



SCIENCE
TECHNOLOGY
PARK
NIS

19th to 21st October 2023

XXIV

International
Scientific
Conference

FIS COMMUNICATIONS
2023 in Physical Education, sport and recreation

Book of **Abstracts**

Niš, 2023.



University of Niš
Faculty of Sport and Physical Education

XXIV Scientific Conference
„FIS COMMUNICATIONS 2023“
in physical education, sport and recreation
(Niš, Serbia, october 19-21, 2023)

Book of Abstracts

Niš, 2023.

XXIV Scientific Conference
„FIS COMMUNICATIONS 2023" in physical education, sport and recreation

Book of Abstracts

Publisher:

Faculty of Sport and Physical Education, University of Niš

For the publisher:

Faculty dean, prof. Milovan Bratić, PhD

Editor in chief:

Nenad Stojiljković, PhD

Printed by:

Medivest, Niš

Prepress:

Dragan Radojković

Circulation:

100 copies

ISBN-978-86-81474-26-6

COMMITTEES FOR FIS 2023

Honorary Committee			
Members	President	Milovan Bratić, PhD	Faculty of Sport and Physical Education, University of Nis, Serbia
		Sanja Mandarić, PhD	Faculty of Sport and Physical Education, University of Belgrade, Serbia
		Nebojša Maksimović, PhD	Faculty of Sport and Physical Education, University of Novi Sad, Serbia
		Ljubiša Ilić, PhD	Faculty of Sport and Physical Education, University of Priština (Leposavić), Serbia
		Lenče Aleksovska-Veličkovska, PhD	Faculty of Physical Education, Sport and Health, Ss. Cyril and Methodius Universit, Skopje, North Macedonia
		Nebojša Čokorilo, PhD	Faculty of Sport, University Union – Nikola Tesla, Belgrade, Serbia
		Nikolaj Izov, PhD	National Sports Academy (NSA) "Vassil Levski", Sofia, Bulgaria
		Mario Baić, PhD	Faculty of Kinesiology, University of Zagreb, Croatia
		Damir Sekulić, PhD	Faculty of Kinesiology, University of Split, Croatia
		Damir Karpljuk, PhD	Faculty of Sport, University of Ljubljana, Slovenia
		Ifet Mahmutović, PhD	Faculty of Sports and Physical Education, University of Sarajevo, Bosnia and Herzegovina
		Borislav Cicović, PhD	Faculty of Physical Education and Sport, University of East Sarajevo, Republic of Srpska
		Boštjan Šimunič, PhD	Science and Research Centre Koper, Koper, Slovenia
		Hazim Selimović, PhD	Faculty of Education, University of Travnik, Bosnia & Herzegovina
		Vlatko Šeparović, PhD	Faculty of Physical Education and Sport, Tuzla, Bosnia & Herzegovina
		Rašid Hadžić, PhD	Faculty of Sport and Physical Education, University of Nikšić, Montenegro
		Ekrem Čolakhodžić, PhD	Faculty of Teaching, University "Džemal Bijedić", Mostar, Bosnia and Herzegovina
	Borko Petrović, PhD	University of Banja Luka, Faculty of Physical Education and Sports, Republika Srpska, Bosnia and Herzegovina	
	Benim Murić, PhD	State University of Novi Pazar, Serbia	

Scientific Committee

President		
Members	Nenad Stojiljković, PhD	University of Niš, Faculty of sport and physical education, Serbia
	Rado Pišot, PhD	Science and Research Centre Koper, Koper, Slovenia
	Tatiana Iancheva, PhD	National Sports Academy (NSA) "Vassil Levski", Sofia, Bulgaria
	Dejan Madić, PhD	University of Novi Sad, Faculty of Sport and Physical Education, Serbia
	Pierre Besson, PhD	University of Montpellier, France
	Pavle Mikulić, PhD	University of Zagreb, Faculty of Kinesiology, Croatia
	Florentino Huertas, PhD	Catholic University of Valencia, Faculty of Sport Sciences, Spain
	David Cabello, PhD	University of Granada, Department of Physical and Sports Education, Spain
	Saša Pantelić, PhD	University of Niš, Faculty of sport and physical education, Serbia
	Slavoljub Uzunović, PhD	University of Niš, Faculty of sport and physical education, Serbia
	Nikolae Okiana, PhD	Faculty of Movement, Sports and Health Sciences, University "Vasile Alecsandri", Bacau, Romania
	Aleksandar Raković, PhD	University of Niš, Faculty of sport and physical education, Serbia
	Irena Valentine, PhD	Lithuanian Sports University, Kaunas, Lithuania
	Ratko Stanković, PhD	University of Niš, Faculty of sport and physical education, Serbia
	António Figueiredo, PhD	University of Coimbra, Faculty of Sport Science and Physical Education, Portugal
	Dragan Mirkov, PhD	University of Belgrade, Faculty of Sport and Physical Education, Serbia
	Martiniq Sparks, PhD	North-West University, South Africa
	Milan Čoh, PhD	Faculty of Sport, University of Ljubljana, Slovenia
	Laura Capranica, PhD	University of Rome Foro Italico, Italy
	Daniela Dasheva, PhD	National Sports Academy (NSA) "Vassil Levski", Sofia, Bulgaria
	Henriette Dancs, PhD	Institute of Sports Sciences, Sombatel, Hungary
	Milan Petronijević, PhD	University of Belgrade, Faculty of Sport and Physical Education, Serbia
	Patrik Drid, PhD	University of Novi Sad, Faculty of Sport and Physical Education, Serbia
	Lana Ružić, PhD	University of Zagreb, Faculty of Kinesiology, Croatia
	Nemanja Stanković, PhD	University of Niš, Faculty of sport and physical education, Serbia
	Georgi Georgiev, PhD	Faculty of Physical Education, Sport and Health, Ss. Cyril and Methodius University, Skopje, North Macedonia
	Zoran Milanović, PhD	University of Niš, Faculty of sport and physical education, Serbia
	Damir Sekulić, PhD	University of Split, Faculty of Kinesiology, Croatia
	Nick James, PhD	London Sports Institute, Middlesex University, London, Great Britain
	Martin Zvonar, PhD	Faculty of Sports Studies, Masaryk University, Brno, Czech Republic
Peter Krstrup, PhD	University of Copenhagen, Denmark	
Ciaran MacDonncha, PhD	University of Limerick, Ireland	
Eleftherios Kellis, PhD	Aristotle University of Thessaloniki, Greece	
Antonio Tessitore, PhD	University of Rome Foro Italico, Italy	
Hubert Makaruk, PhD	Józef Pilsudski University of Physical Education in Warsaw, Poland	
Aleksandar Nedeljković, PhD	University of Belgrade, Faculty of Sport and Physical Education, Serbia	

Organizing Committee

President	Milovan Bratić, PhD	University of Nis, Faculty of Sport and Physical Education, Serbia
Secretary	Nenad Stojiljković, PhD	University of Nis, Faculty of Sport and Physical Education, Serbia
Members	Nebojša Randelović, PhD	University of Nis, Faculty of Sport and Physical Education, Serbia
	Tomislav Okičić, PhD	University of Nis, Faculty of Sport and Physical Education, Serbia
	Katarina Herodek, PhD	University of Nis, Faculty of Sport and Physical Education, Serbia
	Daniel Stanković, PhD	University of Nis, Faculty of Sport and Physical Education, Serbia
	Zvezdan Savić, PhD	University of Nis, Faculty of Sport and Physical Education, Serbia
	Petar Mitić, PhD	University of Nis, Faculty of Sport and Physical Education, Serbia
	Vladimir Antić, PhD	University of Nis, Faculty of Sport and Physical Education, Serbia
	Nemanja Stanković, PhD	University of Nis, Faculty of Sport and Physical Education, Serbia
	Mladen Živković, PhD	University of Nis, Faculty of Sport and Physical Education, Serbia
	Nikola Stojanović, PhD	University of Nis, Faculty of Sport and Physical Education, Serbia
	Bojan Jorgić, PhD	University of Nis, Faculty of Sport and Physical Education, Serbia
	Aleksandra Aleksić-Veljković, PhD	University of Nis, Faculty of Sport and Physical Education, Serbia
	Tijana Purenović-Ivanović, PhD	University of Nis, Faculty of Sport and Physical Education, Serbia
	Miloš Paunović, PhD	University of Nis, Faculty of Sport and Physical Education, Serbia
	Danijela Živković, PhD	University of Nis, Faculty of Sport and Physical Education, Serbia
	Nikola Milošević, PhD	University of Nis, Faculty of Sport and Physical Education, Serbia
	Marko Đurović, PhD	University of Nis, Faculty of Sport and Physical Education, Serbia
	Ljubomir Pavlović, PhD	University of Nis, Faculty of Sport and Physical Education, Serbia
	Andela Došić, PhD	University of Nis, Faculty of Sport and Physical Education, Serbia
	Stevan Stamenković, PhD	University of Nis, Faculty of Sport and Physical Education, Serbia
Nebojša Trajković, PhD	University of Nis, Faculty of Sport and Physical Education, Serbia	
Stefan Đorđević, PhD	University of Nis, Faculty of Sport and Physical Education, Serbia	

FOREWORD

Dear authors it is with great pleasure that I introduce the proceedings of the XXIV International Scientific Conference “FIS COMMUNICATIONS 2023” held in Niš, October 19 - 21, 2023, featuring the Book of Abstracts. This comprehensive compilation stands as a testament to the remarkable diversity and intellectual richness of the global community engaged in the fields of sport science, exercise science, physical education, recreation, sports medicine, and related disciplines.

In this year’s conference, we have the privilege of presenting 84 abstracts authored by 240 scholars and researchers from an impressive 17 countries. This global representation is a reflection of the diverse and multifaceted nature of our academic community, which thrives on the exchange of ideas and expertise from every corner of the world. As we navigate the rich tapestry of research within this book, we are reminded of the boundless possibilities and unifying power of science.

The heart of any conference lies in its keynote lectures, and this year’s “FIS COMMUNICATIONS 2023” is no exception. We are honored to have three distinguished scholars grace our stage as keynote lecturers. Professor Laura Capranica, from the Foro Italico University of Rome, brings her expertise to shed light on vital issues in dual career of athletes. Professor António J. Figueiredo, hailing from the Faculty of Sport Sciences and Physical Education at the University of Coimbra, will offer his unique insights into the complex world of identification of sports talents. Finally, professor Ranko Rajovic, based at the Faculty of Education, University of Primorska, is set to inspire us with his forward-thinking perspectives about the influence of exercise on the cognitive abilities and intelligence. These keynote lectures stand as pillars of knowledge, setting the tone for the conference and guiding us toward new horizons in our shared disciplines.

The abstracts presented here represent the spectrum of research that forms the foundation of our academic pursuits. Whether delving into the intricacies of human physiology, exploring the nuances of psychological aspects in sports, devising innovative exercise interventions and methods, or advancing the frontiers of sports medicine, these abstracts reveal the breadth and depth of our collective knowledge. They emphasize not only our current understanding but the promise of the future as well. These abstracts, the result of countless hours of dedication and perseverance, illustrate our unwavering commitment to exploring the potential of human performance and promoting health and wellness through sports and exercise.

