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**ABSTRACT**

Edited by Toivo Jürimäe, Mati Pääsuke and Jaak Jürimäe

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University of Tartu  
18 Ülikooli Street  
50090 Tartu  
Estonia

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## **Dear Friends,**

We have a great pleasure to invite you to Fourth Baltic Conference in Exercise and Sport Sciences held in Tartu, Estonia, April 7–9, 2011. We are happy to host you in our country and hope that the time will be unforgettable for all of you.

The meeting is organized by the Faculty of Exercise and Sport Sciences, University of Tartu. University of Tartu, founded by the Swedish King Gustav II Adolf in 1632, has been known in different periods of history as the second-oldest Swedish University and, centuries later, the only University in the Russian Empire in which the language of instruction was German. The Faculty of Exercise and Sport Sciences was founded 80 years ago. The scientific programme will include main lectures in important fields of exercise and sport sciences, given by international and local experts. Both oral and poster presentations are invited on the broad theme of the significance and meaning of sport science.

Toivo Jürimäe  
Mati Pääsuke  
Jaak Jürimäe

## CONTENTS

<b>INVITED SPEAKERS</b> .....	17
<b>N. Armstrong (United Kingdom).</b> The journey from playground to podium .....	19
<b>J. Lanka (Latvia).</b> Sport throwing: an approach to performance development .....	20
<b>F. B. Ortega (Sweden).</b> What do we know about physical activity, fitness and childhood obesity? Evidence from cross-sectional, longitudinal and intervention studies.....	21
<b>A. Raslanas (Lithuania).</b> Programme management for Lithuanian Olympic team training.....	22
<b>L. Raudsepp (Estonia).</b> Psychological and social factors of regular physical activity participation and sport- a developmental perspective .....	23
<b>H. Sievänen (Finland).</b> Exercise loading and bone strength .....	24
<b>FOURTH BALTIC CONFERENCE IN EXERCISE AND SPORT SCIENCES OF YOUNG SCIENTISTS (ORAL PRESENTATIONS)</b> .....	25
<b>H. Aibast, H. Gapeyeva, T. Kums, J. Erelina, M. Pääsuke (Estonia).</b> Baropodometric and plantarflexor muscle strength characteristics in power- and endurance-trained men .....	27
<b>V. Aleknavičiūtė, D. Parulytė, R. Solianik, N. Masiulis, A. Skurvydas (Lithuania).</b> Variability of torque during isometric knee extension and flexion muscles strength after anterior cruciate ligament rupture .....	28
<b>O. Ates, A. Burk, K. Karelson, K. Jagomägi, R. Raamat, J. Talts, H.B. Cotuk, V. Ööpik (Turkey, Estonia).</b> Time dependent changes of heart rate variability during head up tilt test .....	29
<b>E. Balčiūnas, R. Dadelienė, J. Skernevičius, L. Tubelis (Lithuania).</b> Typical features of kayakers physical development, physical preparedness and functional capacity .....	30

<b>N. Barauskiene, A. Stasiulis (Lithuania).</b> Changes in EMG of m. m. vastus lateralis and medialis during heavy cycling one and 24 hours after one leg eccentric exercise .....	31
<b>A. Caune, V. Hein (Estonia).</b> Differences of the constructs related to motivation in physical education among Latvian and Estonian schoolchildren .....	32
<b>L. Daniuseviciute, I. Ramanauskienė, S. Sipavičienė, A. Skurvydas, M. Brazaitis (Lithuania).</b> The effects of menstrual cycle on the perception and cognitive functions.....	33
<b>G. Dargevičiūtė, N. Masiulis, R. Solianik (Lithuania).</b> Force depression dependency on low frequency fatigue and work done.....	34
<b>D. Gražulis, D. Radžiukynas, V. Jančiauskas (Lithuania).</b> Factors that encourage young people practicing soccer .....	35
<b>A. Ivuškans (Estonia).</b> Relationships between somatotype components and bone parameters in prepubertal boys.....	36
<b>T. Kaldur, J. Kals, V. Ööpik, A. Burk, K. Zilmer, M. Zilmer, E. Unt (Estonia).</b> Effect of acclimation on arterial elasticity and endurance capacity in young men in the heat.....	37
<b>A. Kaupuzs, V. Larins (Latvia).</b> A cross-sectional analysis of physical activity, psychological determinants and health related variables of Latvian older adults .....	38
<b>A. Kisieliene (Lithuania).</b> The expression of self-determination and aggression by judo athletes and basketball players .....	39
<b>T. Koovit, H. Aibast, J. Ereline, H. Gapayeva, T. Kums, M. Pääsuke (Estonia).</b> Differences in leg extensor muscle force-generation capacity in young and elderly men .....	40
<b>D. Kudaba, A. Vilkas (Lithuania).</b> Influence of orienteering sport coaches operational competence to the training process....	41
<b>K. Leisson, K. Alev, P. Kaasik, Ü. Jaakma, T. Seene (Estonia).</b> Endurance and speed capacity of akhal-teke horses.....	42
<b>M. Lescinskis, L. Cupriks, U. Ciematnieks, S. Saulīte, S. Rozenstoka, A. Lāce (Latvia).</b> Dynamics of forearm muscle parameters and competition exercises of kettlebell lifters in different training periods .....	43
<b>J. Matsi (Estonia).</b> Preliminary comparison of linear vs. curve-linear relationship pattern analysis based on exercise motivation and related variables .....	44

<b>K. Matulaitis, A. Skarbalius (Lithuania).</b> Case study of long-term training of male basketball players aged 7–17 years in “sabonis’ basketball centre” .....	45
<b>A. Medonis, V. Blauzdys (Lithuania).</b> Development of personal competence of adolescents employing physical self-education process .....	46
<b>M. Mooses (Estonia).</b> Differences between Estonian long and middle distance runners’ functional, anthropometrical and body composition parameters .....	47
<b>G. Onusaityté, A. Skarbalius (Lithuania).</b> Physiological profile of semi profesional female handball .....	48
<b>A.-L. Parm, J. Jürimäe, M. Saar, K. Pärna, V. Tillmann, K. Maasalu, I. Neissaar, T. Jürimäe (Estonia).</b> Plasma adipocytokine levels in relation to bone mineral density in prepubertal rhythmic gymnasts .....	49
<b>D. Parulyté, N. Masiulis, V. Aleknavičiūtė, R. Solianik, G. Dargevičiūtė, A. Skurvydas (Lithuania).</b> Pilot study: does functional tests performance depends on dynamic strength in ACL ruptured patients? .....	50
<b>K. Pärna, A.-L. Parm, M. Saar, T. Jürimäe, J. Jürimäe (Estonia).</b> The influence of anthropometrical parameters to the specific gymnastics tests in young rhythmic gymnasts .....	51
<b>A. Rikberg, L. Raudsepp, K. Kais.</b> Congruence of actual and retrospective reports of precompetition affect and anxiety for young volleyball players .....	52
<b>R. Rämson (Estonia).</b> The changes of perceived recovery-stress state, cytokines and ghrelin during high volume training period .....	53
<b>T. Rääsk (Estonia).</b> Relationship between anthropometrical parameters and swimming performance among young male swimmers .....	54
<b>S. Sabaliauskas, S. Poteliūnienė (Lithuania).</b> Causal conditions for effective interaction between elite athletes and their coaches from coaches’ point of view .....	55
<b>J. Sagim, K. Alev, P. Kaasik, A. Pehme (Estonia).</b> Effect of resistance training on fast skeletal muscle morpho-functional parameters .....	56
<b>R. Sakalauskaitė, D. Satkunskienė (Lithuania).</b> A new foot type classification scale for foot arch evaluation .....	57



<b>S. Saulite, L. Cupriks, V. Fedotova, U. Ciematnieks, M. Lescinskis (Latvia).</b> Developing of kicking speed qualities in taekwondo.....	58
<b>J. Sokk, H. Gapeyeva, J. Ereline, M. Merila, M. Pääsuke (Estonia).</b> Recovery of shoulder function after manipulation under general anesthesia in frozen shoulder syndrome patients – six months followup study.....	59
<b>R. Solianik, D. Parulyté, N. Masiulis, A. Skurvydas, V. Aleknavičiūtė, V. Streckis, V. Dudonienė (Lithuania)</b> Accurate and fast movement performance in the lower extremity: normal vs. anterior cruciate ligament reconstructed knees.....	60
<b>R. Solianik, A. Skurvydas, M. Brazaitis, G. Dargevičiūtė, N. Masiulis, D. Parulyté (Lithuania).</b> Age-related motor performance: blocked vs random task.....	61
<b>L. Utsal, J. Jürimäe, P. Purge, J. Mäestu, M. Saar, E. Lätt, V. Tillmann, M. Zilmer, T. Jürimäe (Estonia).</b> Associations of different inflammatory markers with body fat mass in 11-year old overweight boys.....	62
<b>D. Vahtrik, H. Gapeyeva, H. Aibast, J. Ereline, T. Kums, T. Haviko, M. Rätsepsoo, A. Märtson, G. Schneider, M. Pääsuke (Estonia).</b> Quadriceps femoris muscle force generation and relaxation capacity after total knee arthroplasty.....	63
<b>S. Vaiksaar, J. Jürimäe, J. Mäestu, P. Purge, T. Jürimäe (Estonia).</b> Menstrual cycle phase has no effect on fuel oxidation during submaximal exercise in endurance-trained rowers.....	64
<b>D. Vaitkevičiūtė, K. Milašius, J. Skernevičius (Lithuania).</b> The characteristics of training, physical strength and functional ability variations for Lithuania’s world champion runner-up and world cup champion pentathlete .....	65
<b>M. Zienius, A. Skarbalius (Lithuania).</b> Peculiarities of performance indicators on the professional golf association tour 2010 .....	66
<b>A. Zusa, J. Lanka, A. Paeglītis, V. Fedotova (Latvia).</b> Analysis of young tennis players’ statics of the locomotor system .....	67

<b>FOURTH BALTIC CONFERENCE IN EXERCISE AND SPORT SCIENCES (ORAL AND POSTER PRESENTATIONS).....</b>	<b>69</b>
<b>S. Anisimova, A. Fernate (Latvia).</b> Correlation between functional tests results and physical activity level in 55–65 year-old women.....	71
<b>O. Batutis, T. Pakštys (Lithuania).</b> Value orientation expression in the context of 15–18 year-old adolescents' physical activity..	72
<b>D. Belyukov (Russia).</b> Sports history of Pskov province in pre-soviet period.....	73
<b>I. Bula – Biteniece, R. Jansone, J. Grants (Latvia).</b> Family sport in preschool education.....	74
<b>A. Burk, S. Timpmann, K. Kreegipuu, M. Tamm, K. Karelson L. Medijainen, E. Unt, V. Ööpik (Estonia).</b> Effects of acclimation on endocrine response to exercise in young men in the heat .....	75
<b>U. Ciematnieks, L. Čupriks, N. Keizāns, M. Lesčinskis, S. Saulīte (Latvia).</b> Immediate effect of vibrostimulation .....	76
<b>R. Dadelienė, J. Skernevičius, R. Paulauskas. A. Šatas (Lithuania).</b> Changes of physical development and functional capacity of deaf basketball players (women) during preparatory period for 21 summer deaf Olympic Games .....	77
<b>B. Donuk (Turkey).</b> The examination of sport managers and coaches' stress levels and depressed mood at work .....	78
<b>I. Dravniece (Latvia).</b> Comparison of results in study course “movement games” in LASE .....	78
<b>V. Fedotova, V. Pilipiv (Latvia).</b> Comparison of bobsleigh performance at St. Moritz track.....	79
<b>V. Fedotova, V. Pilipiv (Latvia).</b> Timing rhythm in female lugers' starts .....	80
<b>A. Fernate (Latvia).</b> The physical education teachers' professional activity motivation and planning competence: a qualitative approach .....	81
<b>Z. Galeja, A. Paeglītis, E. Eglītis (Latvia).</b> Influence of functional state of cervical vertebra on regulation of tone of anterior part of neck muscles.....	82
<b>H. Gapeyeva, H. Aibast, J. Ereline, T. Kums, K. Jansen, M. Pääsuke (Estonia).</b> Postural stability of stance in female endurance trained athletes versus moderately physically active women aged 18–26 years .....	83

<b>A. Gedvilaite (Lithuania).</b> Evaluation of the sport strategy project in Lithuania .....	84
<b>V. Ginevičiene, A. Jakaitiene, K. Milašius, L. Tubelis, V. Kucinskas (Lithuania).</b> Association analysis of the ACE and ACTN3 polymorphisms with physical performance phenotypes in Lithuanian athletes .....	85
<b>J. Grants, I. Belousa, I. Kravalis, J. Zidens (Latvia).</b> Qualitative research on dual career for professional athletes in latvia: inductive approach .....	86
<b>J. Gross (Estonia).</b> Technique and methodics of check rotation jumping in figure skating: four steps from single jumps to quadruples .....	87
<b>V. Hein (Estonia).</b> Relationships between teacher motivation and teaching methods .....	88
<b>V. Issurin (Israel).</b> Block periodized training in view of the theory of adaptation and insights of sport psychology .....	89
<b>M. Jakovleva, J. Zidens, A. Fernate (Latvia).</b> Coach opinion about the opportunities, participation and motivating factors of further education in Latvia .....	90
<b>T. Jallai, J. Ereline, T. Kums, H. Aibast, H. Gapejeva, M. Pääsuke (Estonia).</b> Physiological characteristics of male basketball players during pre-season phase: a pilot study .....	91
<b>K. Jansen, L. Esko, M. Luik, V. Viljasoo, J. Ereline, H. Gapeyeva, H. Aibast, M. Pääsuke (Estonia).</b> Subjective and objective workload assessment in male tile layers .....	92
<b>E. Johanson, J. Ereline, H. Gapeyeva, M. Pääsuke, S. Brumagne (Estonia, Belgium).</b> Back extensor muscle fatigability and postural control in people with low back pain ...	93
<b>V. Juškeliénė, S. Poteliūnienė (Lithuania).</b> Socialization agents as the constrains of insufficient health related physical activity among Lithuanian adolescences .....	94
<b>J. Jürgenson, P. Kampus, M. Zagura, V. Ööpik, K. Karelson, M. Viru, E. Unt (Estonia).</b> Effect of strength training on arterial stiffness and blood pressure in powerlifting athletes .....	95
<b>P. Kaasik, K. Alev, M. Aru, A. Pehme, R. Puhke, L. Lahe, E.-L. Rahu-soo (Estonia).</b> Dynamics of myogenetic response followed after myotoxin- caused muscle damage .....	96

<b>P.S. Kaimbacher, E. Tafait, R. Möller, K. Sudi, S. J. Wallner-Liebmann, P. Scheer, M. Dunitz-Scheer (Austria).</b> Subcutaneous adipose tissue topography (SAT-Top) development in young children.....	97
<b>A. Kamar, Ö.C. Göksu (Turkey).</b> The effects of Astrand and 3 step test on the values of circulation parameters, leukocyte, neutrophyl and lymphocyte.....	98
<b>M. Katinas, V. Lemezis (Lithuania).</b> Aspects of co – ordination abilities training in 10–11 years old football players by the way of use of nonstandard balls.....	99
<b>A. Kholodnova, A. Stasiulis (Latvia, Lithuania).</b> Influence of coral calcium “coral mine” on working capacity and restoration of sportsmen after loading.....	100
<b>A. Klonova, A. Cicchella, J. Klonovs (Latvia, Italy).</b> Biomechanical analysis of partners’ contact in standard dances using motion capture smart system 2011 .....	101
<b>A. Koka, R. Viira (Estonia).</b> Causal relationships between global self-esteem and health-related quality of life among adolescents .....	102
<b>V. Kontautienė, A. Vilkas (Lithuania).</b> Correlation between 9–10 year old students’ self-control skills and subjective social adaptation.....	103
<b>V. Krauksts, U. Ciematnieks, L. Čupriks, K. Krauksts, A. Nemčenko (Latvia).</b> Local vibration in strength endurance development.....	104
<b>M. Kull, J. Matsi, L. Raudsepp (Estonia).</b> What is more important for health – the domain of physical activity or amount of physical activity? .....	105
<b>T. Kums, H. Pilt, H. Gapeyeva, H. Aibast, J. Ereline, K. Jansen, V. Viljasoo, M. Pääsuke (Estonia).</b> Whole-body vibration and postural control ability in middle-aged men .....	106
<b>I. Liepina, D. Krauksta (Latvia).</b> Games for development of balance for climbing sportists .....	107
<b>A. Litwiniuk, R. Cieśliński, E. Huk-Wieliczuk, A. Daniluk (Poland).</b> The lifestyle of the polish students of the University of Physical Education and Sport in Biala Podlaska.....	108
<b>S. Luika (Latvia).</b> Realization of governmental sport politics in Latvia .....	109

<b>E. Maciuleviciene, K. Kardelis, S. Domarkiene (Lithuania).</b> Adults subjective health evaluation and their interrelation to socio-demographic and health risk factors.....	110
<b>E. Maciuleviciene, R. Sadzeviciene (Lithuania).</b> Different physical activity schoolchildren approach to physical education .....	111
<b>E. Maciuleviciene, R. Sadzeviciene (Lithuania).</b> Family influence on England and Lithuanian 9th grade students physical activity .....	112
<b>E. Maciuleviciene, R. Sadzeviciene (Lithuania).</b> Vigorous physical activity content in adolescent boys.....	113
<b>E. Maciuleviciene, R. Sadzeviciene, O. Smirnoviene (Lithuania).</b> The changes of physical fitness in Lithuanian schoolgirls .....	114
<b>D. Mickeviciene, K. Motiejūnaitė, A. Skurvydas, D. Karanauskienė, V. Mickevicius (Lithuania).</b> Is intraindividual variability of motor performance different between unilateral and bimanual speed-accuracy tasks?.....	115
<b>A. Molotanovs, J. Žīdens, R. Līcis (Latvia).</b> Correlation between functional results and competition of the handball goalkeeper .....	116
<b>K. Motiejūnaitė, D. Mickevičienė, A. Skurvydas, K. Pukėnas, D. Karanauskienė (Lithuania).</b> Gender-dependent bimanual task performance .....	117
<b>J. Mäestu, C.L. Passariello, R. Gruodytė, K. Hiio, J. Jürimäe, M. Saar, A. Cichella, C. Stefanelli, G. Moruzzi, T. Jürimäe (Estonia, Italy).</b> Adipoq SNP45 associated with lean body mass in physically active normal weight adolescent girls.....	118
<b>S. Pajaujiene, R. Jankauskiene (Lithuania).</b> The relationships between addictions, exercising, weight reduction behavior and risk of eating disorders in the sample of 11th students.....	119
<b>M. Pečiukoniene, E. Kemeryte-Riaubienė, R. Stukas, R. Paulauskas (Lithuania).</b> Nutrient supply of high performance women basketball players .....	120
<b>E. Petkus, A. Raslanas, J. Skernevičius (Lithuania).</b> The specific directions of the training of Lithuanian high performance rowers.....	121
<b>I. Pontaga (Latvia).</b> Adaptation of human tibia bone tissue characteristics to regular physical loads.....	122

<b>I. Pontaga (Latvia).</b> Knee joint stability estimation by hamstrings/ quadriceps femoris muscles torques ratios in range of movements.....	123
<b>P. Purge, J. Mäestu, M. Saar, E. Lätt, R. Rämson, L. Utsal, T. Jürimäe, J. Jürimäe (Estonia).</b> The effect of time in sport training to physical performance and anthropometrical parameters in 10–11 year old young boys.....	124
<b>M. Pääsuke, J. Ereline, H. Gapeyeva, T. Kums, H. Aibast, M. Leht, M. Nigul, R. Pääsuke, E. Seppet (Estonia).</b> Quadriceps femoris muscle force production capacity and volume in moderately physically active young and elderly women.....	125
<b>V. Rakauskienė, L. Kardelienė (Lithuania).</b> Alteration of adolescent athletic identity when applying brief counselling.....	126
<b>R. Rutkauskaite, M. Brazauskas, A. Emeljanovas (Lithuania).</b> Inter-relation between schoolchildren physical activity, physical fitness and academic achievements.....	127
<b>R. Rutkauskaite, D. Bujaunuskas (Lithuania).</b> Family and friend influence on schoolchildren's physical activity.....	128
<b>R. Rutkauskaite, A. Emeljanovas, D. Novak, J. Poderys (Lithuania, Croatia).</b> Impact of training in sports games and cyclic sports events on muscles and cardiovascular system of 11–14 years old boys.....	129
<b>R. Rutkauskaite, A. Emeljanovas, I. Valantiniene, D. Novak (Lithuania, Croatia).</b> Relationship between physical activity and health-related physical fitness of 17-year-old girls.....	130
<b>R. Rutkauskaitė, A. Emeljanovas, V. Volbekienė, E. Maciulevičienė, R. Sadzevičienė, O. Batutis (Lithuania).</b> Relationships between physical activity and physical fitness in Lithuanian schoolboys.....	131
<b>M. Saar, T. Jürimäe, M. Pääsuke, T. Kums, H. Gapeyeva, J. Ereline, J. Jürimäe (Estonia).</b> Relationships between contraction properties of knee extensor muscles and fasting IGF-1 and adipocytokines in physically active postmenopausal women.....	132
<b>I. Sağıroğlu, O. Ateş, M. E. Önen, M. Kayatekin, I. Semin (Turkey).</b> Effect of plyometric training on vertical jump performance and anaerobic capacity in young basketball players.....	133

<b>T. Seene, P. Kaasik, K. Alev (Estonia).</b> Training paradox: concurrent endurance and strength training .....	134
<b>A. Skarbalius (Lithuania).</b> Selected monitoring sport performance in handball.....	135
<b>V. Skyriene, T. Sibik (Lithuania).</b> Analysis on the efficiency of the swim start improvement program .....	136
<b>B. Smila, V. Zaļaiskalna, Andra Fernate (Latvia).</b> Young orienteers' balance improvement .....	137
<b>B. Statkevičienė (Lithuania).</b> 2010 world masters swimming championship results evaluation in 200m–800m distances.....	138
<b>B. Statkevičienė (Lithuania).</b> Lithuania's all time swimming championships and their champions .....	139
<b>L. Straubergaite, K. Muckus, L. Škikas (Lithuania).</b> The effect of physical therapy on the symmetry of passive mechanical properties of muscles of children with and without cerebral palsy .....	140
<b>A. Suprun, Y. Medvedeva (Russia).</b> Major training algorithmization in rhythmic gymnastics considering psychological and physiological peculiarities of sportswomen .....	141
<b>K. Tammik, L. Pilt (Estonia).</b> Motor development of 5-year-old children with iron deficiency anemia and iron deficiency in infancy.....	142
<b>S. Timpmann, A. Burk, L. Medijainen, M. Tamm, K. Kreegipuu, E.Unt, V. Ööpik (Estonia).</b> Effects of sodium citrate on recovery after rapid body mass loss in wrestlers.....	143
<b>S. Valo, T. Janson (Estonia).</b> Falls as risk factors of health problems of elderly: occurrence, consequences and measures for prevention in Estonia .....	144
<b>R. Viira, A. Koka (Estonia).</b> Does students' motivational responses toward physical education are correlated with after-school sport participation? .....	146
<b>K. Zaicenkoviene, A. Stasiulis (Lithuania).</b> The effect of preceding drop jumps on oxygen uptake kinetics during moderate and heavy intensity running in young women.....	147
<b>R. Žilinskienė, J. Armonienė (Lithuania).</b> Attitude of the university students towards their health, physical activity and self-dependent physical development .....	148

<b>N. Žilinskienė, D. Radžiukynas (Lithuania).</b> Analysis of the results alteration of the elite female high jumpers during the long-term training process.....	149
<b>I. J. Zuoziene (Lithuania).</b> Did the increase in the results of competitive swimming cease after banning the use of new technology swimming suits? .....	150
<b>INSTRUCTION TO AUTHORS</b> .....	152



## **INVITED SPEAKERS**



## **THE JOURNEY FROM PLAYGROUND TO PODIUM**

**N. Armstrong**

University of Exeter, UK

Initial selection and retention in elite sport takes place within a matrix of biocultural characteristics but success in sport during youth is underpinned by a range of age- and maturation- related factors which influence performance in a gender- and sport-specific manner. Biological clocks run at different rates and boys who mature early are taller, heavier, and more muscular than boys of the same chronological age who mature later. A marked increase in muscle mass results in the expression of greater strength during adolescence. The muscle enzyme profile needed to promote the anaerobic generation of energy is enhanced as children move through adolescence into young adulthood and this is reflected by a surge in boys' anaerobic performance.

Aerobic fitness is strongly and independently related to age, growth, and maturation. As selection for youth sport is based on chronological age, few later maturing boys are successful during early adolescence. Earlier maturing girls do experience an adolescent spurt in physiological processes such as muscle strength, muscle power and aerobic fitness which promote sport-performance but the differences in physiological characteristics associated with maturity are less pronounced in girls than in boys. The linear physiques, with less weight for height, less fatness, relatively longer legs and lower hip-to-shoulder ratios of later maturers are more suitable for success in some sports. Earlier maturers therefore tend not to dominate elite female sport. This presentation will analyze the journey from playground to podium and explore whether boys and girls follow the same route or travel at the same speed

## **SPORT THROWING: AN APPROACH TO PERFORMANCE DEVELOPMENT**

**J. Lanka**

Latvian Academy of Sport Education, Latvia

The purpose of this review is to summarize the results of investigations on the biomechanics of shot putting and javelin throwing. The main emphasis is on the conventional technique. Precise and thoroughly documented data are available on only certain aspects of performance. Many variations in technique are based on personal opinions of athletes, coaches and researchers. In the research, using shot put as an example of a difficult movement, we have worked out the evaluation methodology of the movement technique quality and acquiring level. Sports technical proficiency is determined by many indices, the main one are – rationality and effectiveness of the technique, as well as the degree of acquiring. The technical means that allow achieving the highest results are considered to be rational. To what extent the athlete can realize his/her preparedness, using one or other variant of movement execution, shows the realization effectiveness of technical means. A well acquired movement is characterized by the stability, durability and the maintaining of the execution level after a break in training. Skilful throwing should follow the biomechanical principles (universal, particular) of coordinated movements: general laws based on physics and biology which determine human motion. Several mechanisms (“whip technique”, reversible muscle action, body and body parts as inverted pendulum a.o.) ensure maximal release velocity of the sport implement. Report will be about our research main results.

# **WHAT DO WE KNOW ABOUT PHYSICAL ACTIVITY, FITNESS AND CHILDHOOD OBESITY? EVIDENCE FROM CROSS-SECTIONAL, LONGITUDINAL AND INTERVENTION STUDIES**

**F. B. Ortega**

Unit for Preventive Nutrition at Karolinska Institutet, Sweden  
School of Medicine at University of Granada, Spain.

Physical fitness and adiposity, especially abdominal adiposity, are well-known factors associated with general health status in childhood and adolescents. Physical activity may play a crucial role in fitness enhancement and the prevention of abdominal adiposity accumulation. The apparently obvious association of physical activity with fitness and adiposity still requires further research, since previous knowledge is mostly based on data from self-reported measures but such measures are of limited use in pediatric populations. Over the last ten years our group has focused its research on physical activity and fitness in relation to obesity and other health outcomes. Large-scale epidemiological studies, such as the AVENA study (Spanish adolescents), the EYHS (children and adolescents from different countries in Europe, including Estonia and Sweden), the HELENA study (adolescents from 9 different countries in Europe), the ALPHA study (young and adult people from 6 countries in Europe) have greatly contributed to a better understanding of the potential of physical activity and fitness as health promotion tools. Recent longitudinal data from the EYHS collected in Estonia and Sweden are providing new evidence on important health issues by identifying determinants related with the development of different diseases, such as childhood obesity. Intervention studies (such as the EDUFIT study) will confirm or contrast the findings provided by observational studies during the last years, establishing key recommendations for designing successful disease prevention strategies.

## **PROGRAMME MANAGEMENT FOR LITHUANIAN OLYMPIC TEAM TRAINING**

**A. Raslanas**

Vilnius Pedagogical University, Lithuania

The main effect on the advancement of sport achievements results from the optimization of athletes' training technologies, the logical construction of the structure of athletes' preparation and its management. In the process of sports training it is necessary to improve and extend organizational forms, which constitute a pattern for training and competition (Karoblis, 2007; Thomas et al., 2008). The goal of this research was to create and scientifically validate the system of Lithuanian elite athlete training and the programme of Lithuanian athlete preparation for summer and winter Olympic Games. Research has identified the management principle of elite athlete preparation, which is collective model for athlete development. In the research we investigated social features of Lithuanian athlete development, determined the main principles of national sport development programmes, and proposed a long-term structural schema of Lithuanian Olympic team preparation, organizational structure and functions of athlete development as well as scientific and methodical management.

# **PSYCHOLOGICAL AND SOCIAL FACTORS OF REGULAR PHYSICAL ACTIVITY PARTICIPATION AND SPORT- A DEVELOPMENTAL PERSPECTIVE**

**L. Raudsepp**

University of Tartu, Estonia

Understanding development, whether motor, cognitive, or emotional, has been a central focus of scientific investigations mainly in psychology for hundreds of years. How are changes in the way we perceive our world and our ability to master physical tasks associated with changes in the way we feel, interact with others, and behave in physical activity and sport contexts? Clearly, a developmental perspective is crucial for understanding and explaining varying perceptions, emotions, social factors, and achievement behaviors related to regular physical activity and sport participation across the childhood and adolescence. Additionally, understanding age-related changes in perceptions, physical competencies, emotions, social influences, and achievement behaviors is critical in terms of developing theory, enhancing our research knowledge base, and devising applied programs to promote positive physical activity and sport experiences for youth. The general objective of the current lecture is to give an overview of studies in which different psychological and social factors of regular physical activity participation and sport of Estonian children and adolescents were examined from a developmental perspective. The results of cross-sectional and longitudinal studies will be presented and theoretical as well as practical suggestions and applications will be discussed.

