decrease in quality of life, cardiorespiratory fitness and muscle strength. Regular and longterm physical activity is an effective non-pharmacological strategy that can improve physical, psychological and social outcomes. The aim of our research was to evaluate the effect of various modes of an exercise intervention on physical performance, body composition, depression and autonomic nervous system in breast cancer survivors. Methods: 16 women after surgery with hormonal treatment enter the research. Thirteen of them completed the controlled, quasi-experimental study (54±9yrs, 164cm±6 cm, 72±12kg) and were divided into 3 groups according to their place of living: trained under supervision (n=5) (SUPERV), trained at home without supervision by videos (n=7) (HOME) and with no prescribed physical activity (n=4) (CON). Exercise intervention lasted 3 months and comprised of 60min training units 3×week (aerobic with resistant exercise in a 2:1 mode combined with regular weekly yoga and breathing exercises). The exercise intensity was set individually at 65-75% of HRR based on spiroergometry and was continuously controlled by heart rate monitors. The same principles applied to the HOME group, which, in addition to heart rate monitors, recorded frequency, length, HRmax, HRavg, and Borg scale of intensity perception. VO_{2max} , BMI, fat mass, depression level (Beck's depression inventory) and the power of the autonomic nervous system (total power and S-V balance) were analysed. For data evaluation we used descriptive statistics and Cohens d effect size. Results: 3 women dropped out of research because of medical reason. In all groups VO_{2max} values increased. The largest increase in VO_{2max} values was in SUPERV group by 36%, in HOME group by 20% and in CON group by 2%. Body weight decreased for groups SUPERV (-1.2kg) and CON (-0.1kg), for HOME group there was an increase (+0.2kg). Body mass index decreased for SUPERV group (-0.4), for HOME and CON it increased (both +0.1). Total power decreased in SUPERV (-0.6) and HOME group (-0.2), in CON has not changed. The same results were achieved by the S-V balance, only the CON group increased. Values from Beck's depression inventory decreased for all groups, most for CON group. Conclusion: A 3-months of supervised and controlled exercise had a significant effect on physical fitness and body composition in comparison with non-supevised home-based physical intervention. Our results indicate that it is strongly advisable to apply a supervised exercise program to induce positive physiological changes in breast cancer survivors as part of aftercare.

Keywords: cancer, physical activity, anthropometric changes, Beck's depression inventory, spectral analysis of heart rate variability.

CORRELATION BETWEEN RACE DISTANCE AND DURATION AND HEART RATE IN SKYRUNNING: A CASE STUDY

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Purpose: In road running for distances shorter than marathon, the heart rate (HR) is mostly without a change over the whole race. Runners hold almost constant pace and intensity from start to finish. This is different in skyrunning. Higher variability in race profile is one of the most important determinants in difficulty and duration of the race. HR is changing all the time of the race and the aim of this case study is to describe the correlation between HR and race duration in skyrunning. Methods: One elite male skyrunner aged 27,3 years, body mass 65 kg, body height 173 cm participated in this study. Three races over 25 kilometres and 120 minutes with different race characteristics were included in this study (race 1: distance (d) = 28,6 km, elevation gain (EG) = 888 m, time (t) = 2:12:30; race 2: d = 26,44 km, EG = 1834 m, t = 2:40:11; race 3: d = 42,54 km, EG = 3200m, t = 5:06:44). Average HR, race duration, elevation gain, speed and race distance were observed. HR was monitored by a chest belt Polar H7 and sports watch Suunto Ambit3 Peak. To analyse the correlation between analysed variables and race characteristics the Spearman's rank correlation coefficient was used. Results: A correlation between HR and distance of the race in race 1 (r = -0.646), race 2 (r = -0.732) and race 3 (r = -0.838) was observed. Furthermore, longer duration of race was directly associated with higher difference of HR at the beginning and at the finish of the race. Finally, average HR was decreasing with increasing duration of the race (race 1 = 159,81 beats per minute (bpm); race 2 = 155,98 bpm; race 3 = 152 bpm). Conclusion: Skyrunning races are more interesting for many people. Distance and duration of the race is associated with the HR change. HR monitoring could be a valid parameter for maintaining the high performance during the race. Future research on physiological parameters in skyrunning is needed. *Limits*: Results from this case-study cannot be generalize. There is no comparison with other type of running races.

Keywords: heart rate, skyrunning.

POINTS RELATIONSHIP OF THE RESULTS FROM FITNESS TEST AND FORCZECH NATIONAL PERFORMANCE IN ALPINE SKIING 0 F THE TEAM U 1 4 AND U16 CATEGORIES IN THE SEASON 2018/2019.

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The main motivation for the research is a verification of applicability of the fitness test as a predictor for specific alpine skiing performance of the Czech national team of U14 and U16 categories. We want to verify if the results from the fitness test correspond with points for the performance in alpine skiing disciplines (slalom, giant slalom, super giant slalom). In total, 42 men and women (U14 an U16 categories), members of the Czech national team, participated in the research. Participants were grouped by gender (women n = 21, age 14.23 (± 1.04), men n = 21, age 14.19 (± 1.07)). Fitness test consisted of six individual tests and was used as a tool to examine the level of motor abilities (box jump test, shuttle run 4x10m, standing long jump, hurdles run - boomerang test, twist test, beep test). Points for the performance in alpine skiing show the best result from a single competition transferred to the points. In our research we were looking for relationship between the points from three different disciplines (slalom, giant slalom, super giant slalom) and the results from the fitness test. In the men category we found high correlation (at the significance level of p < 0.05) between super giant slalom and standing long jump (r = -0.73; $r^2 = 0.53$), between super giant slalom and boomerang test (r = 0.62, $r^2 = 0.38$) and between super giant slalom and shuttle run 4x10m (r = 0.61, $r^2 = 0.37$). Small correlation was found between slalom and box jump test (r = -0.31, $r^2 = 0.1$), between slalom and twist test (r = -0.33, $r^2 = 0.11$) and between super giant slalom and twist test (r = -0.34, $r^2 = 0.12$). In women category we did not found high correlation (at the significance level of p < 0.05). Small correlation was found between slalom and box jump $(r = -0.31, r^2 = 0.1)$, between giant slalom and twist test $(r = 0.01, r^2 = 0.0001)$, between super giant slalom and standing long jump (r = -0.03, $r^2 = 0.0009$) and between slalom and shuttle run 4x10m (r = -0.05, $r^2 = 0.0025$). Twist test had very small correlation in both men and women categories. We can say that it is not relevant for prediction of alpine skiing performance. Based on different significance of correlations between men and women (super giant slalom and standing long jump; slalom/super giant slalom and shuttle run 4x10m) it might be necessary to adjust fitness testing as a predictor of alpine skiing performance according to a gender.

Keywords: Alpine skiing, Slalom, Giant slalom, Super giant slalom, Fitness test, FIS, FIS points, Points for performance in alpine skiing, Motor abilities.