Once again, thank you to all the authors, co-authors, reviewers, organizers, and attendees who have made this conference a resounding success. May these abstracts continue to inspire, educate, and drive progress in the fields we hold so dear.

Sincerely,

Nenad Stojiljković, PhD

Chair of the Scientific Committee

XXIV International Scientific Conference “FIS COMMUNICATIONS 2023”

Niš, October 19 - 21, 2023

CONTENTS

PLENARY SESION	15
TALENT IDENTIFICATION AND DEVELOPMENT - PERFORMANCE OR POTENTIAL?	17
António J. Figueiredo	
DUAL CAREER OF ATHLETES	19
Laura Capranica	
NEUROSCIENCE IN SPORTS - THE INFLUENCE OF MOVEMENT ON THE DEVELOPMENT OF COGNITIVE ABILITIES	21
Ranko Rajović	
ABSTRACTS.....	23
EMPLOYMENT OF ATHLETES AFTER ENDING THEIR PROFESSIONAL CAREER	25
Adam Kyselica and Sára Kocourková	
COMPARATIVE ANALYSIS OF ANTHROPOMETRIC CHARACTERISTICS AND POSTURAL STATUS BETWEEN PRESCHOOL CHILDREN FROM URBAN AND RURAL AREAS IN THE MUNICIPALITY OF ČAČAK	26
Aleksandra Aleksić Veljković, Jovica Peulić, Borko Katanić and Nataša Jovanović	
INJURY FREQUENCY IN MODERN BALLET.....	27
Aleksandra Aleksić Veljković, Katarina Herodek, Slavoljub Uzunović, Lucija Milčić and Kamenka Živčić	
THE EFFECTS OF SPECIFIC PREPARATION FOR TRAINING ON THE PHYSICAL FITNESS OF PROFESSIONAL MMA FIGHTERS	29
Aleksandar Stamenković and Stevan Stamenković	
ASPECTS OF COMMUNICATION IN PHYSICAL EDUCATION LESSONS FOR PRIMARY SCHOOL PUPILS ..	30
Alina Ababei	
METRIC CHARACTERISTICS OF THE GROSS MOTOR DEVELOPMENT TEST	32
Andrea Marković, Nikola Simonović, Anja Obradović, Doroteja Rančić, Danijela Ljubojević and Slađana Stanković	
BARRIERS TO THE WORKING POPULATION'S PHYSICAL ACTIVITY.....	34
Anđela Došić, Danijela Živković, Tijana Purenović-Ivanović, Mladen Živković, Nebojša Randelović and Saša Pantelić	
HIIT INTERVENTIONS IMPROVE CARDIORESPIRATORY FITNESS IN ADULTS WITH DIABETES TYPE 1	35
Anja Lazić, Dušan Stanković and Cristina Cadenas-Sánchez	

THE RELATIONSHIP BETWEEN VERTICAL JUMP PERFORMANCE AND BODY COMPOSITION PARAMETERS IN PROFESSIONAL BASKETBALL PLAYERS	37
Anja Lazić, Miodorag Kocić, Dragana Berić and Špela Bogataj	
STUDENT'S ATTITUDES TOWARDS ENGLISH LANGUAGE IN KINESIOLOGY: INSIGHTS THROUGH GENDER-RELATED DIFFERENCES.....	39
Ana Penjak, Igor Jelaska and Jelena Žanić Mikuličić	
ACL RECONSTRUCTION IN ATHLETIC PATIENTS WITH ANTERIOR CRUCIATE LIGAMENT INJURIES: AUTOGRAFT VS ALLOGRAFT.....	40
At. Andreev, I. Kolev and Ig. Zazirnyi	
EFFECTS OF SUPERVISED EXERCISE ON BODY COMPOSITION IN PATIENTS SUCCEEDING BARIATRIC SURGERY 1 YEAR LONGITUDINAL STUDY.....	41
Azize Bingöl Diedhiou and Ayten Altunsaray	
EFFECTS OF STATIC AND DYNAMIC STRETCHING ON INJURY PREVENTION IN FOOTBALL: A SYSTEMATIC REVIEW	42
Branislav Majkić, Zoran Milanović, Mila Vukadinović Jurišić, Luka Radosavljević and Tomislav Okičić	
PARENTS, COACHES AND YOUNG FOOTBALL PLAYERS: SUPPORTING OR CREATING PRESSURE?	43
Branislav Majkić, Ana Lilić, Neda Karaleić, Lora Kostić and Matej Išasegi	
THE EFFECT OF EDUCATIONAL STRESS ON ACADEMIC PROCRASTINATION BEHAVIOR	44
Bülent Duman, Nuri Berk Güngör and Zülbiye Kaçay	
EXAMINATION OF FACTORS AFFECTING THE DRIVE FOR MUSCULARITY IN INDIVIDUALS EXERCISING IN THE GYM	45
Burak Gönültaş, Ismail Ilbak, Ahmet Yasuntimur, Stefan Stojanović, Bojan Jorgić and Marko Aleksandrović	
NEW APPROACHES IN DEVELOPING GENERAL ENDURANCE IN MIDDLE SCHOOL PUPILS.....	46
Cătălina Ababei and Radu Ababei	
THE CORRELATION OF HANDGRIP STRENGTH AND SUCCESS IN "MODIFIED STYLE" OF WRESTLING	48
Damir Pekas, Nebojša Trajković and Mario Baić	
SENSATION SEEKING AND ANXIETY IN SPORTS CLIMBERS - A SYSTEMATIC REVIEW.....	50
Daniel Stanković and Nikola Čirić	
DIFFERENCES IN MOTOR ABILITIES IN ACTIVE VS. NON-ACTIVE STUDENT POPULATION	51
Dejan Joksimović, Slobodan Andrašić, Milan Cvetković, Boris Popović, Danilo Radanović, Dragan Marinković, Lidija Marković and Nikola Manolopoulos	
INFLUENCE OF MOTOR SKILLS AND ANTHROPOMETRIC CHARACTERISTICS ON SUCCESS IN RHYTHMIC GYMNASTICS: A SYSTEMATIC REVIEW RESEARCH	53
Dorotheja Rančić, Tamara Ilić, Stefan Stojanović and Andrea Marković	

BLOOD PRESSURE DURING EXERCISE TESTS IN CHILDREN AND ADOLESCENTS.....	54
Dragan Radovanović	
MOTOR SKILLS INFLUENCE ON MORPHOLOGY PARAMETERS IN MALE PRESCHOOL CHILDREN INCLUDED IN THE ARTISTIC GYMNASTICS RECREATIONAL PROGRAM.....	55
Dušan Đorđević, Miloš Paunović, Petar Veličković, Mima Stanković, Božidar Marović, Slavoljub Uzunović and Milan Zelenović	
VALIDITY AND RELIABILITY OF MY JUMP 2 APP FOR MEASURING THE VERTICAL JUMP PERFORMANCE IN FEMALE BASKETBALL PLAYERS	56
Dušan Stanković, Saša Bubanj, Stefan Pivač, Marko Gušić and Draženka Mačak	
EFFECTS OF PLYOMETRIC TRAINING ON PHYSICAL FITNESS AMONG YOUNG TENNIS PLAYERS: A SYSTEMATIC REVIEW.....	58
Elzan Bibić and Nataša Branković	
ACTIGRAPH IN ASSESSMENT OF CHILDREN'S PHYSICAL ACTIVITY - A SYSTEMATIC REVIEW	60
Emilija Petković, Nese F. Sahin and Ivana Đorđević	
THE ROLE OF PHYSICAL THERAPY IN DORSALGIA	62
Gabriela Ochiană and Delia-Nicoleta Ochiană	
THE ROLE OF NEUROPROPRIOCEPTIVE FACILITATION TECHNIQUES IN FROZEN SHOULDER RECOVERY	64
Gabriela Ochiană and Sorin Bereş	
EFFECTS OF DIFFERENT LOADING TYPES ON EMG ACTIVITY OF UPPER BODY MUSCLES DURING BENCH PRESS THROW EXERCISE	66
Goran Janković, Danica Jančićević, Aleksandar Nedeljković, Milos R. Petrović, Marko Cosić and Amador Garcia-Ramos	
EFFECTS OF YOGA EXERCISES ON PHYSICAL FITNESS: SYSTEMATIC REVIEW	68
Gulseren Yurekli and Fatma Celik Kayapinar	
DIFFERENCES IN AGILITY PERFORMANCE IN FUTSAL PLAYERS.....	69
Hrvoje Ajman, Zoran Špoljarić and Dominik Mateo Rončević	
ASSESSING STANDING LONG JUMP DISTANCE: ACCURACY OF KINOVEA-BASED VIDEO ANALYSIS	70
Jelena Aleksić, Nikola Maksimović, Lucija Faj, Anastasija Kocić, Dragan M. Mirkov and Olivera M. Knežević	
DURATION OF TENNIS MATCHES IN UNDER 12 AGE GROUP	71
Josip Cveniċ, Lucija Faj and Ozana Brkić	
GENDER DIFFERENCES IN THE SELF-EFFICACY OF PHYSICAL EDUCATION TEACHERS ACCORDING TO INCLUSION IN TEACHING - THE EXAMPLE OF MONTENEGRO	72
Igor Tomić, Nada Šakotić, Miljan Hadžović and Marko Aleksandrović	
THE EFFECTS OF KINESITHERAPY AND NEUROREHABILITATION WITH „NEUROBLAST“ PORTABLE DEVICE IN A PATIENT WITH MULTIPLE SCLEROSIS: A CASE REPORT.....	73
Ivan Ćuk, Anastasija Kocić, Marija Grujić and Marko Grujić	