## **EXERCISE LOADING AND BONE STRENGTH**

**H. Sievänen**

The UKK Institute, Finland

Basically the mammal bones are relatively light to allow efficient movement at low metabolic cost, and the long bones provide stiff lever arms for locomotive muscle contractions. To cope with varying loading conditions, bone tissue contains a cell-based control system that can sense load-induced minuscule deformations within the stressed bone. Thus, any substantial change in prevalent skeletal loading can modify the bone structure so that the load-specific prevalent strains remain within a physiologically predetermined range. Studies on athletes provide useful “natural experiments” to unravel associations of specific, long-term exercise loading with bone structure. From our 20 years experience, we can speculate on some general principles of natural functional adaptation of bone to different exercise loading types. High impacts and impacts from atypical directions are the most effective loading to strengthen bone. Cortical thickness of loaded bones is generally increased – particularly so if subjected to high impacts. Also, cross-sections of long bone diaphyses are larger – particularly so if subjected to great bending loads. In contrast, cross-sections of bone epiphyses seem not to be larger, the forearm excluded and when the exercise had been started before puberty. In addition, cross-sectional geometry reflects the predominant loading direction. Trabecular apparent density (~trabecular architecture) at loaded bones is generally higher, and is close to ‘ceiling’ if the bone experiences high impacts. In contrast, cortical apparent density is slightly reduced among athletes. In conclusion, findings from various athlete studies suggest that exercise regimens that include moderate- to high-magnitude impacts from varying loading directions represent the optimal mode to enhance bone structure and strength. Several RCTs, although showing much smaller treatment effects, support the above notion.



**FOURTH BALTIC CONFERENCE  
IN EXERCISE AND SPORT SCIENCES  
OF YOUNG SCIENTISTS  
(ORAL PRESENTATIONS)**



## **BAROPODOMETRIC AND PLANTARFLEXOR MUSCLE STRENGTH CHARACTERISTICS IN POWER- AND ENDURANCE-TRAINED MEN**

**H. Aibast, H. Gapeyeva, T. Kums, J. Ereline, M. Pääsuke**

University of Tartu, Estonia

**Aim:** This study investigated postural control characteristics during gait, active range of motion (aROM) in ankle joint and maximal voluntary isometric contraction (MVC) force of the plantarflexor muscle in male endurance (END; n=10, 21.8±2.4 yrs, 181.2±4.6 cm, 71.8±5.5 kg) and power (POW; n=11, 23.1±3.7 yrs, 187.6±8.2 cm, 80.4±7.9 kg) athletes and untrained control group (CON; n=10, 23.6±2.7 yrs, 182.4±8 cm, 83.1±1 kg). The total duration of training were 8.9±3.8 yrs in END and 10.8±3.9 yrs in POW group, respectively. **Methods:** Body weight distribution during gait between forefoot and rearfoot, the total surface, the total load and the mean load pressure in right and left foot with gait velocity were measured with Digital Biometry Images Scanning System (Italy). The isometric MVC force of plantarflexor muscles was measured at frequency of 100 kHz and stored on a hard disk of a computer using software WsportLab (Estonia). The ankle active plantar- and dorsiflexion were recorded by mechanical Biplane Goniometer (USA). **Results:** The total surface of the right foot was larger in CON compared to END group (116.8±15.7 vs 100.9±19.2 cm<sup>2</sup>, p≤0.05). There was a tendency towards larger dorsiflexion in right ankle (13.9±3.4 vs 11.4±2.4 deg, p≤0.06) and total foot surface in left foot (112.9±21.8 vs 97.3±14.3 cm<sup>2</sup>, p≤0.06) between CON and END, respectively. A large rearfoot weight ratio was noted in left foot in POW compare to END group (47.2±4.0 vs 43.4±3.9 %, p≤0.04). The MVC power of the dominant plantar muscles was greater in POW compare to END group (1002.7±109.5 vs 1117±82 N, p≤0.03). **Conclusion:** Total foot surface during gait is influenced by body weight and plantarflexor strength: subjects with higher body weight had larger foot surface, whereas subjects with

greater plantarflexor strength had less foot surface during gait. The study was supported by project EU28869 “Development and introduction of novel technology to be embedded in Myoton Lite allowing for objectified muscle assessment – MYOLITE”.

## **VARIABILITY OF TORQUE DURING ISOMETRIC KNEE EXTENSION AND FLEXION MUSCLES STRENGTH AFTER ANTERIOR CRUCIATE LIGAMENT RUPTURE**

**V. Aleknavičiūtė<sup>1,2</sup>, D. Parulytė<sup>2</sup>, R. Solianik<sup>2</sup>, N. Masiulis<sup>2</sup>,  
A. Skurvydas<sup>2</sup>**

<sup>1</sup> Šiauliai State College, Lithuania

<sup>2</sup> Lithuanian Academy of Physical Education, Lithuania

The aim of this study was to determine variability of torque (VT) during isometric knee flexion (KF) and knee extension (KE) muscles strength after anterior cruciate ligaments rupture. Methods: each of the 11 male took a part in control (non-injured leg) and experimental (with ACL) group. KF and KE muscles isometric maximal voluntary contraction (MVC) torque and VT was measured in seated position with hip flexed 90° and knee at 40°, 80° angles. Isometric VT was established during a 20 seconds isometric contraction at a target torque equal to 40% of isometric MVC torque. All subject performed 3 trials: 2 with and 1 without visual feedback (VF). Results: In injured and non-injured leg there was difference ( $p < 0.05$ ) in KE with VF at 80° angle. In KE muscles with and without VF there was difference ( $p < 0.05$ ) in non-injured leg at 40°, 80°, in injured leg at 40°, 80 angles. In KF between trials with and without VF there was differences ( $p < 0.05$ ) in non-injured leg at 40° and injured leg at 80° angles. The results showed, that KE muscles variability at 80° angle is higher in injured compared to non-injured legs. Also KF and KE muscles variability at 40° and 80° angles in tasks without VF compared with VF.

## **TIME DEPENDENT CHANGES OF HEART RATE VARIABILITY DURING HEAD UP TILT TEST**

**O. Ates<sup>1,2</sup>, A. Burk<sup>2</sup>, K. Karelson<sup>2</sup>, K. Jagomägi<sup>2</sup>, R. Raamat<sup>2</sup>,  
J. Talts<sup>2</sup>, H.B. Cotuk<sup>3</sup>, V. Ööpik<sup>2</sup>**

<sup>1</sup> Istanbul University, Turkey

<sup>2</sup> University of Tartu, Estonia

<sup>3</sup> Marmara University, Turkey

**Aim:** Analysis of heart rate variability (HRV) provides a non-invasive measure of autonomic heart rate (HR) control. The aim of the present study was to evaluate time dependent changes of HRV and follow High (HF) and Low frequency (LF) bands during head-up tilt (HUT). **Methods:** Nineteen athletes [age  $24.2 \pm 2.7$  yr;  $VO_{2max}$   $52.9 \pm 7.4$  ml/kg/min] rested for 10-min in supine on the horizontal tilt table (TT). Then the TT was brought up to  $70^\circ$  within 3 s for 10 min, and finally it was lowered down to horizontal position for the last 10 min. HR data were collected with Suunto® Memory Belt. Time dependent spectral analysis of HF and LF bands of HRV was performed by wavelet based multiscale Time-Frequency-Distributions (mTFD) (Procalysis® [www.simplana.de](http://www.simplana.de)). **Results:** During HUT the initial HR increase was accompanied by LF power elevation and HF power decrease, but LF power decayed toward the end of HUT. After HUT HF power was recovered rapidly. The evolution of the time localized LF/HF quotient showed inter-individually varying fluctuations and patterns. **Conclusions:** In these trained athletes, HUT resulted in increased but fluctuating sympathetic activity. Such nonlinear time evolutions of spectral indices of HRV require adequate time resolved spectral analysis by wavelet based mTFD.

## **TYPICAL FEATURES OF KAYAKERS PHYSICAL DEVELOPMENT, PHYSICAL PREPAREDNESS AND FUNCTIONAL CAPACITY**

**E. Balčiūnas, R. Dadelienė, J. Skernevičius, L. Tubelis**

Vilnius Pedagogical University, Lithuania

The aim of our work was to examine physical development, physical and functional capacity of elite Lithuanian kayakers, and to compare data of high physical active with not engaged in sports persons. We examined 12 elite Lithuanian kayakers and 36 students of Vilnius Pedagogical University. We estimated the main indices of their physical development; height, body mass, the fat muscle mass index, leading hand force, lung volume. To evaluate physical capacity we asses single muscle contraction capacity, anaerobic alaktic muscular power, gas analyzers was used to asses  $VO_2$  max. To assess the functional capacity of the circulatory system, we measured the pulse rate at rest, in orthostasis, in response to a standard physical load and after 60s of recovery. We determined the rate of psychomotor reaction and central nervous system liability by applying a 10-s tapping test. Kayakers body mass, leading hand force, single muscle contraction capacity, anaerobic alaktic muscular power, psychomotor reaction, movement frequency indices are far from not engaged in sports persons more than 3 S. Analysis of data showed that high physical active kayakers have exceptional feature of organism. It is necessary to pay attention in choosing process of sport's branches and in process of physical training for preparing high performance athletes.

## **CHANGES IN EMG OF M. M. VASTUS LATERALIS AND MEDIALIS DURING HEAVY CYCLING ONE AND 24 HOURS AFTER ONE LEG ECCENTRIC EXERCISE**

**N. Baranauskiene, A. Stasiulis**

Lithuanian Academy of Physical Education, Lithuania

The aim of the study was to assess the differences of EMG parameters of quadriceps during heavy cycling exercise after one leg eccentric exercise in male students. Methods: On four different days 8 male students performed one increasing (ICE) and three (control, 1 h and 24 h after one leg eccentric exercise (EE)) heavy cycling (Ergoline-800, Germany) exercises (HCE). As EE subjects performed ten sets of 12 knee extensions on isokinetic dynamometer (System 3, New York). The intensity of HCE was set in the middle between first and second ventilatory thresholds which were determined using pulmonary gas exchange parameters (Oxycon Mobile, Germany) during ICE. The cadence was 70 rpm. Pulmonary gas exchange parameters and EMG (Biometrics Ltd, USA) of both thighs m. vastus lateralis and m. vastus medialis were continuously recorded during HCE. Results: The EMG root mean square amplitude significantly decreased of left (not eccentric exercised) m. vastus lateralis one hour after EE ( $P < 0.01$ ), with no significant difference of right (eccentric exercised) m. vastus lateralis during HCE. After 24 h the subjects felt moderate muscle pain (5.9 (1.4)) according to Borg's CR-10 scale and the creatine kinase (CK) activity in blood 24 h after EE had increased ( $P > 0.05$ ) up to 792.7 (547.2) IU/ L (pre-exercise CK 131.2 (46.7) IU/ L). Conclusion: Prior EE seems to have significant effect on EMG of not eccentric exercised left quadriceps during heavy cycling exercise within one hour of recovery in male students.

## **DIFFERENCES OF THE CONSTRUCTS RELATED TO MOTIVATION IN PHYSICAL EDUCATION AMONG LATVIAN AND ESTONIAN SCHOOLCHILDREN**

**A. Caune, V. Hein**

University of Tartu, Estonia

The objectives of this study was at first to evaluate the appropriateness of instruments to measure the perception of psychological needs, intrinsic and extrinsic types of motivation and perceived autonomy supportive behaviour. The second aim was to test whether the differences exist between these constructs among Latvian and Estonian schoolchildren. A sample of 704 schoolchildren from Latvia (n=365) and Estonia (n=339) at age of was used for this study. Methods: The perceived autonomy supportive behavior from teacher was assessed by the items presented by Reeve and Halusic (2009). The perception of psychological needs and the types of motivation was assessed by the items presented Standage et al (2005). Confirmatory factor analyses and reliability coefficients were used to test the appropriateness of the instruments. The comparison of the constructs was made by the independent t-test. Results: The fit indexes of the instruments were acceptable [(NNFI=0.96, CFI=0.97 and RMSEA=0.07 (CI95 0.067–0.077); NNFI=0.96, CFI=0.97 and RMSEA=0.07 (CI95 0.065–0.080) respectively for measuring motivational types and the perception of psychological needs]. The comparison of the types of motivation showed that Estonian children evaluated all motivational types higher than Latvian children. However, index of motivation, calculated by the types of motivation, was not different across cultural groups. No difference was found between perceived relatedness. Estonian children perceived psychological needs (except relatedness) and perceived autonomy supportive behavior higher than Latvian children. Conclusions: The instruments were appropriate to measure motivational types and perception the psychological needs. All types of motivation are higher in Estonian than Latvian children.



## **THE EFFECTS OF MENSTRUAL CYCLE ON THE PERCEPTION AND COGNITIVE FUNCTIONS**

**L. Daniuseviciute<sup>1,2</sup>, I. Ramanauskienė<sup>2</sup>, S. Sipavičienė<sup>1</sup>,  
A. Skurvydas<sup>1</sup>, M. Brazaitis<sup>1</sup>**

<sup>1</sup> Lithuanian Academy of Physical Education, Lithuania

<sup>2</sup> Kaunas University of Technology, Lithuania

The main aim of the study was to investigate the relation between the menstrual cycle on the perception and cognitive function. Healthy and physical active women (n=15) and basketball players (n=17) with normal menstrual cycle, whom age 19–23 years have participated in the study. All the participants did not use oral contraceptives during 6 month and had regular menstrual cycle. Each participated subject measured basal body temperature (BBT) every morning 3 month before the experiment. BBT have increased approximately 0.3 °C after ovulation, which is sustained throughout the luteal phase. At the beginning of every experiment the sample of 5 ml venous blood was taken to establish the menstrual cycle phases: follicular, ovulation, luteal phases and also the amount of estradiol $17\beta$ -estradiol. Proprioception of the knee was evaluated by examining the joint position sense using a Biodex 3 the knee was extended slowly from 90° flexion at an angles and flexed from 0° extention ant an angles, velocity of 2°/s, 5°/s, 10°/s. Attention, short-term memory tasks, reaction time measurement were made to estimate the cognitive functions. Knee joint kinesthesia was impaired in the luteal phase compared to the follicular and ovulatory phases. The basic cognitive functions (reaction time, visual short-term memory and sustained attention) are affected by menstrual cycle.

## **FORCE DEPRESSION DEPENDENCY ON LOW FREQUENCY FATIGUE AND WORK DONE**

**G. Dargevičiūtė, N. Masiulis, R. Solianik**

Lithuanian Academy of Physical Education, Lithuania

When muscle is allowed to shorten during an active contraction, the maximum force that redevelops after shortening is smaller than the isometric force at the same muscle length without prior shortening. This phenomenon is referred to as force depression (FD) following muscle shortening contractions. The purpose of this study was to investigate FD dependency on low frequency fatigue (LFF) and work done (WD). Healthy untrained men ( $n=8$ ) performed isometric reference contractions (ISOM) and isometric–concentric–isometric (ICI) contractions, using maximal electrical stimulation at 30°/s and 60°/s speeds of muscle shortening. FD was assessed by comparing the steady-state isometric torque produced following active muscle shortening with the purely isometric reference torque obtained at the corresponding muscle length. In order to test the fatigue effect on FD was performed stretch-shortening cycle exercise (SSC) which consisted of 50 drop-jumps performed from 0.4 m with counter – movement to 90° in the knee with immediate maximal rebound, with 30 s interval between the jumps. Additionally, muscle soreness as well as creatine kinase activity before and at 24 h, 48 h and 72 h after SSC exercise was calculated. Our results showed strong correlation between FD and LFF ( $R^2=0.79$ ). A similar relationship between changes in FD and WD at both shortening speeds were found ( $R^2=0.91$  and  $R^2=0.93$  at 30°/s and 60°/s respectively). We conclude from these results that force depression depends from low frequency fatigue and work. The higher the force for a given amount of shortening, the large the mechanical work produced.

## **FACTORS THAT ENCOURAGE YOUNG PEOPLE TO PRACTICE SOCCER**

**D. Gražulis, D. Radžiukynas, V. Jančiauskas**

Vilnius Pedagogical University, Lithuania

Non-formal education of children and young people is a continuous and integral part of formal education, which attempts to nurture personal, educational, social and professional competences. A significant part of schoolchildren (20.6%) would prefer to dedicate more time for sporting activities. 54.5% of exercising respondents practice basketball and 38.2% – soccer. Factors that show a strong impact on a personal choice for practicing desirable sports and games determine practical decisions how to engage a greater number of young people into sporting activities. The study aims to identify factors that encourage schoolchildren to practice soccer. The research was based on an anonymous questionnaire with 93 young soccer players (aged 8–17) participating as the respondents. The statistical analysis was performed using SPSS PC (version 13.0). The results are presented in percentage. The following deciding factors show the preference for soccer game: the respondents liked the game (66.7%), they took a decision on their own (52.7%), they were affected by the popularity of this game (26.9%), they wanted to follow the example of famous soccer players (24.7%), parents advised (‘they wanted me to go’) (23.7%). Moreover, some encouraging factors such as a wish to participate in sports competitions (81.7%), a desire to be strong and healthy (81.7%), interesting training sessions (73.1%), a wish to gain new skills (72.0%), a wish to get into a well-known or popular sports club (69.9%) have also determined the choice. Conclusions: The results of the research show that soccer as a game has the key factors which involve young people into the process of effective physical education and encourage them to practice playing soccer.

## **RELATIONSHIPS BETWEEN SOMATOTYPE COMPONENTS AND BONE PARAMETERS IN PREPUBERTAL BOYS**

**A. Ivuškans**

University of Tartu, Estonia

There is much attention attracted to the issue of low bone density in children and adolescents, in recent years. The classic definition of osteoporosis should be valid at any age, yet its practical applicability to children and adolescents remains a matter of debate and there is no consensus on a diagnosis based solely on the bone mineral density (BMD) value. That leads us to that bone strength is a composite of bone density and bone quality what leads to increased bone fragility and a greater risk of fractures. The aim of the study is to compare the somatotype components and the bone parameters of Estonian school-children (boys) aged 10–11 years. We hypothesized that possibly endomorphy component first of all must influence bone density in boys. The study consisted of healthy school children (n=375), aged between 10 and 11 years. The subjects were randomly selected from elementary schools in Tartu, Estonia. Bone mineral content (BMC) and bone mineral density (BMD) measurements were done using dual-X-ray absorptiometry (DXA). BMC and BMD measurements were performed on the total body, the lumbar spine (L2-L4) and femoral neck. In our study 10–11 year-old boy's somatotypes were positively associated with totBMC, femoral neck BMC and BMC. In obese children group endomorph somatotype were positively associated with weight, BMI, L2-L4BMC and L2-L4BMD. Ectomorph somatotype was not significantly related to BMI in any of two groups. Endomorph somatotype children were comparatively older and had higher values for body mass and body height than ectomorph and mesomorph somatotype boys. There are significant differences between somatotype components between somatotype groups. All bone components in BMC as well as BMD were significantly higher for mesomorph somatotype. Our main conclusion is that endomorphy and even higher mesomorphy seems to be related to high bone parameters. The differences could be because of the weight bearing bones.

## **EFFECT OF ACCLIMATION ON ARTERIAL ELASTICITY AND ENDURANCE CAPACITY IN YOUNG MEN IN THE HEAT**

**T. Kaldur<sup>1,2</sup>, J. Kals<sup>1,2</sup>, V. Ööpik<sup>1</sup>, A. Burk<sup>1</sup>, K. Zilmer<sup>1</sup>,  
M. Zilmer<sup>1</sup>, E. Unt<sup>1,2</sup>**

<sup>1</sup>University of Tartu, Estonia

<sup>2</sup>Tartu University Hospital, Estonia

The aim of the present study was to evaluate the effect of acclimation on arterial elasticity and endurance capacity in young men in the heat. Twenty-two healthy young adult men were examined. Parameters of arterial elasticity and endurance capacity were measured in baseline and after 10 training and acclimation sessions (110 minutes per session, training intensity 55–60% of  $\text{VO}_{2\text{max}}$ ) under heat stress conditions (42°C; relative humidity 18%). An endurance capacity test was performed till exhaustion on a treadmill under the same heat conditions. The arterial waveform was measured by a Cardiovascular Profiling Instrument (C1 is a marker for large artery elasticity, C2 is a marker for small artery elasticity). After acclimation in the heat, the subjects' mean endurance capacity increased statistically significantly ( $p < 0.005$ ). Arterial elasticity parameters increased statistically significantly after acclimation in the heat as compared to the baseline values (C1  $p < 0.040$ ; C2  $p < 0.009$ ; respectively). In conclusion, acclimation in the heat improves arterial elasticity and increases endurance capacity under the heat conditions.

## **A CROSS-SECTIONAL ANALYSIS OF PHYSICAL ACTIVITY, PSYCHOLOGICAL DETERMINANTS AND HEALTH RELATED VARIABLES OF LATVIAN OLDER ADULTS**

**A. Kaupuzs, V. Larins**

Latvian Academy of Sport Education, Latvia

Aim of the study: Insufficient physical activity is related to the progress of different diseases. To enable the development of effective lifestyle interventions for older people, we investigated the current situation of physical activity, psychological determinants derived from the Transtheoretical and Social Cognitive theories, and health related variables. Although in the literature there are a number of evidences of physical activity interaction with health and psychological variables however, in Latvia there is a lack of such data. Subjects and methods: The study population consisted of 359 respondents (63.5% female and 36.5% male) aged 60–75 who visited the Heart Health Cabinets across 5 Latvia regions. The mean age was  $67.6 \pm 5.1$  years. For the assessment of the physical activity we used interviewer-administered the International Physical Activity Questionnaire (IPAQ) short version. To measure outcome expectations we asked to complete the Multi-dimensional Outcome Exercise Expectation Scale (MOEES). To detect the involvement in regular PA we used Exercise Stages of Change – short form. As subjective measure of health status it was used The Short Form Health Survey (SF-36v2). For the measuring of subjective health determinants we used the Heart Health Cabinet cardiovascular risk factors assessment data aggregated as SCORE index. Results: The results of the study shows that 20.6% of the respondents have “low” PA level, 30.4% are “moderate” and 49.0% are “high” physical active. Nevertheless only 19.7% exercise regularly more than 6 months and 49.9% do not even plan to engage regular activities in the next 6 months. MOEES data shows that outcome expectations decrease with age the same as PA. At the age group 60–65 MOEES mean result is a  $3.5 \pm 0.69$  point of Likert scale and at the age group 70–75 it is only  $2.9 \pm 0.96$  point. These results reflected on subjective health assessment, because more than half of respondents are rated below the General Population Norm. Moreover, poor adherence to exercise is closely related to higher cardiovascular illness risk. Conclusion: At this study

we found out the statistically significant relationship between PA and subjective and objective health variables. Adherence to regular PA is related to outcome expectations although it mutual decrease with age. This research has provided important background for effective intervention program development based on increasing of confidence thereby help to move people through stage of change.

## **THE EXPRESSION OF SELF-DETERMINATION AND AGGRESSION BY JUDO ATHLETES AND BASKETBALL PLAYERS**

**A. Kisieliene**

Lithuanian Academy of Physical Education, Lithuania

The aim of the research was to determine and compare the expression of aggression and self-determination among the adolescent judo athletes and basketball players; to explore the relationship between aggression, self-determination, age and sexes. The main method of research was anonymous interview in writing. A questionnaire with closed question was based on the Buss-Perry Scale 1992 aggression questionnaire and the Ryan and Conell 1989 BREQ-2 self-determination Scale. Research sample: 94 judo athletes (69 boys and 25 girls) and 67 basketball players (47 boys and 20 girls) aged  $14 \pm 1.9$  years. Results: the statistically reliable differences between aggression and self-determination among judo and basketball sportsmen were not determined. There are significant differences between sexes. The athletes boys showed greater physical aggression than the girls ( $z=3.87$   $p<0.01$ ). The boys demonstrated higher external regulation ( $z=2.43$   $p<0.01$ ). A motivation was more expressed among the girls ( $z=2.61$   $p<0.01$ ). Conclusions: the significant correlation was determined between all forms of aggression (physical and verbal aggression, anger and hostility) and higher level of external and introjected regulation especially among the male sportsmen. Level of verbal and physical aggression keeps growing with age among the male athletes.

## **DIFFERENCES IN LEG EXTENSOR MUSCLE FORCE-GENERATION CAPACITY IN YOUNG AND ELDERLY MEN**

**T. Koovit, H. Aibast, J. Ereline, H. Gapayeva, T. Kums,  
M. Pääsuke**

University of Tartu, Estonia

**Aim:** The purpose of this study was to compare isometric voluntary force-generation capacity of the leg extensor muscles in young and elderly men. **Subjects:** Seventeen young (aged 21–30yrs), 17 physically active elderly (aged 68–80yrs) and 15 sedentary elderly (aged 66–86yrs) males volunteered in this study. Young men were moderately active; none of them were competitive athletes. **Methods:** Leg extensor muscle isometric strength during bilateral (BL) and unilateral contraction of the right (ULr) and left leg (ULl) were measured by custom-made dynamometer. Vertical jumping performance characteristics (jump height and power output) in squat jump (SJ), counter-movement jump without (CJ1) and with help of arms (CJ2) were measured with force plate. Subject's physical activity and health-related data were screened by MYOAGE Case Report Form. **Results:** In SJ, CJ1 and CJ2, active elderly had higher jump height (11.8; 5.9 and 9.1%, respectively) and greater absolute power (17.3; 15.5 and 16.2%, respectively) than sedentary elderly men ( $p>0.05$ ). Young men had higher jump height (45.2; 52.8; and 48.8%, respectively) and greater absolute power (56.2; 47.8 and 44.3%, respectively) than active elderly men ( $p<0.05$ ). Active elderly men had higher BL and ULl outcomes (23.2 and 28.3%, respectively) than sedentary men ( $p>0.05$ ). Young men had higher BL; ULr and ULl outcomes (39.9; 40.2 and 42.7%, respectively) than active elderly men ( $p<0.05$ ). **Conclusions:** Aging, which is related with sarcopenia, leads to reduced voluntary maximal and explosive force-generation capacity of the leg extensor muscles. However, no significant differences in measured muscle force-generation characteristics were found among active and sedentary elderly males in this study.



## **INFLUENCE OF ORIENTEERING SPORT COACHES OPERATIONAL COMPETENCE TO THE TRAINING PROCESS**

**D. Kudaba, A. Vilkas**

Vilnius Pedagogical University, Lithuania

The aim of the research was investigate how operational competencies of orienteering sport coaches may influence youth training process. The research has been carried out during 2010 (September-October), focused extensive interview has been carried out with 10 orienteering sport coaches (8 male and 2 female) (age 30–54 years), as well as by pedagogical tests was evaluated general physical and special physical fitness of young orienteers. During analysis of research results all coaches have been separated into two different groups by coaching experience: I – group (10–20 years) and II – group (21–30 years). Investigation between these groups showed some differences of training content. Coaches' from both groups training sessions performs 2–6 times per week. Duration of the training session lasts averagely 45 min. up to 1 hour. 30 min. During the year, with youth they participate more than in 21 orienteering sport event. Most of the second group coaches indicated that they regularly execute control tests for general and special physical fitness investigation. Mean while most of the first group coaches do this just sometimes. However, most of the first group coaches' regularly fills training load records, before training session always prepares plans, after orienteering events with athletes have analysis of the mistakes, at the training sessions organize exercises for memory and attention development, mean while most of second group coaches do this just sometimes. Coaches' from both groups don't have the model characteristics of young orienteers, but they believe it would be useful for them in training process. Coaches also noted that for achieving better sport results young orienteers should mostly improve the OS technique, mental fitness, general and special physical fitness. Data analysis of Lithuanian orienteering sport coaches operational competency showed that there is no single technology at young orienteers training process. Records of physical activity and rationing are not consistent. Therefore, in our further studies we hope to improve the training process of young orienteers preparation.

## **ENDURANCE AND SPEED CAPACITY OF AKHAL-TEKE HORSES**

**K. Leisson<sup>1</sup>, K. Alev<sup>2</sup>, P. Kaasik<sup>2</sup>, Ü. Jaakma<sup>1</sup>, T. Seene<sup>2</sup>**

<sup>1</sup> Estonian University of Life Sciences, Estonia

<sup>2</sup> University of Tartu, Estonia

The Akhal-Teke (AT) horse is a versatile but a pure breed, used in various horse sport disciplines. These horses were originally bred as war and riding horses. The versatility of these horses is a class of its own as they are highly regarded for speed, stamina and trainability. Unfortunately there are no studies so far about AT horses skeletal muscle fiber composition. The purpose of this study was to assess endurance and speed capacity and age-related changes in AT horses skeletal muscle. 23 horses (1.5–23.5) were studied, a muscle biopsy was obtained from gluteus medius muscle of a depth 60 mm. Myosin heavy chain (MyHC) and myosin light chain (MyLC) isoform pattern was determined in three age groups (1.5–2.5 year-old; 9–20 year-old and 21–23.5 year-old). The current study demonstrated that AT horses skeletal muscle consists of a relatively high percent (50%) of MyHC I and IIa isoforms. MyHC IIa and IIx isoforms together compose about 90% of MyHC isoforms. Age related changes in MyHC and MyLC isoforms starts in AT horses older than 20 years. Muscle fibers' composition show that AT horse skeletal muscle have high capacity of endurance and speed.