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Coaches play a crucial role in the development of sport at all levels. However, there is often talk of a lack of coaches. This problem is compounded by the fact that female coaches make up only a much smaller part of the coaching staff. Significant deficits of woman are particularly noticeable in senior coaching positions (e.g., among head or national coaches). The issue of female representation in coaching has received considerable attention for forty years, especially within the broader topic of women and sport. At the same time, the literature reflects an interesting paradox. Political and sporting bodies at the international and national level address the shortage of female coaches, and many projects promoting women in coaching have emerged. Research but shows that female representation in coaching is practically not improving. Many organizational and interpersonal problems and myths about the possibilities of women trainers remain. Also, in the Czech Republic, in the last two decades, political and research activities pay considerable attention to the topic of women in coaching. Our study builds on Czech empirical findings in the field of women in sport from the first decade of the 21st century. A partial goal of our more extensive research was to find out the reasons for the low representation of women among sports coaches. We addressed women (questionnaire survey, N = 103, average age 24.3 years), who at the performance or top-level are engaged in various sports and who are - at the same time - feel "at the end" of their active sports track, and realistically think about the professional future after finishing their sports career. We processed the results using statistical analysis and open coding. The most common reasons that negatively affect the continuation of the addressed female athletes as coaches, respondents report low financial remuneration of coaching work and loss of leisure time. Other reasons why women do not consider coaching include the lack of their professional ambitions and respect from sports associations and sports clubs. Research carried out shows that about half of the addressed female athletes are interested in staying in the sport as a coach, but they are aware of many obstacles in this area at the same time. This report was written at Masaryk University as part of the project "Gender aspects of coaching" number MUNI/A/1037/2017 with the support of the Specific University Research Grant, as provided by the Ministry of Education, Youth and Sports of the Czech Republic in the year 2018.

Keywords: coaching, women in coaching, lack of female coaches

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In recent years, worldwide obesity has increased both in the adult as well as childhood populations. Research shows that obesity nowadays is associated with still younger age. What is currently becoming the focal point of attention is the prevalence of obesity in people with intellectual disabilities whose physical and mental limitations affect, to a certain degree, their daily lives. Nevertheless, there is a lack of data for the childhood population with intellectual disabilities. This research seeks to compare trends in BMI indicators and eating habits among children with moderate intellectual disability who live with their families as opposed to those who are provided for at Children's home in Zlín. The research method used was quantitative and comparative research approached deductively. BMI indicators were determined by means of InBody analyser. Eating habits data were collected through a questionnaire of our own design which is standardly used in the Special Olympics Healthy Athlete Project. The BMI trends were observed in six children from two primary schools. We have concluded that children who are provided for at the children's home do not tend to be obese, rather they have a proclivity to normal BMI or underweight. As emerged from case histories, children living with their own families tend to have normal BMI or obesity. Summer holidays had no verifiable effect on the BMI indicators. Children's weight remained the same within the existing BMI ranges. The research further shows that children being cared for in the institutional environment have a healthier diet than children living with their families. The conclusions of the research may serve as a recommendation for parents to pay more attention to their children's diet as well as their physical activity.

Keywords: children with intellectual disabilities, moderate level of intellectual disability, BMI indicator, obesity, eating habits.

RESEARCH AND EVALUATION OF EXPOSITION TO HEALTH-AFFECTING CHEMICALS DURING INDOOR FIRE SUPPRESSION AND USAGE OF EXTINGUISHING FOAMS IN FIREFIGHTERS - STUDY DESIGN

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To meet the modern standards and demands of the firefighting profession, the firefighters must be physically fit. During the fire suppression, there is a potential risk of exposure to chemicals with significantly negative health effects that many of them are lipophilic. Aim of our study is to identify whether there is a relationship between physical fitness, amount of body fat fraction and a level of exposition to health-affecting chemicals in a group of firefighters. Study design meets the standards of modern research with a similar focus. This presentation describes the study design for the purposes of primary research. In the pilot phase of FIREexpo study, started in 2017, 30 non-smoking male participants were divided into three groups according to their exposure: first - young firefighters in training, second - chronically exposed active firefighters, and third - non-exposed control group. In the main research is expected participating of 150 volunteers. The focus groups are the same as in the pilot phase of the study. Performance evaluation is consisted of strength test - One-repetition maximum (1-RM) the bench press (BP) and squat and the aerobic performance test on the level 170 pulses. Other method for assessing current level of physical activity of individuals is applied International Physical Activity Questionnaire (IPAQ). As a supplementary examination for realationship individuals and physical activity is used the Big Five Factors (dimensions) of personality questionnaire. Test for body lipid composition contain the dual-energy X-ray absorptiometry (DEXA) and the blood tests. Biochemical parameters, levels of PAHs and PFCs, DNA damage assessment (comet assay, micronuclei), oxidative stress and other measurements are the blood/urine samples assessed. A better understanding of the relationship the level of the physical fitness and the exposition to health-affecting chemicals could potentially lead to refining the fire extinguishing procedures and work conditions that could result in minimization of the health treating effects in firefighters.

Acknowledgements: This project was approved by the CELSPAC Ethics Committee. This work was carried out with the support of core facilities of the RECETOX Research Infrastructure and the pilot phase FIREexpo study was supported by the CETOCOEN PLUS project (CZ.02.1.01/0.0/15 003/0000469) and project MU-NI/A/1135/2018 (ID=46868) funded by Masaryk University in Brno.

Keywords: Firefighters, physical fitness, intoxication, polycyclic aromatic hydrocarbons, fire retardants.

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Overweight and obese children often suffer for many physiological and psychological issues. Resistance training allows them to excel over their peers due to strength ability which is related to their somatotype. The aim of this study was to examine the effect of an eight-week resistance training program on body composition in overweight and obese children. Study sample included 8 boys and 4 girls (age = 11.7 ± 1.54) who were involved in an eight-week strength specifically designed program consisted of two strength training unit per week. Resistance of exercise was set on 8-10 RM. Body composition were measured by InBody 720 two times before and after the training intervention. The Wilcoxon matched pairs test was used. Results showed increase in total body weight (2.7%), lean body mass (2.5%) and fat mass (3.7%). This effect indicates that used resistance training program is sufficient to lean body mass grow. Nevertheless, program proved to be inadequate to avoid an increase in fat mass. This could be caused by many factors which should be consider in further research (e.g. longer technique practice, diet, number of training units).

Keywords: exercise, youth, obesity, strength training.