SPORTS INJURIES IN BASKETBALL: A SYSTEMATIC REVIEW	75
Ivana Anđelković and Slađan Karaleić	
IMPLICATIONS OF AGE AND GENDER DISPARITIES IN STRENGTH TRAINING AMONG CHILDREN AND ADOLESCENTS	76
Izet Kahrović, Benin Murić, Oliver Radenković, Omer Špirtović, Raid Mekić and Ilma Čaprić	
EFFECTS OF PROGRAMMED TRAINING ON EXPLOSIVE STRENGTH OF VOLLEYBALL PLAYERS	77
Katarina Nejić, Dragan Nejić, Vladan Savić, Andrijana Zafirovska Misovski and Joško Milenkoski	
FUNCTIONAL FITNESS AND QUALITY OF LIFE IN PEOPLE WITH COVID-19	79
Marko Đurović, Dejan Madić, Katarina Praznik, Ana Sršen, Mia Perić and Boro Štrumbelj	
RELATIONSHIP BETWEEN FUNCTIONAL FITNESS AND THE SEVERITY OF COVID-19 SYMPTOMS	80
Marko Đurović, Tomislav Okičić, Boštjan Jakše, Barbara Gilić, Robert Marčun, Goran Dimitrić and Dorica Šajber	
PLAYING LEVEL AND POSITION DIFFERENCES IN BODY CHARACTERISTICS AND PHYSICAL FITNESS PERFORMANCE AMONG ELITE AND SUB-ELITE FEMALE HANDBALL PLAYERS	81
Maša Antonijević, Sonja Antonijević, Stefan Mijalković, Borče Daskalovski, Goran Nikovski and Saša Milenković	
EFFECTS OF PLYOMETRIC TRAINING ON PHYSICAL PERFORMANCE IN ADOLESCENT MALE BASKETBALL PLAYERS	82
Mila Jovanović, Maša Antonijević Stefan Đorđević, Sonja Antonijević and Dušan Nikolić	
BREASTSTROKE ELITE SWIMMERS: AGE-PERFORMANCE COMPETITIVE CAREER QUANTITATIVE MODEL PROFILING	83
Milivoj Dopsaj and Klara Šiljeg	
DIFFERENCES IN PLANTAR FLEXOR STRENGTH CHARACTERISTICS IN YOUNG FEMALE VOLLEYBALL PLAYERS MEASURED DURING TWO TYPES OF CONTRACTIONS: CLASSIC AND IMPULS	84
Milivoj Dopsaj, Nikola Majstorović and Aleksandar Borisavljević	
THE ASSOCIATION BETWEEN EATING ATTITUDES AND AGE GROUPS AMONG FEMALE BASKETBALL PLAYERS	85
Mima Stanković, Ivana Bojić, Ilma Čaprić, Borko Katanić, Vladan Milić, Adem Preljević and Oliver Radenković	
THE RELATIONSHIP BETWEEN NETWORK SOCIETY, PHYSICAL ACTIVITY AND NUTRITION	86
Mine Turğut, Emre Yamaner, Emel Gökmen and Ümran Sarıkan	
METHODS FOR ASSESSING MICROCIRCULATORY, HEMORHEOLOGICAL CHANGES AND OXYGEN TRANSPORT IN ATHLETES OF VARIOUS SPORTS DISCIPLINES	87
Nadia Antonova and Ivan Ivanov	

TRADITIONAL GAMES AND FORMS OF PHYSICAL EXERCISE AND COMPETITION AND THEIR SIGNIFICANCE	88
Nebojša Randelović, Danijela Živković, Zvezdan Savić, Andela Došić, Ljiljana Bjelaković and Saša Pantelić	
THE DIFFERENCES IN THE PROFESSIONAL WORKING PHYSICAL PREPARATION OF THE FIREFIGHTERS OF THE REPUBLIC OF SERBIA FROM DIFFERENT REGIONS	89
Nemanja Samardžić and Dragan Klisarić	
IDENTIFICATION OF THE STANDARDS FOR TALENTED CHILDREN IN SPORT	90
Nenad Stojiljković and Milovan Bratić	
EXPLORING FACTORS INFLUENCING ATTITUDES AND MOTIVATION IN SCHOOL SPORTS: A COMPARATIVE STUDY OF ADMINISTRATIVE DISTRICTS, ENGAGEMENT FREQUENCY, AND SCHOOL TYPES	92
Nikola Stojanović, Vukašin Rajković, Zvezdan Savić, Petar Mitić and Vladimir Antić	
INFLUENCE OF EXTRA-CURRICULAR SPORTS ACTIVITIES IN STIMULING EXPLOSIVE FORCE AND CONCENTRATE CAPACITY AT PRIMARY SCHOOL CHILDREN IN A RURAL ENVIRONMENT	93
Nicolae Ochiană and Călin Miron	
EFFICIENCY OF DYNAMIC GAMES AND RELAYS RACE WITH TABLE TENNIS ELEMENTS IN THE DEVELOPMENT OF PSYCHOMOTRICAL SKILLS OF SECONDARY SCHOOL CHILDREN	95
Nicolae Ochiană and Mihaela Ciubotariu,	
DIFFERENCES IN THE STRENGTH OF YOUNG JUDOKAS IN RELATION TO WEIGHT CATEGORIES: A REVIEW	96
Nikola Milošević, Sara Perković, Filip Nurkić and Igor Nurkić	
IMPACT OF BODY COMPOSITION ON THE FUNCTIONAL ABILITY OF ATHLETES.....	97
Nikola Milošević, Mirsad Nurkić, Amel Mekić, Sara Perković, Filip Nurkić and Igor Nurkić	
THE EFFECTS OF NEUROMUSCULAR FATIGUE ON FUNCTIONAL MOVEMENT AND BALANCE PERFORMANCE IN FOOTBALL PLAYERS	98
Ozkan Guler, Nese Sahin,Hamza Küçük, Ozkan Isik, Sally Salam and Abbas Ali	
DIFFERENCES IN MOTOR ABILITIES OF GYMNASTS IN RELATION TO CHRONOLOGICAL MATURITY	99
Petar Veličković, Saša Veličković, Miloš Paunović, Dušan Đorđevićand Božidar Marović	
PSYCHOLOGICAL COMPONENTS OF INTEREST IN THE PROFESSION OF SPORTS TEACHER.....	100
Polina Tsonkova and Dimitar Nikolov	
ANALYSIS OF SUCCESSFUL JUMPS AT THREE DIFFERENT HEIGHTS IN JUMPING COURSES	101
Predrag Ilićand Nemanja Stanković	
DIFFERENCES IN PHYSICAL FITNESS IN ADOLESCENTS IN RELATION TO GENDER	102
Rade Jovanović, Nebojša Trajković, Vladimir Ristić, Miloš Ignjatović and Nataša Zelinčević Vukajlović	

THE RELATIONSHIP BETWEEN INTERNAL AND EXTERNAL LOAD IN VERTICAL JUMP SESSIONS: THE IMPACT OF TRADITIONAL AND CLUSTER SET STRUCTURES	104
Radenko Arsenijević, Filip Kojić, Predrag Božić, Milan Matić, Bobana Berjan Bačvarević, Saša Jakovljević and Nemanja Pažin	
CORRELATION BETWEEN ECCENTRIC HAMSTRING STRENGTH AND SPEED IN ADOLESCENT FOOTBALL PLAYERS	106
Radovan Gladić, Bojan Rašković, Dragan Marinković, Miodrag Spasić, Nikola Foretić, Dejan Madić, Patrik Drid and Borislav Obradović	
EFFECTS OF PHYSICAL ACTIVITY ON THE BALANCE OF OLDER ADULTS	108
Raid Mekić, Izet Kahrović, Benin Murić and Omer Špirtović	
SPINE INJURIES IN VOLLEYBALL - LOW BACK PAIN	109
Rašid Hadžić, Jovica Petković, Kosta Goranović and Marko Joksimović	
COMBINED EXERCISE PROGRAMS FOR OLDER ADULTS - SYSTEMATIC REVIEW	110
Romina Herodek and Aleksandra Ilić	
CHANGES IN BODY COMPOSITION UNDER THE INFLUENCE OF DIFFERENT DIETARY PATTERNS - SYSTEMATIC REVIEW	111
Romina Herodek, Mladen Živković, Aleksandra Ilić and Aleksandra Catić Đorđević	
GENDER-BASED DIFFERENCES IN SELECTED VERTICAL JUMP PARAMETERS AND THEIR VARIABILITY: A CROSS-SECTIONAL STUDY	112
Sara Aščić, Klara Findrik, Iva Macan and Marin Marinović	
THE DIFFERENCE IN THE POSTURAL STATUS OF THE SPINAL COLUMN IN FOOTBALL PLAYERS OF DIFFERENT CATEGORIES	113
Stefan Đorđević, Bojan Jorgić, Saša Milenković, Mila Manić, Miljan Hadžović and Aleksandar Stamenković	
THE 800 AND 1500 METERS RUNNING TECHNIQUE ANALYSIS: A SYSTEMATIC REVIEW	114
Stefan Mijalković, Daniel Stanković, Fatma Nese Sahin, Ana Stanković and Aleksandar Raković	
CORRELATION BETWEEN VERTICAL JUMP, SPEED, COD AND REACTIVE AGILITY IN ADOLESCENT SOCCER PLAYERS	115
Sreten Marković, Dino Mujanović and Rifat Mujanović	
MOTOR CAPABILITIES OF HANDBALL PLAYERS IN RELATION TO THE POSITION IN THE TEAM ...	117
Stefan Pivač, Jovan Radenković and Saša Bubanj	
COMPARING QUALITY OF LIFE IN PROFESSIONAL SOCCER PLAYERS AND PHYSICALLY ACTIVE UNIVERSITY STUDENTS: A CROSS-SECTIONAL STUDY	118
Tijana Purenović-Ivanović, Milan Zelenović, Anja Petrović and Ljiljana Bjelaković	

INVESTIGATION OF THE RELATIONSHIP BETWEEN NATURE AND MOOD OF INDIVIDUALS PARTICIPATING IN ECORECREATIVE ACTIVITIES	119
Ümran Sarikan, Mine Turğut and Zülbiye Kaçay	
ANALYSIS OF DIFFERENCES IN MORPHOLOGICAL CHARACTERISTICS AND MOTOR-FUNCTIONAL ABILITIES IN JUNIOR DANCERS	120
Velibor Srdić	
IMPACT OF MORPHOLOGICAL CHARACTERISTICS AND MOTOR-FUNCTIONAL ABILITIES ON THE EFFICIENCY OF PERFORMING MOVEMENT STRUCTURES IN DANCE AMONG YOUNG DANCERS .	121
Velibor Srdić and Osmo Bajrić	
ANALYSIS OF FACTORS THAT INFLUENCE SUCCESS IN HANDBALL	122
Vladimir Ristić, Uroš Nikolić, Rade Jovanović, Anja Obradovićand Danijela Ljubojević	
TREATMENT OF LOW BACK PAIN WITH DIFFERENT METHODS: A SYSTEMATIC REVIEW AND META-ANALYSIS	124
Vanja Dimitrijević, Bojan Rašković, Nikola Jevtić, Dejan Viduka, Nachiappan Chockalingam, Patrik Drid and Borislav Obradović	
THE INFLUENCE OF PHYSICAL TRAINING ON ATHLETIC PERFORMANCE AND INJURY PREVENTION IN YOUTH SPORTS	126
Yang Huipengand Zeyu Liu	
TRAINING PROGRAM FIRST STAGE IN THE RECOVERY OF AN ATHLETE (SWIMMER) AFTER MYOCARDITIS - A CASE REPORT	127
Yuliyán Zlatkov and Krasimira Zlatkova	
FITNESS TRACKERS - VALID TECHNOLOGY OR ADVANCED MARKETING?	128
Zoran Milanović, Nenad Stojiljković, Ljubomir Pavlović, Vladimir Antić and Nemanja Stanković	
DIFFERENCE IN EXPLOSIVE STRENGTH BETWEEN TYPICALLY DEVELOPING CHILDREN AND CHILDREN WITH DEVELOPMENTAL DISABILITIES	130
Zvonimir Tomac, Zoran Špoljarić and Matej Išasegi	
MATERIAL AND SPACE EQUIPMENT OF PRIMARY AND SECONDARY SCHOOLS FOR THE IMPLEMENTATION OF PHYSICAL EDUCATION TEACHING	131
Živorad Marković, Antonio Antonov and Jelena Jančić	
AUTHOR INDEX	133

Plenary Sesion

TALENT IDENTIFICATION AND DEVELOPMENT - PERFORMANCE OR POTENTIAL?