## **DYNAMICS OF FOREARM MUSCLE PARAMETERS AND COMPETITION EXERCISES OF KETTLEBELL LIFTERS IN DIFFERENT TRAINING PERIODS**

**M. Lescinskis<sup>1</sup>, L. Cupriks<sup>1</sup>, U. Ciematnieks<sup>1</sup>, S. Saulīte<sup>1</sup>,  
S. Rozenstoka<sup>2</sup>, A. Lāce<sup>3</sup>**

<sup>1</sup>Latvian Academy of Sport Education, Latvia

<sup>2</sup>Latvian Association of Sport Medicine, Latvia

<sup>3</sup>Center of Physical Health, Sports Medicine and Rehabilitation, Latvia

The most part of first sport class athletes' in kettlebell snatch have a problem of achieving good results. One of the main reasons by many Russian authors' opinions is forearm muscles special strength endurance, because precisely these muscles first reject to fulfill their functions. The task of research was to determine influence of statodynamic method on forearm muscles development and special work capacity increasement. In study voluntarily participated 10 kettlebell lifters. All the kettlebell lifters were first sport class athletes. All the subjects involved in the experiment average age were  $21 \pm 1.2$  years, mean height  $183.4 \pm 2.1$  cm, mean weight  $71.9 \pm 1.7$  kg. The testing was carried out: at the beginning of first preparation period, at the end of first competition period, at the beginning of second preparation period, and at the end of second competition period, a total in a whole year training cycle. We tested following parameters: maximal results in competition exercises – kettlebell clean and jerk and snatch (reps); handgrip strength (kg); anthropometric parameters of forearm (cm) and hang on the bar (sec). Results of athletes in kettlebell clean and jerk increased from  $55.4 \pm 1.9$  (reps) at the beginning of first preparation period till  $74.5 \pm 4.8$  (reps) at the end of second competition period; in kettlebell snatch increased from  $120.1 \pm 2.6$  (reps) at the beginning of first preparation period till  $140.4 \pm 8.3$  (reps) at the end of second competition period; handgrip strength decreased from  $101.3 \pm 8.7$  (kg) at the beginning of first preparation period till  $96.7 \pm 10.8$  (kg) at the end of second competition period; anthropometric parameters of forearm increased from  $90.5 \pm 3.1$  (cm) at the beginning of first preparation period till  $92.6 \pm 3.4$  (cm) at the end of second competition period; results in hang on the bar increased from  $165 \pm 4.2$  (sec) at the beginning of first preparation period till  $262 \pm 11,4$  (sec) at the end of second competition period.

## **PRELIMINARY COMPARISON OF LINEAR VS. CURVE-LINEAR RELATIONSHIP PATTERN ANALYSIS BASED ON EXERCISE MOTIVATION AND RELATED VARIABLES**

**J. Matsi**

University of Tartu, Estonia

The main purpose of this study was to examine whether common linear regression analysis would give us different and possibly erroneous results compared to the surprisingly simple techniques of logical model building (Taagepera 2008) when analyzing self-report data for exercise, exercise motivation and related variables. This would give us better understanding of exercise motivation needed for exercise promotion for health benefits and well-being (USDHHS 2001) of society. Method: The data for analysis was extracted from the Estonian Women's Physical Activity Study (EWPAS) conducted in 2008. The detailed description of the sample, questionnaire and data collection is available in Kull, Matsi, Raudsepp (2010). For data analysis results of linear regression were compared to the curve-linear patterns. Curve-linear patterns were established via determining theoretical and actual data zones for each variable, fitting them through logical anchor points and testing their predictive power. Results: In case of predicting leisure time physical activity from other variables, curve-linear models had seemingly more logical fit than linear regression models. This was especially apparent for socio-demographic variables measurable on real ratio scales. Conclusions: Different results do arise when applying techniques of either linear regression or logical model building to actual exercise motivation data. Therefore one should compare both methods before making the final conclusions based on data.

## **CASE STUDY OF LONG-TERM TRAINING OF MALE BASKETBALL PLAYERS AGED 7–17 YEARS IN “SABONIS’ BASKETBALL CENTRE”**

**K. Matulaitis, A. Skarbalius**

Lithuanian Academy of Physical Education, Lithuania

**Aim:** The aim of the research was to identify the efficiently applied training programme for 7–17 years basketball players in “Sabonis’ Basketball Centre”. **Methods and Subjects:** Basketball coaches (n=10) for every training age category (7 to 17 years) took part in the interview. **Results:** In the preparatory phases integral training dominated in 9 and 12 years old players (30%), tactical training in 17 years old (25%), technical training in 7 years old (60%), physical conditioning in 13 years old (70%), psychological, and theoretical training in 8 years old players (15%). In the competition phases integral training dominated in 9 and 13 years old (30%), tactical training in 15 years old (35%), technical training in 7 years old (60%), physical conditioning in 15 years old (30%), psychological, and theoretical training in 17 years old players (20%). In the transition phases integral training dominated in 13 years old (45%), tactical training in 12 years old (15%), technical training in 7 years old (60%), physical conditioning in 15 years old (50%), psychological, and theoretical training in 7, 11, 14 years old players (10%). **Conclusions:** The phenomenon of long-term basketball players development is: that training programmes for 7-to-9-year subjects are not classified related to annual periods; integral training prevailed through 7 to 17 years; the selection of the best players in “Sabonis’ Basketball Centre” are classified from 9 years old.

## **DEVELOPMENT OF PERSONAL COMPETENCE OF ADOLESCENTS EMPLOYING PHYSICAL SELF-EDUCATION PROCESS**

**A. Medonis, V. Blauzdys**

Vilnius Pedagogical University, Lithuania

The aim of the research is to investigate the impact of physical self-education process influencing gymnasiums first grade schoolboys' personal competence development. The subject of the research is the 1st grade schoolboys being in the main medical physical preparedness group from Vilnius gymnasiums. Research methods were used: analysis of scientific literature, educational experiment, questionnaire and statistical analysis. Results: At the beginning of the school year 77.8 percent and 80.0 percent at the end of the school year the E1 group schoolboys and respectively 86.7 percent and 82.7 percent of the E2 group schoolboys developed their personal competence mobilizing the efforts with the aim of achieving personal defined goals. Virtually, the number of schoolboys developing their personal competence ability scale resistant to failures and conflicts increased from 55.6 percent after the first questionnaire to 70.0 percent after the second questionnaire of the E1 group accordingly with 57.8 percent to 63.5 percent of the E2 group. In addition to that, after the first questionnaire 60.0 percent and 72.5 percent after the second questionnaire of the E1 group respectively 73.3 percent and 69.2 percent of the E2 group schoolboys developed their personal competence predicting consequences of their physical activity. Conclusion: Gymnasium schoolboys employing content and process of physical self-education based on self-determination theory, achievement goal theory and constructivist theory, ideas of democracy, develop meaningfully their personal competence during the physical education lessons and leisure activities.

# DIFFERENCES BETWEEN ESTONIAN LONG AND MIDDLE DISTANCE RUNNERS' FUNCTIONAL, ANTHROPOMETRICAL AND BODY COMPOSITION PARAMETERS

M. Mooses

University of Tartu, Estonia

The purposes of this study were to document main functional, anthropometrical and body composition parameters of Estonian national level middle and long distance runners and to compare these parameters between middle and long distance runners group. A total of 48 male runners were divided into 2 groups – long distance LD (n=24) and middle distance MD (n=24) – according to their best competition results by IAAF score table. Subjects, age, height and weight were in MD  $20.6 \pm 3.5$  y,  $1.81 \pm 0.04$  m,  $71.5 \pm 7.2$  kg and in LD group  $24.9 \pm 4.0$  y,  $1.81 \pm 0.06$  m,  $70.1 \pm 7.6$  kg respectively. All participants did incremental test on treadmill until voluntary exhaustion. 11 anthropometric characteristics were determined. Body composition was measured by DXA. Results showed no statistical significant differences between MD and LD groups anthropometrical and body composition measures. However there were differences in treadmill  $v\dot{V}O_{2max}$  (MD  $17.5 \pm 1.5$   $\text{km} \cdot \text{h}^{-1}$  and LD  $18.7 \pm 1.2$   $\text{km} \cdot \text{h}^{-1}$   $p < 0.01$ ). LD group also had higher speed at anaerobic threshold ( $17.0 \pm 1.3$   $\text{km} \cdot \text{h}^{-1}$  vs  $15.9 \pm 1.5$   $\text{km} \cdot \text{h}^{-1}$   $p < 0.01$ ) and peak treadmill velocity ( $19.3 \pm 1.1$   $\text{km} \cdot \text{h}^{-1}$  vs  $18.05 \pm 1.7$   $\text{km} \cdot \text{h}^{-1}$   $p < 0.01$ ) than MD group. There were no statistically important differences in  $\dot{V}O_{2max}$  (MD  $64.6 \pm 6.0$   $\text{ml} \cdot \text{min}^{-1} \cdot \text{kg}^{-1}$  and LD  $67.2 \pm 6.6$   $\text{ml} \cdot \text{min}^{-1} \cdot \text{kg}^{-1}$   $p > 0.05$ ). Our study found important differences between long and middle distance runners' functional parameters but not in body composition and anthropometrical parameters.

## **PHYSIOLOGICAL PROFILE OF SEMI PROFESSIONAL FEMALE HANDBALL**

**G. Onusaityté, A. Skarbalius**

Lithuanian Academy of Physical Education, Lithuania

The aim of the present study was to determine the physiological profile of semi-professional female handball players. Methods: Players (age –  $21.4 \pm 2.7$ ; height –  $1.77 \pm 0.56$ m; body mass –  $69.5 \pm 9.8$ kg) of semi-professional team (N=14) were involved in research. Body composition,  $VO_{2max}$ ,  $HR_{max}$ , aerobic and anaerobic thresholds were determined by means of an incremental treadmill test with spirometry until exhaustion in laboratory testing in the beginning of the season. Results: The physiological indices (mean $\pm$ s):  $VO_{2max}$  –  $45.8 \pm 5.8$  ml $\cdot$ kg $^{-1}\cdot$ min $^{-1}$  (range 38.6–56.2);  $HR_{max}$  –  $196.3 \pm 8.1$  beats.min $^{-1}$  (range 180–208); HR at aerobic threshold –  $168 \pm 10.1$  beats.min $^{-1}$  (range 150–187) and at anaerobic threshold  $185 \pm 8.6$  beats.min $^{-1}$  (range 163–197); the blood lactate concentration –  $8.6 \pm 1.83$  mmol.l $^{-1}$  (range 5.2–11.9); maximum speed during the test –  $15.13 \pm 1.29$  km.h $^{-1}$  (range 12.34–16.75). Conclusions:  $VO_{2max}$  – highest was of playmakers, less of goalkeepers. HR at aerobic and anaerobic threshold highest were of wings players. The physiological profiles of semi-professional female handball players were different between the player's positions. Differences could lead to game activities diversity.



## **PLASMA ADIPOCYTOKINE LEVELS IN RELATION TO BONE MINERAL DENSITY IN PREPUBERTAL RHYTHMIC GYMNASTS**

**A.-L. Parm, J. Jürimäe, M. Saar, K. Pärna, V. Tillmann,  
K. Maasalu, I. Neissaar, T. Jürimäe**

University of Tartu, Estonia

The aim of the present study was to investigate possible differences in plasma adipocytokines (leptin and adiponectin) levels and body composition parameters in prepubertal rhythmic gymnasts (RG) and untrained controls (UC), and to examine the relationships of bone mineral density (BMD) with hormonal status in prepubertal children with different physical activity patterns. Eighty nine 7–9-year-old girls participated in study (RG [n=46], UC [n=43]). Body composition and BMD were measured by dual-energy X-ray absorptiometry. Bone maturity was estimated by using a radiograph of the non-dominant hand. The measured whole-body, lumbar spine (LS) and femoral neck BMD values were significantly higher ( $p<0.05$ ) in gymnasts than controls. In addition, RG presented significantly lower values ( $p<0.05$ ) for leptin concentrations, in comparison with UC. No differences were observed for adiponectin levels between studied groups. No relationships between measured BMD values with leptin were observed even after adjustment for age and fat mass (FM) in RG. Whole-body and LS BMD values were significantly correlated with leptin after controlling for age and FM ( $r=0.32$ ;  $p<0.05$ ) in UC. No relationships were found between measured BMD values and adiponectin even after controlling for age and FM values in both groups. In conclusion, although all measured BMD values were significantly higher in RG, plasma adipocytokines concentrations were not directly related to bone mineralization in prepubertal RG in contrast to UC.

## **PILOT STUDY: DOES FUNCTIONAL TESTS PERFORMANCE DEPENDS ON DYNAMIC STRENGTH IN ACL RUPTURED PATIENTS?**

**D. Parulytė<sup>1</sup>, N. Masiulis<sup>1</sup>, V. Aleknavičiūtė<sup>1,2</sup>, R. Solianik<sup>1</sup>,  
G. Dargevičiūtė<sup>1</sup>, A. Skurvydas<sup>1</sup>**

<sup>1</sup> Lithuanian Academy of Physical Education, Lithuania

<sup>2</sup> Šiauliai State College, Lithuania

Cruciate ligament of the knee joint is often quite a fragile structure of the knee. After the rupture of anterior cruciate ligament (ACL) neuromuscular control worsens (Skurvydas et al., 2011) and sensorimotor system breaks down (Bonsfills et al., 2008), muscle activation is poor and muscle strength decreases (Ingersol et al., 2008). The functional performance tests are a practical, performance-based outcome measure that reflects the integrated effect of neuromuscular control, strength and confidence in the limb (Reid et al., 2007). Therefore it is important to establish does functional tests performance depends on dynamic strength in ACL ruptured patients. Single-limb triple hop for distance, 5 m. walk test for time and concentric isokinetic torque for extension and flexion (injured and uninjured legs) was measured using a isokinetic dynamometer at randomly ordered 60 or 180°/s angular velocities. After ACL rehabilitation quadriceps femoris muscle torque remained more affected than hamstring femoris muscle torque for both injured and healthy legs. Strong correlations were found between hop and 5 m walk tests and ACL ruptured leg for knee extension and flexion at 60 and 180°/s. While for healthy knee strong correlation was observed only at 180°/s. In conclusion, functional tests performance depends on dynamic strength in ACL ruptured patients.

# **THE INFLUENCE OF ANTHROPOMETRICAL PARAMETERS TO THE SPECIFIC GYMNASTICS TESTS IN YOUNG RHYTHMIC GYMNASTS**

**K. Pärna, A.-L. Parm, M. Saar, T. Jürimäe, J. Jürimäe**

University of Tartu, Estonia

The aim of the study was to investigate the influence of anthropometrical parameters to the specific physical tests (jumping ability, balance and shoulder mobility) in young rhythmic gymnasts and same age controls. Subjects and methods: Study participants were 7–8 year-old girls RG (n=36) and controls (n=39) in the first year of study and gymnasts tested next three year once per year (in total three times). Jumping height was measured by special contact mat. Shoulder mobility was measured in a yardstick and balance was measured by Flamingo Balance test. Fat and fat-free body mass were measured by DXA. Results: Gymnasts compared with the same old controls at all three study years have a better ability to perform the following: shoulder mobility, balance and jumping ability. Gymnasts have lower body mass index, body fat percentage and fat-free body mass. No any statistically significant relations was found in a three-year study of gymnasts anthropometric parameters and physical abilities ( $p>0.05$ ). Significant negative relationships was found in a controls at all three study year between the percentage of the total body fat and jumping height ( $r=-0.567$ ;  $r=-0.433$ ;  $r=-0.415$ ). It was also found that the first and second study on body mass index and fat mass negatively depends on the jump height in controls ( $r=-0.490$ ;  $r=-0.334$ ) ( $r=-0.575$ ;  $r=-0.398$ ). Conclusions: Gymnasts have better physical abilities. There are no relationships between gymnasts anthropometry and physical abilities.

## **CONGRUENCE OF ACTUAL AND RETROSPECTIVE REPORTS OF PRECOMPETITION AFFECT AND ANXIETY FOR YOUNG VOLLEYBALL PLAYERS**

**A. Rikberg, L. Raudsepp, K. Kais**

University of Tartu, Estonia

The current study examined the accuracy of retrospective recall of affect and competitive anxiety in 38 young beach volleyball players, who were randomly assigned into two equal groups: participants who watched a video of their precompetition preparation before responding to the items, and players who did not watch a videotape. All completed the modified state anxiety questionnaire 1 h and the affect grid 5 min before a competition and again 2 days later. Accuracy in recalling anxiety and affect by these players was significant in both conditions (correlations 0.59 to 0.76 and 0.41 to 0.59, respectively). However, in the video condition, item responses showed markedly higher percentages of agreement for the Somatic and Cognitive Anxiety subscales and the affect grid than those for the no-video condition (52.6–78.9% and 36.8–52.6%, respectively). Analysis of variance indicated that watching a video for precompetition preparation improved the accuracy of retrospective recall of anxiety and arousal. Video feedback of performance increased the accuracy of retrospective report of affect and anxiety in these young athletes.

## **THE CHANGES OF PERCEIVED RECOVERY-STRESS STATE, CYTOKINES AND GHRELIN DURING HIGH VOLUME TRAINING PERIOD**

**R. Rämson**

University of Tartu, Estonia

The aim of this study was to investigate plasma IL-6, TNF- $\alpha$ , leptin and ghrelin concentrations during high volume training. Eight trained male rowers participated. Fasting blood was sampled before (T1) and after (T2) increased training volume and after recovery period (T3). Two-hour rowing was performed at T1, T2 and at T3 with blood samples before, POST and POST 30'. Decrease in fasting leptin was observed at T2 (from  $1.31 \pm 0.53$  to  $0.93 \pm 0.27$  ng•ml<sup>-1</sup>;  $p < 0.05$ ). Leptin was also significantly decreased at POST and POST 30' exercise compared to PRE test at T2. At T2 POST 30' leptin was significantly lower compared to corresponding value at T1. There were no significant post-exercise changes in ghrelin at T2 compared to T1 and T3. TNF- $\alpha$  was significantly increased POST exercise only at T2. In perceived recovery-stress state, RESTQ-Index was significantly decreased after high-volume trainings and was returned to base level after the recovery week ( $p < 0.05$ ) In conclusion, high-volume training causes alterations of post exercise leptin, TNF- $\alpha$  and in perceived recovery-stress state while increases in ghrelin are down regulated.

## **RELATIONSHIP BETWEEN ANTHROPOMETRICAL PARAMETERS AND SWIMMING PERFORMANCE AMONG YOUNG MALE SWIMMERS**

**T. Rääsk**

University of Tartu, Estonia

The aim of the study was to examine the possible influence of anthropometrical parameters on the 100-m front crawl swimming performance in male adolescent swimmers. 12 male swimmers (age  $14.5 \pm 0.8$  years; height  $175.9 \pm 6.3$  cm; body mass  $60.4 \pm 6.1$  kg; Tanner stage  $4.2 \pm 0.9$ ; BMI  $19.4 \pm 1.4$ ) performed 100-m front crawl swimming test in the 25-m swimming pool. Young swimmers were taken part in the swimming training past  $5.9 \pm 1.9$  years and in one week they had  $5.5 \pm 1.9$  workouts, what lasts about  $2.0 \pm 0.4$  hours. The International Society for the Advancement of Kinanthropometry (ISAK) recommended anthropometrical parameters were measured, that includes 41 different measurements: 9 skin fold thickness; 13 circumferences; 8 bone length and 11 body length or width. All measurements were measured by the trained anthropologist. Results indicated that young male swimmers 100-m front crawl swimming performance time ( $79.3 \pm 9.1$  sec) was statistically ( $p < 0.05$ ) and negatively associated to the young male swimmers age ( $r = -0.563$ ), chest circumference ( $r = -0.462$ ), chest width ( $r = -0.657$ ), shoulders width ( $r = -0.508$ ) and hips width ( $r = -0.572$ ). Findings surprisingly showed that the skin fold thicknesses and bone lengths were not associated with young male swimmers 100-m front crawl swimming performance time. Therefore, swimming sprint performance in young male swimmers primarily requires larger upper body anthropometrical parameters.

## **CAUSAL CONDITIONS FOR EFFECTIVE INTERACTION BETWEEN ELITE ATHLETES AND THEIR COACHES FROM COACHES' POINT OF VIEW**

**S. Sabaliauskas, S. Poteliūnienė**

Vilnius Pedagogical University, Lithuania

The work was aimed to disclose causal conditions for effective interaction between elite athletes and their coaches. Method of grounded theory was applied. Data was collected using half-structured interview method. The sample for this work was purposive and was made up of a group of nine coaches. The coaches were selected due to achievements of their athletes. Grounding theory of elite athlete-coach educational interaction highlighted specific features of such interaction environment, in particular – high sport competition level among athletes in international area and low level of such competition in Lithuania; complex prognosis of sport results because of multidimensional aspect of phenomenon of sport training process; plenty of coach's performed functions which are not in direct relation with coach's work; lack of appropriate training conditions and finances; pressure, which is felt by coach from society. Results showed that dominating factors which influence quality of coach-athlete interaction were athlete's genetic potential (talent and gender), as well as personal characteristics; coach's professional features, high professional qualification, communication habits and leading style; reciprocal understanding and coorientation; strong motivation of an athlete, strive for common aims, mutual confidence based proximity, as well as coach-athlete mutual respect is the indicator of positive emotional connection and stability of relations.

## **EFFECT OF RESISTANCE TRAINING ON FAST SKELETAL MUSCLE MORPHO-FUNCTIONAL PARAMETERS**

**J. Sagim, K. Alev, P. Kaasik, A. Pehme**

University of Tartu, Estonia

All skeletal muscles have adaptive potential, which means that they are capable to modify their structure to increased or reduced activity. Resistance training is the most superior way to train when muscle mass and strength improvements are aimed. The primary acute response to resistance training is an increase in the rate of protein synthesis. During resistance training the muscle undergoes many changes at the level of muscle tissue: increase in cross-sectional area (CSA) of muscle fibers, alterations in fiber type distribution and myosin heavy chain (MHC) isoforms composition. The most significant changes occur in muscle contractile proteins. The contractile protein myosin plays an important role in dictating the functional properties of skeletal muscle. The aim of the present study was to evaluate the adaptive changes in the muscle hypertrophy, strength and MHC isoforms composition evoked by resistance training and to examine to what extent the expected gain in muscle strength is associated with muscle hypertrophy. 16–18 weeks old male Wistar strain rats were used. Training programme consisted resistance exercise with extra weight in vertical treadmill. Myofibrillar proteins were analyzed using SDS-PAGE and morphological characteristics using histochemical methods. Our data showed that uphill running with extra weight caused significant changes in the relative content of the MHC isoforms (i.e. MHC isoform transition), selective hypertrophy of type II muscle fibers (CSA) and gain in muscle strength. In conclusion: adaption to resistance training is determined by volume, intensity, and frequency of contractile activity, and the sum of these inputs initiate various cell processes that modify the regulation of muscle mass.



# **A NEW FOOT TYPE CLASSIFICATION SCALE FOR FOOT ARCH EVALUATION**

**R. Sakalauskaitė<sup>1</sup>, D. Satkunskienė<sup>1,2</sup>**

<sup>1</sup> Lithuanian Academy of Physical Education, Lithuania

<sup>2</sup> Kaunas University of Technology, Lithuania

The purposes of this study were to assess the MLA according to the foot type classification scales presented by the authors, to verify assessment scales that are used; to determine a single assessment scale for the methods used, and to verify scale repeatability. Methods: 176 feet of 88 subjects (41 female, and 47 male) were measured. The medial longitudinal plantar arch was estimated using five different methods: arch index by Williams (AIW), arch index by Didia (AID), the Chipaux-Smirak Index (CSI), the Staheli Index (SI) and the rear foot (calcaneus) angle (RA) by Root. A new foot type classification scale (based on z-score) for foot arch evaluation was established. Foot arch was assessed by using the frequency distribution quartile. Results: Average amount of low arch foot assessed according to the foot type classification scales by the selected authors was 58.8 (SD=57.4), normal foot 89.4 (SD=49.4) and high arch foot 27.8 (SD=28.8), by using a new foot type classification scale (based on z-score), respectively average amount of low arch foot was 27.6 (SD=4.1), normal foot 126.2 (SD=4.55) and high arch foot 22.2 (SD=3.11). In conclusion, the medial longitudinal arch according to the foot type classification scales presented by the authors was assessed and unconformity of data distribution was found. So a new single assessment scale was determined and repeatability was verified.

## **DEVELOPING OF KICKING SPEED QUALITIES IN TAEKWONDO**

**S. Saulite<sup>1</sup>, L. Cupriks<sup>1</sup>, V. Fedotova<sup>2</sup>, U. Ciematnieks<sup>1</sup>,  
M. Lescinskis<sup>1</sup>**

<sup>1</sup>Latvian Academy of Sport Education, Latvia

<sup>2</sup>Riga Technical University, Latvia

Introduction: Current problems in speed qualities development during training periods are examined in this study. Methods: Level of speed qualities was determined using high-speed video recording with two Basler A602fc cameras and following data processing with SIMI Motion software. 10 taekwondo athletes aged 12–14 years with green-blue belt level participated in the study. Athletes performed 12 kicks with different objective. Simple reaction speed, speed of motion and kicking frequency were determined. Results: Kicking speed changes after preparation and competitive period were examined in this study. During preparation period the main exercises were various leg movements over a stuffed ball, jumping, etc. During competitive period special exercises representing kick phases and simulating kicks were performed. After the preparation period the kicking time was improved for 0.01 s, and after the competitive period for 0.04 s. It can be noted that larger change had occurred in knee flexion phase duration – it decreased for 0.01 s after the preparation period and for 0.03 s after the competitive period. After the preparation phase the reaction time was improved for 0.02 s, and after the competitive period for 0.05 s. After the preparation phase the frequency did not increase significantly ( $p>0.05$ ), but after the competitive period there was a significant improvement for 26% ( $p<0.05$ ). Conclusions: 1. Exercises aimed at development of overall athletes' speed qualities form a basis for development of kick execution speed. 2. Implementation of special exercises during competitive period influenced development of speed qualities in kicking to a larger extent.

## **RECOVERY OF SHOULDER FUNCTION AFTER MANIPULATION UNDER GENERAL ANESTHESIA IN FROZEN SHOULDER SYNDROME PATIENTS – SIX MONTHS FOLLOWUP STUDY**

**J. Sokk<sup>1</sup>, H. Gapeyeva<sup>1</sup>, J. Ereline<sup>1</sup>, M. Merila<sup>2</sup>, M. Pääsuke<sup>1</sup>**

<sup>1</sup> University of Tartu, Estonia

<sup>2</sup> Tartu University Hospital, Estonia

**Aim:** To assess changes in shoulder active range of motion (aROM) and shoulder muscle isometric maximal voluntary contraction (MVC) force in patients with frozen shoulder syndrome (FSS) after manipulation under general anesthesia (MUA). **Methods:** Eighteen FSS patients with mean ( $\pm$ SE) age of  $53.6\pm 9.7$  years participated in this study. Shoulder aROM in abduction, internal and external rotation were measured by goniometry. MVC force of shoulder abductors, internal and external rotators were measured by hand-held dynamometer. Patients were also screened by self-administered shoulder rating questionnaire (SRQ). Data was collected before MUA and one and six months after MUA. **Results:** A significant preoperative reduction ( $p<0.05$ ) in aROM and MVC force were noted as compared with uninvolved extremity. These characteristics for involved extremity were increased ( $p<0.05$ ) one month postoperatively as compared to the preoperative level. Six months postoperatively, aROM and MVC force did not differ significantly as compared with uninvolved extremity, whereas the aROM in abduction and external rotation, remain reduced ( $p<0.05$ ). Shoulder rating questionnaire score points increased ( $p<0.05$ ) one and six months after MUA. **Conclusions:** The fastest recovery in FSS patients proceeds following first month after MUA. Six months after MUA shoulder muscle MVC force for involved extremity did not differ as compared with uninvolved extremity, however aROM in abduction and external rotation remained lower. It is very important to start physiotherapy sessions as soon as possible after MUA and therapist must pay attention to the aROM and muscle force exercises for a long recovery period.

## **ACCURATE AND FAST MOVEMENT PERFORMANCE IN THE LOWER EXTREMITY: NORMAL VS. ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTED KNEES**

**R. Solianik, D. Parulyté, N. Masiulis, A. Skurvydas,  
V. Aleknavičiūtė, V. Streckis, V. Dudonienė**

Lithuanian Academy of Physical Education, Lithuania

It is generally accepted that major injury to the knee results in neuro-sensory and/or proprioceptive deficit which can have a substantial effect on motor control function of the joint (Barret et al., 1991; Denti et al., 2000). To our knowledge, there have been no investigations on the effect of anterior cruciate ligament (ACL) reconstruction on motor control function in lower extremity (LE), during seated activities. The following question was aimed to be discussed in the study: is there any difference between reaction time, movement time, velocity, movement trajectory and those parameters variability performing accurate and fast movements by non-intact and ACL-reconstructed LE? Eleven males (age  $32.27 \pm 8.11$  years; 3 months post-surgery) who had undergone ACL reconstruction using Semitendinosus-Gracilis graft participated in the research. The study was performed using the dynamic movement analyzer DPA-1. Before testing participants were allowed to familiarize themselves with motor control evaluation. All subjects performed random LE reaching task (15 times for each LE). The participants were asked to react to the target appearing on the computer screen as quickly as possible and in the most accurate trajectory. Results showed that there were no significant differences between non-intact and ACL-reconstructed LE. Conclusion: Anterior crucial ligament reconstruction does not affect accurate control of movements.