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This study is a major part of the dissertation research. It is focused on the development of shooting skills in young biathletes in a three-year training period. Specifically, the long-term development of the percentage success rate of prone and standing shooting in both training and races is described in study. It mentions marginally shooting skills such as the postural stability, the stability of aiming and triggering. The first part of our research, completed in 2017, brought findings that the relationship between exercise intensity and the biathlete's postural stability exists, but following part of it, finalized in 2018, did not demonstrate the dependence of exercise intensity on the aiming stability and triggering. Initially, the study involved 23 young biathletes (13 girls, 10 boys). Whole research was completed by 19 biathletes (11 girls: age 17.8 \pm 0.64 years; 8 boys: age 17.4 ± 0.72 years) after three years. The results of our current study are based on the records of shooting on metal targets that were created during each biathlon shooting training and all biathlon races of the participants in the three-year period. Only shooting with previous physical load was involved into results, shooting at rest was not included in the study. The results show the improvement of the percentage success rate in both prone and standing shooting in the three-year training period in both girl and boy groups and in both training and races (total percentage success rate = the average of the training and races percentage success rate – girls in prone: 2016/2017: 71.3 %, 2017/2018: 75.5 %, 2018/2019: 80.0 %; girls in standing: 2016/2017: 61.8 %, 2017/2018: 67.7 %, 2018/2019: 73.4 %; boys in prone: 2016/2017: 72.0 %, 2017/2018: 72.9 %, 2018/2019: 75.3 %; boys in standing: 2016/2017: 57.6 %, 2017/2018: 63.5 %, 2018/2019: 67.7 %). Girls are better shooters than boys in this research group. In general, the gradual improvement of percentage success rate in time is expected to occur in young biathletes that are in the intensive training process, but our study brings unique data of concretely values at this age of athletes that has not been known yet. The obtained data could be used by biathlon trainers to compare the current level of shooting skills at a given age of their young athletes. At the same time, a normative standard of biathlon shooting skills in a given age could be created in the case of gathering more data. That is one of the goals of the Czech Biathlon Union.

Keywords: Biathlon training, Shooting analysis, Physical load.

COMPARATION OF PRIMARY SCHOOL TEACHERS' ATTITUDE AND OPINIONS TOWARDS INCLUSIVE EDUCATION IN SOUTH MORAVIAN REGION AND SPLIT-DALMATIAN AREA

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The terms integration and inclusion are being used in the context of taking in, integrating and effective education of special needs students into society (Votavova, 2013). In Czech Republic, in September 2017 a bill n. 27/2016 Sb., o vzdělávání žáků se speciálními vzdělávacími potřebami a žáků nadaných (MŠMT, 2016) came into effect, which made major changes to the approach of public education towards integration and inclusion. In Croatia, as of 15th June 2013 the Ministry for Science, Education and Sport issued a public appeal to raise interest in participation in the project "EU & EU Council joint project to support regional inclusive education". Schools that that took part were supposed to create a regional "Inclusive School Net" for mutual learning and experience exchange, with the support of corresponding internet platforms and subsidies (Council of Europe and the European Union, 2013) (Osnovna škola Okučani, 2013). The research is focused on teachers' approaches, opinions and visions concerning inclusive education in South Moravian region and Split-dalmatian area, further analyzes the degree of integration and inclusion in these areas. The relationship of pedagogues towards integration/inclusion, due to steep increase of specific disorders, is extremely important. The research was made in the year, when the inclusive education bill wass passed in Czech Republic. Data was collected in the first school year, when schools in Czech Republic functioned as inclusive. Aim: The goal of this work was to determine the teacher' opinions and positions on integration and inclusion in selected areas. Methodology: The research is qualitative, an open-questioned questionnaire was made and a non-structured interview was made when visiting schools, that was analyzed using content analysis. Data collection took place in Split-dalmatian in 2016 and in South Moravian region in 2017. It was conducted on ordinary elementary schools. Special types of schools were not a part of the study field. Research sample: 12 adressed schools in Split-dalmatian area - 12 female teachers; 14 adressed schools in South Moravian region - 12 female teachers, 2 males. Teachers aged 25-45. Turnout in South Moravian region was 80%, in Split-dalmatian area 66.6%. Results: In Czech (tested) schools, individual integration takes place, two schools stated they have no integrated students. In Split-dalmatian schools, on the other hand, is integration both individual and group-based, that takes place in all schools. In selected czech schools there is a lower average pupil per class rate, but higher integration rate (per class). Integrated students in selected schools in SDA are much more active in PE than the czech ones. Only 25% of the pedagogues think the system on their schools is beneficial. 50% are convinced it is not. In croatian schools, 60% of pedagogues are convinced the systém on their schools is beneficial, only 20% think otherwise. In 50% of the tested South moravian schools pedagogues support segregation and in another 30% individual assessment of individual cases. Only 8% support individual classrooms in schools, here it's likely that they aren't much informed on this topic. In the Split-dalmatian area 40% support special classrooms on ordinary schools, 40% support integration in regular classrooms. Conclusion: Determined facts are in my opinion a probe into the czech pedagogues' mentality. Split-dalmatian area, where the systém is running without larger problems for a considerable time now, I only took as a comparative sample and I wondered, why the opinions are so different here. Bad awareness about the issue between proffesionals surprised me greatly and I think that awareness betterment is pivotal in a change of czech pedagogues' attitude towards the given issue. Limits: The studied sample is not representative. It would be appropriate to further continue in the research and adress a larger number of schools. It is presumed that the situation will change due to a longer time having had elapsed since the passing of the bills.

Keywords: Integration, inclusion, South Moravian region, Split-Dalmatian area, primary school teachers, opinions, physical education, International Classification of Diseases and Related Health Problems, (ICD).

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Sports performance is influenced by a number of factors that can be characterised as its relatively independent - although synergetic - components. The most frequently mentioned are the fitness, somatic, tactical, mental and technical factors of sports performance. The subject of interest in sport is the process of monitoring and evaluating the level of these individual factors, i.e. the diagnostics of sports performance. The use of the kind of diagnostic methods that cover sports-specific preconditions for tennis is recommended in diagnosing the level of performance preconditions in tennis. Analyses of modern tennis show speed (reaction, action), strength (explosive), strength endurance and specific coordination abilities to be the most important motor preconditions. Diagnostics of the motor preconditions of an athlete are often performed in practice by means of motor tests and test batteries. Methods of evaluating the results obtained are generally based on the probability approach, though an alternative is provided by a method based on the theory of fuzzy logic. The aim of the research was to use the theory of fuzzy logic in evaluating the level of performance preconditions and comparison of evaluation results by means of a classic discrete approach and a fuzzy approach. An evaluation and comparison of the two approaches is presented against the results of testing of a group of tennis players in the age category 15–16 years (n = 203, height M \pm SD = 181.9 \pm 6.8 cm, weight M \pm SD = 71.6 \pm 8.6 kg) who took part in regular testing by the Czech Tennis Association in the years 2000-2018 using the TENDIAG1 test battery. STATISTICA 12 software was used for the analysis of data using a probability approach. FuzzME software was used for analysis by means of a fuzzy approach. The testing of research data (the Kolmogorov-Smirnov test) demonstrated the normal distribution of the frequency of the results of individual tests in the test battery. The level of agreement of the results (the Pearson correlation coefficient) obtained by the two approaches (the discrete and fuzzy approaches) was substantively (ES, large) and statistically (r = 0.89, p = 0.05) significant. Evaluation of the substantive significance (ES) of the differences between the mean values of the results obtained by the two approaches with the use of the Cohen's d did not demonstrate any substantively significant difference (d = 0.16). For a more detailed analysis, two subsets were selected from the set of tennis players, which were made up of players with an overall evaluation (probability approach) at a level of 4-5 points and 8-9 points, respectively. The level of agreement of the results in the subset with the evaluation 4-5 points was substantively (ES, small) and statistically (r = 0.15, p = 0.05) insignificant, while that in the subset with the evaluation 8-9 points was substantively of medium importance (ES, medium), though statistically insignificant (r = 0.47, p = 0.05). Assessment of substantive significance (ES) of differences between mean values of the results obtained by the two approaches did not demonstrate any effect (d = 0.12) in the group with an overall evaluation of 4-5 points and a large effect (d = 0.89, large) in the group with an overall evaluation of 8-9points. Despite the similarity of the results obtained by the probability and fuzzy methods, it was shown that the fuzzy approach enables finer differentiation of the level of fitness preconditions in players on the evaluation boundaries. In view of the fact that the results for individual items in the TENDIAG1 test battery indicate the level of individual performance preconditions, the use of different criteria weightings may be considered for future evaluation using the fuzzy approach. For this approach, the use of a points method, a paired comparison method or the Saaty method can be considered for the estimation and calculation of weightings for individual subtests.