António J. Figueiredo^{1,2}

¹ Faculty of Sport Sciences and Physical Education, University of Coimbra, Portugal

² Research Unit for Sport and Physical Activity (CIDAF), University of Coimbra, Portugal

UDC 796.015.83.322-053.6

The organized sport is one of the most important opportunities of social participation of the adolescents. In spite of the emergency of a social alarm about a sedentary way of life and paediatrics obesity, the statistics of sport participation continue to give information about a increased volume of people practicing. Among the most popular sports, soccer is the predominant choice, with about 150 million players around the world with positive annual variations and in all of the age-groups.

Meanwhile, the applied research on youth soccer has also showed an abundant and growing production. The more studied topics in the research are based in questions related with talent, readiness and soccer selection.

The growing popularization of soccer and the increasing demand in the long term sport preparation results in the need of answers to new problems related with the prognosis of the sport performance, the adjustment of the training and match contents to the growth characteristics, maturation and young athletes' development, the control of the incidence of sport injuries and the predict variables of the injuries and the description of the players with different sport trajectories.

Talent identification and development is a dedicated topic in the research in sport sciences, partly, for the capacity to request concepts and methodologies in domains as different as the sport medicine, genetics, sport psychology and other disciplines. The analysis of the programs of sport preparation evidences a huge variation associated with the number of age-groups, the duration of the age-groups, the beginning of the formal competitions and their organization and stages of the sport selection. Different sports assume different models being the organization relative to male and female an additional source of variation. However, in all the cases, the chronological age constitutes the agglutinant element of the long-term programs of sport preparation. There is a need to complement the organization of the sport career based in information that considers the substantial biological variation that happens inside the same age-group. This consideration has not been contradicting with other sport agents, once the problem locates, above all, at the operational level. Even FIFA has been sensitive to the discussion of the problem.

Although the concept of biological maturation exists, the scientific and technological progresses make available a group of somatic, sexual and skeletal indicators, each one of them with different potentialities and limitations with an increased capacity to use in sample with more participants and out of the context of investigation. The determination of the stages of the secondary sexual characters promotes the invasion of the privacy of those observed. On the other hand, the methods as the radiological exams are revealed extremely difficult to become massively used. Alternatively, the percentage of predicted adult stature seems to be of easy utilization, having, however, a possible question about the validity of the formulas out of the original population.

There is a strong link between maturational development and growth and performance. Organizing age-groups using the criteria of chronological age leads to a big difference in size, composition and performance, and adolescence is the period when these differences are more visible and the ages between 13 and 15 years old seems to be the most heterogeneous period. In the same age group, the subjects maturationally more advanced are in general heavier and taller than their peers of the same chronological age since childhood until the end of adolescence. However, adults don't usually show the same differences when the same comparison is made. This situation can be explained by the catch up phenomenon in the late mature individuals.

The initial process to identify promising soccer players is multidimensional and the literature in the area show that growth and maturation are two important concepts to better understand the identification, selection, and development processes of young athletes. Usually young soccer players tend to be above the mean for height and mass and tend to be advanced in biological maturity status with increasing age during adolescence and in elite development programs. Worst results is been reported for body size and functional performance in young soccer players who were not selected to play in more demanding competitions or who dropped out from sport. The same trend was visible in academy players to whom were not proposed a professional contract. Despite of the lack of evidence that the anthropometrical, maturational and physical characteristics in the beginning of the process are not direct associated with the exceptional performance in the adulthood it is of interest to understand that these indicators may open the doors of academies and others training centers of excellence promoting better conditions and better coaching to the selected players. Recently were not found decennial differences in the entrance profile of soccer players in a club academy. This finding suggests that soccer promoting strategies are being maintained despite of the increased demanding in the anthropometric characteristics of professional players and demands of the actual professional soccer competitions.

DUAL CAREER OF ATHLETES

Laura Capranica

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

UDC 796.077.5

Since the 2004 European Year of Education through Sport (EYES 2004), the talented and elite athletes' right to pursue their educational and a professional career in combination to their sporting career (e.g., dual career) has been supported from the White Paper on Sport (European Commission, 2007) to the implementation of the EU Guidelines on Dual Careers of Athletes (European Commission, 2012). To establish a platform for an effective dialogue between educational bodies (e.g., universities, high schools, sports schools), sport organizations (e.g., clubs, sport federations, National Olympic Committees), governmental organizations, and for profit companies, dual career is among the priorities of the ERASMUS+Sport funding, which fosters also the development of research and promotes the development of a European dual career culture (Capranica & Guidotti, 2016; Capranica et al., 2015; Guidotti et al., 2015; Guidotti et al., in press; Stambulova & Wylleman, 2019). During the past 10 years student-athletes have been the focus of dual career projects and research, whereas in 2021 the European policies in sports have extended the dual career to all the sportspersons (e.g., coaches, physical trainers, referees, sports managers, and volunteers), who are often challenged to combine their professional and sports careers (MacDonncha et al., 2023).

This presentation will provide an overview of the past and present implementation of the European dual career and will offer an analysis of projects carried out between 2014 and 2022 under the ERASMUS+ programme of the European Commission. In highlighting the focus on the different dual career dimensions (Capranica & Guidotti, 2016), and the characteristics of the established partnerships, potential gaps will be highlighted to guide future actions fostering long-term impact and ensuring sustainability.

References

1. Capranica L, & Guidotti F. (2016). Research for cult committee qualifications/dual careers in sports. European Parliament: Directorate-General for internal policies. Policy Department. Structural and cohesion policies: Cultural and Education. [https://www.europarl.europa.eu/RegData/etudes/STUD/2016/573416/IPOL_STU\(2016\)573416_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/STUD/2016/573416/IPOL_STU(2016)573416_EN.pdf)
2. Capranica, L. et al., (2015). The European athlete as student network ("EAS"): Prioritizing dual career of European student-athletes. *Kinesiologia Slovenica*, 21(2), 5–10.
3. Condello, G., Capranica, L., Doupona, M., Varga, K., & Burk, V. (2019). Dual-career through the elite university student-athletes' lenses: The international FISU-EAS survey. *PLoS ONE*, 14(10), e0223278.
4. European Commission (2007), White Paper on Sport. <http://eur-lex.europa.eu/legalcontent/EN/TXT/PDF/?uri=CELEX:52007DC0391&from=EN>.
5. European Commission (2012). EU guidelines on dual careers of athletes: Recommended policy actions in support of dual careers in high-performance sport. http://ec.europa.eu/sport/library/documents/dual-career-guidelines-final_en.pdf.

6. Guidotti, F., et al. (in press). Dual career in European funded projects: a critical analysis and review. RBCE
7. Guidotti, F., Cortis, C., & Capranica, L. (2015). Dual career of European student-athletes: A systematic literature review. *Kinesiologia Slovenica*, 21(3), 5–20.
8. MacDonncha C., et al. (2023). Challenges of the employee-sportspersons: An integrated multi-sectorial partnership for dual career through the BRAVA-DC project. UCAM Publ.
9. Stambulova, N. B., & Wylleman, P. (2019). Psychology of athletes' dual careers: A state-of-the-art critical review of the European discourse. *Psychology of Sport and Exercise*, 42, 74-88.

NEUROSCIENCE IN SPORTS - THE INFLUENCE OF MOVEMENT ON THE DEVELOPMENT OF COGNITIVE ABILITIES

Ranko Rajović¹

¹ Center for Education NTC, Department of Science, Mensa Serbia, Novi Sad

UDC 796.012:159.922

Physical activity significantly impacts the enhancement of cognitive capabilities. A plethora of studies indicates that consistent exercise can yield improvements in various cognitive functions, including attention, concentration, working memory, information processing speed, and problem-solving skills. Additionally, emerging research highlights that a lack of physical activity is associated with the reduction of deep brain regions, particularly the basal ganglia, which may result in adverse effects on cognitive abilities.

Engaging in movement promotes increased blood flow and oxygen delivery to the brain, leading to improved brain function, enhanced learning capacity, memory, and cognitive processes. Furthermore, physical activity influences the release of various neurotransmitters and neurotrophic factors within the brain, primarily dopamine and serotonin, known for their associations with improved attention, mood, and motivation. Additionally, exercise stimulates the production of brain-derived neurotrophic factor (BDNF), a critical element in neuronal growth, survival, and connectivity.

Incorporating tasks involving mental classifications and sequences, such as problem-solving during physical activities, becomes a vital aspect of contemporary sports training, as well as educational settings, including kindergartens and schools.

Ultimately, regular physical activity, encompassing movement and exercise, emerges as a valuable strategy to support the optimal development of cognitive abilities across all age groups.

Keywords: movement, neurogenesis, neurotransmitters, cognitive abilities.

Abstracts

EMPLOYMENT OF ATHLETES AFTER ENDING THEIR PROFESSIONAL CAREER

Adam Kyselica and Sára Kocourková

Faculty of Sports Studies, Masaryk University, Brno, Czech Republic

UDC 796.071.2

Summary

The transition from a professional sports career to post-retirement life is a multifaceted process that profoundly influences athletes both psychologically and socially. This article presents a comprehensive exploration of the relationship between athletes' careers, their personalities and motivations. Additionally, it investigates the strategies and opportunities available to athletes for effectively utilizing their skills and experience. This study primarily focuses on the employment of athletes after leaving their professional sports careers and examines the specific career options available in the mainstream workforce post-retirement. It also examines whether athletes receive support during this significant life change and provides insights into their psychological well-being during and after their careers. To investigate these aspects, we employed qualitative research methods, with a particular emphasis on semistructured interviews. These interviews were exclusively conducted with former professional athletes. The findings of this research highlight that professional athletes often experience profound personal development during their sports careers, with enhanced qualities such as discipline, perseverance, leadership skills, and teamwork. These attributes often influence their career choices after retirement. Athletes also emphasize the importance of mental resilience and fair play, which are cultivated through their sports experiences. While athletes enjoy a range of positive influences from their sports careers, some challenges emerge, such as physical strain and the limitation of personal life. Nevertheless, the ability to set and pursue goals is a skill athletes acquire through sports, which they apply to other areas of their lives. Furthermore, this research reveals the diverse career paths that athletes embark upon after retiring from their professional sports careers, including roles in sports management, coaching and various professional fields. In conclusion, this study the process of athletes transitioning to post-retirement life, highlights the impact of a sports career on their personal and professional lives.