## **AGE-RELATED MOTOR PERFORMANCE: BLOCKED VS RANDOM TASK**

**R. Solianik, A. Skurvydas, M. Brazaitis, G. Dargevičiūtė,  
N. Masiulis, D. Parulytė**

Lithuanian Academy of Physical Education, Lithuania

The following questions were aimed to be discussed in the study: 1) is there any difference between reaction time, movement time and velocity performing a reaching movement by middle-aged and young adults? 2) do these parameters depend on the level of movement complexity? The study was performed using the dynamic movement analyzer DPA-1. Sixteen right-handed [defined by Edinburgh handedness questionnaire (Oldfield, 1971)] healthy women participated in the research. First group (n=8) consisted of middle-aged (age  $54.63 \pm 3.74$  years), second group – of young women (age  $25.88 \pm 1.46$  years). Before testing all subjects completed the Stanford Sleepiness Scale (SSS), a standard measure of subjective alertness (Hoddes et al., 1973). Then subjects performed two different tasks: blocked (had to reach the same target, 20 times) and random (had to reach the target, which appeared in random place, 20 times). The participants were asked to react to the target appearing on the computer screen as quickly as possible and in the most accurate trajectory. There were no significant differences in SSS within groups. The results showed that first group reaction time was slower ( $p < 0.05$ ), movement time was longer ( $p < 0.05$ ) and mean velocity was lower ( $p < 0.05$ ). Compared different tasks performance all participants blocked task movement time and mean velocity was faster ( $p < 0.05$ ) compared to random task, however, both groups showed no difference in reaction time. Conclusions: 1. age significantly affects motor learning; 2. movement time and velocity depend on the complexity of the task, while reaction time did not differ.

## **ASSOCIATIONS OF DIFFERENT INFLAMMATORY MARKERS WITH BODY FAT MASS IN 11-YEAR OLD OVERWEIGHT BOYS**

**L. Utsal, J. Jürimäe, P. Purge, J. Mäestu, M. Saar, E. Lätt,  
V. Tillmann, M. Zilmer, T. Jürimäe**

University of Tartu, Estonia

The aim of this study was to investigate 13 different serum inflammatory markers in overweight boys in comparison with normal weight control subjects and their relationships with body fat mass. The participants of this study were 78 healthy prepubertal boys, aged 10–11- years, who were divided into two groups: overweight boys (BMI > 85th percentile; mean age: 11.2±0.7yrs, mean height: 153.2±7.8 cm, mean weight: 64.5±12.0 kg, n=38) and control group boys with normal BMI (mean BMI 17.2±1.7; mean age: 11.0±0.8yrs, mean height: 146.0±7.5 cm, mean weight: 36.8±5.6 kg, n=40). IL-1 $\alpha$ , IL-1 $\beta$ , IL-2, IL-4, IL-6, IL-8, IL-10, vascular endothelial growth factor (VEGF), interferon- $\gamma$  (IFN $\gamma$ ), monocyte chemoattractant protein (MCP)-1, epidermal growth factor (EGF), tumor necrosis factor (TNF) –  $\alpha$  and C-reactive protein (CRP) have been measure in fasting serum samples. Blood samples were obtained from a vein before breakfast and testing between 8:00 AM and 9.00 AM. Total fat mass (FM), total FM % and trunkal fat % were measured by dual-energy X-ray absorptiometry (DEXA). For the inflammatory parameters, out of 13 measured markers overweight boys had significantly higher serum IL-6 (1.1±0.6 vs. 0.8±0.3pg/ml; p<0.01), IL-8 (9.5±3.6 vs 7.7±2.9pg/ml; p<0.05), IFN $\gamma$  (2.2±1.2 vs 1.5±1.0pg/ml; p<0.05), MCP1 (212.8±58.0 vs 165.8±67.9pg/ml; p<0.01) and CRP (2.3±2.1 vs 1.0±0.2; p<0.01) values in comparison with normal weight boys. In overweight group, total FM and %FM were significantly correlated with IL-6, IFN $\gamma$ , and TNF $\alpha$  values ( $r$ >0.39; p<0.05), whereas trunk FM was related to IL-6, and TNF $\alpha$  values ( $r$ >0.37; p<0.05). In normal weight boys, the only significant correlations were found between total and trunk FM values with IL-6 ( $r$ >0.35; p<0.05). In conclusion, only inflammatory markers of IL-6, TNF- $\alpha$  and IFN $\gamma$  were associated with fat mass in overweight boys indicating the link between proinflammatory state and obesity.

## **QUADRICEPS FEMORIS MUSCLE FORCE GENERATION AND RELAXATION CAPACITY AFTER TOTAL KNEE ARTHROPLASTY**

**D. Vahtrik, H. Gapeyeva, H. Aibast, J. Ereline, T. Kums, T. Haviko, M. Rätsepsoo, A. Märtson, G. Schneider, M. Pääsuke**

University of Tartu, Estonia

**Aim:** The aim of this study was to evaluate an isometric voluntary force production and relaxation capacity of the quadriceps femoris (QF) muscle before and after total knee arthroplasty (TKA). **Methods:** Isometric maximal voluntary contraction (MVC) force, half relaxation time (HRT) after MVC and voluntary activation (VA) of QF were recorded in fourteen female patients with knee osteoarthritis one day before, 3 and 6 months following TKA. The characteristics were determined in operated and non-operated leg. Postoperatively, all patients get detailed supporting handout, containing instructions of exercises for home, with purpose to improve QF muscle strength and endurance, balance and coordination. **Results:** Isometric MVC force in operated leg was lower ( $p < 0.05$ ) before, 3 and 6 months after TKA as compared to the non-operated leg (18, 47 and 39%, respectively). VA of the QF muscle did not differ in operated leg compared to non-operated leg, pre- and postoperatively. Significant prolongation of HRT after MVC was established only before TKA. **Conclusion:** The present study confirmed that patients with knee OA had reduced voluntary force production capacity of QF muscle preoperatively and 6 months postoperatively, and reduced voluntary muscle relaxation capacity preoperatively. However, VA of QF muscle did not differ in patients with knee OA as compared operated and nonoperated leg.

## **MENSTRUAL CYCLE PHASE HAS NO EFFECT ON FUEL OXIDATION DURING SUBMAXIMAL EXERCISE IN ENDURANCE-TRAINED ROWERS**

**S. Vaiksaar, J. Jürimäe, J. Mäestu, P. Purge, T. Jürimäe**

University of Tartu, Estonia

**Aim:** The aim of this investigation was to examine the effects of menstrual cycle phase (MCP) on substrate oxidation and lactate kinetics during submaximal exercise in female rowers. **Methods:** Eleven eumenorrheic female rowers with normal menstrual cycles completed 60-min rowing ergometer exercise at 70% of maximal oxygen consumption ( $VO_{2max}$ ) during two different phases of the menstrual cycle: the follicular phase (FP) and the luteal phase (LP). Resting and exercise measurements of whole body energy expenditure, oxygen consumption ( $VO_2$ ), respiratory exchange ratio (RER), substrate oxidation and lactate kinetics were made. **Results:** Energy expenditure,  $VO_2$  and heart rate during the 60-min rowing ergometer exercise were not different ( $p>0.05$ ) among MCP. Resting RER and RER during the entire 60-min exercise period was not different ( $p<0.05$ ) among MCP. There was an increase ( $p<0.05$ ) in RER in the transition between rest and exercise and a further increase in RER occurred after the first 30 min of exercise at both MCP. Blood lactate concentrations increased ( $p<0.05$ ) in the transition between rest and exercise and remained relatively constant during the whole 60-min of exercise in both MCP. No MCP effect ( $p>0.05$ ) was observed for blood lactate concentrations. **Conclusions:** Our results demonstrated no effect of MCP on substrate oxidation and blood lactate concentration during rowing exercise at 70% of  $VO_{2max}$  in endurance-trained athletes. Normally menstruating female rowers should not be concerned about their MCP with regard to substrate oxidation in everyday training.



## **THE CHARACTERISTICS OF TRAINING, PHYSICAL STRENGTH AND FUNCTIONAL ABILITY VARIATIONS FOR LITHUANIA'S WORLD CHAMPION RUNNER-UP AND WORLD CUP CHAMPION PENTATHLETE**

**D. Vaitkevičiūtė, K. Milašius, J. Skernevičius**

Vilnius Pedagogical University, Lithuania

The aim of this study was to analyze the structure and content of a two year preparation cycle, also to explore and assess the variation of physical strength and functional ability of four year preparation for D.R., the member of Lithuanian's national women's modern pentathlon team. Methods: Physical load during the year 2009 and 2010 was analyzed. These indices of the physical development were measured: body mass, muscle and fat mass, their ratio and vital lung capacity. Muscle power in the different zones of energy production was studied. The efficiency of the alactic anaerobic energy production mechanism was evaluated by SMCP and AAMP. The indices of psychomotor functions were tested (PRT and CNS mobility). The intensity of bioenergetic processes along with the anaerobic threshold was estimated. The functional ability of cardiovascular system was evaluated by heart rate (resting, during orthostatic test, after standard physical load, during recovery) and Roufier test. Results and conclusions: Physical load during the training period for the year 2010 is optimal and amounts to 1144 hours. Percentage of training hours spent in each event of modern pentathlon matches the training load characteristics' model of the world's elite pentathlon athletes. For the purpose of improving the results of fencing, shooting and riding events, it is necessary to increase the average muscle capacity during short duration tests. The athlete's functional ability of the cardiovascular system is the strongest part of the physical strength and functional ability system and allows to compensate for weaker results in fencing and shooting events.

## **PECULIARITIES OF PERFORMANCE INDICATORS ON THE PROFESSIONAL GOLF ASSOCIATION TOUR 2010**

**M. Zienius, A. Skarbalius**

Lithuanian Academy of Physical Education, Lithuania

Introduction: The competitive outcome is a direct function of the score. The approach of using performance indicators is to predict performance outcomes (Hellström, 2009). The aim of the research was to assess the peculiarities of performance indicators in professional golfers 2010. Subjects & methods. End of season averages for performance variables for all PGA Tour players (n=192) were obtained from the PGA website for the year 2010. The research data were analyzed using the software package SPSS 17. Results. Scoring average (actual) correlated stronger to scrambling ( $r=-0.70$ ,  $p<0.01$ ), than greens in regulation (GIR) ( $r=-0.51$ ,  $p<0.01$ ), putts per GIR ( $r=0.50$ ,  $p<0.01$ ), sand save ( $r=-0.43$ ,  $p<0.01$ ), putts per round ( $r=0.36$ ,  $p<0.01$ ) and total driving ( $r=0.36$ ,  $p<0.01$ ). Scoring average (adjusted) correlated stronger to scrambling ( $r=-0.69$ ,  $p<0.01$ ), than putts per GIR ( $r=0.51$ ,  $p<0.01$ ), sand save ( $r=-0.47$ ,  $p<0.01$ ), putts per round ( $r=0.42$ ,  $p<0.01$ ), GIR ( $r=-0.38$ ,  $p<0.01$ ) and total driving ( $r=0.33$ ,  $p<0.01$ ). Conclusions. Scrambling is currently the best general measure of the combination of short game and putting skills (Hellström, 2009). Findings results suggest that short game and putting skills of professional golfers mostly determine scoring average. Golfers, playing in professional tournaments, therefore must be advised to include additional short game and putting training into their training week programme.

## **ANALYSIS OF YOUNG TENNIS PLAYERS' STATICS OF THE LOCOMOTOR SYSTEM**

**A. Zusa<sup>1</sup>, J. Lanka<sup>1</sup>, A. Paeglitis<sup>1</sup>, V. Fedotova<sup>2</sup>**

<sup>1</sup>Latvian Academy of Sport Education, Latvia

<sup>2</sup>Riga Technical University, Latvia

Aim of current research was to investigate locomotors system static's condition of young tennis players. Methods: Thirteen young healthy tennis players were studied using photogrammetry, goniometry methods and high speed video registration system Simi Motion. Seven children (aged  $6.4\pm 1.2$ ), who played tennis less than 2 years and six athletes (age  $10.3\pm 0.8$ ), who played tennis more than 3 years and participated in Latvian Tennis Federation official competitions in U-10, U-12 age groups. Photographs and video of the anterior, posterior and sagittal views of relaxed upright standing were taken. Results: Young tennis players were divided in two groups "A" – beginner group, children who played tennis less than 2 years and "B" – sport group, tennis players who participated in official competitions. The children locomotors system's statics measurements do not show a common trend and no any valid conclusions about incorrect postures causes, as well as make a statement that the load of asymmetric sport such as tennis is primary cause at this age. Conclusions: Tennis specialized training starts for children at 4–5 years old. Their locomotors system is in active developing stage. When coaching children of this age, the sport specialists should draw significant attention to locomotors system's as well as postures harmonic development. This will serve as a foundation for rational performing of technical elements in the tennis game. The experiment data provides no basis about the general trends of children's locomotors systems asymmetry because of tennis specific loads influence. This question requires further detailed study.



**FOURTH BALTIC CONFERENCE  
IN EXERCISE AND SPORT SCIENCES**  
(ORAL AND POSTER PRESENTATIONS)



## **CORRELATION BETWEEN FUNCTIONAL TESTS RESULTS AND PHYSICAL ACTIVITY LEVEL IN 55–65 YEAR-OLD WOMEN**

**S. Anisimova, A. Fernate**

Latvian Academy of Sport Education, Latvia

Aim of the study: examine the relationship between the results of EUROFIT test, Step-test and General Practice Physical Activity Questionnaire (GPPAQ). Subjects and methods: 45 women (mean age 59.1; among them: 59–61 year old – 58%) were randomized in three groups (15 in each) for an assessment. The EUROFIT test, Harvard Step-test and GPPAQ (PAI) was used for assessment. Physical Activity Index (PAI) characterizes an individual's current physical activity. Significant relationships were identified using Pearson correlation ( $\alpha < 0.05$ ). Results: training program for Group 1 included 4 types of aerobic exercise – Classic Aerobics, Step-Aerobics and two combined classes – Classic Aerobics+circuit training and Classic Aerobics+Pilates method. The results of PAI test and breath retention test show significant, negative, medium strong correlation:  $r = -0.684$ ; the indicators of PAI test and heart rate before Step-test show significant, strong positive correlation ( $r = 0.823$ ); the results of PAI test and heart rate after Step-test show significant, strong positive correlation ( $r = 0.707$ ). Group 2 was that of General physical development, so-called “Health group”. The results of PAI test and the sum of four skin fat folds show significant, positive, medium strong correlation ( $r = 0.615$ ); the results of PAI test and breath retention test show significant, negative, medium strong correlation:  $r = -0.684$ ; the indicators of PAI test and heart rate before Step-test show significant, strong positive correlation ( $r = 0.831$ ); the results of PAI test and heart rate after Step-test show significant, medium strong positive correlation ( $r = 0.625$ ). Group 3 women did not attend any organized physical activity training sessions. Significant, positive, medium strong correlation ( $r = 0.604$ ) is found only between the results of PAI test and heart rate before Step-test. Conclusions: out of 15 EUROFIT and Step-test indicators with Physical Activity Index (PAI) statistically significantly

( $\alpha < 0.05$ ) correlate only four indicators. In all investigated groups heart rate before Step-test correlates with Physical Activity Index. But from EUROFIT test indicators with PAI test results correlates only 'the sum of four skin fat folds' indicator.

## **VALUE ORIENTATION EXPRESSION IN THE CONTEXT OF 15–18 YEAR-OLD ADOLESCENTS' PHYSICAL ACTIVITY**

**O. Batutis, T. Pakštys**

Lithuanian Academy of Physical Education, Lithuania

The aim of the research is to define value orientation expression in the context of 15–18 year-old adolescents' physical activity. Research method: 200 respondents, from Kaunas secondary schools, were participated in the research (101 boys and 99 girls from 15 to 18 years). Physical activity of adolescents was determined by a modified international physical activity (IPAQ) short questionnaire, and physical orientation was determined by B. Basso's, Czech psychologist, questionnaire. The results of the research: 1. Most adolescents have a high (48%) and average (39.5%) physical activity. Boys are more physically active than girls, more of them are characterized with high physical activity whereas girls only with average or low ( $p < 0.05$ ) physical activity. 2. Most adolescents are oriented towards communication (the average selection number according to value scale is 13.0; min – 6; max – 20; median – 13), less towards activity and towards yourself (7.3 and 7.0 respectively). Among girls and boys value orientation differences were not determined. 3. In low and average physical activity groups adolescents are more oriented towards communication than high activity group (the average selection number 13.1 and 12.7 respectively), while high physical activity group is more oriented towards activity (7.4 and 7.0). Among boys and girls value orientation differences were not determined.



## **SPORTS HISTORY OF PSKOV PROVINCE IN PRE-SOVIET PERIOD**

**D. Belyukov**

Velikiye Luki State Academy  
of Physical Educational and Sport, Russia

**Aim:** To study the history of sport in the Pskov province in the pre-Soviet period. **Methods:** Identify and bring into scientific turn the unpublished documents from the state archives of the Pskov region. **Results:** In the late XIX and early XX century in Russia rapidly developed sport. A great attention was paid to physical education in schools. Pskov man's gymnasium occupied a leading position in the pre-revolutionary education of the Pskov province. In 1912 the school-boys took part in the gymnastics show in St. Petersburg and attended Sokol meeting in Prague. In Pskov region skating, cycling and gymnastics developed in particular. The statutes of Pskov gymnastic society and society of cyclists were approved in 1896. There were 11 sports clubs in the province in the pre-Soviet period. The intensification of military orientation in physical education of youth was manifested at the turn of the first and second decades of the XX century in many European countries. In Russia this trend found its expression in the scout troops' creation. During the World War I the beginning of pre-prescription training of young people in Russia began. Military and sporting committees were set up to do that. There were six committees in Pskov province. **Conclusions:** Revolutionary upheavals and the civil war in Russia suspended sports development. However, the foundation laid in the late XIX and early XX century was continued in Soviet times, but at a new level and a new ideological and organizational basis.

## **FAMILY SPORT IN PRESCHOOL EDUCATION**

**I. Bula – Biteniece, R. Jansone, J. Grants**

Latvian Academy of Sport Education, Latvia

In democratic society more and more is expressed an opinion that parent task is to help their children to become such human beings, who are able to adapt to fast changing environment, work creatively and independently seek for solutions. To enable child to learn independently and be successful in life, one should start with family, and one of the means, which will help to carry out this task, is family sport. Aim: the model of the realization of family sport in pre-school, taking as the foundation holistic approach in child upbringing. Methods: partly structured interview, student self-assessment. Results: Main conclusions, based on parent interviews about the realization of the model of family sport in pre-school education, are: parents are more educated about family sport; families are more actively pursuing different physical activities; parents have started to understand the significance of physical activities in long-term development of child personality; Having analyzed student self-assessment and the obtained assessment in study course “Pre-school sport didactics” can be concluded that Program supplement with offered innovations has promoted the improvement of student skills and attitudes: the number of skill codes has increased per 14 units. The number of attitude codes has increased per 31 units. In its turn the number of knowledge codes has decreased per 2 units. This indicates that knowledge has remained on the previous level. Conclusion: Working out and realizing the model of family sport model in pre-school, based on holistic approach in child upbringing, has promoted: student and parents upbringing experience; the importance of theoretical base in the organization of physical activities and family sporting habits; practical empirical experience in the realization of family sport.

## **EFFECTS OF ACCLIMATION ON ENDOCRINE RESPONSE TO EXERCISE IN YOUNG MEN IN THE HEAT**

**A. Burk, S. Timpmann, K. Kreegipuu, M. Tamm, K. Karelson  
L. Medijainen, E. Unt, V. Ööpik**

University of Tartu, Estonia

**Aim:** In non-acclimated (n-AC) subjects, endurance capacity (EC) is decreased and endocrine response to exercise is increased in hot compared to moderate environment. Acclimation (AC) improves EC but data on the effect of AC on endocrine response to exercise is scarce. Therefore, the aim of the present study was to assess the effect of AC on blood hormonal response to endurance exercise in the heat. **Methods:** Healthy males (n=22; age 25.0±3.7 years) completed three tests: T1 (walk till exhaustion [EX] in the heat), T2 (walk in moderate conditions; duration of the walk equal to that of T1), T3 (walk till EX in the heat). The subjects were n-AC in T1 and T2, whereas T3 was completed after 10-day AC. Air temperature and relative humidity were 42°C and 18%, respectively, in T1, T3 and during AC, and 22°C and 35% in T2. The level of 6 hormones was measured in blood. Heart rate and rectal temperature were continuously registered. **Results:** EC increased from 86.4±28.8 min in T1 to 158.0±50.1 min in T3 (p<0.005). Blood levels of prolactin, growth hormone (GH), adrenocorticotropin, renin, cortisol and aldosterone were lower in T3 compared to T1 at most time points during exercise. At the time of EX, similar levels of five hormones were observed in T1 and T3. An exception was GH, the level of which was lower at EX in T3 compared to T1 (p<0.05). **Conclusion:** AC slows down the increase in blood hormones but, except in case of GH, does not reduce the peak level at the end of exhausting endurance exercise in the heat.

## **IMMEDIATE EFFECT OF VIBROSTIMULATION**

**U. Ciematnieks, L. Čupriks, N. Keizāns, M. Lesčinskis, S. Saulīte**

Latvian Academy of Sport Education, Latvia

Foreign literature contents studies about the general effects of vibro-stimulation on the human work capacity, so we had an interest of immediate effect of local vibro-stimulation application possibilities bobsleigh. Aim of study Determination of immediate effect of local vibro-stimulation in bobsleigh push. Subjects and Methods: Subjects of experiment was 10 bobsleigh sportsmen of Latvian national bobsleigh team,  $23 \pm 1.5$  years old with at least three years of bobsleigh training experience. Following to the previous researches of local vibro-stimulation, we organized experiment: sportsmen executed control exercise – bobsled push on tracks for three times, immediately after we applied local vibro-stimulation (VS) of posterior thigh flexors – m.biceps femoris, m.semitendinosus, m.semimembranosus, then three other bobsled pushes was repeated, time was fixed at 5m and 20m distance. Results: In best repeat of three runs after VS result in 5m distance decreased by 0.02sec and amounted  $1.76 \pm 0.3$ sec ( $p < 0.05$ ), but in 20m distance push time decreased by 0.04sec and amounted  $6.15 \pm 0.2$ sec ( $p < 0.05$ ). Conclusions: We can conclude that local vibro-stimulation of single muscle group can positively affect result in bobsled push in tracks, so a result in the bobsled push in competitions can be affected as well. Local vibro-stimulation can be used before or in middle of competition (between runs), based of fact, that the decrease-ment of result occurred after 3 pushes at maximal power expressions.

## **CHANGES OF PHYSICAL DEVELOPMENT AND FUNCTIONAL CAPACITY OF DEAF BASKETBALL PLAYERS (WOMEN) DURING PREPARATORY PERIOD FOR 21 SUMMER DEAF OLYMPIC GAMES**

**R. Dadelienė, J. Skernevičius, R. Paulauskas. A. Šatas**

Vilnius Pedagogical University, Lithuania

The aim of this study was to analyze: correlations and changes of physical development and functional capacity of deaf Lithuanian basketball players during preparatory period for 21 summer deaf Olympic Games. Methods: There were 2 examinations during preparatory period for deaf Olympic Games in 2009. We examined 12 Lithuanian deaf basketball (women) team members. The physical development indices were measured. Also we measured muscle power in different energy production zones (SMCP, AACP). The indices of psychomotor functions were tested. The functional ability of cardiovascular system was evaluated by heart rate (at rest, during orthostatic test, after standard physical load, during recovery) and Roufier test. Result and conclusions: Physical development of deaf basketball players (women) hasn't significant changes. Relative SMCP and AACP are the same as health basketball players and have progress but no significant changes. Data of agility changed significantly. Insignificant changes of functional ability of cardiovascular system were recorded, systolic blood pressure decreased significantly. Correlations studies showed that height, body mass, vital lung capacity had intercorrelation. Jump high had correlation with SMCP and AACP. Relative data of SMPC and AACP had correlation with CNS mobility's data.

## **THE EXAMINATION OF SPORT MANAGERS AND COACHES' STRESS LEVELS AND DEPRESSED MOOD AT WORK**

**B. Donuk**

Istanbul University School of Physical Education and Sports, Turkey

**Aim:** This paper is an investigation of stress levels and depressed mood at work in sport managers and coaches. **Methods:** Three different questionnaires were applied to professional sport managers and coaches in Turkey. **Results:** The first questionnaire was to assess perceived stressful situations and results show that general stress levels of managers and coaches are under the average. Second questionnaire consisting of health, physical condition and tension caused by stress; it is seen that negative effects of these factors increase. At last questionnaire which evaluates the physiological conditions related to stress; it's found out that both managers and coaches aren't satisfied with their working atmosphere. **Conclusions:** It is important to determine the stress levels in working environment, because much stress can negatively influence psychological and physical health.

## **COMPARISON OF RESULTS IN STUDY COURSE "MOVEMENT GAMES" IN LASE**

**I. Dravniece**

Latvian Academy of Sport Education, Latvia

In LASE the study course of Games is 40 hours and the students receive one credit point for it. Movement Games course is practical course, which includes one lecture and methodological and practical classes. Subject of my research was Full time and Part time Department Year 2 students. My aim was to analyze the activity of students in the study course of Movement Games in Study Year 2009/2010. The used methods were: observation; talks, the analysis of pedagogical situation; the investigation of documentation, questioning, mathematical statistics. **Results:** In the study process we evaluate students

game organizing and conducting skills, their theoretical knowledge about Movement Games and found out students previous experience about games. As assessment criteria we exploited the system of assessment in marks from 1 to 10. Then I investigated student marks, depending on their age and gender, and compare results between Full time and Part time Department Year 2 students. The computation of the quantity of students' exposed in percents. Conclusions: Women have more satisfactory marks; men have received lower assessment in conducting games. Better results show the older students. If we compare the Part time and Full time students, better assessment have students of Full time Department.

## **COMPARISON OF BOBSLEIGH PERFORMANCE AT ST. MORITZ TRACK**

**V. Fedotova, V. Pilipiv**

Riga Technical University, Latvian Olympic Team, Latvia

The aim of this study was to compare results shown by 2- and 4-man bobsleigh teams at St. Moritz-Celerina sliding track. The St. Moritz naturally refrigerated track is being rebuilt each season and therefore obtains different shape every year. Data for the study were collected from FIBT results' database: 5 four-man and 6 two-man major competitive events (World Cups and World Championships) in seasons 2005/2006 – 2008/2009 were analyzed. Each heat was observed separately; only the results of top-ten finishers of each heat were processed. It had been shown that 2- and 4-man teams have similar, though statistically different average total and interval times. For each run there are registered start time and four interval times. Overall, only the 3rd, 4th and 5th interval times for both data groups had shown a significant correlation with the total run time (correlation was calculated with time remaining to finish after the corresponding interval; the last, 6th interval time is not included into correlation analysis). For 2-man team the highest correlation was with the 4th interval; for 4-man team it was with the 5th interval. The study had

shown that in average the largest difference among teams occurs on the 4th and 5th interval, and that is probably due to the accumulated speed of heavier 4-man sled.

## **TIMING RHYTHM IN FEMALE LUGERS' STARTS**

**V. Fedotova, V. Pilipiv**

Riga Technical University, Latvian Olympic Team, Latvia

Rhythm is an important characteristic of performance in sports as it describes how a motion is designed in time. It had been thoroughly studied in many sports; the aim of this research was to investigate rhythmic parameters of lugers during the starts. Data of 4 female athletes – 2 junior-level, and 2 general class-level – were analyzed in the study. The athletes performed 10 starts per day on the iced start ramp 5 times per week for 2 weeks. Time of start phases was calculated from high-speed video records (100 and 210 fps). The analysis had shown that after the 2nd paddling stroke off the ice surface all athletes have very similar rhythm of push-offs, which is around 1:1. General class-level athletes have relatively stable rhythmic characteristics throughout the whole start, whilst junior-level athletes have more stable rhythm of paddling strokes than of initial start phases (eccentric backward sliding and the start jerk). This is most probably due to the fact that junior-level athletes are still mastering the art of the important initial start phases that require a relevant physical conditioning. Overall rhythm of the paddling strokes is more similar among athletes than rhythm of the initial start phases, and largest differences between athletes are observed at the beginning of the motion.