Keywords: diagnostics, fuzzy logic, FuzzME, probability approach, TENDIAG1 test battery.

POSTER SECTION



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Regardless of the alpine ski school program, ski beginners need to learn movements essential for specific turn phases in order to control speed and direction of skiing. Some ski schools insist from the beginning phases on an optimal ski position, which principally relates to the distribution of weight exclusively on the outer ski. But, some ski schools base their programs on stabile balance position through putting weight on both skies. The aim of this research was to determine the differences in the kinematic parameters of lower extremities during parallel turn in case of pressure distribution on outer ski exclusively compared to both skies. Kinematic analysis was conducted on 28 turns (14 in both conditions) using Xsens kinematic suit. Parameters were measured while performing parallel turn. Results of MANOVA showed significant difference between parallel turn performed in both conditions (F=255,06; p=0,04). Hip abduction was smaller during parallel turn performed on outer ski when compared to turn on both skies. Mentioned suggests better body position during parallel turn when performed exclusively on the outer ski.

Keywords: alpine skiing, ski school, kinematic analysis, kinematic suit.

THE ROLE OF PERFECTIONISM AND CERTAIN PERSONALITY CHARACTERISTICS IN THE CONTEXT OF SUBJECTIVE PERCEPTION OF OVERTRAINING IN TEAM SPORTS

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The main aim of this study was to examine the relationship between perfectionism and personality traits with perceived training load in elite adolescent athletes. We also examined the relationship between perfectionism and certain personality traits. The secondary aim was to verify the basic psychometric characteristics of used methods. The study is based on the quantitative research and Czech versions of following methods were used: BFI-44, POMS a Sport-MPS-2. We collected data from 180 athletes (M=180; age 14-19; M= 16,10). The hypothesis about the relationship between the perfectionism and personality traits were confirmed. We found weak but significant correlation between perceived load level and perfectionism (r=0,189, p<0,001), Extraversion (-0,241, p<0,001), Conscientiousness (r=-0,287, p<0,001) and Neuroticism (r=0,343, p<0,001). The relationship between perfectionism and neuroticism was also found (r=-0,176, p<0,001). There was significant difference between groups in perceived training load according to perceived training difficulty. No difference was found between athletes playing different sports. Results can be used as basis for future research or in coaching practice.

Project: Psychosocial aspects influencing the performance of top athletes (MUNI/A/1027/2017) buresova@phil.muni.cz

EFFECTIVENESS OF MANUAL YUMEIHO THERAPY AND EXERCISE ON DEPRESSION AND NEUROPATHIC PAIN IN PATIENTS SUFFERING FROM CHRONIC NONSPECIFIC LOW BACK PAIN

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Introduction: Chronic low back pain is the leading cause of disability, which reduces quality of life and increases the healthcare costs. Psychosocial factors (depression, kinesiophobia and somatization) may also have an important role in the appearance and duration of chronic nonspecific low back pain. Depression may predispose low back pain, while the chronicity of pain affects the degree of disability, which is also related to mental health. Many studies suggest the association between depression and low back pain by explaining a significant physiological link. Different types of manual therapy are used in the treatment of chronic low back pain, but recent studies suggest that a rehabilitation models which combine manual therapy and exercise, provide better results compared to individual (separate) applications. The aim of this research was to examine the effects of the rehabilitation program, which includes manual yumeiho therapy and exercise, on depression in people suffering from chronic nonspecific low back pain.

Methods: The study included 21 participants, aged 40 to 60 (M=51.1, wSD=5.9) who suffer from chronic non-specific low back pain. The study included the initial and final depression test and the initial and final neuro-pathic pain test. Between the initial and the final testing, a three-week therapeutic procedure of yumeiho manual therapy and exercise was performed (15 treatments). Repeated estimates of depression and neuropathic pain were tested 30 and 60 days after the implementation of the rehabilitation protocol.

Results: Statistically significant improvements were noted between the initial and the final test in both observed variables. Significant improvements (lower depression and neuropathic pain) have also been noted 30 and 60 days after the implementation of the rehabilitation protocol (in relation to the initial state).

Conclusion: The findings indicate that the rehabilitation protocol, involving manual yumeiho therapy and exercise, is an effective method for treating depression and neuropathic pain in people suffering from chronic nonspecific low back pain. Considering the lack of research on the effects of manual therapy by yumeiho technique, the results contribute to a better understanding of technique which, although used in practice, has not been sufficiently explored. Further research is required, on comparing this rehabilitation model to other methods, as well as longer follow-up in the post-rehabilitation period.

Keywords: rehabilitation program, spine, movement, quality of life.

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Purpose: It is estimated that more than 20 percent of the adult population in Europe suffer from some psychological problems or mental health disorders (Silobrčić-Radić, 2004). More than one in six people across EU countries had a mental health problem in 2016 (OECD/EU, 2018). Exercise can make benefit on different aspects of mental health of individual. In this paper we will pay attention to the effect of kinesitherapy on several aspects of coditions on persons with mental disability and mental illness, in further text will use the term persons with dual diagnosis. The aim of this paper is to investigate whether there is influence of kinesitherapy to change of the mood and change of body weight in individuals with a dual diagnosis.

Methods: In this study we had 20 respondents with dual diagnosis (mild mental retardation and schizophrenia). Respondents where divided into two equal groups S1(10) and S2(10). The study lasted for 26 weeks. Respondents in S1 group were included in the group kinesitherapy for 45 minutes from Monday to Friday for the duration of the study. The data which were required this study were collected before and after the study. For assessment of mood we have used questionnaire whitch was modified for persons with mental disabilities, and to measure the body weight we have used medical scale.