Keywords: professional sport, sports career, employment after sports career

COMPARATIVE ANALYSIS OF ANTHROPOMETRIC CHARACTERISTICS AND POSTURAL STATUS BETWEEN PRESCHOOL CHILDREN FROM URBAN AND RURAL AREAS IN THE MUNICIPALITY OF ČAČAK

Aleksandra Aleksić Veljković¹, Jovica Peulić², Borko Katanić³ and Nataša Jovanović⁴

¹ University of Nis, Faculty of Sport and Physical Education, Niš;

² Preschool Institution Moje detinjstvo, Čačak;

³ Montenegrin Sports Academy, Podgorica;

⁴ Children's Dispensary of the Health Center Čačak

UDC 612.766:796.012.1:314.1-053.4(497.11)

Summary

The aim of the study was to determine urban-rural differences in anthropometric characteristics, prevalence of obesity, and postural status among preschool children aged 6-7. A total of 922 preschool children aged 6-7 from the municipality of Čačak participated in this cross-sectional study (452 boys and 470 girls). The sample was divided by settlement type into urban and rural inhabitants. Anthropometric characteristics were assessed using a battery of three variables: body height (BH), body weight (BW), and body mass index (BMI). BMI was categorized based on the World Health Organization's (WHO) cut-offs. Postural status was evaluated by a physiatrist, and postural parameters such as foot status, scoliosis, and shoulder droop were determined using the method. It was found that preschool children from rural areas have significantly higher body mass index (BMI) values compared to children from urban areas. Furthermore, it was concluded that every fourth preschool-age child is overweight or obese. There was also an association between weight status and residential status. As for the analysis of postural status, a high percentage of foot deformities and shoulder droop were observed, while the prevalence of scoliosis was considerably lower, with approximately one in four children having scoliosis. However, due to the limited anthropometric variables and subjective assessment of postural status, these results should be taken with caution. Nevertheless, this study has made a significant contribution to the assessment of the anthropometric and postural status of children in the municipality of Čačak and can be considered a pivotal initiative, as it is the first study of its kind conducted in this part of Serbia. Thus, this research can serve as a starting point for future practical and research endeavors.

Keywords: morphological characteristics, BMI status, prevalence of obesity, postural deformities, children

INJURY FREQUENCY IN MODERN BALLET

Aleksandra Aleksić Veljković¹, Katarina Herodek¹, Slavoljub Uzunović¹,
Lucija Milčić² and Kamenka Živčić²

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

² Faculty of Kinesiology, University of Zagreb, Croatia

UDC 792.8:616.001

Introduction

Modern ballet is a dance which incorporates elements of classical ballet while introducing innovations in movement, music, and choreography. Modern ballet represents a departure from the strict conventions of classical ballet, allowing for greater creativity and experimentation. Modern ballet dancers enjoy greater freedom of movement compared to classical ballet, using a wider range of techniques, including both classical and contemporary styles, enabling more expressive and fluid choreography. The aim of this study was to determine the frequency of injuries in modern ballet and the recovery methods used. The study participants were active members of the "Teatro" dance club in Niš. Before training, the participants completed a questionnaire that included demographic information, as well as details about the frequency and location of injuries.

Methods

The study involved 60 participants aged 12 to 17, of whom 16 (13.37±1.99) reported having had injuries during their dance careers. The participants reported an athletic career ranging from one to eight years, with an average of 1.63±0.62 hours of training per day, five to six times a week.

Results

The number of injuries during the participants' careers ranged from one to a maximum of seven. Interestingly, the participant who reported the highest number of injuries stated that three of them occurred during training, while the remaining injuries happened at home. As expected, the most common type of injury was ankle sprains, accounting for 62.5% (10 out of 16 participants). The second most frequent type of injury was foot injuries at 25% (four out of 16), while other injuries were reported only once, including knee, lumbar spine, shoulder, hip, etc. It is noteworthy that the majority of participants reported experiencing only one injury during their dance careers. What's interesting is that none of these injuries occurred during competitions or performances, which might be a common assumption due to the high stress levels during such events.

Discussion & Conclusion

In terms of injury types, the majority of injuries occur during landings (40.6%), which is not surprising given the high number of jumps in dance activity. The knee, ankle, and foot are the most vulnerable areas of a dancer's body. Injuries to the knee, ankle, and foot account for nearly 60% of the total injuries, which is a similar percentage to previous research conducted in the United States and the United Kingdom. Nearly half of the injuries are due to strains. Over 70% of injuries in students resulted in the inability to train for at least a week, with some injuries requiring much longer recovery, consistent with the results of previous research.

References

1. Angioi, M., Metsios, G. S., Koutedakis, Y., Twitchett, E., & Wyon, M. (2009). Physical fitness and severity of injuries in contemporary dance. *Medical Problems of Performing Artists, 24*(1), 26-29.
2. Cardoso, A. A., Reis, N. M., Marinho, A. P. R., Vieira, M. D. C. S., Boing, L., & Guimarães, D. A. (2017). Injuries in professional dancers: a systematic review. *Revista Brasileira de Medicina do Esporte, 23*, 504-509.
3. Henn, E. D., Smith, T., Ambegaonkar, J. P., & Wyon, M. (2020). Low Back Pain and Injury in Ballet, Modern, and Hip-Hop Dancers: A Systematic Review. *International journal of sports physical therapy, 15*(5), 671-687.

Keywords: dance injuries; ankle sprains; dance training

THE EFFECTS OF SPECIFIC PREPARATION FOR TRAINING ON THE PHYSICAL FITNESS OF PROFESSIONAL MMA FIGHTERS

Aleksandar Stamenković¹ and Stevan Stamenković¹

¹ Faculty of Sports and Physical Education, University of Niš, Niš, Serbia

UDC 796.8

Introduction

The purpose of the present study was to investigate the effects of specific training preparation on the physical fitness of professional MMA fighters.

Methods

The following databases, Google Scholar, PubMed, Web of Science, were searched in detail and reviewed for articles published from June 2014 to April 2023. Inclusion criteria were longitudinal studies written in English, in which the training treatment conducted on professional MMA fighters was clearly described. Exclusion criteria were all review papers, as well as those that did not clearly describe the results obtained by applying specific programs. After the search was completed, a total of six studies met the inclusion criteria, with a total of 178 participants.

Results

By applying different specific training treatments, it was determined that there was a significant improvement in explosive power, maximum strength and the VO₂max parameter. Also, there were positive changes in body composition parameters, which primarily refers to the decrease in BF% and increase in lean mass.

Discussion & Conclusion

It was concluded that the specific physical training programs developed and implemented led to beneficial changes in the physical fitness parameters of professional MMA fighters. This information can be very important for coaches, especially for developing fighters' strength and conditioning.

References

1. La Bounty, P., Campbell, B. I., Galvan, E., Cooke, M., & Antonio, J. (2011). Strength and conditioning considerations for mixed martial arts. *Strength & Conditioning Journal*, 33(1), 56-67.
2. Kostikiadis, I. N., Methenitis, S., Tsoukos, A., Veligekas, P., Terzis, G., & Bogdanis, G. C. (2018). The effect of short-term sport-specific strength and conditioning training on physical fitness of well-trained mixed martial arts athletes. *Journal of sports science & medicine*, 17(3), 348.
3. Tota, Ł., Pilch, W., Piotrowska, A., & Maciejczyk, M. (2019). The effects of conditioning training on body build, aerobic and anaerobic performance in elite mixed martial arts athletes. *Journal of Human Kinetics*, 70(1), 223-231.
4. Barley, O. R., Chapman, D. W., Guppy, S. N., & Abbiss, C. R. (2019). Considerations when assessing endurance in combat sport athletes. *Frontiers in physiology*, 10, 205.
5. Chernozub, A., Olkhovyi, O., Aloshyna, A., Savenko, A., Shtefiuk, I., Marionda, I., & Tulaydan, V. (2023). Evaluation of the Correlation Between Strength and Special Training Indicators in Mixed Martial Arts. *Physical Education Theory and Methodology*, 23(2), 276-282.

Keywords: combat sports, reality fighting, training program, motor skills, body composition

ASPECTS OF COMMUNICATION IN PHYSICAL EDUCATION LESSONS FOR PRIMARY SCHOOL PUPILS

Alina Ababei¹

¹ Department of Teaching and Research, Faculty of Economic, Law, and Management Sciences, "George Bacovia" University of Bacău, 96 Pictor Theodor Aman Street, Bacău, Romania

UDC 316.47:371:796.01-053.5

Introduction

The issue of communication has always been and remains relevant, and the act of communication is essential, vital. It encompasses the entire social space and its spheres. Without communication, we are practically nonexistent. Communication is the process of sending a message and transmitting it using a code through a channel to a recipient who intercepts the message. When communication becomes bilateral (mutual), the recipient becomes the sender at the moment of transmitting the message, and the sender becomes the recipient. To achieve effective communication, a code and a message to be transmitted are needed. Codes come in various types. They can consist of language types (verbal, nonverbal, paraverbal) or symbols (concrete or abstract). However, the most encountered codes in social communication are related to language. Through the socio-cultural dimensions of physical education, the physical education lesson provides a unique opportunity to get to know children, communicate with them, take on different roles, acquire physical skills and moral attitudes (such as tolerance, respect for others, etc.), accept attitudes related to activity (which contribute to personality development), experience emotions that are difficult to feel in other spheres of life, accept positive elements of lifestyle (such as nutrition, rest, etc.), adapt to the proposed objective (through cooperation, cohesion, and others), and become socially active through the achievements of others. At the age of 7, a child is a miniature adult with a personality. They must follow certain rules to integrate into the collective, and therefore, the physical education lesson offers the most suitable means in this regard through its character and content. Personality development occurs in parallel with new life experiences.

Methods

The research started from the following working hypothesis: a study on communication in physical education lessons with primary school students could lead to new solutions regarding this aspect. In the development of this study, the following research methods were used: the method of studying the professional literature, the observation method, and the case study method.

Results

The basis of the case study conducted in collaboration with the school's psychological counselor was the ESPERE method, a method through which the student learned about concepts, rules of relational hygiene, and concrete tools of relational communication. These he will be able to use in his relationships to respect himself and others. The 10 one-hour working sessions were based on various experiences lived by the children. At the end of the study, the student was able to say 'No' to anything that is not good for him and 'Yes' to what is good. He learned to take responsibility for his own actions, to respect those around him, and most importantly, to express

in words what he feels and experiences without reacting verbally or physically violently, to manage various conflicts in the absence of parents.

Discussion & Conclusion

In school, the student is shaped, and what they acquire during their school years will remain in their memory throughout their life. The first thing to consider regarding the relationship between the student and the teacher is communication. Following the case study conducted, we have found that in communication with students, the teacher is required to adhere to certain conditions, namely: using language appropriate to the intellectual development level of the students, conveying clear messages that cannot be misinterpreted, instilling confidence in the students, communicating with all students while giving them as equal attention as possible. Another important aspect is the ability to engage and stimulate the student/students to express their opinions, whether they are correct or not, and to obtain quick feedback. To achieve this, it is necessary to create a friendly relationship and a positive atmosphere in which physical education lessons take place.