# **THE PHYSICAL EDUCATION TEACHERS' PROFESSIONAL ACTIVITY MOTIVATION AND PLANNING COMPETENCE: A QUALITATIVE APPROACH**

**A. Fernate**

Latvian Academy of Sport Education, Latvia

The main aim of the study is to investigate the relationship between physical education teacher's professional activity motivation and planning competence. Subjects and methods: 276 physical education teachers (118 males; 158 females) from all Latvia regions were interviewed during the study. Semi-structured interviews were conducted. The questions were as follows: 1) Why do you teach physical education? 2) What are the advantages and disadvantages of a physical education teacher's work? 3) What do you want to achieve as a result of teaching? 4) What objectives have you put to yourself? Results have shown that most of the people who have chosen physical education as a career mostly have positive experience in sports, they like sports (67%) or they like sports and work together with children (10%). Only 7% consider that the career choice was determined by combination of different factors. Physical education teachers believe that physical conditioning, movements (49%) and friendly environment (20%) are advantages of the profession, but disadvantages are overload (10%), inadequate equipment (9%) and inadequate physical conditioning, the weather (7%). They want to guide students to healthy (22%) and active lifestyle (33%), help students understand the importance of physical activity (19%) and teach students' motor skills (10%). Physical education teachers have put such objectives to themselves: to work creatively and using different methods (22%), to maintain their physical condition (20%), to improve their knowledge and skills (16%). There is a relationship between physical education teachers' (female) beliefs about disadvantages and expectations to achievements as a result of teaching. Conclusions: it is essential and valuable to understand teachers' beliefs if we are to develop teacher professional education programmes. Meaningful change in teaching practice may be achieved, when teachers' beliefs are tested through analytical processes.

## **INFLUENCE OF FUNCTIONAL STATE OF CERVICAL VERTEBRA ON REGULATION OF TONE OF ANTERIOR PART OF NECK MUSCLES**

**Z. Galeja, A. Paeglitis, E. Eglitis**

Latvian Academy of Sport Education, Latvia

In practice often it is observed increased curvatures in cervical and upper thoracic regions of spine in sagittal plain. This situation is caused by asymmetric tension of neck anterior and posterior muscles. It is due the shift from normal resting tone of these muscles. From applied kinesiology view point it is known that muscles which are functionally weak, are not adequately involved in posture maintenance. Muscles working instead of these in such situation are hyper loaded and therefore increases their fatiquability. The aim of this investigation was to clear up – did the normalization of neck vertebra functional state with mobilization techniques renews the tone of functionally weak muscles and with this normalizes increased tone of m. scalenius and m. sternocleidomastoideus. Material and methods: In this investigation participated 9 students. For evaluation of functional state of spine neck region we use stance evaluation with photogrammetric method. For evaluation of muscle tone and its functional state we use methods of applied kinesiology. Results: Using stance evaluation with photogrammetric method we select 9 students with increased kyphosis in cervicothorocal region and increased lordosis in C4–C6 level. These students also have functional blocks in C0–C1 level. Evaluation of muscle tone reveals that tone of muscle scalenius and sternocleidomastoideus were increased and range of motion in neck extension was decreased. Neck deep muscles- m.longus capitis and m. rectus capitis anterior reveal functional weakness. Using mobilisation technique with rotation and lateroflection in segment C0–C1 the block in this segment disappears and renews normal functional state of m.longus capitis and m. rectus capitis anterior. In general, using this mobilisation technique we achieve decrease in tone of m. scalenius and m. sternocleidomastoideus and thereby increase of range of motion in neck extension. After repeated stance evaluation in neck and shoulder region in sagittal plain we establish statistically significant decrease of kyphosis in cervicothorocal region and decrease of lordosis in C4–C6 level.

Conclusions. There exists neuroreflectoric regulation between functional state of C0–C1 joints and tone of muscles – m.longus capitis, m. rectus capitis anterior and m. sternocleidomastoideus and m. scalenius.

## **POSTURAL STABILITY OF STANCE IN FEMALE ENDURANCE TRAINED ATHLETES VERSUS MODERATELY PHYSICALLY ACTIVE WOMEN AGED 18–26 YEARS**

**H. Gapeyeva, H. Aibast, J. Ereline, T. Kums, K. Jansen,  
M. Pääsuke**

University of Tartu, Estonia

The aim of the study was to analyze postural control differences of stance in female endurance trained athletes and moderately physically active women. Eight endurance trained athletes (ETA) and eight moderately physically active women (CON) aged 18–26 years (mean and SD, body height 172.6 (6.6) and 164.5 (4.2), respectively, and body mass 62.1 (9.4) and 54.6 (4.4), respectively, participated in the study. Training load was 9.8 hrs and 2.38 hrs per week in ETA and CON group, respectively. To determine the postural sway characteristics, biomechanical movement analyzer system Elite (BTS S.p.A., Milano, Italy) and force platform (Kistler Instrument AG, Switzerland) were used. The subject was asked to keep body static balance during quiet bipedal standing for 30 s. The sway characteristics of centre of foot pressure (CoP) were recorded with eyes open, first standing on the force platform (stable ground, SG) and then on the balance pad, placed on the same platform (foam ground, USG). The results of the study demonstrated that ETA group had lower CoP sway range in ML direction than CON group. No statistically significant differences in this variable for AP direction between the groups were noted. CoP sway trajectory characteristics (trace length, speed and radius) were lower in ETA group as compared to CON group. Nagy et al (2004) in the investigation of Ironman triathlon athletes found that “ironmen” are

more stable and less dependent on vision for postural control than the control subjects. Based on the results of our study, we can conclude that regular endurance training improves postural control in young women.

## **EVALUATION OF THE SPORT STRATEGY PROJECT IN LITHUANIA**

**A. Gedvilaite**

Vytautas Magnus University, Lithuania

The long term sport strategy in Lithuania has never been implemented during the Independence years. Only a few years ago sport experts, scientists and enthusiasts have held several conferences and prepared several projects for sport development in Lithuania. Lithuanian government has approved “2009–2020 Lithuanian sport development strategy project” and requested to amend it slightly at the end of 2010. This project has 4 principle aims, each aim has tasks and result criteria or a mean, which show the efficacy of the aim implementation: 1. Increase in public awareness of participating in sports; 2. Horizontal public administration system development; 3. Human resource management in order to promote society’s active participation in sports; 4. Base infrastructure development. The aim of this study is to have this project evaluated by 4 independent experts (2 sport and 2 strategic management specialists), in order to investigate the main issues and suggest possible correction actions for the project. Experts were provided with 15 questions regarding the impact on the society and overall strategy project content. All 4 experts were unanimous regarding the importance of such strategy and the positive impact on economy of regions, social development of communities and separate groups. Sport experts disagree on horizontal public administration system development due to vertical administration system being neglected. Experts point out the lack of financial tools and clear delegation of duties, they also highly criticize result criteria provided in the strategy, which in most cases is immeasurable. Strategy experts suggest reviewing strategy mission, vision and separate goals from means.

## **ASSOCIATION ANALYSIS OF THE ACE AND ACTN3 POLYMORPHISMS WITH PHYSICAL PERFORMANCE PHENOTYPES IN LITHUANIAN ATHLETES**

**V. Ginevičiene<sup>1,2</sup>, A. Jakaitiene<sup>1</sup>, K. Milašius<sup>3</sup>, L. Tubelis<sup>2</sup>,  
V. Kucinskas<sup>1</sup>**

<sup>1</sup> Vilnius University, Lithuania

<sup>2</sup> Lithuanian Olympic Sports Centre, Lithuania

<sup>3</sup> Vilnius Pedagogical University, Lithuania

The aim of this study was to determine the relationship between the polymorphisms of the ACE and ACTN3 gene and adaptation to training for Lithuanian athletes practicing various sports disciplines. The study involved 193 elite athletes (endurance (n=77), power (n=51), mixed (n=65)) and 250 controls. Anthropometric measurements and muscle strength were evaluated. Genotyping was performed by PCR-RFLP. The frequency of ACE I allele was higher for athletes rather controls (49.7% vs. 42.6%; p=0.03) due to significant difference for male athletes (50% vs.39.5%; p=0.006). ACE genotypes for power athletes were different from controls (II/ID/DD: 23.5/56.9/19.6% vs. 23.6/38.0/38.4%; p=0.019). ACE DD genotype was more common among the endurance athletes (31.2%) rather power-oriented (19.6%). For the ACE I/I athletes compared to the D/D, the BMI, muscle mass and fat mass were higher (p<0.05). The male athletes with the ACE I/I genotype had higher grip strength compared to the D/D genotype (p<0.05). There were no significant ACTN3 allele or genotype frequency differences between the athletes and controls. For the ACTN3 polymorphism significant differences were found between females: RR genotyped athletes had higher grip strength than X/X genotyped athletes (p<0.05). Our results suggest that the ACE D/D genotype is associated with endurance. The effect of the ACE and ACTN3 variants depends on the gender. According to the physiological parameters, ACE I/I and ACTN3 R/R genotyped athletes have better physical fitness compared to the ACE D/D and ACTN3 X/X genotyped athletes. From the results the high handgrip strength is dependent on both environmental and genetic factors.

## **QUALITATIVE RESEARCH ON DUAL CAREER FOR PROFESSIONAL ATHLETES IN LATVIA: INDUCTIVE APPROACH**

**J. Grants, I. Belousa, I. Kravalis, J. Zidens**

Latvian Academy of Sport Education, Latvia

Life story interview was selected to analyze internal professional and educational needs of the present professional top level and the future athletes in the framework of the European research project “Dual career for young athletes in Europe”. The following guidelines for life story interview were applied: significant events in personal professional career, significant moments in personal professional career, personal professional growth, future intentions in personal professional career, or life after personal professional career. Life story includes extensive data about person’s life in terms of different aspects that surface during an interview (Atkinson, 1998; Creswell 1998; Denzin 1989; Denzin & Lincoln 1994; Kvale & Birkmann 2009; Kvale 1996; Merriam & associates 2002; Seidman 1991; Weiss 1992). Eight elite athletes were interviewed following the guidelines for life story. The themes developed from life story interviews were as follows: Sport and education – two lives in one; Sport and education – similarity in diversity; Sport and education – mutual benefits; Sport and education – combining motifs; Sport, not education – reasons of leaving behind; Life after sport career. The final reflections of the interview were: enthusiasm – “be a poet, create it from nothing!” and self – directed learning.

# **TECHNIQUE AND METHODICS OF CHECK ROTATION JUMPING IN FIGURE SKATING: FOUR STEPS FROM SINGLE JUMPS TO QUADRUPLES**

**J. Gross**

University of Tartu, Estonia

The aim of the study was to find out effective and safe means and methods for the development of the skaters abilities to do well coordinated powerful figure skating jumps from the singles up to the quadruples. The Figure Skating traditional training methods compared the effectiveness of the use of the patented Grossing system. Most effective is the using four-steps Automatic training harness system (ATHS) in the longitudinal preparing process of the high level Figure skating. The key of the using ATH system is the Central jump harness Icegrossing-1 as the Coordinator of the skater jumping rhythms and movements on air with maximum supporting power and safety. Long-line Jump Harness Icegrossing-2 works as Analyzer and motor-rhythmical Coordinator of figure skater movements in speed from the ice to the air with medium supporting power that can softer regulate for skaters needs, when their skills become better trough the regular practicing on the Icegrossing-1. Super jump harness Icegrossing-3 is the Figure skater movements Coordinator and Synthesiser in the most of real situations on ice and air and landing in practice on complicated jumps, rotations and steps combinations on different lines and serpentine over the ice with minimum supporting power. Central off-ice jump harness Grossing is the Analyzer, Coordinator and Developer of the Figure Skater basic skills, powerful jumps, sense of rhythm and physical abilities on off-ice practice, acrobatics, making tricks, lifts, gives creative freedom for working out new elements etc., useful for specific off-ice warming-up, saves time for more specialized practice on ice.

## **RELATIONSHIPS BETWEEN TEACHER MOTIVATION AND TEACHING METHODS**

**V. Hein**

University of Tartu, Estonia

The present study aimed to test the validity of the teacher motivation questionnaire among Estonian physical education teachers and how teachers' motivation is related with different teaching methods and the latter with antecedents of students' motivation. Methods: The samples of 48 teachers and 584 students were used for this study. The teacher motivation was assessed by the items developed by Roth et al (2007). The use of teaching methods was estimated by teachers' self-reported data according to the description of teaching methods (Curtner-Smith et al., 2001). Perceived psychological needs for autonomy, competence and relatedness, and autonomy supportive behavior from teachers were assessed among students. Confirmatory factor analyses were used to test the appropriateness of the questionnaire. Results: The fit indexes of the modified version of the questionnaire showed an acceptable level (NNFI=0.94, CFI=0.91 and RMSEA=0.049). Reproductive teaching methods were not significantly related with different types of motivation whereas the productive methods were related with intrinsic and identified types of motivation. The productive methods were related to the need for perceived relatedness which in turn with autonomy supportive behavior from teacher. Conclusions: The modified version is suitable to measure teacher's motivation to teach and productive methods are related with intrinsic types of motivation.



## **BLOCK PERIODIZED TRAINING IN VIEW OF THE THEORY OF ADAPTATION AND INSIGHTS OF SPORT PSYCHOLOGY**

**V. Issurin**

Wingate Institute for Physical Education and Sport, Israel

**Aim:** This presentation is purposed to introduce fundamental biological and psychological backgrounds of Block Periodized (BP) training that is considered as the foremost approach to preparation designing of high-performance athletes. **Methods:** The proposed review summarizes outcomes of the long-term studies, scientific reports and follow-up processing fulfilled by the author with elite athletes. **Results:** The general idea of recently published BP concept presupposes the sequencing of specialized mesocycle-blocks, where highly concentrated training workloads focus on a minimal number of motor and technical abilities (Issurin, 2008–2010). Since the general idea of BP proposes separation of generalized and more specialized highly intensive drills, two different mechanisms of human adaptation are engaged. The first group that encompasses exercises for cardio-respiratory fitness, morphological and organic adjustment, and general neuro-muscular coordination, require homeostatic regulation – a fundamental mechanism for controlling constancy of the internal milieu (Cannon, 1929). The second group contains more specialized highly intensive workloads, which performance demands activation of the stress mechanism as described by Selye (1950). Administering training that entails the concurrent use of both biological adaptation mechanisms leads to conflicting responses, which are characteristic of the traditional model of periodization. Consideration of psychological issues emphasizes benefits of BP designs for mental training and mental concentration. Multi-peak preparation, which is a distinctive aspect of BP, provides multiple opportunities to implement various psychological techniques repeatedly, sharing them during the length of an annual season. Reduction in the number of targeted abilities, which is substantial condition of BP designing, facilitates more efficient mental concentration and maintenance of a sufficient level of arousal. Attaining similar levels of concentration while working simultaneously on many athletic abilities, as it is proposed by traditional system, seems unrealistic. **Conclusions:** Two fundamental mechanisms of

human adaptation i.e. homeostatic regulation and stress adaptation form biological background of BP training. The favorable pre-conditions for mental training and mental concentration give support for psychological background of BP system.

## **COACH OPINION ABOUT THE OPPORTUNITIES, PARTICIPATION AND MOTIVATING FACTORS OF FURTHER EDUCATION IN LATVIA**

**M. Jakovleva, J. Zidens, A. Fernate**

Latvian Academy of Sport Education, Latvia

Aim of the study: investigate the mutual relationship between the coaches' views on the opportunities of further education in Latvia, coaches' participation in further education and factors motivating it. Subjects and methods: in the investigation participated 191 respondent, out of which 72 were women (38%) and 119 men (62%), aged from 20 to 71 years (coming from various regions of Latvia and having different levels of education). In the research were used questionnaires (Cronbach  $\alpha$ ,  $\alpha=0.60$ ) and mathematical statistics. In the process of quantitative data processing was used Spearman correlation analysis. Results: respondent satisfaction with the opportunities of further education in Latvia and self-assessment of respondent theoretical knowledge mutually correlate ( $r_s=0.18$ ;  $p<0.05$ ). Coach self-assessment of their theoretical knowledge correlates with their age ( $r_s=-0.35$ ;  $p<.001$ ), years of service ( $r_s=-0.30$ ;  $p<.001$ ), practical professional knowledge ( $r_s=0.17$ ;  $p<0.05$ ) and coach opinion that lifelong learning is changing people attitude to important issues ( $r_s=-0.23$ ;  $p<0.01$ ). There exists correlation between the coaches' views about lifelong learning, in which are complemented innovative competences, and factors, motivating further education ( $r_s=-0.18$ ;  $p<0.05$ ). If coaches in addition attend courses and seminars, then their practical professional knowledge they evaluate as medium or satisfactory ( $r_s=-0.22$ ;  $p<0.01$ ). There exists a correlation between the participation in coach courses and seminars, and the development of professional competence for

further education ( $r_s=0.24$ ;  $p<0.01$ ), as well as with the coach's views that in lifelong learning is being elaborated and put into order their system of values ( $r_s=0.20$ ;  $p<0.01$ ). There exists a mutual correlation between the coaches opinion about everyday learning activities, and courses and seminars attended by coaches ( $r_s=0.15$ ;  $p<0.05$ ). Conclusions: in the process of working out the Programs of further education, should be taken into consideration coaches' views about the opportunities of further education, self-assessment of their theoretical professional knowledge and skills, as well as factors, motivating further education.

## **PHYSIOLOGICAL CHARACTERISTICS OF MALE BASKETBALL PLAYERS DURING PRE-SEASON PHASE: A PILOT STUDY**

**T. Jallai, J. Ereline, T. Kums, H. Aibast, H. Gapejeva, M. Pääsuke**

University of Tartu, Estonia

The purpose of this pilot study was to determine the changes in physiological characteristics in male basketball players throughout different training periods. Twenty-seven male basketball players, age ranging from 14 to 27 years, were distributed into 3 groups: I group consisted of elite male basketball players ( $n=4$ , mean age and SD  $23\pm 3.8$  yrs), II group consisted of development team basketball players ( $n=12$ , mean age  $17.5\pm 1$  yrs), and III group consisted of young basketball players ( $n=11$ , mean age  $15\pm 0.6$  yrs). The subjects performed static balance, muscle power, strength and endurance tests, and their body composition was also determined. The subjects filled in a questionnaire that included anthropometric data, physical activity level, and history of injuries. Anthropometric data, characteristics of static standing balance, vertical jumps and leg extensor muscle and quadriceps femoris muscle isometric maximal voluntary contraction force; also one-mile jogging test, T-test, the running-based anaerobic sprint test, static and dynamic core exercises estimations were recorded in August 2010, at the end of the basketball players' pre-season training phase. The battery of tests gives a comprehensive overview of

physiological characteristics of well-trained male basketball players. Mixed modeling will be used to estimate mean changes within and between phases of one year and covering several years.

## **SUBJECTIVE AND OBJECTIVE WORKLOAD ASSESSMENT IN MALE TILE LAYERS**

**K. Jansen<sup>1</sup>, L. Esko<sup>2</sup>, M. Luik<sup>2</sup>, V. Viljasoo<sup>2</sup>, J. Ereline<sup>1</sup>,  
H. Gapeyeva<sup>1</sup>, H. Aibast<sup>1</sup>, M. Pääsuke<sup>1</sup>**

<sup>1</sup> University of Tartu, Estonia

<sup>2</sup> Estonian University of Life Sciences, Estonia

The aim of this study was to evaluate tile layers workload at a construction site before and after the working day and its influence to their working ability. The subjects (n=8) were male tile layers aged 24–49 years. First the subjects completed a questionnaire and thereafter they performed before and after the working day a test of tile setting on a special wall, where was 3 stages and every stage they must set correctly 14 tiles. In the course of test the electromyographical (EMG) power spectral median frequency (MF) of biceps brachii, trapezius, deltoideus and erector spinae muscles was measured (both sides). The results of questionnaire indicate that the tile layer's most burdened parts of the body were knees, lower back and upper back. Workers complained most about tiredness, skin irritations, discomfort in eyes, knee, leg, lower back and neck/shoulder pain. Objectively estimated muscle fatigue emerged before and after the working day when comparing EMG power spectral MF measured at the beginning and end of the tile setting test. The results indicated that the most burdened muscle was right erector spinae for all 3 stages. In case of physical work, it is advisable to make short breaks every hour, so as to avoid the problems caused by overload.

## **BACK EXTENSOR MUSCLE FATIGABILITY AND POSTURAL CONTROL IN PEOPLE WITH LOW BACK PAIN**

**E. Johanson<sup>1</sup>, J. Ereline<sup>1</sup>, H. Gapeyeva<sup>1</sup>, M. Pääsuke<sup>1</sup>,  
S. Brumagne<sup>2</sup>**

<sup>1</sup>University of Tartu, Estonia

<sup>2</sup>University of Leuven, Belgium

**Aim:** The purpose of the present study was to evaluate back extensor muscle fatigability and postural control in people with and without low back pain. **Methods:** In total, 57 subjects with and 58 subjects without chronic low back pain aged 22 to 50 yrs participated in this study. Back extensor muscle isometric endurance was evaluated using Sørensen test. Surface electromyogram during Sørensen endurance test was recorded from the iliocostalis lumborum pars thoracis and multifidus muscles. Vibration as a strong stimulation for muscle spindles was used to appraise the role of proprioception in postural control. **Results:** Chronic low back pain patients had significantly shorter ( $p<0.05$ ) endurance time of the Sørensen test and they had also a significantly higher ( $p<0.05$ ) mean power frequency slope for left and right side compared to healthy controls. People with chronic low back pain showed significantly larger ( $p<0.001$ ) posterior sways than controls during ankle muscle vibration when standing on an unstable support surface. Back muscle fatigue induced a significant decrease ( $p<0.05$ ) in postural stability in healthy subjects when standing on an unstable support surface compared to the unfatigued condition. **Conclusions:** People with chronic low back pain fatigued faster than healthy controls during the Sørensen back isometric endurance test and they relied strongly on ankle proprioception resulting in a decreased postural stability. These findings suggest that impaired back muscle function, as a result of back muscle fatigue or pain, may lead to an inability to adopt postural control strategies to the prevailing conditions.

## **SOCIALIZATION AGENTS AS THE CONSTRAINTS OF INSUFFICIENT HEALTH RELATED PHYSICAL ACTIVITY AMONG LITHUANIAN ADOLESCENCES**

**V. Juškelienė, S. Poteliūnienė**

Vilnius Pedagogical University, Lithuania

**Aims:** To investigate socialization agents that should be considered as constraints influencing participation of Lithuanian adolescences in sports or physical activity. **Methods:** The study performed in 2010. Study sample represents Lithuanian schoolchildren aged 14–18 years who attended 8–12th form of secondary schools, totally 1118 persons. The study was based on anonymous questionnaire. **Results:** The survey results showed that 66.6% of adolescences physical activity is insufficient, their extracurricular exercise and sports activities don't march the health recommendations. Low physical activity are more characteristic to girls than boys, 76.3% vs. 58.2%, it decreases with age. Insufficient physical activity of adolescences was significantly association with some external and internal socialization agents: sedentary life style of the parents reported 51.1% of inactive and 48.9% of active students, absent of pairs respectively 92.2% and 7.8%, lack of space for exercising at home 68.1% and 31.9%, lack of sport areas in living place 70.7% and 29.3%; poor self-evaluation of health was characteristic to 75.2% and 24.8%, poor self-evaluation of fitness to 94.5% and 5.5%, absence of favourite sport activity to 62.6% and 37.4%, insufficient awareness in questions of physical activity to 95.0% and 5.0%. **Conclusions:** Sedentary life style of the family, absence of pears, lack of adequate space for exercising at home and living areas, poor self-perception of health and fitness, lack of favourite sport activity and insufficient awareness in questions of physical activity my be considered as socialization agents limiting exercising habits of Lithuanian teenagers.

## **EFFECT OF STRENGTH TRAINING ON ARTERIAL STIFFNESS AND BLOOD PRESSURE IN POWERLIFTING ATHLETES**

**J. Jürgenson<sup>1</sup>, P. Kampus<sup>1</sup>, M. Zagura<sup>1</sup>, V. Ööpik<sup>1</sup>,  
K. Karelson<sup>1</sup>, M. Viru<sup>1</sup>, E. Unt<sup>1,2</sup>**

<sup>1</sup>University of Tartu, Estonia

<sup>2</sup>Tartu University Hospital, Estonia

The aim of this study was to evaluate the effect of 12-week supervised strength training on arterial stiffness, peripheral and central blood pressure in powerlifting athletes. 19 male athletes (28.2±6.1 yrs) participated in the study. They exercised for 12 weeks (four days per week with intensity 60 to 100 % assessed from 1 repetition maximum, 90–120 min per session). Arterial stiffness was measured by applanation tonometry using the Sphygmocor device. There were no statistically significant differences in carotid-femoral pulse wave velocity (PWV), carotid-radial PWV or augmentation index. Peripheral and central systolic blood pressure decreased significantly after the training period (132.3±8.8 vs 124.3±8.7 mmHg,  $p=0.002$  and 110.1±7.7 vs 104.5±8.7 mmHg,  $p=0.008$ , respectively). Strength training decreased central pulse pressure (39.0±3.7 vs 35.6±5.0 mmHg,  $p=0.004$ ) but did not affect significantly peripheral pulse pressure. In conclusion, 12-week strength training period in powerlifting athletes significantly improved resting peripheral and central systolic blood pressure, but the changes in arterial stiffness parameters remained nonsignificant.

## **DYNAMICS OF MYOGENETIC RESPONSE FOLLOWED AFTER MYOTOXIN- CAUSED MUSCLE DAMAGE**

**P. Kaasik, K. Alev, M. Aru, A. Pehme, R. Puhke,  
L. Lahe, E.-L. Rahu**

University of Tartu, Estonia

One of the basics of adaptation of skeletal muscle tissue is ability to regenerate after degeneration, whereas the dynamics and degree of regeneration depend on the origin of degeneration. Many experimental models of muscle injury induce muscle degeneration by inflicting direct trauma to the structure of the muscle. On the other hand the disadvantage of these models is that the extent of damage inflicted can be inconsistent between experiments, making direct comparisons difficult. Furthermore, these injuries can damage the muscle's supporting environment, including its nerve and blood supply and satellite cells, which are crucial for successful muscle regeneration. It is known that local anesthetics cause extensive damage that is largely specific to muscle fibers, without causing damage to the basal lamina, blood vessels, or the regenerative capabilities of satellite cells. Consequently, muscle fiber regeneration can be studied unhindered, without the competing complications of ischemia and fibrosis commonly observed with other models of experimental muscle injury. Aim: The present study was undertaken in order to investigate the dynamics of regenerative response after muscle damage caused by bupivacaine injection. Methods: Adult Wistar rats were used in the study. Muscle damage was caused by 0.5% bupivacaine injection. Muscle samples were analyzed histologically and electrophoretically to clarify dynamics of regenerative changes of tissue structures and protein synthesis. Results: Intramuscular myotoxin injection caused rapid and well-pronounced damage of affected muscles, whereas almost of muscle fibers were damaged. By our data rapid myogenetic response occurred 4 days after bupivacaine injection, although serious signs of degenerative process remained for 7–8 days following myotoxin injection. Almost complete regeneration of tissue occurred 2 weeks after myotoxin action. Myofibrillar protein content decreased remarkably after myotoxin injection and remained lower compared with pretreatment values. During regenerative process differential overexpression



and underexpression of myofibrillar proteins occurred. Conclusion: myogenetic response to muscle damage caused by direct action of myotoxin occurs rapidly and is more pronounced on histological level of muscle compared with protein synthesis.

## **SUBCUTANEOUS ADIPOSE TISSUE TOPOGRAPHY (SAT-TOP) DEVELOPMENT IN YOUNG CHILDREN**

**P. S. Kaimbacher<sup>1</sup>, E. Tafeit<sup>1</sup>, R. Möller<sup>1</sup>, K. Sudi<sup>2</sup>,  
S. J. Wallner-Liebmann<sup>3</sup>, P. Scheer<sup>1</sup>, M. Dunitz-Scheer<sup>1</sup>**

<sup>1</sup> Medical University Graz, Austria

<sup>2</sup> Karl-Franzens University Graz, Austria

<sup>3</sup> Medical University Graz, Austria

**Aim:** The purpose of this study was 1) to describe the SAT-Top development for the first time in children age < 7 years and 2) to analyze the differences of SAT-Top development in girls and boys. **Methods and subjects:** The optical device LIPOMETER was applied to measure the thickness of subcutaneous adipose tissue (SAT) layers (in mm) at 15 well-defined body sites distributed from neck to calf on the right body side. These measurement points define subcutaneous adipose tissue topography (SAT-Top). In this study SAT-Top was determined in 138 normal weight children (59 girls, 79 boys) divided into three age groups (infant (0–1 yrs.), toddler (1–5 yrs.), child (5–7.5 yrs.)). **Results:** Throughout the age groups both sexes showed a decrease of SAT layers. Boys showed a faster onset of decreasing SAT layer thickness of trunk ( $p < 0.001$ ), abdomen ( $p < 0.001$ ), legs ( $p < 0.001$ ) and Total-SAT ( $p < 0.001$ ), whereas in girls only SAT layer thickness of legs ( $p = 0.006$ ) decreased. In the infant and child group SAT layer profiles showed a similar pattern for both sexes. Differences of SAT-Top between girls and boys could be found in the toddler group. Male toddlers showed significantly lower values of the SAT layer thickness of arms ( $p = 0.038$ ), trunk ( $p = 0.049$ ) and legs ( $p = 0.046$ ). **Conclusions:** The results of these measurements suggest sex-specific differences of decreasing fat mass and SAT-Top development between girls and

boys. Furthermore, an accurate description of SAT-Top of healthy children can help to describe various diseases in relation to malnutrition and obesity from infancy to childhood.