Results: Statistically significant difference in change of mood after participation in group kinesitherapy, was messured in S1 group (p <0.0005). When we have compared the mood in S1 and S2 group after study, S1 group have shown statistically significant better mood (p<0.0005). Within the S1 and S2 group there was not statistically significant difference in change of body weight before and after the study (S1-p = 0.284, S2-p = 0.275). In S1 group we have messured the highest decrease of body weight at the individual person of 8 kilos, while in the group S2 there was a person with highest increase in the body weight of 8.3 kilograms. Conclusions: On the basis of collected data we can say that kinesitherapy have a positive effect on a particular group of users and some spheres of their lives. With participating in the group kinesitherapy we have noticed that participants have developed a better social contact between themselves. In this study kinesitherapy have a positive effects on the mood of persons with dual diagnosis and they have accept kinesitherapy as method of rehabilitation. The combination with other rehabilitation methods is important for achieving the best and long lasting results. Because of mental helth problem in EU is increasing it should be noted that the effects of physical activity and kinesitherapy on people with psychological and mental problems is relatively poorly researched, especially in people with a dual diagnosis.

Keywords: kinesiotherapy, dual diagnosis, schizophrenia, mental disabilities, mood, body weight.

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International and Czech research shows that sports coaching is predominantly the domain of men, even in sports where the representation of male and female athletes are well balanced. Experts and sports public agree that female coaches can play the same important role in all sports sectors as male coaches, especially in cooperation with children, women, and women's teams.

Our society is still based on some gender stereotypes. These stereotypes are gradually disappearing from central Europe. Women get the same job opportunities as men. Women can work full-time. Men can stay on maternity leave, etc. Although gender imbalances are decreasing in many areas, some stereotypes persist in the field of sport. The coaching sector is still massively masculine and also full of gender prejudices (not just only for women but also men). Women and girls should be supported in sports activities, and coaching area should be more open to them. Male and female coaches should have the same opportunity.

One of the main problems in staying as a coach is a lack of finance. Most coaches in the Czech Republic have other jobs, and they are doing coaching in their leisure time. The second biggest problem is the fact that coaching is time-consuming. Coaching involves training, but also competitions/races, sports camps, individual preparation, etc. Female coaches mention that it's almost impossible to combine coaching with care about household and family without the help of another person. For example, women coaches would welcome the childcare service in sports facilities. Female coaches would like to feel more support from sports associations. They would like to have the opportunity to coach men or men's teams to show their abilities and skills.

The research aims to find out the reasons for the low representation of women among sports coaches in the Czech Republic and which changes could contribute to the improvement of gender imbalance in coaching.

This report was written at Masaryk University as part of the project "Gender aspects of coaching" number MUNI/A/1037/2017 with the support of the Specific University Research Grant, as provided by the Ministry of Education, Youth and Sports of the Czech Republic in the year 2018.

T O **EFFECTS** 0 F SPORTIVE DANCE TRAINING COMPARED ENDURANCE STRENGTH TRAINING 0 N COGNITIVE PERFORMANCE IN 0 L D AGE LONGITUDINAL STUDY 0 N THE PREVENTION 0 F MEMORY LOSS

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Introduction: Physical activity and cognitive training have proved to be beneficial methods for positively influencing age-related structural and functional changes in the brain. A combination of physical and psychological demands seems to be the most effective method. Since dance combines motor and cognitive strains, it plays an important role in the prevention of age-related degenerative changes. We examined whether repetitive physical exercises differ from alternating movement patterns in terms of their effect on memory performance.

Purpose: The aim of this study is to compare the impact of long-term sportive dance training with endurance and strength training on memory performance in seniors.

Methods: In a longitudinal study of 17 participants aged 67 to 80 years (72.1 ± 3.4 years, 41% females), data were collected before the start of training, after 6 months, 18 months and 5 years of regular training. The memory performance of 8 dancers and 9 active control subjects was determined with the Verbal Learning and Memory Test (VLMT). Statistical analyses were conducted with SPSS Statistics 25 and intervention effects were tested using repeated-measurement ANOVAs. Data without normal distribution were analyzed using the Friedman-Test.

Results: Significant improvements occurred at the earliest after 18 months of regular training. The dancers improved in learning performance (p=.033, r=.55), retrieval performance of the interference list (p=.038, r=.62) and corrected recognition performance (p=.007, r=.69). In addition, there are tendential enhancements in total learning performance (p=.060) and retrieval performance of the learning list after time delay (p=.058). The active controls improved the retrieval performance of the interference list (p=.016, r=.57), retrieval performance of the learning list after interference (p=.021, d=.37) and after time delay (p=.011, r=.56).

Conclusion: Both groups were able to delay age-related degenerative changes in memory performance over a time period of 5 years demonstrating maintenance in 7 out of 10 parameters and significant improvements in the remaining 3 parameters of the VLMT. As a result, it could be verified that regular physical activity can prevent memory loss in older age. The small group differences might be caused by the partial inclusion of coordinative contents in the training of the active control group after the second posttest. However, constant cognitive and motor learning seemed to be slightly superior to engaging in repetitive physical exercises in order to prevent memory loss. It has a promising potential to counteract age-related cognitive decline and prevent neurodegenerative diseases. Due to neuroplasticity, it is possible to improve memory performance into old age. It is further concluded that an intervention period of 6 months is not sufficient to detect an increase in cognitive performance. Only a long-term physically active lifestyle can lead to an enhancement of memory performance in old age and thus to an improved quality of life.

Keywords: physical activity, dance, cognition, memory, seniors.

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The questionnaires originate from Canada and are used for evaluating the level of physical activity. In the poster steps of the validation procedure of PAQ-C and PAQ-A are presented.

The focus will be on the content validity of both PAQs and results of inter-item and inter-rater reliability. At the moment the questionnaires are prepared to be distributed among Czech school children and adolescents, the results will be for the international conference Sport and Quality of Life 2019 available.

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Equilibrium represents the motor capability responsible for the performance of virtually all functional movements. Thus, the importance of early diagnosis of equilibrium levels in boys and girls was recognized as the key factor for the prevention of motor deficits and muscles misbalances later in life. Purpose: The purpose of this paper was to show the difference between boys and girls aged 7-10 years in the level of unilateral static balance of the take-off leg. Methods: Research was conducted at the Kvarner Athletics Club Rijeka, and it involved 80 children aged 7-10 years (38 boys and 42 girls). Measurement of static unilateral equilibrium was obtained using Gyko Inertial System (Microgate, Bolzano, Italy). Three attempts were made in 20 seconds and two motor variables were observed: medio-lateral and antero-posterior trajectories of the body. For both variables, the arithmetic mean, the minimum and maximum score and standard deviation were calculated. Moreover, a non-parametric method of the Mann-Whitney U test was used to determine statistical significance between boys and girls. Statistical significance was set at p <0.05. Results: Statistically, girls have significantly better results compared to boys, both in the medio-lateral trajectory variable (M_Sumg = 335.1, M_Sumb = 479.34) and the antero-posterior trajectory variable (M_Sumg = 291.14, M_Sumb = 411.71). Conclusion: The results of this study showed that girls aged 7-10 years achieved significantly better results compared to boys in observed motor variables (medio-lateral and antero-posterior trajectory of the body), when performing a static unilateral take-off leg balance test. These results are consistent with previous research. Indications for such results stem from different perspectives, among which the most common one refers to the earlier maturation of the systems responsible for postural control in female bodies. Recommendation for further research is to conduct examination on a larger sample of subjects, in younger children (pre-school age) and with both legs.