References

1. Albert-Lorincz,E.,Carcea,I.M. (1998) *Prevenirea dezadaptării școlare*, Ed.Cermi,Iași
2. Albulescu,I. (2014) *Pedagogii alternative*,Ed.ALL, București
3. Aldo,N. (2010) *Cum să ne educăm copiii*, Ed.TREI, București
4. Aldort,N. (2015) *Creștem împreună*, Ed.Herard, București
5. Baci,A.(coord.) (2006) *Educația părinților*,Ed. MarLink, București

Keywords: pupils, primary, communication, physical education

METRIC CHARACTERISTICS OF THE GROSS MOTOR DEVELOPMENT TEST

**Andrea Marković¹, Nikola Simonović¹, Anja Obradović², Doroteja Rančić¹,
Danijela Ljubojević³ and Slađana Stanković⁴**

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

² Faculty of Sport and Physical Education, University of Novi Sad, Novi Sad, Serbia;

³ Institute for Educational Research Belgrade, Serbia;

⁴ Faculty of Pedagogy, University of Kragujevac, Jagodina, Serbia

UDC 796.012.2:612.7-053.2

Introduction

Developing motor skills in children is a complex process that profoundly impacts their development, it runs parallel with brain maturation in specific motor areas, not solely dependent on age. Adequate motor skills benefit daily activities, physical activity enjoyment, and professional development. This lifelong process benefits from physical education and outdoor play, fostering skills like balance and agility while enhancing self-confidence and social development, positively impacting self-esteem in children and youth. Battery tests are commonly used to assess children's motor skills and abilities, including balance, agility, and strength. The Test of Gross Motor Development-2 (TGMD-2) is a standardized test assessing gross motor skills in children aged three to ten, covering twelve skills in two categories: locomotor and object control skills. A third version of this battery includes two extra tests within the object control skills subtest: striking a ball with a racket, and tossing a ball from underhand, also added two extra tests in locomotor skills (jump and skip). However, they eliminated from TGMD-2 leap, horizontal jump and underhand roll (rolling a ball) bringing the total skill count up to thirteen from the previous twelve. While numerous studies have dealt with this issue, no scientific review article is available on this subject to our knowledge. Therefore, the study aimed to determine the metric characteristics of the Test of Gross Motor Development (TGMD).

Methods

The study followed PRISMA guidelines and included research conducted from 2012 to 2022, utilizing databases like Google Scholar, PubMed, Mendeley, Science Direct, and Scopus. The criteria for inclusion were original English-language, studies involving children using standardized measuring instruments like TGMD-2 or TGMD-3 in both lab and field settings. Exclusion criteria encompassed non-English publications, inadequate sample populations, insufficient data presentation, and non-standardized measures.

Results

The presented results confirm that TGMD shows high validity and reliability, instilling confidence in its use and establishing new norms. The research has consistently demonstrated high validity and reliability values in the internal structure of TGMD-2 and 3. The findings from these studies affirm that the TGMD is a reliable and valid tool for assessing children's gross motor skills.

Discussion & Conclusion

The results presented in this study confirm the high validity and reliability of the TGMD, instilling confidence in its use and establishing new norms. The research demonstrates that TGMD-2 and TGMD-3 variants exhibit consistent and high values of validity and reliability in assessing children's gross motor skills. These assessments play an important role in shaping programs, monitoring children with developmental challenges, correcting poor movement patterns, enhancing coordination, and overall cognitive abilities. Future research should focus on validating TGMD-3 in diverse settings to encourage its broader application. The TGMD is a valuable tool for assessing children's motor skills, offering qualitative insights into their competency in locomotor and manipulative skills, and providing a high level of validity and reliability for establishing new norms.

References

1. Brian, A., Taunton, S., Lieberman, L. J., Haibach-Beach, P., Foley, J., & Santarossa, S. (2018). Psychometric properties of the Test of Gross Motor Development-3 for children with visual impairments. *Adapted Physical Activity Quarterly*, 35(2), 145-158
2. Capio, C. M., Eguia, K. F., & Simons, J. (2016). Test of gross motor development-2 for Filipino children with intellectual disability: validity and reliability. *Journal of sports sciences*, 34(1), 10-17
3. Duncan, M. J., Martins, C., Ribeiro Bandeira, P. F., Issartel, J., Peers, C., Belton, S., ... & Behan, S. (2022). TGMD-3 short version: Evidence of validity and associations with sex in Irish children. *Journal of sports sciences*, 40(2), 138-145.
4. The study was created as a result of research within the bilateral project "Crisis, challenges and the modern education system", which is implemented by the Faculty of Pedagogical Sciences of the University in Kragujevac (Serbia) and the Faculty of Philosophy, University of Montenegro (Montenegro) (2021-2023).

Keywords: children, locomotor skills, object control skills

BARRIERS TO THE WORKING POPULATION'S PHYSICAL ACTIVITY

**Anđela Đošić¹, Danijela Živković¹, Tijana Purenović-Ivanović¹, Mladen Živković¹,
Nebojša Randelović¹ and Saša Pantelić¹**

¹ Faculty of Sport and Physical Education, University of Niš

UDC 796.035

Summary

The working population's physical activity has an enormous influence on their health. Despite the well-documented health benefits of physical activity for this population, the working population is not sufficiently physically active and faces a wide range of internal and external barriers. The aim of the study was to identify the differences in barriers to physical activity between working men and women, as well as the differences in barriers related to age. The sample of subjects consisted of 619 working adults (aged 20 to 65), of which 354 were men and 265 were women. The questionnaire developed by Mitic et al. (2010) was used to identify the barriers. Frequencies and percentages of responses were calculated, and differences between groups were determined by the χ^2 test. The data were processed using the SPSS 20 statistical package, and the level of statistical significance was $p = .05$. Significant differences were found in most barriers to physical activity between working men and women, in relation to age. The most frequently stated barriers were "I lack time", "I don't feel the need" and "I lack habits". Age-related barriers have been identified for men above the age of 40, but they begin for women at the age of 30. In relation to gender, a statistically significant difference was found in the barriers "I lack habits" ($p = .050$) and "There is a lack of place to perform it" ($p = .044$), with a higher proportion of women confirming the mentioned barriers. The study showed that there are differences in barriers to physical activity between men and women, and accordingly there is a need to offer different programs and exercise opportunities to reduce these barriers.

Keywords: barriers, physical activity, working population, workplace health, sedentary behavior

HIIT INTERVENTIONS IMPROVE CARDIORESPIRATORY FITNESS IN ADULTS WITH DIABETES TYPE 1

Anja Lazić¹, Dušan Stanković¹ and Cristina Cadenas-Sánchez^{2,3}

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

² Stanford University, Department of Cardiology,

Stanford; Veterans Affairs Palo Alto Health Care System, Palo Alto, California, United States;

³ Department of Physical Education and Sports, Faculty of Sports Science, Sport and Health University Research Institute (iMUDS), University of Granada; CIBEROBN, ISCIII, Granada, Spain.

UDC 796.015.132:616.379-053.8

Introduction

Type 1 diabetes (T1DM) is one of the most widespread autoimmune diseases affecting 8.4 million patients, with a predicted alarming 13.5-17.4 million new cases by 2040. Patients with T1DM face an increased risk of cardiovascular complications and premature death attributed to impaired cardiorespiratory fitness. Despite the benefits of exercise interventions are well established in this population, more than 60% are sedentary. The main reasons are lack of time and fear of exercise induced hypoglycemia. Recent studies have highlighted concern about time consuming traditional exercise modalities such as moderate continuous training (MCT). Therefore, High-Intensity Interval Training (HIIT) is a promising exercise modality known for its efficiency in improving cardiorespiratory fitness. Moreover, on T1DM have shown that HIIT is safe modality of exercise and can improve main modifiable factor (cardiorespiratory fitness) for sustaining diabetes-related diseases in short period of time. However, overall effects on cardiorespiratory fitness still remains unclear.

Methods

Two data bases (Web of Science and PubMed) were searched until November, 2022. Adult patients with T1DM who were free of complications or/and additional diseases were included in randomized and non-randomized studies investigating the effects of HIIT on cardiorespiratory fitness (VO_{2max} and VO_{2peak} (HIIT pre vs. post; HIIT vs. control group or HIIT vs. MCT)).

Results

A total of 10 studies met the inclusion criteria. The systematic review included 234 participants, while the meta-analysis included 134 participants. The meta-analysis revealed a significant improvement in cardiorespiratory fitness following HIIT interventions in patients with T1DM (SMD=0.59, 95% CI=0.15,1.02; $I^2=44.3\%$).

Discussion & Conclusion

The main finding of this study is that HIIT interventions are effective for improving cardiorespiratory fitness in adults with T1DM. Furthermore, HIIT was more efficient compared to control groups and MCT groups. Finally, at least 6 weeks of HIIT intervention is needed for visible changes in cardiorespiratory fitness.

References

1. Farinha, J. B., Krause, M., Rodrigues-Krause, J., & Reischak-Oliveira, A. (2017). Exercise for type 1 diabetes mellitus management: general considerations and new directions. *Medical Hypotheses*, *104*, 147-153.
2. Gregory, G. A., Robinson, T. I., Linklater, S. E., Wang, F., Colagiuri, S., de Beaufort, C., ... & Ogle, G. D. (2022). Global incidence, prevalence, and mortality of type 1 diabetes in 2021 with projection to 2040: a modelling study. *The lancet Diabetes & endocrinology*, *10*(10), 741-760.
3. Kennedy, A., Narendran, P., Andrews, R. C., Daley, A., & Greenfield, S. M. (2018). Attitudes and barriers to exercise in adults with a recent diagnosis of type 1 diabetes: a qualitative study of participants in the Exercise for Type 1 Diabetes (EXTOD) study. *BMJ open*, *8*(1), e017813.
4. Rawshani, A., Rawshani, A., Sattar, N., Franzén, S., McGuire, D. K., Eliasson, B., ... & Gudbjörnsdóttir, S. (2019). Relative prognostic importance and optimal levels of risk factors for mortality and cardiovascular outcomes in type 1 diabetes mellitus. *Circulation*, *139*(16), 1900-1912.
5. Tonoli, C., Heyman, E., Roelands, B., Buyse, L., Cheung, S. S., Berthoin, S., & Meeusen, R. (2012). Effects of different types of acute and chronic (training) exercise on glycaemic control in type 1 diabetes mellitus: a meta-analysis. *Sports medicine*, *42*, 1059-1080.

Keywords: exercise; disease; intervention; diabetes melitus

THE RELATIONSHIP BETWEEN VERTICAL JUMP PERFORMANCE AND BODY COMPOSITION PARAMETERS IN PROFESSIONAL BASKETBALL PLAYERS

Anja Lazić¹, Miodorag Kocić¹, Dragana Berić¹ and Špela Bogataj²

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

² Department of Nephrology, University Medical Centre Ljubljana, Ljubljana, Slovenia

UDC 796.012.112.323

Introduction

Professional female basketball is very demanding sport where success depends on various factors. It is already well known that explosive power and body composition are among the strongest predictors for the performance. The most searched indicator of explosive power is vertical jump (VJ). The Vertical jump (VJ) is the most frequent activity and strong determinant of basketball performance and represents a crucial part of various defensive and offensive maneuvers. However, it still remains unclear how is VJ related to different body composition parameters. Therefore, the purpose of this study was to summarize the relationship between explosive power (VJ) and body composition parameters in female basketball players.

Methods

Three major data bases (PubMed, Scopus and Web of Science) were searched until July, 2023. The inclusion criteria were as follows: the sample of the participants was consisted of female basketball players of all ages and studies that investigated relationship between VJ and body composition parameters.

Results

A total of 9 studies met the inclusion criteria. The total sample of participants included 132 basketball players of different level of playing and ages. The most frequently used tests that were used to evaluate the VJ were countermovement jump (CMJ), countermovement jump with arm swing (CMJa) and squat jump (SJ).

Discussion & Conclusion

From this standpoint female basketball players with a lower % of FM and LMM showed better performance in VJ suggesting that body composition can be considered an indirect predictor of performance.