## **THE EFFECTS OF ASTRAND AND 3 STEP TEST ON THE VALUES OF CIRCULATION PARAMETERS, LEUKOCYTE, NEUTROPHYL AND LYMPHOCYTE**

**A. Kamar, Ö.C. Göksu**

Istanbul University School of Physical Education and Sports, Turkey

**Aim:** Aim of this study is to investigate the effects of Astrand and 3 step test on the values of circulation parameters, leukocyte, neutrophyl and lymphocyte. **Method:** WBC, Neutrophyl and lymphocyt and haemodynamic responses to the Astrand and 3 Step tests have been studied in 28 male moderately fit subjects mean age was  $20.2 \pm 0.8$  years, mean height was  $178 \pm 3$  cm, mean weight was  $68.5 \pm 5$  kg and  $MaxVO_2$  was  $48.5 \pm 6$  ml/min/kg. **Conclusions:** After astrand test, mean value of WBC (leukocyte) is 30.19%. Neutrophyl has been found to decreased (7.7%). Lymphocyt has been found to increased (13.83). After the 3 step test, WBC's mean value 53.4%. Neutrophyl has been decreased (13.23%) and lymhocyt has been increased (20.5%) Hearth Rate has been increased during astrand test (from  $66 \pm 5$  to  $149.2$ /min). Systolic blood pressure has been increased (31%), diastolic blood pressure has been decreased (17%). During 3 step test HR has been increased (from  $67.4 \pm 8$  to  $178.4$ /min). When the systolic blood pressure is increased (36.6%), diastolic blood pressure is decreased (24%).

## **ASPECTS OF CO – ORDINATION ABILITIES TRAINING IN 10–11 YEARS OLD FOOTBALL PLAYERS BY THE WAY OF USE OF NONSTANDARD BALLS**

**M. Katinas, V. Lemezis**

Vilnius Pedagogical University, Lithuania

The aim of investigation – to study the development of co–ordination abilities in 10–11 year old boys during football training. Methods for the implementation of the aim of investigation: analysis of scientific data, educational experiment, testing, statistical methods. It was found out that E1 group boys made a bigger progress and their co – ordination abilities were better in compare to E2 group. The greatest improvement of results the E1 group boys made by hitting the target with a ball – the results of felicity by hitting ball with right leg was better 2.04 time and by left leg – 3.33 time. The games like control ball by both legs involved in the experimental program positively influenced control of ball by left leg for the E1group boys. The boys from E2 group were trained by the standard training program so the marginal increase of their physical preparation and co – ordination abilities were observed. The data obtained shows that it is possible to improve co – ordination abilities and the level of other physical preparations in 10–11 years old boys by the way of use of different exercises with nonstandard size balls in the training program. It is appropriate to prepare the complex of exercise for the development of – co ordination abilities for such age of football players. We suppose that better results of co – ordination abilities let them quicker and on even keel to learn different football technical movements in the future.

## **INFLUENCE OF CORAL CALCIUM “CORAL MINE” ON WORKING CAPACITY AND RESTORATION OF SPORTSMEN AFTER LOADING**

**A. Kholodnova<sup>1</sup>, A. Stasiulis<sup>2</sup>**

<sup>1</sup>Latvian Academy of Sport Education, Latvia

<sup>2</sup>Lithuanian Academy of Physical Education, Lithuania

**Aim:** By means of coral calcium “Coral Mine” to reach improvements of working capacity of sportsmen. **Subjects:** The 21 subjects took part in research (10 in experimental and 11 in control groups). All of them were members of national teams of Lithuania on track and field athletics (14 sprinters) and cycling sports (7). **Methods:** Questioning. Pulmonary ventilation and gas exchange data recording. Biochemical blood analysis. Body composition analysis. Ergometry – Continuously increasing running exercise (CRE) – Continuously increasing cycling exercise (CCE). Determination of aerobic capacity and pulmonary gas exchange parameters. The analysis of pulmonary ventilation, gas exchange, HR and lactate kinetics. Determination of ventilatory thresholds, maximal cardiorespiratory values and working efficiency. Mathematical statistics. **Results and Discussion:** The results of the study were analyzed using the following statistical methods: means and standard deviations were calculated; sample means were compared using nonparametric Wilcoxon test; differences between data were considered as statistically significant, when  $p < 0.05$ . According to the poll was fixed significant improvement of health and working capacity after coral calcium “Coral Mine” taking. As a result of identical loading in both groups, average value of indicators in experimental group has increased by 0.42 points, in the control group has decreased on 0.04 points on of Ashmarin’s method. Parameters of pulmonary ventilation and gas exchange in experimental group in individual indicators have yielded positive result, in control are not present. Blood sampling for lactate showed quick recovery after workload. The body composition remained is invariable. Ergometry showed statistical improvement in the efficiency of work on the first and second ventilation threshold. We consider that due to insufficient quantity of the experimental group, not all results are statistically authentic.

## **BIOMECHANICAL ANALYSIS OF PARTNERS' CONTACT IN STANDARD DANCES USING MOTION CAPTURE SMART SYSTEM 2011**

**A.Klonova<sup>1</sup>, A.Cicchella<sup>2</sup>, J.Klonovs<sup>3</sup>**

<sup>1</sup>Latvian Academy of Sport Education, Latvia

<sup>2</sup>University of Bologna, Italy

<sup>3</sup>Ventspils University College, Latvia

Dance sport is a highly technical sport, in which performance is characterized by specific dexterity, coordination, harmony in movements and synchronizations with the partner. To dance means to move the body in time with the music and to perform actions with the body or its parts. To define dance sport actions and movements is not particularly easy, because it can be made in an endless number of directions and often involve several parts of the body. All movements in compositions were made in partners' close contact. Depending on dancing professional skills of the couple, ability to continuously keep contact changes. The aim of this study was to analyze biomechanical movements of the partners' bodies and to determine contact in Standard dances with Motion Capture Smart System 2011. The investigation was carried out by analyzing videos of basic compositions in Standard dance programme: Slow waltz, Tango, Viennese waltz, Slow foxtrot and Quickstep. Videos were captured with 10 high performance infrared cameras (250 frames per second). Fifteen Professional dancing couples participated in the research, all of whom are athletes of Standard dance field. First, we have configured cameras and made the static and dynamic space calibration. Second, we have recorded necessary initial parameters of subjects. Third, we have adjusted markers on the joints of each dancer and measured biomechanical parameters of close partners' contact during Standard dances. After recorded data processing and analysis, we established that there is a difference between partners' flexion and extension of knees. Also partners' hip line transversal plane is not parallel. Results proved that contact condition influences on physical load of dancers during competition. Continuous contact keeping with parallel hip line transversal plane and synchronous lowering and rising in a couple enables more effective and dynamic movements in composition.

## **CAUSAL RELATIONSHIPS BETWEEN GLOBAL SELF-ESTEEM AND HEALTH-RELATED QUALITY OF LIFE AMONG ADOLESCENTS**

**A. Koka, R. Viira**

University of Tartu, Estonia

**Aim:** The purpose of this study was to examine the causal nature of the relationship between global self-esteem and health-related quality of life among adolescents using a cross-lag panel design while controlling for the covariance stability of the constructs. **Methods:** A total of 204 secondary school students (111 girls and 94 boys, M age=13.57, SD=0.67) from Estonia completed questionnaires assessing their global self-esteem and health-related quality of life at two points in time, three months apart. Data were analyzed using structural equation modeling analysis. **Results:** Results from the well-fitting cross-lagged structural model [ $\chi^2(120)=202.66$ ,  $p<0.001$ , CFI=0.94, IFI=0.94, NNFI=0.93, RMSEA=0.058] revealed that global self-esteem and health-related quality of life constructs exhibited moderate to high degree of temporal stability, and that prior global self-esteem was related to higher perceptions of subsequent health-related quality of life and not the reverse. **Conclusions:** Results suggest that global self-esteem is a predictor variable of the health-related quality of life among adolescents. This unidirectional causal effect suggests that interventions should strive to improve adolescents' global self-esteem in order to produce positive changes in perceptions of health-related quality of life.

## **CORRELATION BETWEEN 9–10 YEAR OLD STUDENTS' SELF-CONTROL SKILLS AND SUBJECTIVE SOCIAL ADAPTATION**

**V. Kontautienė<sup>1</sup>, A. Vilkas<sup>2</sup>**

<sup>1</sup> Klaipeda University, Lithuania

<sup>2</sup> Vilnius Pedagogical University, Lithuania

Physical education develops young learners' ability to adapt to constantly changing conditions and requirements and help a person to know oneself better, assess one's body physical senses and psychical state, and to develop self-control skills (Pradinio ir pagrindinio ugdymo bendrosios programos, 2008; Baumeisteris, 2003; Cecchini et al, 2007). Therefore, it is meaningful to research correlation between 9–10 year old students' self-control skills and social adaptation so as to improve students' self-control skills and physical education achievements. Research aim: to determine correlation between 9–10 year old students' self-control skills and social adaptation. The research was conducted in general schools of Vilnius, Kaunas, Klaipeda in 2010. 410 9–10 year old students participated in the research. Research methods: analysis of specialist literature, survey applying questionnaires, mathematical statistics. The questionnaire of self-control evaluation was designed on the basis of the programme To Grow and Strengthen (2004) of Lithuanian physical culture, as well as following Social Skills Inventory for Emotional Control and Social Control by Riggio and Friedman (1982, 1983). The scale of subjective social adaptation by V. Legkauskas (2009) was applied to assess students' contentment with social relations. Research results: The analysis of research results allowed determining correlations between psychosocial self-control and students' social adaptation. Statistically significant linear correlations were determined between psychosocial self-control and contentment with one's relations with classmates and classmates' respect, between physical self-control and absence of enemies in class.

## **LOCAL VIBRATION IN STRENGTH ENDURANCE DEVELOPMENT**

**V. Krauksts, U. Ciematnieks, L. Čupriks, K. Krauksts,  
A. Nemčenko**

Latvian Academy of Sport Education, Company “Vibromed”, Latvia

Aim of the study: Research of local vibration as the mean of strength endurance increasement. Subjects and Methods: We have studied theoretical basis of local vibrostimulation, so experiment was organized, we included 11 subjects aged  $23\pm 0.7$  years, with 2–3 years experience in heavy athletics kinds of sport. Subjects were tested in control exercise – seated leg extension for 10 reps with each lower extremity, maximal load applied, then local vibration, based on our developed plan, was applied only on subjects right quadriceps muscle. Experiment with local vibrostimulation application lasted for 7 weeks, then retest followed. Due experiment subjects did not developed strength endurance by any means. Results: After experiment, subjects could extend right lower extremity for 10 reps with  $65\pm 1.9$ kg load, but there were only  $8\pm 1$  reps with same load for left lower extremity. The load increasement was 29% ( $p<0.05$ ). Conclusions: We can conclude that vibrostimulation affects the central nervous system, leading to faster muscle fiber recruitment during the shorter period of time and more motion units involved in movement, so the local vibrotraining can be applied in training process to separate muscle, and the strength endurance dynamics will be positive. In this case, local vibration is a good choice to develop single muscles strength abilities, if there is no other way to influence the target muscle.



## **WHAT IS MORE IMPORTANT FOR HEALTH – THE DOMAIN OF PHYSICAL ACTIVITY OR AMOUNT OF PHYSICAL ACTIVITY?**

**M. Kull, J. Matsi, L. Raudsepp**

University of Tartu, Estonia

**Aim:** The purpose of this study was to determine the relationship between self-perceived health and recreational, occupational, commuting, and total physical activity in women. **Subjects and methods:** The sample included 956 Estonian women aged 18–50. Cross-sectional data were collected via a mail-out survey in 2008. Physical activity was assessed with the Global Physical Activity Questionnaire (Armstrong & Bull, 2006) and health status by self-perceived health. The associations were examined using multiple logistic regression and were adjusted for potential confounding factors. **Results:** Occupational (work-related and domestic) physical activity comprised the largest proportion of total physical activity estimates, while recreational physical activity provided the lowest median physical activity. Occupational physical activity had an inverse relationship with good self-perceived health (aOR=0.51, CI 0.33–0.77). No significant relationships were found between commuting and self-perceived health. Recreational physical activity was positively associated with good self-perceived health, while the relationships in the highest recreational physical activity group (compared to none) were statistically significant (aOR=2.09, CI 1.36–3.21). The higher total level of MET-hours per week was not related to good health status. **Conclusion:** From a public health perspective, these findings suggest that physical activity programs must emphasize the positive role that recreational physical activity has for women, as opposed to total weekly energy expenditure. Study was supported by Estonian Science Foundation Grant nr 7266.

## **WHOLE-BODY VIBRATION AND POSTURAL CONTROL ABILITY IN MIDDLE-AGED MEN**

**T. Kums<sup>1</sup>, H. Pilt<sup>1</sup>, H. Gapeyeva<sup>1</sup>, H. Aibast<sup>1</sup>, J. Ereline<sup>1</sup>,  
K. Jansen<sup>1</sup>, V. Viljasoo<sup>2</sup>, M. Pääsuke<sup>1</sup>**

<sup>1</sup> University of Tartu, Estonia

<sup>2</sup> Estonian University of Life Sciences, Estonia

The purpose of this study was to investigate acute effects of a single vibration session on balance control in a group of 57–65-yr-old men, bus drivers by profession, and age-matched controls (n=8 and 10, respectively). The subjects underwent a 15-min session on the vibration platform of Crazy Fit massage apparatus CMS-440, the vibration frequency was set at 15 Hz. Static balance control ability (bipedal standing eyes open, eyes closed and eyes open on a foam) before and after whole body vibration (WBV) was assessed through computerized posturography: a force plate (Kistler 9286 A, Switzerland) was used to measure the center of pressure (CoP) trajectories during two trials – before and immediately after WBV. A set of postural parameters was computed and two-way analysis of variance was used to determine the differences between the values found in three postural tests (level of significance  $p=0.05$ ) in two groups. Significant differences emerged in the recording of postural parameters during the two sessions. Before WBV the bus drivers demonstrated significantly more stability in M-L direction and control group in the A-P direction (eyes open and eyes closed). According to this study the only effect of WBV consisted in CoP displacement during bipedal standing both eyes open and eyes closed in both groups. The somatosensory information at plantar sole and ankle during bipedal standing on foam did not change after WBV in both groups. Postural perturbations during bipedal standing on foam were in the bus drivers' group less pronounced.

## **GAMES FOR DEVELOPMENT OF BALANCE FOR CLIMBING SPORTISTS**

**I. Liepina, D. Krauksta**

Latvian Academy of Sport Education, Latvia

Climbing sport (climbing the artificial climbing walls) is a relatively new kind of sport with a tendency to grow strongly also in Latvia. Sense of a balance in this sport is one of the very important forms of expression coordination. Climbers need to keep the balance during any performance of any movement on the climbing wall. There are two kinds of balance - static and dynamic balance. The first form is needed for maintaining long-term human postures, such as the climber keeps in a difficult climbing discipline putting up a lower security rope, looking at the further route, when resting on the wall. Various literature sources explain that the static balance may be developed by complicating the structure of exercises and using the psycho-functional situation, such as climbing with eyes closed. Improvement of dynamic balance is achieved by exercises of the acyclic nature. Changes in static balance are formed by continuous change of difficulty in coordination movements. Dynamic balance changes when changing conditions of the exercise performance. The goal of the research was set: to elaborate a methodology for developing the static balance of sport climbers, including plays and games to foster the sense of a balance; The elaborated balance development methodology was approved from 8 November 2010 till 19 December 2010, a total of 6 weeks. Children and young people aged 11 to 18, who are engaged in climbing sports (program of the interests education) participated in the experiment. The elaborated balance development tools and techniques were implemented in the study program of experimental group, whereas the control group worked in accordance with the previous program. Before and after the experiment participants of both control and experimental groups were tested using Bondarevsky method with a balance platform DBA (Digital balance analyzer). It was found that both control and experimental groups have improved their static balance. However, comparing the figures, it is evident that the average increase in the experimental group is higher than the average increase in the control group. Therefore, it can be concluded that exercising the sport climbing improves balance, but even faster development of the

sense of balance can be achieved by using our elaborated balance development tools and methods in the climbing courses.

## **THE LIFESTYLE OF THE POLISH STUDENTS OF THE UNIVERSITY OF PHYSICAL EDUCATION AND SPORT IN BIALA PODLASKA**

**A. Litwiniuk, R. Cieśliński, E. Huk-Wieliczuk, A. Daniluk**

Josef Pilsudski Academy of Physical Education Warsaw, Poland

**Aim:** Physical activity is one of the mayor elements of lifestyle which are requisite of suitable health condition, psychological and social level. Regular physical activity, nutrition habits and not following patterns of behaviour risky for our health contribute to a decrease in social pathology and an increase in level of health state. The main subject of the research is to diagnose the lifestyle of students (regular physical activity, nutritional habits and risk behaviour for health) of University of Physical Education and Sport in Biala Podlaska (Poland). **Methods:** The research comprised 280 students of University of Physical Education and Sport. The average age of respondents was (M=21.4 years) The subjected were interviewed of IPAQ questionnaire, Value Schwartz questionnaire and HBUSQ. **Results:** The very high percentage of students leading healthy lifestyle calls for promoting health-directed behaviour among youths. Most of students represented high level of physical fitness and practiced many of physical activity disciplines. **Conclusions:** Students prefer sport as a sport for all character on his pleasure values rather. It with introduced compositions results that good-sized divergence exists among consciousness of needs which in case of academicals environment is enough high and real part in different form of physical activity. Graduating from universities, apart from becoming teachers of physical education, they also should promote a healthy lifestyle, that why regular physical activity its very important for quality his life during the study. Active lifestyle gives well-being, fitness at the old age and possibility to keep his organism in good health.

## **REALIZATION OF GOVERNMENTAL SPORT POLITICS IN LATVIA**

**S. Luika**

Latvian Academy of Sport Education, Latvia

The aim of the research was to define governmental sports strategical planning effect to development of sport. The method used was studying documents of sport strategical planning and the analyses of statistics. The following results were obtained: from year 2006 to year 2009 the development of sport evolves accordingly to two documents: Basic Statement for Sport Policy from 2004 to 2009 and National Program for Sport development from 2006 to 2012. Analyzing the realization of the program from year 2006 to year 2009 can be concluded that the measures envisaged in the program are realized in the amount of 80 p.c. The following conclusions were drawn: to spend finance of state administration with economy is reorganized state sport administration system, in the result of which several functions are not carried out; sharp changes have affected state sport budget: state financing from year 2006 to 2008 has increased per 25%, but from year 2008 to year 2009 has decreased per 36%; taking into account that the state does not demand statistical report about sport, particular organizations have carried out inhabitant inquires about sporting habits. The results of public inquires do not confirm significant raise of the number of people, involved in sport; the number of children and youngsters, pursuing sport activities in children and youngsters sport schools, established by municipalities, has decreased; in international competitions have been reached high results; total number of sport buildings has diminished, however has increased the number of new and renovated sport buildings; had increased the number of people with special needs involved in sport, who have reached high results in sport.

## **ADULTS SUBJECTIVE HEALTH EVALUATION AND THEIR INTERRELATION TO SOCIO-DEMOGRAPHIC AND HEALTH RISK FACTORS**

**E. Maciuleviciene<sup>1</sup>, K. Kardelis<sup>1</sup>, S. Domarkiene<sup>2</sup>**

<sup>1</sup>Lithuanian Academy of Physical Education, Lithuania

<sup>2</sup>Kaunas University of Medicine, Lithuania

The aim was to show middle-aged people's subjective assessment of their health links with social-demographic and health risk factors. Subjects and methods: The study was conducted in 2003–2007 in Kaunas. There were 916 participants (392 men and 524 women) selected randomly of Kaunas city inhabitants. The age ranged from 35 to 64 years. In the work survey has been applied, was assessed physical activity at leisure, blood pressure (BP), waist volume, height, weight, calculated body mass index (BMI) and performed the statistical analysis of data. At the research was used a standard questionnaire, supplemented by the researchers questions. Results: Testing 35–64 year olds' inhabitants of Kaunas assessment of their health, has been found out that their health as very good and good assessed 25.1 percent, as average – 61.7 percent., as bad and very poor – 13.2 percent. Men statistically significant subjective assessed their health as good and very good more often than women ( $p < 0.01$ ). Bad health assessment status was determined from the dependence of education and social status: the lower level of education and social status people tend to assess their health worse than 2.6 times ( $p < 0.001$ ). With age, a subjective assessment of health has deteriorated ( $p < 0.05$ ). Conclusion: Logistic regression analysis revealed a statistically significant probability that their health worse subjectively assessed by older, low physical activity, lower social status of the population, as well as women compared to men. Data of analysis showed that the worse subjective evaluation of health is related to overweight or obesity, increased waist volume, increased blood pressure, lack of physical activity.

## **DIFFERENT PHYSICAL ACTIVITY SCHOOLCHILDREN APPROACH TO PHYSICAL EDUCATION**

**E. Maciuleviciene, R. Sadzeviciene**

Lithuanian Academy of Physical Education, Lithuania

The aim was to determine attitude to physical education of the different physical activity 15 years old schoolchildren. Methods: In questionnaire survey were participating 321 15 years old schoolchildren (151 girls and 170 boys). Study was conducted in five schools of Kaunas city in March 2009. Participants filled out two questionnaires: about the attitude to physical education and physical activity of schoolchildren. Using the modified international physical activity short form questionnaire (IPAQ). Results: Comparing the different physical activity schoolchildren views on physical education, we found out that physical education do not like pupils with low physical activity, both boys and girls. That physical education classes are necessary think most significant physical active boys (82.1%) and girls (63%). Low physical activity schoolchildren attitude is significantly different ( $p < 0.05$ ), 76.7% boys and 78.7% girls think that physical education lessons are unnecessary. All vigorous physical activity girls and 82.4% boys' do not attend physical education classes only because of disease. Laziness as the reason for attendance mentions more low and moderate physical activity schoolchildren comparing with schoolchildren of high physical activity ( $p < 0.05$ ). Conclusion: 15 years old girls and boys view to physical education depends on their physical activity. A positive view to physical education has physically active schoolchildren. More dissatisfied with the physical education are low physical activity schoolchildren.

## **FAMILY INFLUENCE ON ENGLAND AND LITHUANIAN 9TH GRADE STUDENTS PHYSICAL ACTIVITY**

**E. Maciuleviciene, R. Sadzeviciene**

Lithuanian Academy of Physical Education, Lithuania

The objective – to compare the frequency of physical activity with families and the frequency of various forms of physical activity of the 9th grades English and Lithuanian students. Subjects and methods: The study included 9th Grade Students (n=140) from Lithuanian city of Kaunas and the English city of Manchester. The study was conducted in February – March 2010. At the research was used a standard questionnaire, supplemented by the researchers questions. Results: Lithuanian students physically active leisure time spend with family more often ( $p<0.05$ ) as compared with English students. Approximately half students surveyed in England never spend leisure time physically active with family. Lithuanian students more often ( $p<0.05$ ) than the English students are doing morning gymnastics, skiing, skating, bike riding, sailing, engaged in aerobics with family members, while the British students with family travel more ( $p<0.05$ ) and most popular physical activity form among them is walking ( $p<0.05$ ). In addition, the Lithuanian students are more promoted of their family be physically active than English students ( $p<0.05$ ). Conclusion: Lithuanian 9th Grade Students with their families are physically more active than English students. There are the more popular forms of intense physical activity with family among Lithuanian students, and among English students – moderate.



## **VIGOROUS PHYSICAL ACTIVITY CONTENT IN ADOLESCENT BOYS**

**E. Maciuleviciene, R. Sadzeviciene**

Lithuanian Academy of Physical Education, Lithuania

Purpose – determine vigorous physical activity content in adolescent boys per one week. Subjects and methods: The study was undertaken in spring 2010 in randomly selected secondary schools of Kaunas (Lithuania). The participants were 104 healthy schoolboys of 9th grade. Vigorous physical activity in schoolboys was measured using Tri-axis ActiTrainer Activity Monitor device. Schoolboys wore this device for one week to measure metabolic equivalent (MET). From the data were selected vigorous physical activity which was  $\geq 6$  METs and lasted more than 10 min. Results. This study showed that 27.9 percent adolescent boys have vigorous physical activity per week. Mostly adolescent boys are vigorous active one day per week (12.5 percent) ( $p > 0.05$ ), 9.6 percent – two days per week, 3.8 percent – three times per week, 1 percent – four and six days per week, while nobody had vigorous physical activity five and seven days per week. 23.1 percent boys have vigorous activity from 10 to 20 minutes per day, 9.6 percent boys – more than 20 minutes. The longest vigorous activity time per day was 69 minutes. The biggest amount of vigorous activity per week was six days, 266 minutes, 1596 METs. Conclusion: About one third adolescent boys have vigorous activity per week, mostly one or two days, while most of the adolescent boys have no vigorous activity per week.

## **THE CHANGES OF PHYSICAL FITNESS IN LITHUANIAN SCHOOLGIRLS**

**E. Maciuleviciene, R. Sadzeviciene, O. Smirnoviene**

Lithuanian Academy of Physical Education, Lithuania

The aim of research was to determine physical fitness changes in one year period of 15 years old Lithuanian schoolgirls. Methods: It was a one year longitudinal study; 15 years old girls were tested in October and the same girls were tested in October after one year. Participants: 230 15 years girls from Kaunas (Lithuania) were tested. Measures: the Eurofit test battery was used to analyze girl's fitness. Girls performed the 20 m endurance shuttle run test, the sit-ups in 30 seconds test, the standing long jump test and the 10 x 5 m shuttle run test. Results: Girls after one year (in 16 years old) performed better the 10 × 5 m shuttle run test ( $20.24 \pm 0.19 - 19.8 \pm 0.12$ ,  $p < 0.05$ ) but performed worse the 20 m shuttle run test ( $6.98 \pm 0.13 - 6.61 \pm 0.11$ ,  $p < 0.05$ ) and did fewer sit-ups ( $30.18 \pm 0.42 - 29.35 \pm 0.43$ ,  $p < 0.05$ ). There were no changes obtained in standing long jump test results. Conclusions: One year period is enough for physical fitness significant changes in adolescent girls. There was a marked decrease in 16 years old girls endurance of cardiovascular system and abdominal muscle endurance and improvement in the results of agility.

## **IS INTRAINDIVIDUAL VARIABILITY OF MOTOR PERFORMANCE DIFFERENT BETWEEN UNILATERAL AND BIMANUAL SPEED-ACCURACY TASKS?**

**D. Mickeviciene, K. Motiejūnaitė, A. Skurvydas,  
D. Karanauskienė, V. Mickevicius**

Lithuanian Academy of Physical Education, Lithuania  
Kaunas Technical College, Lithuania

The purpose of this paper is to investigate dominant (right hand, RH) and nondominant (left hand, LH) arm differences in motor performance variables during targeted rapid aiming unilateral and bimanual speed-accuracy tasks (50 repetitions). Dependent variables were: reaction time (RT), average ( $V_a$ ) and maximal velocity ( $V_m$ ), time to  $V_m$ , path of movement (S) as well as intraindividual variability of these variables. Independent variables – unilateral and bimanual (symmetric) tasks. Twenty healthy males aged 21.8 years ( $SD=1.1$ ) participated in the research. All the subjects were right-handed. The main findings of study are as follow: 1) as task difficulty increased from unilateral (UT) to bimanual (BT), significantly increased RT and decreased velocity ( $V_a$ ,  $V_m$ ) of performance, however accuracy of movement (S) as well as variability (CV) of all variables did not change significantly; 2) the effect of hand was significant only on  $V_a$  as well as on variability of accuracy during (in both cases performance in LH was worse); 3) there was no significant correlation between UT and BT variables both in RH and LH. Bilateral task control is not the sum of left and right hand control. These findings support the idea the two hands have different internal models and motor planning processes.

## **CORRELATION BETWEEN FUNCTIONAL RESULTS AND COMPETITION OF THE HANDBALL GOALKEEPER**

**A. Molotanovs, J. Žīdens, R. Līcis**

Latvian Academy of Sport Education, Latvia

The aim of this study was to prescribe correlation between functional results and competition of the handball goalkeeper. The study included Latvian handball team and HK LSPA team's goalkeeper. Methods: Was used for teaching observation and testing method. The study was conducted in 2010, from 28 to 29 August in international handball competitions "Kalev Cup". Handball team HK LSPA played, the six games. One hour before the match was tested the goalkeeper with the functional status with diagnostic system OMEGA-M. Functional status data were compared with the goalkeeper performance data. Results: A statistically significant result is a AVE and A ( $r=0.903$ ), AVE and C ( $r=0.892$ ), AVE and D ( $r=0.812$ ), 9m and D ( $r=0.982$ ). Conclusions: Handball goalkeeper performance data and functional status indicators are a strong correlation. Handball goalkeeper competitive functional status efficiency is possible to predict with the diagnostic system OMEGA-M.

## **GENDER-DEPENDENT BIMANUAL TASK PERFORMANCE**

**K. Motiejūnaitė, D. Mickevičienė, A. Skurvydas, K. Pukėnas,  
D. Karanauskienė**

Lithuanian Academy of Physical Education, Lithuania

The aim of this paper was to investigate gender-dependent bimanual speed-accuracy task performance (50 repetitions): reaction time, average and maximal velocity, time to maximal velocity, path of movement as well as intraindividual variability of these variables. Twelve healthy males aged  $20.8 \pm 1.1$  years and 12 healthy females aged  $21.4 \pm 1.2$  years participated in the research. All participants were right-handed. The participants were asked to perform two tasks: a) a simple reaction task with unilateral hand (10 repetitions with the right and the left hand), b) a triple task with the right and the left hand simultaneously: react as fast as possible and move to two targets with maximal speed and maximal accuracy with both hands (bilateral symmetrical speed-accuracy task toward separate visual targets) (50 repetitions with each hand were performed). Though no significant difference was observed in reaction time in unilateral speed-accuracy task between left and right hands and between men and women, during bilateral task reaction time of both hands was significantly longer in women than in men. Besides, there was no significant difference in velocity in bilateral speed-accuracy task between men and women's both left and right hands, while the accuracy of the left hand was significantly greater in men than in women. There was no significant difference in intraindividual variability of reaction time, maximal velocity and path of movement between men and women as well as between left and right hands, but variability of average velocity in the right hand both in women and men was significantly greater compared to their left hand.