Keywords: static unilateral balance, early school-age children, take-off leg.

HIERARCHICAL CLASSIFICATION OF EXPERT MODELS OF EXERCISES DESIGNED TO ELIMINATE SPECIFIC MISTAKES OCCURING IN SHORT SKITURN

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The aim of the present study was to examine the structure of an expert model of exercises designed to eliminate the Lack of specific ski movement mistake in short ski turn, as well as offer a hierarchical classification of the expert model. For this purpose, a two-stage research was conducted. During the first stage of the research the exercises with the purpose of Lack of specific ski movement mistake elimination were designed by 20 skiing experts aged 25 to 45. By means of email and coordinated by the paper author, the experts first designed a model of 14 methodical exercises and subsequently selected the five most relevant ones, ranking them on a scale from 1 to 5. A nonparametric chi - square test (χ 2) was used. The research showed there was no significant variation across the experts' evaluation of the five most important methodical exercises ($\chi 2=21,69$; p=0,06). The expert model of the most important methodical exercises for the Lack of specific ski movement mistake correction thus includes the following: Holding a ski stick under the handle, Jump turns, Hands on hips, Unbuttoned ski boots and Ski poles in vertical position in forwards. 307 skiing professionals of various levels of expertise participated in the second stage of the research, whose aim was to classify the Lack of specific ski movement mistake elimination exercises. The participants' task was to rank the exercises based on their relevance. Total amounts of rank sums (ΣR) were calculated, the Kruskal-Wallis test (H-test) was carried out, and the corresponding levels of significance (p) were recorded, for the purpose of comparing the significance of diversity between rank sums and the expert model. The statistically significant difference was found between the rank sums (Σ R) of the most efficient exercises for the Lack of specific ski movement mistake correction (H=198,19; p<0,001). The results obtained in the two stages of the research provide valuable insights regarding the methodology of short ski turns. The hierarchical classification of the most important methodical corrective exercises obtained from ski teachers and professionals with different levels of education and expertise yields accurate and precise data about corrective methodical exercises in the process of studying short ski turn. Any further research regarding the same object should evaluate the designed expert model of the most important methodical exercises, as well as their hierarchical classification, across different groups of participants.

Keywords: Expert evaluation, alpine skiing, methodical exercises, short ski turns.

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Introduction: There is currently no consensus for effective warm up to deliver the best explosive power. And as we know explosive power of lower extremities is fundamental aspect of many sports disciplines. It is important for the athlete to know how to correctly warm up for maximal performance.

Purpose: The aim of this study was to compare two best known warm up protocols and find out which of them is the best choice for explosive performance.

Methods: This work is structured as a case study. Two participants were tested for two different warm up protocols. Protocol A myofascial release (SMR) and protocol B dynamic stretching. Each participant did both warm ups with at least 48 hours between protocols for complete regeneration. SMR protocol is comprised of releasing muscles of lower extremities. Gluteal muscles, m. tensor fasciae latae, m. quadriceps femoris, m. biceps femoris and m. soleus and gastrocnemius. Dynamic stretching protocol is comprised of four different exercises: airplane for external and internal rotators of the hips, leg swings in medial plane for hip flexors and extensors, single leg deadlift for m. biceps femoris and full ROM calf raises for m. soleus and m. gastrocnemius. Before and after each warm up protocol were measured: jump ergometry, sprint (power) stair test, pressure algometry and termography. Each protocol started with warmup on bicycle ergometer for 5 min 1W/kg BW. Then followed warm up protocol which each participant was randomly assigned to and each protocol was finished by cool down 8 minutes on bicycle ergometer 1W/kg BW.

Results: Flight time increased more in both subjects after the SMR protocol.

Subject A - +0,027s;

Subject B - + 0.021s.

It improved also with dynamic stretching for subject A (+0,014s) but didn't increase significantly for subject B (+0,007s). Push off accelerated with dynamic stretching (-0,016s) in subject A and slowed with SMR (+0,04s). Subject B improved with both warm ups while the SMR was better (-0,048s) than dynamic stretching (-0,013s). Jump height improved after dynamic stretching for both subjects (A: +0,018m, B: +0,041m). SMR lowered jump height for subject B (-0,0177m) but increased jump height for subject A more than dynamic stretching (+0,0233m).

Conclusion: Every athlete has different needs for warming up their bodies. While both warm up protocols resulted as effective, every athlete needs to have individualized warm up protocol for his/her own needs and body. For subject A it's generally better to warm up with SMR. For subject B it's better to warm up with dynamic stretching for increased flight time and jump height but it's better to warm up with SMR for faster push off.

Keywords: explosive power, warm-up protocol, jump ergometry, lower extremities.

BODY MASS INDEX, BODY IMAGE DISSATISFACTION AND EATING DISORDERED SYMPTOMS I NFEMALE AQUATIC SPORTS: COMPARISON ARTISTIC (SYNCHRONIZED) SWIMMERS AND FEMALE WATER-POLO PLAYERS

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Previous studies suggest that artistic swimming athletes may demonstrate a certain degree of eating disorders symptoms. However, systematic research on eating disorders in artistic swimming is limited and the nature and antecedents of the development of eating disorders in this specific population of athletes is still scarce. Hence, the aim of our research was to investigate the eating disorder symptoms in artistic swimming athletes using the EAT-26 instrument, and to examine the relation of the incidence and severity of these symptoms to body mass index and body image dissatisfaction. Further, we wanted to compare artistic swimmers with athletes of a non-leanness (but also an aquatic) sport, therefore we also included a group of female water polo athletes of the same age. The sample consisted of 36 artistic swimmers and 34 female water polo players (both aged 13-16). To test the presence of the eating disorder symptoms the EAT-26 was used. The Mann-Whitney U Test (MWU) was used to test for the differences in EAT26 total score, so the EAT26 total score and the Dieting subscale showed significant differences between the two groups. The median value for EAT26 total score is higher in the artistic swimmers group (C=11) than within the water polo players (C=8). The decision tree was used to discriminate artistic swimmers and female water polo players. It is important to emphasize that every sport demands certain nutrition and most of them demand certain weight of athlete, but it should be achieved by expert team.

Keywords: puberty, low body mass, leanness sport, eat 26, decision tree.