References

1. Ziv, G., & Lidor, R. (2010). Vertical jump in female and male basketball players—A review of observational and experimental studies. *Journal of science and medicine in sport*, 13(3), 332-339.
2. Delestrat, A., & Cohen, D. (2009). Strength, power, speed, and agility of women basketball players according to playing position. *The Journal of Strength & Conditioning Research*, 23(7), 1974-1981.

3. França, C., França, A., Marques, A., Ihle, A., Lopes, H., Santos, F., & Gouveia, É. R. (2022). Monitoring body composition and physical fitness of elite female basketball players after 16 weeks of in-season training. *Journal of Physical Education and Sport*, 22(10), 2386-2392.
4. Alemdaroğlu, U. (2012). The relationship between muscle strength, anaerobic performance, agility, sprint ability and vertical jump performance in professional basketball players. *Journal of human kinetics*, 31, 149.
5. Ribeiro, B. G., Mota, H. R., Sampaio-Jorge, F., Morales, A. P., & Leite, T. C. (2015). Correlation between body composition and the performance of vertical jumps in basketball players. *J. Exerc. Physiol. Online*, 18, 69-79.

Keywords: explosive power; body fat; performance; muscle mass

STUDENT'S ATTITUDES TOWARDS ENGLISH LANGUAGE IN KINESIOLOGY: INSIGHTS THROUGH GENDER-RELATED DIFFERENCES

Ana Penjak¹, Igor Jelaska¹ and Jelena Žanić Mikuličić²

¹ Faculty of Kinesiology, University of Split;

² Faculty of Maritime Studies, University of Split

UDC 612.76:811.111

Summary

The English language, which has attained a global status, plays an important role in modern times and is used in almost all fields such as science, engineering, education, information and technology, business, etc. Thus, it has the status of "English for specific purposes" (ESP), which means that it focuses on the linguistic and communicative requirements in a specific professional field and becomes an important force in English language teaching and research. Therefore, the aim of this study was to identify and explain gender related differences in student's attitudes towards necessity of English language. In doing so, by using 2 newly-constructed questions, N1=48 male and N2=53 female students of kinesiology were assessed for their attitudes towards the relationship between English language proficiency and finding a job 1) in Croatia 2) internationally. Used questions appeared to be a-priori valid using expert assessment and highly reliable ($r > 0.92$; $p < 0.05$). Using Mann Whitney U test, it was found ($p = 0.34$; $p = 0.53$) that male and female students have the same attitudes towards the applicability of English when looking for a job in Croatia or abroad. The results of this research indicate that the attitudes of male and female students on this issue are homogeneous. The absence of differences can be used as an additional indication for structuring learning materials for undergraduate and graduate students of kinesiology, physical culture and/or sports science. Although, many researches of the relationship between gender-related differences and English language learning acquisition abound in the publications, further studies should include similar research for other languages that are also prevalent today in the global sense.

Keywords: learning English, physical education, importance of English, interaction English – real life

ACL RECONSTRUCTION IN ATHLETIC PATIENTS WITH ANTERIOR CRUCIATE LIGAMENT INJURIES: AUTOGRAFT VS ALLOGRAFT

At. Andreev¹, I. Kolev² and Ig. Zazirnyi³

¹ South-West University Neofit Rilski Blagoevgrad Bulgaria,

² Medical Institute of the Ministry of Internal Affairs, Sofia, Bulgaria,

³ Hospital Feofania Kiev Ukraine

UDC 616.001

Introduction

Anterior cruciate ligament (ACL) rupture is a common sporting-relates keen injury with a potentially detrimental impact on the athlete's career, yet there is no formal consensus on the optimal graft choice for reconstructing the ruptured ACL in the specific population. Options for reconstruction include autograft and allograft. Our operational definition of the athlete is a skeletally mature individual participating in high level activity with the expectation to return to pre-injury level of activity. For the athlete long-term outcomes are of particular importance given on-going mechanical demands on the reconstructed knee.

Methods

In this study we included 50 patients. 25 operated with BTB allograft and 25 operated with hamstrings autograft. The patients were selected from a pool of 160 patients based on the following criteria: NO previous surgeries on the operated knee, NO patella-femoral pain, NO systemic disorders, NO injury to the contralateral knee and every patient must be reconstructed with anatomic single bundle ACL reconstruction technique. We compared the time needed for subsiding of the post operative pain, the IKDC and Lysholm scores of the two groups and the active flexion and loss of power of the operated knee.¹

Results

The patients in the allograft group showed statistically significant better results in the tested categories compared to the autograft group.

Discussion & Conclusion

Comparing the results of the two groups we concluded that allografts are viable option when choosing a graft type for ACL reconstruction. Patient operated with allografts have less postoperative pain, better postoperative strength of the operated knee and better long-term performance results when it comes to return to high-level sporting activities.

References

1. Carter T, Norton A. A Prospective, Double-Blind Evaluation of Anterior Cruciate Ligament Reconstruction With Tibialis Tendon Allograft: Donor Age Does Not Alter Outcomes. *Arthrosc Sports Med Rehabil.* 2022 Dec 20;5(1):e267-e272. doi: 10.1016/j.jasmr.2022.11.025. PMID: 36866298.

Keywords: allograft, autograft, active flexion and loss of power, post operative pain

EFFECTS OF SUPERVISED EXERCISE ON BODY COMPOSITION IN PATIENTS SUCCEEDING BARIATRIC SURGERY 1 YEAR LONGITUDINAL STUDY

Azize Bingöl Diedhiou¹ and Ayten Altunsaray²

¹Şırnak University, School of Physical Education and Sport
Department of Training Education Şırnak, Türkiye;

²Lokman Hekim University, Department of Nutrition and Dietetics, Ankara, Türkiye

UDC 796.012.6:613.22

Summary

This study aims to investigate whether a supervised, multicomponent exercise program can provide additional benefits on body composition after bariatric surgery. 18-65 year; body mass index (BMI) >35 kg/m²; 54 patients (Exercise Group 29; Control Group 25) who had mini gastric bypass or Gastric Sleeve Surgery were included in the study. A verbal suggestion was made to the CG to increase physical activity, but this suggestion was not taken into consideration. The exercise group participated in a supervised multicomponent exercise program, 3 days a week, nonconsecutively, lasting 60 minutes each, for 11 months, starting 1 month after surgery. All variables were tested with two-way ANOVA test according to the effect of exercises on body weight (BW), fat mass (FM), fat-free mass (FFM) and BMI. After completion of descriptive statistics (mean ± SD), an independent t test was used to examine between-group differences in anthropometric components at baseline. Accordingly, there was no significant difference between the groups at baseline, including age, BW, BMI, FM and FFM ($p > .05$). Both groups experienced significant initial BW and FM loss, but these changes did not differ significantly between groups ($p > 0.05$). On the other hand, FFM changes showed significant differences between groups ($p < .05$). Although there was no statistical difference in BW, FM and BMI values of the exercise group and the control group in this study, the positive change in the FFM of the exercise group was found to be significant compared to the control group. This clearly shows the importance of exercise in our study.

Keywords: bariatric surgery; exercise; fat free mass; fat mass; obesity

EFFECTS OF STATIC AND DYNAMIC STRETCHING ON INJURY PREVENTION IN FOOTBALL: A SYSTEMATIC REVIEW

**Branislav Majkić¹, Zoran Milanović^{1,2,3}, Mila Vukadinović Jurišić⁴,
Luka Radosavljević¹ and Tomislav Okičić¹**

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

²Science and Research Center Koper, Koper, Slovenia,

³Faculty of Sports Studies, Masaryk University, Brno, Czech Republic,

⁴Faculty of Sport and Physical Education, University of Novi Sad

UDC 616.001:796.322

Summary

In elite and professional football, injuries can have serious consequences for the entire team, as well as for the career of a particular player. Stretching, as one of the main components of the warm-up, may be beneficial in preventing muscle injuries by requiring greater stretch length and force to cause muscle rupture. The aim of this review was to review the published literature that investigates the effects of static and dynamic stretching on the prevention of injuries in football. Index databases were used to collect adequate literature: GoogleScholar, SCOPUS, PubMed. Based on the set subject and research goal, 14 original scientific researches were found and analyzed in detail. Looking at the results of the presented studies, it can be seen that 11 of the 14 presented studies showed positive results in the form of injury prevention by applying stretching before or after football players' training. The two studies that did not show positive effects were of short duration, so the absence of positive effects can be attributed to the shortcomings of the two studies. One study found no positive effects of static stretching on injury prevention in football. Future research should concentrate on developing new methods and combinations with other tools and training methods in order to prevent injuries. In conclusion, stretching may be beneficial in preventing muscle injuries by requiring greater stretch length and force to cause muscle rupture and is overall good for injury prevention especially when combined (static & dynamic) and practiced for prolonged period of time.

Keywords: soccer, flexibility, additional training, hamstring

PARENTS, COACHES AND YOUNG FOOTBALL PLAYERS: SUPPORTING OR CREATING PRESSURE?

Branislav Majkić¹, Ana Lilić¹, Neda Karaleić², Lora Kostić¹ and Matej Išasegi³

¹ Faculty of Sport and Physical Education, University of Nis;

² Faculty of Philosophy, University of Nis;

³ Faculty of Kinesiology, Josip Juraj Strossmayer, University of Osijek, Croatia

UDC 159.922:796.322-053.6

Summary

Parents play an important role in a child's socialization and involvement in sports as well as during the period of life in which they engage in sports. The aim of this study was to determine how parental and coach's behavior affect on the motivation to play sport in the adolescent sample of football players. This study examined 131 subelite football players, age 12-16, from one club playing in Serbian top youth leagues and at the time of testing all of them had a training experience of 4-11 years. The survey was conducted using three psychological instruments that will assess the opinion of children about their motives for playing sports (SIMS), the parental bonding styles (mothers and fathers separately) (PBI-BC) and how coaches and the team climate influence them (MCSYS). In the first step predictive power of the parental bonding is tested (parental care for mother and father, parental overprotection for mother and father), which explained 26.6% variance of the dependant variable ($p = .000$). Mastery climate scores were significantly and positively associated with liking for the coach and desire to play for the coach in the future, whereas MCSYS ego scores were negatively associated with these variables. According to this research's data, the athletes who are high on mastery scores are the ones who have intrinsic motivation and identified regulation, and the ones with ego scores are amotivated.

Keywords: motivation, adolescent athletes, sense of competence

THE EFFECT OF EDUCATIONAL STRESS ON ACADEMIC PROCRASTINATION BEHAVIOR

Bülent Duman¹, Nuri Berk Güngör² and Zülbiye Kaçay³

¹ Department of Banking and Insurance, Balıkesir University, Balıkesir, Türkiye

² Department of Sports Management, Balıkesir University, Balıkesir, Türkiye

³ Department of Sports Management, Çanakkale Onsekiz Mart University, Çanakkale, Türkiye

UDC 613.86:796.077.5

Introduction

The purpose of this research is to determine the effect of educational stress levels on academic procrastination of students studying at the Faculty of Sports Sciences.

Methods

The research was designed in the relational scanning model. The study group of the research consists of a total of 196 students, 94 women and 102 men, who continue their education at a public university in Turkey in the 2022-2023 academic year. In the analysis of the data, parametric tests were applied after testing that the data set met normal distribution parameters.