## **ADIPOQ SNP45 ASSOCIATED WITH LEAN BODY MASS IN PHYSICALLY ACTIVE NORMAL WEIGHT ADOLESCENT GIRLS**

**J. Mäestu<sup>1</sup>, C.L. Passariello<sup>2</sup>, R. Gruodyté<sup>1</sup>, K. Hiio<sup>1</sup>,  
J. Jürimäe<sup>1</sup>, M. Saar<sup>1</sup>, A. Cicchella<sup>2</sup>, C. Stefanelli<sup>2</sup>,  
G. Moruzzi<sup>2</sup>, T. Jürimäe<sup>1</sup>**

<sup>1</sup> University of Tartu, Tartu, Estonia

<sup>2</sup> University of Bologna, Bologna, Italy

Recently, two single nucleotide polymorphisms at position 45 and 276 on the adiponectin gene (ADIPOQ) have been recognized as determinants of total adiponectin levels, insulin resistance, and risk for diabetes in various obese populations. The aim of this study was to determine whether these two polymorphisms are indeed determinants in the development of metabolic disorders or whether they are secondary to other confounding factors. In this study, 170 physically active adolescent girls (mean age, 14.03±1.5 years and mean body mass index, 19.98±2.5 kg/m<sup>2</sup>) devoid of any metabolic diseases or confounding factors, to better attribute any findings to genotype effects. Concentration of adiponectin, insulin, and glucose were determined from blood samples with appropriate kits. Body fat parameters were evaluated with dual-energy X-ray absorptiometry, and genotype was analyzed with DNA extracted from whole blood samples followed by polymerase chain reaction and electrophoresis to separate alleles. Neither single nucleotide polymorphism +45T/G nor +276G/T was related to homeostasis model assessment index or adiponectin levels; however, the presence of the G allele on site 45 favored a significant decrease in lean body mass compared with those who were T homozygous (TG:36.90/TT:41.07 kg, p<0.05). Results suggest that the reported increase in the risk of diabetes in subjects that were G allele carriers at site 45 in obese populations compared with normal-weight populations can be linked instead to a change in muscle mass or the muscle itself present in this genotype group.

## **THE RELATIONSHIPS BETWEEN ADDICTIONS, EXERCISING, WEIGHT REDUCTION BEHAVIOR AND RISK OF EATING DISORDERS IN THE SAMPLE OF 11TH STUDENTS**

**S. Pajaujiene, R. Jankauskiene**

Lithuanian Academy of Physical Education, Lithuania

The studies sought to determine whether adolescents engaging in weight control behaviors are at increased risk for tobacco, alcohol, and marijuana use. There is practical evidence that adolescents not only use disordered eating patterns, but use health harmful exercise – related behaviour. Findings suggest an overall pattern in which adolescents engaging in extreme weight control behaviors were at increased risk for the other health-compromising behaviors. The aim of this study was to define the relationship between addictions and exercising, weight control behavior, risk of eating disorders (ED). Methods: Unhealthy weight control behaviour, abuse of harmful substances, ED risk (Eat-26 scale) was assessed using anonymous questionnaire, which filled 457 adolescents (mean age – 17 (0.55) years, 277 females). The results: One third of adolescent were involved in various sport. Majority had optimal BMI, but half of the sample reported using unhealthy PA behaviour for weight reduction, for 39.5% was usual to be on diet. 57 adolescent (12.5%) subsumed into ED risk group. Alcohol consumption and smoking conceded 31.3% and 38.3%, drugs – 7.7% of teen. Risk of ED and dieting was significantly associated with female gender as pursuit of results and addictions – with male. Professional sport was more related with unhealthy behaviour. Unhealthy PA behavior was related with ED risk. Conclusions: Teens who declared the consumption of alcohol and cigarettes were more likely to experience unhealthy weight control behavior, risk of ED and were less physical active. Drug abuse weren't related with above mentioned behavior, but significant related with pursuit of high results in sport.

## **NUTRIENT SUPPLY OF HIGH PERFORMANCE WOMEN BASKETBALL PLAYERS**

**M. Pečiukoniene<sup>1</sup>, E. Kemeryte-Riaubienė<sup>1</sup>, R. Stukas<sup>2</sup>,  
R. Paulauskas<sup>1</sup>**

<sup>1</sup> Vilnius Pedagogical University, Lithuania

<sup>2</sup> Vilnius University, Lithuania

The aim of the study was to investigate the nutritional intake of women basketball players from Lithuanian basketball team. We have analyzed the players' factual nutrition applying weighing-questionnaire method 3 days in a row and energy expenditure. We evaluated the chemical composition of daily menu: the amounts of protein, fats, carbohydrates, vitamins and minerals in food rations of basketball players. We proceed with anthropometry (height, body mass and its components) and statistical analysis to obtain the results. The results of factual nutrition research showed that average daily amount of protein was sufficient. Only two players had protein amount slightly lower than recommended and three had exceeded safe protein intake limit. Basketball players' average food ration was lack of carbohydrates. The disbalance of carbohydrate intake showed the ratio of mono- and disaccharides (54%) and polysaccharides (46%). Factual carbohydrates amounts of some players did not reach the half of recommended amount. The average daily fat intake (37%) increased at the expenses of animal fat. Even vegetable fat intakes exceeded the daily requirement. The fluctuation of energy nutrients in the players' food rations showed the unbalance of protein, fat and carbohydrates – 1: 1.1: 4.5. Analyzing amounts of vitamins in the women daily menu we found them close to recommended, except vitamins A, D B1 and Bc. The unbalance of vitamins showed the ratio between vitamins A:C:E: it was 1:25:187. Vitamins C, E and B12 in women food ration exceeded recommended limits. Average minerals amounts in players food ration were close to recommended: Ca: P–1:1.47; Ca:Mg –1:0.43.



## **THE SPECIFIC DIRECTIONS OF THE TRAINING OF LITHUANIAN HIGH PERFORMANCE ROWERS**

**E. Petkus, A. Raslanas, J. Skernevičius**

Vilnius Pedagogical University, Lithuania

Rowers' training loads are mainly focused on the rowing power increase at the anaerobic threshold, therefore the selection of the implements for the performance of special training is undoubtedly very important and adverse climate conditions become a result limiting factor. The aim of the research was to study the directions of the training of Lithuanian high-performance rowers and to analyze the alternation of applied training implements at various seasons and different training stages. The study has revealed that during the preparatory period (November – April) 80–85% of total time, climate conditions are unsuitable for rowing on water in Lithuania. Training time abroad in warmer climates made only 35–37% (30–32% rowing on water) of the preparatory period. Time for special training during the preparatory period took 51% (rowing on water or Concept2), total cyclic training at aerobic zone amounted to 74%, anaerobic-glycolytic 2%, Power room at aerobic zone 7%, anaerobic-glycolytic-aerobic 6%, anaerobic-glycolytic 6% and anaerobic-alactatic 5%. On the average per year, rowing on water makes 72%, power room 14%, skiing-running 10%, Concept 2–7%. Throughout this Olympic cycle, physical loads at aerobic training zone were increasing though training implements changed insignificantly. Although  $VO_{2max}$  absolute parameter had been increasing up to 7.0–7.9 L/min., rowing power at anaerobic threshold and work length (endurance) at critical intensity limit with maximum oxygen consumption during 2008–2011 period was high but rather stable. The results of a 2000 m simulation test have improved by averagely 2 s.

## **ADAPTATION OF HUMAN TIBIA BONE TISSUE CHARACTERISTICS TO REGULAR PHYSICAL LOADS**

**I. Pontaga**

Latvian Academy of Sports Education, Latvia

The aim of our investigation is to determine the effect of weight bearing loads and skeletal muscles action on the tibiae bone mechanical characteristics distribution. The bone tissue characteristics are estimated by ultrasound “in vivo” in 10 athletes and 8 untrained people (the age 22–32 years) and “in vitro” in four isolated tibiae obtained from accident victims. The measurements are performed by the apparatus “ISZU-3308” (Institute of Polymer Mechanics, Riga, Latvia). The frequency of ultrasound was 200 kHz, the base of measurements was 20 mm. The highest ultrasound velocity is detected in the middle part of the tibiae diaphysis – the site of the maximal bending moment value. The second highest velocity is determined in the distal third part of the bone – the site of high, intermittent stresses and strains, and the smallest area of the bone cross-section and the moment of inertia. The skeletal muscles contractions “in vivo” create the additional mechanical stresses in the bone, especially in the distal tibia. It is in a good agreement with the higher ultrasound velocity values in the distal diaphysis “in vivo” in comparison with isolated tibiae. The ultrasound velocity values are higher and their distribution more nonuniform in the bones of the athletes due to higher muscle forces and external stress acting on the bones of athletes.

# **KNEE JOINT STABILITY ESTIMATION BY HAMSTRINGS/ QUADRICEPS FEMORIS MUSCLES TORQUES RATIOS IN RANGE OF MOVEMENTS**

**I. Pontaga**

Latvian Academy of Sports Education, Latvia

The hamstrings/ quadriceps femoris muscles (H/Q) torques ratios in the extreme positions of the range of movements (ROM) must be informative in the joint stability estimation because in these positions an injury can occur more probable. An aim of our investigation is to determine the H/Q torques ratios in the concentric/ concentric (C/C) and eccentric/ concentric (E/C) contractions in different angular positions of the knee ROM. Fifteen females and 13 males participated in the investigation. The muscles were tested by the dynamometer system "REV-9000" (Technogym, Italy) in isokinetic movements (90°/s). The ROM in the knee joint was from 10° in extension to 90° in flexion. The muscles torques is detected at the ROM with the step of 10° in C/C and in the E.H/ C.Q contractions. The ratios of H/ Q muscles torques are calculated. The ratio of the E.H/ C.Q muscles torques is significantly higher than in C/C contractions in the extended (30°) and flexed knee positions (70°, 80°). In daily and sport movements the contraction of hamstrings is eccentric only in the extreme positions of the ROM, but it is concentric in the middle part of the ROM. The H/Q muscles torques ratios in the C/C muscles contractions are significantly greater for males than for the females in the middle part of the ROM and flexed knee joint (ROM angles 50°, 60°, 70°). The muscles torques ratios in the E.H/C.Q contractions have a tendency to be greater for males than for females. It proves greater knee joint stability during movements in males than in females.

## **THE EFFECT OF TIME IN SPORT TRAINING TO PHYSICAL PERFORMANCE AND ANTHROPOMETRICAL PARAMETERS IN 10–11 YEAR OLD YOUNG BOYS**

**P. Purge, J. Mäestu, M. Saar, E. Lätt, R. Rämson, L. Utsal,  
T. Jürimäe, J. Jürimäe**  
University of Tartu, Estonia

Ekelund et al. (2007) found that physical activity and cardiorespiratory fitness are separately and independently associated with individual and clustered metabolic risk factors in children and suggested that physical fitness and activity affect metabolic risk through different pathways. Boys who are advanced in biological maturity are generally better performers than their later maturing peers in physical education classes and during competitions (Beunen et al. 1988). The purpose of the present study was to examine the effect of a time in sport training to physical performance and anthropometrical parameters. Cardio-pulmonary exercise testing and DXA was performed in 370 healthy school boys (10–12 years old). Minute ventilation (VE) and maximal oxygen uptake ( $VO_{2max}$ ), were measured continuously with a respiratory gas analysis system (Cortex, MetaMax 3B). Body composition (fat%, FM, FFM) was measured using DXA. Boys were divided into the following groups: having been training for a) less than three years ( $n=128$ ) (age  $10.86\pm 0.65$  yrs; height  $146.29\pm 7.11$ cm; body mass  $40.74\pm 11.00$ kg; BMI  $18.89\pm 4.26$ ;  $VO_{2max}$   $47.02\pm 8.47$  ml.min<sup>-1</sup>.kg<sup>-1</sup>), b) three to four years ( $n=137$ ) (age  $11.01\pm 0.71$  yrs; height  $148.83\pm 7.77$ cm; body mass  $41.47\pm 11.30$ kg; BMI  $18.53\pm 3.83$ ;  $VO_{2max}$   $48.83\pm 8.13$  ml.min<sup>-1</sup>.kg<sup>-1</sup>), and c) five and more years ( $n=105$ ) (age  $11.35\pm 0.63$  yrs; height  $151.56\pm 7.72$ cm; body mass  $45.64\pm 12.04$ kg; BMI  $19.70\pm 4.07$ ;  $VO_{2max}$   $47.97\pm 8.32$  ml.min<sup>-1</sup>.kg<sup>-1</sup>). The subjects who had been training for longer period (a) had significantly higher age, skeletal age, height, weight, BMI, FFM, Pmax,  $VO_{2max}$  and VE from subjects who have three and less (a) or three and four (b) years training ( $p<0.05$ ). The subjects who had been training three and four years had significantly higher skeletal age, height, Pmax and  $VO_{2max}$  from subjects who have three and less years training (a) ( $p<0.05$ ). There are no significant differences between groups in fat%, FM, BMC,  $SLS_{max}$  and  $VO_{2max}/kg$  ( $p>0.05$ ). These results suggest that boys who are at higher age, height and weight, have been for longer time in training and are better in performance.

## **QUADRICEPS FEMORIS MUSCLE FORCE PRODUCTION CAPACITY AND VOLUME IN MODERATELY PHYSICALLY ACTIVE YOUNG AND ELDERLY WOMEN**

**M. Pääsuke<sup>1</sup>, J. Ereline<sup>1</sup>, H. Gapeyeva<sup>1</sup>, T. Kums<sup>1</sup>, H. Aibast<sup>1</sup>,  
M. Leht<sup>2</sup>, M. Nigul<sup>2</sup>, R. Pääsuke<sup>1</sup>, E. Seppet<sup>1</sup>**

<sup>1</sup>University of Tartu, Estonia

<sup>2</sup>Tartu University Hospital, Estonia

**Aim:** This study compared isometric maximal voluntary contraction (MVC) and electrically evoked twitch torques, and volume (MV) of the quadriceps femoris (QF) muscle in young and elderly women. **Subjects:** Eighteen young (20- to 28-year-olds) and 13 elderly (70- to 76 year-olds) women volunteered in this study. All subjects were moderately physically active, many of them performed regular recreational physical activities 2–3 times per week, however, no competitive athletes were included. **Methods:** The torque developed during isometric MVC and electrically evoked twitch of the knee extensor muscles was measured by custom-made dynamometer. Isometric twitches were elicited by femoral nerve stimulation using supramaximal square wave pulses of 1 ms duration. The MV of the QF muscle was determined by magnetic resonance imaging. **Results:** Young women had 28% and 19% greater ( $p<0.05$ ) isometric MVC torque and twitch peak torque, respectively, and 37% and 29% greater ( $p<0.05$ ) MVC torque/body mass and twitch torque/body mass ratio, respectively, compared with elderly women. Twitch peak torque was greater Total MV of the QF muscle, and volumes of rectus femoris, vastus lateralis, vastus intermedius and vastus medialis muscles were by 30, 38, 31, 31 and 24% higher ( $p<0.05$ ) in young than in elderly women, respectively. The isometric MVC torque and twitch torque per total MV did not differ significantly in young and elderly women. **Conclusions:** Aging is characterized by reduced capacity for voluntary and electrically evoked force production, and reduced volume of the QF muscle. However, this study showed no existence of age-related difference in muscle torque per size in moderately physically active women.

## **ALTERATION OF ADOLESCENT ATHLETIC IDENTITY WHEN APPLYING BRIEF COUNSELING**

**V. Rakauskienė, L. Kardelienė**

Lithuanian Academy of Physical Education, Lithuania

Introduction: In the process of alteration of educational paradigms influencing physical education at school when the achievement of individual health and good fitness throughout the life is desired, forms and methods promoting physical activity of adolescents have been sought for. Aim of the study – to identify the alteration of adolescent athletic identity when applying solution brief counseling. Subjects and methods: 39 adolescents were consulted in the frame of solution focused brief counseling. 50 adolescents were not consulted and constituted the comparison group. Athletic identity questionnaire (Anderson, 2004) was filled in twice by all the consulted adolescents before and after consulting while the members of the comparison group did it twice within the period of one month. Results: The counseled adolescents stated that after consultations, the importance of physical activeness ( $p < 0.01$ ) increased for them significantly while there were no substantial alterations in other criteria of the scale of athletic identity including the assessment of one's appearance ( $p > 0.5$ ) and competences ( $p > 0.05$ ) or support from others ( $p > 0.05$ ) for involvement in physical activities. The general evaluation of one's athletic identity among counseled adolescents significantly increased. No significant changes happened in students within the group of comparison. Conclusions: Solution focused brief counseling is suitable for consulting adolescents at school since not only the target issue (the motivation to be physically active or difficulties in pedagogical communication with physical education teachers) which initially was the object of contacting a psychologist is affected but also the athletic identity of adolescent was boosted.

## **INTER-RELATION BETWEEN SCHOOLCHILDREN PHYSICAL ACTIVITY, PHYSICAL FITNESS AND ACADEMIC ACHIEVEMENTS**

**R. Rutkauskaite, M. Brazauskas, A. Emeljanovas**

Lithuanian Academy of Physical Education, Lithuania

The aim of research was to establish inter-relation between schoolchildren's physical fitness, physical activity and academic achievements. Material and Methods: The participants were 200 healthy schoolchildren of 8th and 9th grade. PA was measured by a modified short form of an international PA questionnaire (IPAQ, Ainsworth, Levy, 2004). According to the recommendations of the IPAQ Guidelines all the respondents were divided in three PA categories. The participants performed physical fitness tests for muscular strength and endurance (sit ups and bent arm hang) and explosive power (long jump). Schoolchildren's also were divided in four quartiles according to their average learning results in school. Results and conclusions: There were not established the correlations between total amount of physical activity and academic achievements ( $r=-0.094$ ;  $p>0.05$ ). At least the statistically significant difference was not established ( $p>0.05$ ), however the pupils learning in the middle level are a little bit more physically active than the other subjects. Comparing academic achievements and trunk muscle endurance, muscular strength and power results was established positive statistically significant inter-relation ( $r=0.169$ ,  $p<0.05$ ). It means that when the academic achievements are getting worse, the trunk muscle endurance results and muscular strength and power results are getting better ( $r=-0.382$ ÷ $-0.355$ ,  $p<0.05$ ).

## **FAMILY AND FRIEND INFLUENCE ON SCHOOLCHILDREN'S PHYSICAL ACTIVITY**

**R. Rutkauskaite, D. Bujaunuskas**

Lithuanian Academy of Physical Education, Lithuania

The aim of research was to determine students' physical activity, as well as family and friends influence on physical activity. Material and Methods: The participants were 200 healthy schoolchildren of 9th and 10th grade. PA was measured by a modified short form of an international PA questionnaire (IPAQ, Ainsworth, Levy, 2004). According to the recommendations of the IPAQ Guidelines all the respondents were divided in three PA categories. Schoolchildren's family and friend influence on PA was assessed using Social Support Survey from Prochaska, Rodgers, Sallis, (2002). Results: It was established that students who propose to be occupied physically active friends, activities or sports are more physically active ( $p < 0.01$ ). Encouragement of friends does not affect students' physical activity ( $p > 0.05$ ). Physically active are those which students are physically active or play sports with friends ( $p < 0.05$ ). Physically active are those students whose parents arrange trip to be physically active sports activities, or locations ( $p < 0.05$ ). The family members praise encourages students to be physically active and exercise ( $p < 0.01$ ). Conclusions: It was identified weak correlations between total amount of physical activity and: family influence on physical activity ( $r = 0.243$ ,  $p < 0.01$ ); friends and influence on physical activity ( $r = 0.250$ ,  $p < 0.01$ ). Among the family influence and friends influence on physical activity was found moderate correlation ( $r = 0.459$ ,  $p < 0.01$ ).



## **IMPACT OF TRAINING IN SPORTS GAMES AND CYCLIC SPORTS EVENTS ON MUSCLES AND CARDIOVASCULAR SYSTEM OF 11–14 YEARS OLD BOYS**

**R. Rutkauskaite<sup>1</sup>, A. Emeljanovas<sup>1</sup>, D. Novak<sup>2</sup>, J. Poderys<sup>1</sup>**

<sup>1</sup>Lithuanian Academy of Physical Education, Lithuania

<sup>2</sup>University of Zagreb, Croatia

The aim – to determine the sport games and cyclical sports impact on the features of the dynamics in functional parameters of the muscles and cardiovascular systems in boys of the age groups of 11–14 years old. The contingent of this study was 257 boys aged 11–14 years who were divided into three groups: non-athletes (n=85), cyclical sport athletes (n=89) and sport games players (n=83). Were assessed their muscle strength (calf extensors and flexors, and forearm extensors and flexors) and cardiovascular (heart rate) indices. Were found that sport games training sessions are an important external factor, affecting the functional parameters of accelerated changes in cardiovascular system (CS) of the 11–13 years old age groups. The determinant influence of endogenous factors on child's growth and development particularly increase at the age of 13–14 years, resulting significant changes in CS indices improvement and non-athletes children for the following characteristics almost equal to peers engaged in sports. The improvement of muscle capacity indices depend on the nature of physical load: muscle strength indices more increased in cyclical sports group.

## **RELATIONSHIP BETWEEN PHYSICAL ACTIVITY AND HEALTH-RELATED PHYSICAL FITNESS OF 17-YEAR-OLD GIRLS**

**R. Rutkauskaite<sup>1</sup>, A. Emeljanovas<sup>1</sup>, I. Valantiniene<sup>1</sup>, D. Novak<sup>2</sup>**

<sup>1</sup>Lithuanian Academy of Physical Education, Lithuania

<sup>2</sup>University of Zagreb, Croatia

The aim of the study was to investigate the relationships between physical activity and health-related physical fitness of 17 year old girls. 233 schoolgirls who fulfilled all requirements of the study were selected for the statistical analysis. The study was carried out in two stages: 1) physical activity measurements and 2) health-related physical fitness testing. Physical activity of schoolgirls was measured using modified Short Form of International Physical Activity Questionnaire (IPAQ). Health-related physical fitness was estimated by measuring the following components: 1) speed and agility by 10x5m shuttle test (ms); 2) explosive power of legs by broad jump test (cm); 3) trunk strength by sit-ups test (N/30 sec); 4) flexibility by sit-and-reach test (cm). In the research relationship between physical activity and health-related physical fitness one of the components – legs muscle explosive force was found. 17 year-age girls, experiencing higher physical activity, have better legs explosive force but among the same aged girls physical activity and health-related physical fitness components – flexibility, trunk strength, speed and agility – statistically significant relationships were not found.

## **RELATIONSHIPS BETWEEN PHYSICAL ACTIVITY AND PHYSICAL FITNESS IN LITHUANIAN SCHOOLBOYS**

**R. Rutkauskaitė, A. Emeljanovas, V. Volbekienė,  
E. Maciulevičienė, R. Sadzevičienė, O. Batutis**

Lithuanian Academy of Physical Education, Lithuania

Purpose: the study aims to examine the relationships between PA and PF in 16 year aged boys. Methods: 155 boys have fulfilled all the required tasks of this study. Their PA was measured by modified short form of international PA questionnaire (IPAQ). Respondents were divided in three groups: vigorous PA (n=43), moderate PA (n=63) and low PA (n=49). Participants have performed physical fitness tests to measure their flexibility (sit and reach test), power (vertical jump was obtained using jump parameter gauge), muscular strength and endurance (modified push-up). Results: The differences in physical fitness tests among the groups were identified in vertical jump, sit and reach and modified push-up. The significant positive correlation was between the physical activity and power, flexibility, muscular strength and endurance in 16-year-aged boys. Discussion and conclusions: Some studies have found significant weak to moderate correlations between total PA and cardiovascular fitness in children. Other studies, similarly to our previous results, report that total PA of children has no significant relationship with cardiovascular fitness, but has significant weak correlations with other components. The present study shows that greater volume of PA indicates better health-related fitness outcomes, i.e. legs' power, flexibility, and muscular strength and endurance of arms and trunk in 16 year old schoolboys.

## **RELATIONSHIPS BETWEEN CONTRACTION PROPERTIES OF KNEE EXTENSOR MUSCLES AND FASTING IGF-1 AND ADIPOCYTOKINES IN PHYSICALLY ACTIVE POSTMENOPAUSAL WOMEN**

**M. Saar, T. Jürimäe, M. Pääsuke, T. Kums, H. Gapeyeva,  
J. Ereline, J. Jürimäe**

University of Tartu, Estonia

Aim of this cross-sectional study was to find possible relationships between insulin-like growth factor-1 (IGF-1), adipocytokines (leptin and adiponectin) and twitch contraction (TC) characteristics of the knee extensor (KE) muscles in healthy physically active postmenopausal women (n=28, 64–78 years old). Subjects and methods: Twenty-eight postmenopausal women (64–78 years old) volunteered to participate in the study. Women were physically active, taking regularly part in organized female gymnastics lessons 2–3 times per week for at least recent 10 years. Subjects consumed their ordinary everyday diet. All women were asked to come for three visits to complete the testing. On the first visit, the participants had a venous blood sample taken in the morning after an overnight fast, and the anthropometric parameters were measured and body mass index (BMI) was calculated. All the subjects were measured MVC torque and twitch contractile properties of KE muscles in a custom-made dynamometric chair. To assess the contractile properties of the KE muscles, electrically evoked isometric twitch was elicited by percutaneous electrical nerve stimulation. Serum leptin, adiponectin, IGF-1, insulin-like growth factor-binding protein-3 (IGFBP-3) and insulin were determined. Results: There were a very few significant relationships between the measured muscle contractile parameters and fasting blood hormones. TC Pt correlated significantly with IGFBP-3 ( $r=0.652$ ,  $p=0.001$ ) and insulin ( $r=0.495$ ,  $p=0.007$ ). In conclusion, this study suggests that only TC peak torque correlated positively with serum fasting IGFBP-3 and insulin concentration. Adipocytokines leptin and adiponectin not correlated significantly with measured strength parameters in physically active postmenopausal women.

## **EFFECT OF PLYOMETRIC TRAINING ON VERTICAL JUMP PERFORMANCE AND ANAEROBIC CAPACITY IN YOUNG BASKETBALL PLAYERS**

**I. Sağıroğlu<sup>1</sup>, O. Ateş<sup>2</sup>, M. E. Önen<sup>3</sup>, M. Kayatekin<sup>4</sup>, I. Semin<sup>4</sup>**

<sup>1</sup> Gebze Institute of Technology, Turkey

<sup>2</sup> Istanbul University, Turkey

<sup>3</sup> Kocaeli University, Turkey

<sup>4</sup> Dokuz Eylül University, Turkey

**Aim:** The purpose of this study was to determine the effects of plyometric training in two different training frequencies between the competition season on vertical jump performance, anaerobic capability. **Methods:** Male basketball players aged 15–17 participated in this study. A total of 18 basketball players were divided into three groups as unbiased and in equal number (n=6); two experimental and one control group. One of these groups applied the drop jump plyometric exercise following the basketball training routine once a week while the other two groups did it three times a week, and, then, the training was completed with a stretching exercise. The study of the control group was completed with a stretching exercise after the routine. The training took eight weeks. Some measurements were taken before and after the eight weeks of the training session. Vertical jump height was determined by using the static jump test method. Anaerobic power and capacity was recorded by the Wingate anaerobic test. Flexibility was measured by using a sit and reach flexibility test. Balance measurement was evaluated by using the SporKat balance measurement procedure. Statistical comparisons among the three groups in this study were calculated by taking mean values of dependent variables, and Mann-Whitney U test, and Wilcoxon signed rank test was used for significance effects of dependent variables. **Results:** Significance level was determined as. At the end of the training, it was observed that the values of the vertical jump, anaerobic power and capacity values of plyometric exercise groups showed statistically significant improvements. A statistically significant increase in the values of vertical jump, anaerobic power and capacity and leg force was provided for the experimental group doing the plyometric exercise once a week as compared with the control group.

## **TRAINING PARADOX: CONCURRENT ENDURANCE AND STRENGTH TRAINING**

**T. Seene, P. Kaasik, K. Alev**

University of Tartu, Estonia

The phenomenon of the concurrent training effect has been known for more than three decades (Hickson, 1980). Why does training at the same time for both endurance and strength result in a lower increase of skeletal muscle functional capacity and physical work capacity in top level athletes compared to training for either one alone? The aim of the present paper is to clarify the above mentioned question. The answer mainly lies in the limited capacity of muscle to increase fiber size and oxidative metabolism at the same time. Cellular and molecular mechanisms in high and low oxidative muscle fibers are to some extent different. Compared to low oxidative fibers, high oxidative muscle fibers remain relatively small because of the increase of oxidative metabolism, synthesis and degradation of muscle proteins and their steady state turnover rate (Seene et al., 2010; Alev et al., 2009). Molecular pathways responsible for hypertrophy and oxidative metabolism and the way in which these pathways interact in different muscle fiber types during exercise training are different. Oxidative fibers contain twice more myonuclei per mm fiber length, total MyHC mRNA, higher synthesis and degradation rate (van Wessel et al, 2010). Muscle fiber size is regulated under the same signaling pathways, which control the rate of protein turnover. These signaling pathways are: \*at the level of transcription – Calcium-Calmodulin, MAP-kinase; \*at the level of translation – PI3k – Akt – mTOR; \* at the level of degradation Foxo – E3 ligase – proteasome and NF – kB pathway. In conclusion: AMPK stimulates oxidative metabolism and type I fiber type gene expression i.e. endurance capacity. MAPK and the Akt – mTOR pathway increasing the rate of protein synthesis and increased expression of growth factors i.e. strength capacity. Endurance and strength training induce antagonistic intracellular signaling mechanisms which, in turn, have a negative impact on the muscle adaptive response in comparison with training for either one.