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PURPOSE: The aim of this research was to explore basic kinematic performance technique indicators of the basketball jump shoot with a backward take-off, as well as possible applicability of the results in everyday basketball practice. METHODS: The acquisition of data was carried out on the training of high quality basketball players, members of the first national league. The video footage was taken at a training session of quality A1 league basketball players. Recording was done by two video cameras. After reviewing the recorded material, one jump shot with a reflection in the back was selected, which can be characterized as a model performance of this motor moving structure. The recording was performed by two video cameras. After viewing the 30 jump shoots with a backward take-off, performed by two players, one of them, which could be considered as a typical model, was subjected to further analysis. 3D data processing was made with APAS (Ariel Performance Analysis System). For the purposes of this research, the analyzed movement is divided into 3 phases: preparatory phase, basic phase and final phase. In these three phases, 17 variables have been observed. RESULTS: In preparatory phase right foot was 27,6 in front of left and space between was 49 cm. Before shooting the ball legs are bended at the knees so that the player can jump more efficiently. In that lower position player have better stability and balance. In the case of this research right knee was flexed to 115° and left knee to 102°. Because of knee flexing center of gravity (CG) is lowered 10 cm. In the same time trunk is bended 7° forward. Initial high of the ball is 90 cm above the surface and elbows angles are 88° in the left and 72° in the right elbow. In basic phase with a powerful pushing action with both legs player starts the take-off. That pushes last 0,183 sec until full extension in knee joints and 0,366 sec until release of the ball. Jump backward was 31 cm long (transfer of CG). During the jump player lifts his elbow until reaching 116° between upper arm and trunk. After that player lifts the ball with extension in elbow joint. In the moment of shooting the ball the angle in elbow is 164° (a common opinion is that elbow must be maximally extended). In this study the player released the ball right after reaching maximum height of jump (158 cm height of CG) so theory about releasing the ball in maximum height of the jump is confirmed. CONCLUSION: The results obtained with this analysis can find its application in practice, in terms of more objective and accurate observation and correction of errors in jump shoots with a backward take-off performance.

Keywords: biomechanics, kinematics, basketball, jump shoot.

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The jumper's knee is a overuse injury which manifests with the appearance of pain in the front of the knee, most frequently at the top of the patella bone, that is, at starting point of patellary ligament. The main simptom is inflammatory process and pain just beneath or above patella bone or at the vertex of muscle to the lower leg. In the majority of patients, the diagnosis of jumper's knee is based only on detailed anamnesis and clinical examination. Nowdays, all kinds of jumper's knee treatments are used, of which inoperable ones gone more and more in popularity. Though the jumper's knee is one of the most common overuse injuries, there is no joint view on how to treat a patient with jumper's knee. Consequently, the goal of this seminar is to explore success eccentric exercise treatment in rehabilitation of healing jumper's knee. The study will attend the 20 patients with the diagnosis of the syndrome jumper's knee, which all of them are active athletes. Respondents are divided into two groups of 10 members and both groups will undergo rehabilitation programs of equal duration but of different content. The first group (S1) performs standard physiotherapeutic methods, the second group (S2) conducts eccentric exercises 2 times a day. The assessment in this study included assessment of pain, muscle strength, and ability for specific physical activity. Testing of the respondents is performed before the start of rehabilitation program and after 12 weeks of therapy. The examination before the start of the rehabilitation program showed that both groups feel approximately the same level of knee pain, decreased muscular strength of injured leg muscles, and that they are not in a state that is conducive to carrying out specific sports activity. The results of the study show that both tested groups had a significant improvement in all three tested parameters. These results confirm that both planned rehabilitation programs give positive results in rehabilitation of patients with jumping knee syndrome. By further mutual comparison of the results between groups S1 and S2 after providing the rehabilitation program, we come to the knowledge that the results for all three tested parameters are statistically significantly better for group S2. As a conclusion of the conducted research and statistical analysis, the fact is that the practice of eccentric contraction exercise in treating the jumper's knee undoubtedly gives much better results than the standard physiotherapy procedures and as such becomes an unavoidable part of the therapeutic program for the rehabilitation of the jumper's knee.

Keywords: jumper's knee, treatment, eccentric exercise.

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The aim of this study was to survey possible relations between the types of motivation and the development of overtraining syndrome symptoms in adolescent elite swimmers. The study is based on the quantitative research and the data were collected through one-time questionnaire survey. The research sample included 102 swimmers in the age range 10-19 years (M=14,69 years; SD=2,58) and the proportion between females and males was 57,8 % to 42,2 %. Sport Motivation Scale was used to measure the motivation. Profile of Mood States questionnaire was used to indicate overtraining. Psychometric properties of both methods have been verified. This study confirms the existence of relations between some types of motivation and the symptoms of overtraining syndrome. In particular, the study found significant relations between amotivation and symptoms of overtraining syndrome ($\delta = 0.52$; p <0.01); negative correlation between intrinsic motivation to experience stimulation and fatigue ($\delta = -0.38$; p <0.01); negative correlation between fatigue and intrinsic motivation to know (δ = -0,38; p <0,01); negative correlation between external regulation and vitality (δ = -0,31; p <0,01). General results suggest gender differences in the structure of swimmer motivation. Women scored in motivation components: identification (p <0.05), intrinsic motivation to know (p <0.05) and intrinsic motivation to experience stimulation (p <0,05), higher than men. Men had a higher amotivation value (p <0,01). At the level of perceived training load, men scored higher than women (p <0.05), which is in contrary to previous studies performed on various research samples. The findings of this study shall be used in the education of coaches, swimmers and their parents.

Keywords: motivation, overtraining syndrome, elite athletes, adolescence, swimmers.

Project: Psychosocial aspects influencing the performance of top athletes (MUNI/A/1027/2017) *Contact information:* trckovaevca@gmail.com, buresova@phil.muni.cz

PERFORMANCE INDICATORS OF THE WINNING AND DEFEATED MALE HANDBALL TEAMS IN THE MATCHES OF THE 2017 ON THE WORLD CHAMPIONSHIP IN FRANCE

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The aim was to find which match performance variables had the greatest influence on the outcome of a match. Therefore, the differences between the wining and defeated male handball teams in the indicators of their match performances at the 2017 of the World Championship in France were determined. The sample of entities consisted of 57 games played during by the participant teams in the preliminary round of the competition. The sample of variables was extracted from the official IHF statistics data as frequencies of the completed and failed executions of technical and tactical elements and actions during matches in the phases in the phases of attack (14 indicators) and defense (3 indicators). The differences between the winning and defeated teams in variables of situational efficiency were determined using a Mann-Whitney U-test. The statistically significant differences between the winning and defeated teams were found in the in the following variables: shots taken from either wing position successfully (p=0.00), distance shots taken outside the 9-metre line unsuccessfully (p=0.00), shots taken after fast breaks successfully (p=0.00), assists (p=0.00), turnover (p=0.01), steals (p=0.00) and blocked shots (p=0.00).