## **SELECTED MONITORING SPORT PERFORMANCE IN HANDBALL**

**A. Skarbalius**

Lithuanian Academy of Physical Education, Lithuania

**Aim:** Handball is a complex sport and for monitoring tasks of adaptation, and sport performance of players there is no one key indicator. It is vital question for monitoring players acute adaptation when high intensity loads are applied during preparatory period. The aim of the research was to carry out key indicators for monitoring load intensities and recovery of players from previous applied loads in handball. **Methods:** Subjects: 14 semi-professional female handball players during 10 days of training camp of preparatory period were involved. The intensity of loads was measured using Polar Team System (Finland) equipment and indices of %HRmax, %VO<sub>2max</sub>, TRIMP (training impulse; Stagno et al., 2007) were calculated on the basis of HR. Recovery and influence of the previous loads were monitored before every training session on the basis of CMJ index (Bosco platform). **Results:** During 10 days players had 24 training sessions, 2177 training minutes. Training intensity of loads varied: %HRmax (72–98%), %VO<sub>2max</sub> (67–93%), TRIMP (254–403 units). Height of CMJ varied from 31.2±2.7 cm to 41.8±2.9 cm. **Conclusions:** Correlation between %HRmax, %VO<sub>2max</sub>, TRIMP, CMJ indices varied from 0.521 to 0.829. As the indicator for monitoring loads intensity in female handball we suggest to use one of the indices such a %HRmax, or %VO<sub>2max</sub>, or TRIMP. For practical needs the index of CMJ might be the key indicator in order to decide recovery of handball players from the previous loads.

## **ANALYSIS ON THE EFFICIENCY OF THE SWIM START IMPROVEMENT PROGRAM**

**V. Skyriene, T. Sibik**

Lithuanian Academy of Physical Education, Lithuania

Although the time that a swimmer spends starting in an event is invariably less than they spend stroking or turning, the differences between winning and losing a race are often so small that this can be decisive. The main aim of the swimming start is to propel the swimmer away from the starting block as quickly as possible and with the greatest momentum that can be developed. The previous analysis of Lithuanian swimmers' competitive activities has shown that even the members of the National team not always perform the start effectively. Aim of the study was to establish the efficiency of the short-term swim start from the block improvement program. Subjects and methods: The study included 18 athletes from Kaunas city. The swimmers in the first group performed grab-start, and in the second group they performed track-start. Experimental training and improvement program of start elements was applied 5 times a week during one month. All swimmers filmed from side view underwater with one video camera moving parallel to the swimmer on a tracking system and one panning video camera above water. Using SIMI Motion 2D still mode software selected temporal and kinematics parameters of starts were obtained. The calculations were performed applying Microsoft Excel Data Analysis statistical package. Conclusions: The purposeful short-term program of start technique improvement had a positive effect on the kinematic start parameters and the speed of covering the start distance. After the experiment the duration of push-off of athletes performing the grab-start and the track-start significantly decreased, as well as the duration of the flight in the group that performed the track-start.



## **YOUNG ORIENTEERS` BALANCE IMPROVEMENT**

**B. Smila<sup>1</sup>, V. Zaļaiskalna<sup>2</sup>, A. Fernate<sup>1</sup>**

<sup>1</sup>Latvian Academy of Sport Education, Latvia

<sup>2</sup>University of Latvia, Latvia

The aim of the study is to examine the effect of the use of osteopathic manipulations on the ankle, balance exercises, balance exercises and osteopathic manipulations on the ankle in the context of young orienteers` with previous ankle sprain balance improvement. Subjects and methods: 36 young orienteers` were randomized (3 groups) to an intervention, after being assessed at baseline and then reassessed one week later. Digital Balance Analyzer (DBA) was used for assessment of statical balance. Significant improvement was identified for the intervention groups using t-test. Results have shown that significant improvement in the statical balance test (right leg, closed eyes and ears) was identified for intervention group, whom intervention program was balance exercises ( $t=2.47$ ,  $p=0.03$ ). Significant improvement in the statical balance test (left leg, closed eyes and ears) was identified for intervention group, whom intervention program was balance exercises and osteopathic manipulations of the ankle ( $t=2.61$ ,  $p=0.02$ ). There was not significant improvement in the statical balance test for intervention group, whom intervention program was only osteopathic manipulations of the ankle. Conclusions: significant improvement in the statical balance indicates that the balance exercises, balance exercises and osteopathic manipulations of the ankle program have positive effects and might therefore be accepted in balance training for young orienteers.

## **2010 WORLD MASTERS SWIMMING CHAMPIONSHIP RESULTS EVALUATION IN 200M–800M DISTANCES**

**B. Statkevičienė**

Lithuanian Academy of Physical Education, Lithuania

**Objective:** To make a comparison between the 2010 World Masters Swimming Championship and Lithuania's (non masters) Swimming Championship results in 200M and longer distances. **Research Methods:** Analysis of literature sources, overview of swim competition documentation and comparison of the obtained data. **Research Organization:** Analysis was performed of the results of the 2010 Masters Swimming World Championships in Göteborg swimming 200–800 m distances using all swim strokes. We made a comparison between world masters and Lithuania's championship swimmers (non masters) records. We determined how many masters of various ages who participated in the 2010 World championship demonstrated results, which would permit them to participate in Lithuania's (non masters) swimming championship finals. We compared the obtained results with the short distance results in the 2010 World Masters competition (Statkevičienė 2010). **Obtained Results:** We determined that there would have been 434 female swimmers in the Masters World Championship, among them 7 women participants, whose ages range from 50 to 54 yr. who would have reached the finals in Lithuania's championship 364 men swimmers' of various ages (among them one participant in the 50–54 age group) demonstrated better results than Lithuania's championship (non masters) 8th place finishers. Many female swimmers from 25 to 40 years age have world masters records that are superior to the non masters Lithuania's women champions. **Conclusion:** We determined that 8 women's results and 4 men's results in various competitions are superior to the results of the 2010 Lithuania's Swimming Championship. The obtained results are very similar to the data we obtained analyzing the 2010 World Masters Swimming Championship short distance results (Statkevičienė 2010).

## **LITHUANIA'S ALL TIME SWIMMING CHAMPIONSHIPS AND THEIR CHAMPIONS**

**B. Statkevičienė**

Lithuanian Academy of Physical Education, Lithuania

The very first official swimming competition in Lithuania took place on June 24, 1924. This is the commencement of Lithuania's swimming sport history. The task of our investigation is to determine which Lithuania's swimmers have reached the highest number of Lithuania's Champion titles in individual competition. Who among them are the best universal men and women swimmers? Research methods: Sourced literature analysis. Research organization: We studied all time Lithuania's swimming championship results. We determined which Lithuanian swimmers reached the top honors throughout Lithuania's swimming history. We summarized the obtained results. Obtained results: We can divide the development of Lithuania's swimming into 3 phases: From 1924 to World War II, Soviet times (1946–1990) and the re-established independence. The best swimmers of the Phase I in individual competition can be named: B. Paškevičtė (freestyle) and E. Narbutas (freestyle). Phase II: Lina Kačiušytė (1980 Olympic Champion, World record Holder) Robert Žulpa (1980 Olympic Champion). Phase III: Vytautas Janušaitis (2004 Olympics 7th place). Individual top competitors in Lithuania's Championships are: P. Bezubovas, L. Daugvilaitė (freestyle), J. Sodaitytė, V. Tiknius (backstroke) M. Kuzmickaitė-Korienė, A. Šarpajėvas (breaststroke), I. Mauručiai, R. Bičkauskas (butterfly), B. Užkuraitytė Statkevičienė, P. Andrijauskas (IM). The largest numbers of Lithuania's swimming championship gold medals were won by B. Užkuraitytė Statkevičienė. L. Kačiušytė Olympic Champion and World Record Holder won but a single gold medal in Lithuania's swimming championships (1977). The largest number (32) of gold medals in Lithuanian Championships is owned by B. Užkuraitytė-Statkevičienė. The current top perspective belongs to a young female swimmer R. Meilutytė (breaststroke). Conclusion: The highest achievements in Lithuania's swimming history came in phase II of Lithuania's swimming development. During this time period swimmers P. Bezubovas, B. Užkuraitytė Statkevičienė and J. Sodaitytė won gold medals in Lithuania's swimming championships consecutively and respectively 9, 8 and 7 years in a row.

## **THE EFFECT OF PHYSICAL THERAPY ON THE SYMMETRY OF PASSIVE MECHANICAL PROPERTIES OF MUSCLES OF CHILDREN WITH AND WITHOUT CEREBRAL PALSY**

**L. Straubergaite, K. Muckus, L. Škikas**

Lithuanian Academy of Physical Education,  
Lithuania Šiauliai College, Lithuania

The aim of the research: to investigate whether physical therapy exercises can decrease asymmetry of passive mechanical properties of skeletal pair muscles. Material and methods: In this research, 17 schoolchildren from 8 to 16 years of age ( $12.2 \pm 0.72$ ) participated. 10 of them were boys and 7 were girls. In the first group, 7 children (5 boys and 2 girls) had cerebral palsy. In the second group, there were 10 children (5 boys, 5 girls) without physical and movement impairments. For the subjects we applied 10 sessions of physical therapy on the therapeutic ball that simulates three-dimensional movements. Passive mechanical properties of the muscles we measured using MYOTON-3. Results: no statistically significant difference between children with and without CP was estimated; also, no significant difference between mechanical properties in the beginning of investigation of asymmetry and after physical therapy on the therapeutic ball was found. Stiffness asymmetry of gluteus medius muscles after physical therapy exercises decreased: lying – 85%, standing – 80%. Little difference of both body sides' muscle stiffness asymmetry after the last physical therapy exercise revealed that chosen exercises on the therapeutic ball were effective in decreasing gluteus medius muscles' stiffness asymmetry. Stiffness asymmetry of lumbar erector spinae after physical therapy exercise decreased as well (lying – 45%, standing – 54%); however, it was lesser than that of gluteus medius muscles. The obtained results showed that exercises on the therapeutic ball that has been applied during the experiment only partially decreased asymmetry of stiffness of this muscle. Under the effect of physical therapy, asymmetry of gluteus medius muscles' tone decreased: lying – 80 %, standing – 74 %. The results of asymmetry of gluteus medius muscles' tone obtained after the last physical therapy exercise session (lying  $6.1 \pm 1.2$  %, standing  $9.6 \pm 2.3$  %) showed that applied exercises decreased asymmetry of gluteus medius muscles'

tension (tone). Under the effect of physical therapy, asymmetry of lumbar erector spinae tone also decreased: lying – 58%, standing – 64%. Exercises on the therapeutic ball only partially decreased asymmetry of lumbar erector spinae' tone. Conclusions: exercises of physical therapy on the therapeutic ball imitating horseman's movements decrease asymmetry of stiffness and tone of gluteus medius muscles of children with and without CP as well as only partially decrease asymmetry of stiffness and tone of their lumbar erector spinae.

## **MAJOR TRAINING ALGORITHMIZATION IN RHYTHMIC GYMNASTICS CONSIDERING PSYCHOLOGICAL AND PHYSIOLOGICAL PECULIARITIES OF SPORTSWOMEN**

**A. Suprun, Y. Medvedeva**

Velikiye Luki State Academy of Physical Education and Sports, Russia

The aim of this research is the experimental check of the motor memory development technology to improve the gymnasts' technical skill which was designed considering the tendencies of rhythmic gymnastics development, individual psychological peculiarities of sportswomen and the usage of programmed learning. Research methods: 1) theoretical analysis, generalization of the literary sources and programme documents, 2) pedagogical observation, 3) questioning, 4) psychological and pedagogical testing, 5) expert estimations method, 6) pedagogical experiment, 7) mathematical statistics methods. Results: Most often the effectiveness of technical elements performance within the competitions as well as training is related to the gymnast's psychological peculiarities. In order to reveal those peculiarities the psychological and pedagogical testing with the following mathematical processing of the received data was held, which allowed discovering correlations of different degrees between the factors that characterize individual psychological peculiarities, motor memory components and performance estimation. All the

discovered correlations were taken into consideration during the designing of the motor memory 'compensatory' development technology. Within the designing process over 80 motor prescriptions were defined, optimality and using peculiarities of which determined the individual programme of gymnast's technical training. Conclusions: The experimental check of this technology showed that the given approach allows reducing the terms of the individual styles formation of gymnasts' sport activity, revealing gymnasts' potential possibilities in rhythmic gymnastics all-round events. During the adoption and checking of the designed innovation technology into the rhythmic gymnastics training process gymnasts from experimental group who passed CMS standard were 30 % more than from control one.

## **MOTOR DEVELOPMENT OF 5- YEAR-OLD CHILDREN WITH IRON DEFICIENCY ANEMIA AND IRON DEFICIENCY IN INFANCY**

**K. Tammik, L. Pilt**

University of Tartu, Estonia

Introduction: Several studies have shown an association between iron deficiency with or without anemia and poor cognitive or psychomotor developmental outcomes in infants and young children. The developmental delays observed in iron deficient anemic and without anemia children have, in some studies, been irreversible even if iron status and anemia were corrected and the difference in developmental scores was still seen at ages 5 and 11 years. On the other hand many studies have revealed that replacing iron can positively influence development even in children with severe iron deficiency anemia. However, understanding whether iron deficiency with or without anemia affects children's development may have clinical significance for designing the suitable treatment strategies. Aim: The purpose of the study was to assess the motor development of Estonian 5- year- old children who in infancy had iron deficiency anemia and iron deficiency without anemia in comparison to their sex and age matched peers as controls. Materials

and Methods: The study group consisted of 16 children who were divided into two subgroups: (1) children who in infancy had iron deficiency anemia (n=8) and (2) children who in infancy had iron deficiency without anemia (n=8). The comparison group consisted of 16 children who in infancy were free of iron deficiency with or without anemia. Motor performance was tested using the Movement Assessment Battery for Children (M-ABC). To assess the everyday life management the Movement ABC Checklist, filled by teachers, was used. Results: The data revealed that there were no significant differences in M-ABC Total Impairment Score between children who in infancy had iron deficiency anemia and children who had iron deficiency without anemia. However there were no differences in M-ABC Total Impairment Score in study group compared to controls. Supporting to the M-ABC Total Score the motor development in all three groups of children was age compatible. There was no significant difference between the three measured groups in everyday life management assessed by Total Movement ABC Checklist Scores. Conclusion: There was no significant differences in motor performance of Estonian 5- year- old children who in infancy had iron deficiency anemia and iron deficiency without anemia compared to their sex and aged matched peers who had good iron status in infancy.

## **EFFECTS OF SODIUM CITRATE ON RECOVERY AFTER RAPID BODY MASS LOSS IN WRESTLERS**

**S. Timpmann, A. Burk, L. Medijainen, M. Tamm,  
K. Kreegipuu, E. Unt, V. Ööpik**

University of Tartu, Estonia

Aim: Rapid body mass loss (RBML) before competition is common among wrestlers but this may impair physiological function, affective state and performance. The aim of the present study was to test the hypothesis that ingestion of sodium citrate (CIT) stimulates regaining normal physiological state, performance and affective state during a limited time period equal to that which wrestlers have between official

weigh-in and beginning of competition. Methods: Trained wrestlers (n = 16) simulated preparation for a competition by reducing body mass (BM) by 5.4–5.5% within 72 h and following a typical pre-competition week training regime. During the 16 h recovery period after RBML, the subjects ate a prescribed diet supplemented in a double-blind manner with placebo (wheat flour) in the P group and with CIT (600 mg·kg<sup>-1</sup>) in the C group. Results: In C, an increase in blood pH, blood buffering capacity, plasma volume and regain of BM significantly exceeded the extent of the corresponding changes in P during the 16 h recovery period. Enhanced BM regain in C was associated with water retention. No between group differences were observed in upper body intermittent sprint performance or affective state of the subjects. Conclusion: Ingestion of CIT during recovery after RBML favours rehydration, BM regain and normalization of body acid-base status but does not improve upper body intermittent sprint performance or affective state in trained wrestlers.

## **FALLS AS RISK FACTORS OF HEALTH PROBLEMS OF ELDERLY: OCCURRENCE, CONSEQUENCES AND MEASURES FOR PREVENTION IN ESTONIA**

**S. Valo, T. Janson**

University of Tartu, Estonia

The natural aging process and effects of acute and chronic health conditions increase the risk that elderly person will fall and sustain an injury in a fall. In 2005 victims were observed among the elderly population (65years-old and more) in Europe (36 countries) in 31% of the cases. Falls, primarily among the rapidly growing population of older Estonians are a serious national health and social problem: as older people are frail and more susceptible to adverse consequences, falls are associated with reduced functioning and life quality, loss of independence, premature nursing home admissions, considerable morbidity and mortality. Aim: At the moment, there is very little known about elderly falls in Estonia. As the population in Estonia is



ageing and the burden of different age-associated diseases and injuries is growing, there was a need to conduct a research to investigate the occurrence, health care costs, causes, consequences, and risk factors for falls in elderly to find out if there is a need for prevention. Methods: Study describe elderly (aged 65 and older) falls trends in period between 2005–2009 years on the basis of existing statistical data of Estonian Health Insurance Fund (ICD-10, coded W00-W19). The additional dates was collected by questionnaires for the purpose of elaboration the details of accidents. The statistical analyses were performed with SPSS version 18.0. According to the results, in the year of 2009 altogether 15 523 older people sought for medical help after a fall, which accounts for 6,6% of elderly people in Estonia. Compared to the year 2005 the cases of falls had grown by 3038 persons. The county of Tartu had the highest occurrence of falls, the county of Saaremaa had the lowest one. In the year of 2009 the health care costs associated with elderly falls were approximately 102 million EEK, but the costs had doubled since year 2005. The rate of falls and health related risk factors increased with age. 50% of the falls occurred inside people's homes, 44,1% took place outside. 51% of falls was caused by intrinsic risk factors such as balance disorders, muscle weakness, loss of consciousness etc. 49% happened due to extrinsic risk factors such as home end environmental hazards. Most people fell because of slipping and stumbling. The most common injury was fractures, more than 50% accounted for hip fractures. The prevalence of health and environmental risk factors for falls was high in elderly, 97.1% and 94.1% respectively. Conclusion: The frequency, serious consequences, and healthcare costs of falls in elderly population in Estonia indicate to needs for prevention. Randomized controlled trials of single and multiple interventions have shown that falls can be reduced. According to our results the preventative measures should address three components: intrinsic factors (health, medication, physical activity), extrinsic factors (home and environmental hazards) and risk behaviour associated with falling.

## **DOES STUDENTS' MOTIVATIONAL RESPONSES TOWARD PHYSICAL EDUCATION ARE CORRELATED WITH AFTER-SCHOOL SPORT PARTICIPATION?**

**R. Viira, A. Koka**

University of Tartu, Estonia

**Aim:** This study aimed to examine differences in perceptions of self-determination theory-based constructs such as psychological needs support from the teacher and peers, perceived satisfaction of the needs for competence, autonomy, and relatedness, and different types of motivation with respect to physical education of students who participate in after-school organized sport and students who do not. **Methods:** 659 Estonian secondary school students completed questionnaires assessing the key variables of interest. **Results:** For boys, results indicated that students who did after-school sport scored significantly higher on perceived autonomy and relatedness support from the teacher, relatedness support from peers, perceived satisfaction of the needs for autonomy, competence and relatedness, and external regulation than students without after-school sport experiences. For girls, results revealed that students who did after-school sport scored significantly higher on perceived competence and relatedness support from peers as well as perceived satisfaction of the needs for autonomy and competence compared to students without after-school sport experiences. **Conclusions:** Results suggest that, largely, students' motivational responses toward physical education are correlated with after-school sport participation. In order to facilitate the formation of adaptive motivational responses toward physical education among students without after-school sport experiences, teacher should create the learning environment that support their perceptions of basic psychological needs for autonomy, competence, and relatedness.

## **THE EFFECT OF PRECEDING DROP JUMPS ON OXYGEN UPTAKE KINETICS DURING MODERATE AND HEAVY INTENSITY RUNNING IN YOUNG WOMEN**

**K. Zaicenkoviene, A. Stasiulis**

Lithuanian Academy of Physical Education, Lithuania

The aim of the study was to determine the effect of preceding 100 jumps performed by stretched legs after dropping from 47 cm height on the oxygen uptake kinetics during moderate and heavy intensity running. 9 physically active women participated in this study. Their age, height, weight and maximal oxygen uptake ( $VO_{2max}$ ) were 22.8 (4.1) years, 1.65 (0.48) m, 58.1 (4.7) kg and 42.4 (6.0) ml/kg/min, respectively. At different days the subjects performed four running exercises on the treadmill. The pulmonary gas exchange data, heart rate, rates of perceived exertion, blood lactate were recorded while performing all the exercises. On the first visit the increasing running exercise was performed for  $VO_{2max}$  and ventilatory thresholds (VT) determination. On the next three visits the subjects performed two constant speed running at moderate (90% from the first VT) and heavy intensities (first VT + the 75% of difference between VT). Several days after control running the constant load exercises were preceded by 100 jumps, performed every 20 s by stretched legs after dropping from 47 cm height (PJ). The constant speed running were then repeated 1 h and 24 h after PJ. The results showed that significant changes of oxygen uptake parameters were observed during moderate intensity running performed 1 h after PJ: the amplitude of fast phase of oxygen uptake response and the means of oxygen uptake at 4-th, 5-th and 6-th min of exercise were increased. 24 h after PJ as well as in both cases during heavy intensity running no significant changes were observed. In addition, the rates of perceived exertion were significantly increased during moderate intensity running 24 h following PJ. In conclusion, eccentric concentric preceding exercise of calf muscles (100 drop jumps with stretched legs) causes an increase in oxygen uptake during steady state phase of running with moderate intensity performed 1 h after PJ without significant effect on oxygen uptake kinetics. Both parameters of oxygen uptake are not affected by PJ during heavy intensity running.

## **ATTITUDE OF THE UNIVERSITY STUDENTS TOWARDS THEIR HEALTH, PHYSICAL ACTIVITY AND SELF-DEPENDENT PHYSICAL DEVELOPMENT**

**R. Žilinskienė, J. Armonienė**

Vilnius University, Lithuania

Aim of this research was to evaluate attitude of the students towards their health, physical activity and self-dependent physical development and to identify personal features of PE educator/lector that students consider as important for their successful work during PE lectures. Methods: analysis of literary sources, paper-and-pencil questionnaire, methods of mathematical statistics. Subjects and organization: research participants/respondents included students of Vilnius University who have chosen PE as the subject of free choice (n=232, including 54 males and 178 females, age 19–24 years old). Results and conclusions: Students of this group (both girls and boys) considered themselves as quite healthy and have identified mostly illnesses caused by cold, most of them stated that they take care for their health. Students stated that they liked PE lectures they attended. Concerning self-dependent exercising, more boys than girls stated that they are able to exercise on their own, and more girls than boys stated that they need methodical information on self-dependent physical activities. Information on the impact of physical activities on health both groups acquired equally from internet, TV, during the lectures and literary sources. Replies of the students also confirmed presumption of research authors, that significant part of the students are interested in participating in testing that could demonstrate their fitness levels, but not very much interested in sports history. There also were overviewed most important personal features of the PE lecturer that could motivate students for quality physical activities.

## **ANALYSIS OF THE RESULTS ALTERATION OF THE ELITE FEMALE HIGH JUMPERS DURING THE LONG-TERM TRAINING PROCESS**

**N. Žilinskienė, D. Radžiukynas**

Vilnius Pedagogical University, Lithuania

**Aim of Research:** To determine general consistency and individual peculiarities, which were observed during the long-term training process of the elite female high jumpers. **Subjects:** The Elite Lithuanian and World Female High Jumpers (n=13). **Methods:** Analysis of literature sources and documentation; comparative pedagogical analysis; statistical analysis. **Results:** It was determined that the Elite Female High Jumpers achieve their best results at the age of  $25.92 \pm 0.94$ . Their average height is  $1.81 \pm 0.02$  m and the average weight—  $61.83 \pm 1.41$  kg. It was determined that the sport results of the World's best Female High Jumpers at certain preparation stages would not improve evenly. The saltatory increase of results was determined on the Initial Preparation Stage (12–17 years old) going up from  $1.40 \pm 0.06$  m till  $1.84 \pm 0.02$  m ( $p < 0.001$ ). At the Special Preparation Stage (18–21 year old) the sport results increase apace and start improving from  $1.84 \pm 0.02$  m till  $1.94 \pm 0.03$  m ( $p < 0.001$ ). The Stage of High Sport Results Pursuit (22–26 m.) is slower, yet results improve from  $1.95 \pm 0.02$  m till  $2.01 \pm 0.02$  m ( $p < 0.001$ ). At the Stage of High Sport Results Maintenance (27–32 m.) the rate of sport results is kept stable fluctuating from  $1.99 \pm 0.02$  m till  $2.01 \pm 0.01$  m ( $p < 0.05$ ). We could state that the sport results progress differently depending on the factor of pubescence, especially on the Initial Preparation Stage, the training programs, the competition systems, the organism adaptation to the physical strain, the readiness, the social factors, etc. It was determined that during the annual training cycle the fluctuation of sport results is individual and wavy, i.e. every two or three competitions they increase, but after decrease. Peculiarities of individual sport results fluctuation are depend on preparedness, technique, condition, motivation, competition level, competition conditions, etc. Thus we could conclude that the objective consistency and peculiarities for alteration of sports results exist, and once acknowledged, would allow a better selection of gifted athletes, provide training methodology and means, help with competition planning as well as forecast of sport results evolution.

## **DID THE INCREASE IN THE RESULTS OF COMPETITIVE SWIMMING CEASE AFTER BANNING THE USE OF NEW TECHNOLOGY SWIMMING SUITS?**

**I. J. Zuoziene**

Lithuanian Academy of Physical Education, Lithuania

Swimming is one of few branches of sport where new technologies in sportswear did not have any serious impact in the history of its development. However, at the beginning of the 21st century SPEED Company cooperating with Australian Sports Institute started looking for novelties producing LZR Racer swimming suits applying high technology materials from nylon, elastic and polyurethane. Advertising new swimming suits producers claimed that the suits facilitated the easier process of oxygen getting into muscles, the body was held in a more effective position from a hydrodynamic standpoint, water was repelled, and the seams were fastened by ultrasound for lower water resistance. It was suggested that the speed of swimmers in those suits increased by 1.9–2.2 per cent. In Beijing Olympic Games 94% of swimmers wore LZR Racer, 23 out of 25 world records were beaten wearing those suits. After the Olympic Games, such producers as Jaked, Arena X-Glide, Adidas Hydrofoil, Descente Aquaforce suggested making new technology “super swimming suits”. The process of beating world records became faster. However, the International Swimming Federation opposed to “technological doping”, and since 2010 the new swimming suits were forbidden because in swimming the results must depend only on athlete’s physical fitness. Thus, in our study we aimed at answering the following research question: did the increase of results in competitive swimming cease after new technology swimming suits had been forbidden? Research aim was to analyze the dynamics of contest indices of elite male swimmers in the period of 2000–2010. Methods. On the basis of R. Haljand’s methods ([www.swim.ee](http://www.swim.ee)) we analyzed the dynamics of results and contest indices in 100 m freestyle and 100 m breaststroke in the world championships of 2000, 2002, 2004, 2006, 2008 and 2010. The sample consisted of swimmers who participated in the finals in the chosen events ( $n=8$ ), i.e. the research materials included 96 cases. We analyzed the contest protocols, and the following standard indices were

estimated: swimming speed at the start, turn, finish, stable locomotion, swimming pace and the length of a stroke. Results: The mean index of swimming results in the finals from 2000 till 2010 improved statistically significantly in 100 m freestyle ( $t=3.80$ ,  $p<0.01$ ) and 100 m breaststroke ( $t=6.65$ ,  $p<0.01$ ) distances, but from 2008 till 2010 no significant difference was observed ( $p>0.05$ ). Until 2008, in 100 m freestyle distance, the fast increase in swimming speed was noticed only at turns, the last quarter and at the finish. Those tendencies were noticeable also in the championship of 2010. Male swimmers in 100 m breaststroke improved their start, turn and finish techniques and significantly increased their swimming speed ( $t=4.70-9.29$ ,  $p<0.001$ ), their stroke length and average swimming speed increased as well ( $t=2.17-2.54$ ,  $p<0.05$ ). In the world championship of 2010, statistically significantly higher speed was observed in the start and finish distances. The analysis of the research results showed that covering 100 m distance in different styles the swimming pace and the length of stroke did not change. Conclusions: 1. The increase in results of European elite swimmers in 100 m freestyle and breaststroke was mostly influenced ( $p<0.001$ ) by swimming speed at the start, turn and finish, and those tendencies were observed during the whole period in question. 2. Research results in 2008–2010 did not change significantly ( $p>0.05$ ), but we could observe tendencies in the increase of swimming speed in the final part of the swimming distance.