The winning teams play in defense was characterized by a good shoot blocking which then enabled them to quickly and easily score from fast breaks in positional attacks. In attack, in positional attacks, they attempted many quality assists by which the teammates in the scoring favorable position higher efficiency finalization with wing positions and strict selection of a shots from the external position (the minimum number of unsuccessful implementation with 9 meters) and as well of a higher number of steeled balls and which in less lost ball during the match - turnovers. Since handball game advances every year and a lot of that is changing we needed to do similar researches in future.

Keywords: team handball, World Championship, men, technical-tactical elements performance analysis.

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Purpose: The main goal of this study is to determine possible differences in the range and quality of movement between senior male and female volleyball players of HAOK Mladost.

Methods: Respondents, all right-handed and healthy, were members of the senior volleyball team of HAOK Mladost (female n=24, male n=17). The testing was conducted during the transition period, between the first and second competition period. We used seven tests, all part of standard FMS protocol: Deep Squat (DS), Hurdle Step (HS), In-Line Lunge (ILL), Shoulder Mobility (SM), Active Straight Leg Raise (ASLR), Trunk Stability Push-up (TSPU), Rotary Stability (RS), with 12 measured variables (left and right side for five bilateral tests plus DS and TSPU). Educated staff at the Faculty of Kinesiology, University of Zagreb conducted the testing. The examination of significance of the differences between senior male and female volleyball players was conducted by using the nonparametric Mann-Whitney U test.

Results: Statistical analysis showed significant difference in three tests: In – Line Lunge Left (ILLL), z=-2,11, p=0,03, with moderate effect size (r=0.33), Active Straight Leg Raise Left (ASLRL), z=-2,58, p=0,01, with moderate to strong effect size (r=0.4) and Stability Push-up (TSPU) z=-3,68, p=0,00, with strong effect size (r=0.58) Conclusion: Statistically significant difference was determined in the range and quality of movement in three measured variables. Male volleyball players achieved better results in two tests: In – Line Lunge Left (ILLL) and Stability Push-up (TSPU). That addresses to a higher ability to keep the balance during lunges (reaction on short balls during reception or defence phase of the game) and considerably higher ability to maintain the stability of the trunk in the transfer of force from the upper extremities to the lower (during block) and vice versa (during spike). It is interesting to note that female volleyball players achieved a significantly better rating in the Active Straight Leg Raise Left (ASLRL) test, suggesting a better flexibility of the left hamstrings and better right hip mobility which enables higher capacity in performing elements which require extension, which include almost all volleyball elements (hitting, serve receive and transition into offense, defence and transition into counterattack and blocking, smashing and jump serve).

Keywords: stability, mobility, FMS, volleyball skills, female, male

SPECIFICITY OF THE ANTHROPOMETRIC CHARACTERISTICS AND FITNESS ABILITIES OF MALE VOLLEYBALL PLAYERS

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Purpose: The main goal of this study is to analyze possible differences in the space of anthropometric characteristics, motoric and functional capabilities on the sample of senior male volleyball players with different playing roles. On the base of obtained data normative and modal values could be established eventually helping coaches to perform secondary selection – so called volleyball specialization, pointing young players to certain roles where they will be able to achieve maximum results in the volleyball career.

Methods: The research was conducted on 74 senior volleyball players all members of Croatian premier league teams. Players were categorized as setters (n=11), central players (n = 17), receivers – attackers (n=20), opposite hitters (n=16), and liberos (n=10). The sample of independent variables consisted of 4 anthropometric measures (body height, body weight, one hand standing reach and two hand standing reach. Ten standardized were used for the assessment of motor skills: lateral agility, starting acceleration, spike and block reach, general flexibility, explosive strength of arms and shoulders, spiking speed, repetitive strength of trunk flexors, static strength of trunk extensor and repetitive strength of chest, arm and shoulders. For the estimation of functional abilities, the relative maximal oxygen consumption was used. Dependent variable – playing role – is numerically defined and represents the affiliation of a player to a specific group: (1) setters, (2) central players, (3) receivers – attackers, (4) opposite hitters and (5) libero players. A one-way analysis of variance (ANOVA) with Tukey HSD post-hoc test was used to determine possible significant differences among groups of players. The level of significance was set at 0.05.

Results: Significant differences (p<0,05) were detected for 8 of 16 measured variables - all four anthropometric measures and four measures for the assessment of specific speed – strength capacities.

Conclusion: Based on the obtained results, it is possible to identify the grouping of players in two subgroups, subgroup of attacking players (central players, receivers – attackers and opposite hitters) and the subgroup of the other players (setters and libero players). The main goal of the attackers is to win points with spiking blocking and serving actions for which they need certain anthropometric characteristics (height, weight and arm span) and capabilities that enable high reaches during those actions. Extremely important is the ability to generate high spiking and serving speeds to prevent the reaction of the opponent block, defense and service reception. For the second subgroup it can be said that they are not necessarily concentrated on winning points but on the preparation activities before spike in attack or counterattack like service reception (libero), defense (libero and setter) or setting (setter and libero) in the attack and counterattack complex for which body height, body weight and specific speed – strength capacities are not crucial (setter) or they are completely irrelevant (libero). Based on the obtained results the experts in the training process can direct the players toward specific role and develop very skills that are highly correlated with the specific situational efficiency in the game.

Keywords: volleyball, anthropometry, condition, specialization, playing role

THE KIDMOVE PROJECT - CO-CREATION OF ATHLETE-CENTERED COACHING PRACTICES FOR CHILDREN IN SPORTS TO PREVENT DROP OUT AND SPORTRELATED INJURIES

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Introduction: A significant amount of children in Europe is moving inadequately to stay healthy and there is a high-rate of dropout from organized sports especially at 11-15 years of age. The reasons in the background of the drop out are i.e. loss of interest and fun, coaches' poor pedagogical skills, overemphasis on winning and sport-related injuries. Sports-related injury is one of the five most commonly named reasons for dropout in young athletes. Recent studies have shown that athlete-centered coaching practices with holistic approach, gradual and diverse training, optimizing the workload and delayed specialization are effective ways to prevent injuries and enhance children's continuing participation in sports.

Methods: The aim of the KidMove project is to prevent and reduce the dropout of the 11-15 years-old children from sporting activities. The goal of the project is to identify, co-create and disseminate athlete-centered coaching practices. The project uses co-creation methods by combining the practical knowledge from coaches and views of young athletes, coaches, families and sports clubs with evidence found in literature and expert papers. The project cooperates internationally with actors from sports clubs and organizations, and higher education institutions with multidisciplinary expertise from physiotherapy, podiatry, sport education as well as psychomotricity.

Results: KidMove is a 2-year-long project that shall produce concrete material and outcomes about athlete-centered coaching practices for grassroot sports coaches of young athletes. The athlete-centered coaching practices enhance 1) joy, motivation and empowerment of young athletes and 2) safe sports to prevent sport-related injuries. The good coaching practices include phenomena such as coach as an enabler, parental meetings, tip cards, annual evaluation, social bonding, mentoring systems and others.

Discussion: The athlete-centered coaching practices are put into practice and disseminated nationally and at EU-level through participating countries.

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