Results

Considering the research findings, it can be stated that the academic procrastination and educational stress average scores of the participants are high. As a data collection tool in the research; The Academic Procrastination Scale adapted to Turkish by Çakıcı (2003) and the Educational Stress Scale developed by Seçer, Veyis & Gökçen (2015) were used. It was concluded that the academic procrastination and educational stress levels of the participants did not differ according to the gender variable, but differed statistically according to the grade level variable. In addition, it was determined that there was a significant relationship between academic procrastination and educational stress.

Discussion & Conclusion

Another result obtained from the research is that the educational stress of the participants has a predictive power of 41% on academic procrastination behavior. Therefore, reducing educational stress will contribute to academic success by reducing academic procrastination behavior in students. From this point of view, it is recommended to carry out studies with qualitative research method in order to identify the stakeholders of educational stress in students and to offer solutions.

References

1. Seçer, İ., Veyis, F., & Gökçen, R. A. (2015). Adaptation of Educational Stress Scale to Turkish Culture: Reliability and Validity Study. *Primary Education Online*, 14(1), 216-230.
2. Çakıcı DÇ, 2003. Examining general procrastination and academic procrastination behavior in high school and university students (Master's thesis, Institute of Education Sciences).

Keywords: Educational stress, academic procrastination, student, sports

EXAMINATION OF FACTORS AFFECTING THE DRIVE FOR MUSCULARITY IN INDIVIDUALS EXERCISING IN THE GYM

**Burak Gönültaş¹, Ismail Ilbak², Ahmet Yasuntimur³, Stefan Stojanović⁴,
Bojan Jorgić⁴ and Marko Aleksandrović⁴**

¹Ege University, Institute of Health Sciences, İzmir, Türkiye

²İnönü University, Institute of Health Sciences,

Department of Physical Education and Sports, Malatya, Türkiye

³İnönü University, Institute of Social Sciences, Department of Sociology, Malatya, Türkiye

⁴University of Nis, Faculty of Sport and Physical Education, Nis, Serbia

UDC 613.2:796.071

Summary

Today, the body of human percieve as a “mirror of human existence” and thus a means of presenting oneself to the outside world. It is known that in patriarchal and heterosexist cultures, women are expected to have a "slim and sexy body image," while men are expected to have a "strong and muscular physique." To achieve this ideal body structure and have a positive image in their minds, individuals may engage in sports activities such as fitness, and bodybuilding. Given the physical and psychological consequences of the drive for muscularity, it is thought critical to identify the urge factors that contribute to it. With this framework, the aim of the research was to examine the relationship between the drive for muscularity and factors such as exercise, meal frequency, monthly income, and type of accommodation. This research was designed using the survey model, which is one of the quantitative research methods. The research sample consisted of 465 participants. Participants were determined by the criteria sampling method. In this study, the data collection tool, the original name "Drive for Muscularity Scale", adapted into Turkish and named "Kaslı Olma Dürtüsü Ölçeği" was used. Data were analyzed with the IBM Statistics (SPSS version 26.0, Armonk, NY). The result of this study show that the drive for muscularity was affected by variables including exercise frequency, meal frequency, monthly income and type of accommodation. Considering the existing literature, the relationship between the motivation drive for muscularity and type of accommodation and monthly income has not been adequately studied. In this regard, it is advised that future studies look at the aforementioned variables.

Keywords: muscularity, exercise frequency, meal frequency, monthly income, type of accommodation

NEW APPROACHES IN DEVELOPING GENERAL ENDURANCE IN MIDDLE SCHOOL PUPILS

Cătălina Ababei¹ and Radu Ababei²

¹ Department of Physical Therapy and Occupational Therapy, Faculty of Movement, Sports, and Health Sciences, "Vasile Alecsandri" University of Bacau, Bacau, Romania

² Department of Physical Education and Top Athletic Performance, Faculty of Movement, Sports, and Health Sciences, "Vasile Alecsandri" University of Bacau, Bacau, Romania

UDC 796.012.2-053.6

Introduction

Athletics in physical education and in all high-performance sports play a fundamental role in organizing lessons or sports activities of any kind. Athletics offers the widest range of natural and accessible exercises that can be practiced from a very young age. The three natural movements are running, jumping, and throwing, which are present in the daily life of every individual. They are also used in other sports branches and serve as control tests. These activities mentioned above, not being demanding in terms of space and materials, are present throughout the school year. The teaching of physical education and sports in schools has an extremely important role, which unfortunately very few teachers, parents, and students fully understand. Like other subjects, physical education helps middle school students develop their imagination and creativity. Studies show that self-esteem, body posture, respect, and a high social level are largely due to sports. In cases where a student is inclined towards a particular sports branch, their personality and discipline continually improve. With significant and visible transformations in terms of biology, psychology, and social aspects for students, the need for movement is equally important. Therefore, the requirements for dose adjustment must be studied and respected.

Physical education and sports have been considered a social phenomenon for several centuries. Teaching this discipline in middle school consists of improving the health of students who are in a delicate phase of their lives called puberty. Middle school students need to accumulate a minimum of basic knowledge, motor skills, and motor skills perceptions, which will help them in their physical, psychological, and social development. The research objectives consisted of creating the somatic profile of the 6th-grade students from the schools included in the study and establishing the most effective means for developing endurance in 6th-grade students.

Methods

The research started from the following working hypothesis: *a study on the development of endurance in 6th-grade students could potentially improve the teaching process at this level.* In the development of this study, the following research methods were used: *the bibliographical study method, the observation method, the statistical-mathematical method for analyzing the data.*

Results

From the recorded data, it was observed that teachers used the following methods to teach endurance running: alternating walking with running at a moderate pace - endurance running, repeated running, running at varying paces, running on varied terrain, uphill running, interval running, and control running.

Discussion & Conclusion

Within the framework of school physical education, it is important to select the most efficient means and methods. Using a diverse range of tools makes physical activity more attractive and ensures the students' interest. If a student is interested, the effective working time can be increased by avoiding 'dead' time, and a higher level of progress can be achieved. Adapting the exercise tools through appropriate dosages: based on individual effort capacity, age, and gender is essential. The use of such methodical procedures can provide the teacher with a greater opportunity to observe the activities of each student as much as possible, thereby having the chance to correct their actions or readapt the means according to each one's capacity. These procedures can be applied in group settings, pairs, or individually.

References

1. Ababei. C., Rață. G., 2003, *Predarea atletismului în școală*, Editura Alma Mater-Bacă
2. Ababei, C., 2010, *Bazele generale ale atletismului*, Editura Alma Mater-Bacău
3. Scarlat. E., Scarlat. M., 2002, *Educație fizică și sport*, Editura Didactică pedagogică, București.
4. Alexe, D. I., 2010, *Predarea atletismului în învățământul gimnazial*, Editura Pim, Iași
5. Rață. G., 2002, *Tehnică, metodică, regulament*, Editura Alma Mater, Bacău.

Keywords: pupils, middle school, teaching, motor skill

THE CORRELATION OF HANDGRIP STRENGTH AND SUCCESS IN "MODIFIED STYLE" OF WRESTLING

Damir Pekas¹, Nebojša Trajković² and Mario Baić¹

¹ University of Zagreb, Faculty of Kinesiology,

² Faculty of Sports and Physical Education, University of Niš

UDC 796.853.23

Introduction

Introduction: Due to the nature of the sport, wrestling is suitable for the proper growth and development of beginners of different ages. Schools often don't have mat to carry out complete wrestling training. Therefore, the so-called a "modified style" of wrestling was invented. This style of wrestling doesn't required the material requirements and special prior knowledge. Most used test for evaluating strength in wrestlers is the handgrip. Therefore, the aim of this research was to investigate the correlation between the results of handgrip test and success in the "modified style" of wrestling.

Methods

The sample of participants consisted of students of the Faculty of Kinesiology in Zagreb. None of the students involved in the competition had previous knowledge of wrestling martial arts (wrestling, judo, jiu-jitsu, etc.). Testing and competition was conducted in June 2023. A correlation analysis was performed. Data were processed in the SPSS program with a significance level of $p < 0.05$.

Results

The results of the correlation analysis between success in wrestling and handgrip strength with the dominant and non-dominant hand showed similar results for both hands. A significant correlation was found between the handgrip with the dominant hand ($p=0.01$; $r=-0.348$) and between the handgrip with the non-dominant hand ($p=0.01$; $r=-0.337$) with success in wrestling. A negative correlation represents a better placement in a wrestling competition, which would mean that a stronger handgrip represents a better placement in "modified style" wrestling.

Discussion & Conclusion

From the obtained results, we can conclude that the correlation between the results in the handgrip test with the dominant and non-dominant hand is highly correlated with success in the "modified style" of wrestling. Wrestling coaches consider the strength of the handgrip very important for success in competition. A strong handgrip allows a wrestler to use offensive tactics throughout the fight. Because of all this, wrestlers perform a large number of exercises to strengthen their handgrip during training.

References

1. Baić, M., Trajković, N., Djordjevic, D., Stankovic, M., & Pekas, D. (2022). Strength profile in wrestlers-a systematic review. *Archives of Budo*, 18, 151.
2. Baić, M., Sertić, H., & Starosta, W. (2006). *Razlike između vrhunskih poljskih i hrvatskih hrvača različitih stilova, dobi i težinskih skupina u prostoru varijabli za procjenu kondicijske pripremljenosti:(doktorska disertacija)*. M. Baić.
3. Cvetković, Č., Horvatin-Fučkar, M., & Pekas, D. (2005). Crucial Motoric Abilities for a High Efficiency in a Modified Way of Wrestling. In *10 Annual Congress of the European College of sport science (ECSS: Abstract Book* (pp. 168-168).
4. Marić, J., Baić, M., & Cvetković, Č. (2007). Primjena hrvanja u ostalim sportovima. *Kineziološki fakultet Sveučilišta u Zagrebu*.
5. Marić, J., Baić, M., Aračić, M., Milanović, D., & Jukić, I. (2003). Kondicijska priprema hrvača. U: *Dragan Milanović i Igor Jukić (ur.), Zbornik radova Međunarodnog znanstveno-stručnog skupa "Kondicijska priprema sportaša, 12*, 339-346.

Keywords: motor skills, conditioning of athletes, wrestling in other sports, wrestling at school

SENSATION SEEKING AND ANXIETY IN SPORTS CLIMBERS - A SYSTEMATIC REVIEW

Daniel Stanković¹ and Nikola Ćirić

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

UDC 796.525.2:616.89-008.441

Summary

The aim of this paper was to determine, by summarizing and reviewing published research, the need for sensation seeking and anxiety in sport climbers, as well as how it affects success in sport climbing. For the purposes of the research, the available literature published in the period from 1980 to 2023 was analyzed. The results showed that there is a positive relationship between climbing abilities and higher self-esteem, competitiveness, perfectionism, satisfaction with life, the individual's tendency towards exhibitionism and the difficulty towards sensations on the risk tendency indicated. Also, sports climbers have low anxiety both in daily training and when it comes to competitive situations, they are more social and anti-structural than the "normal" population and reacting to group events, controlling subjects at the local level, striving for experience, excitement and adventures. In addition, sensation seeking affects the perception of anxiety and arousal as regular companions of sports performances. The pronounced need for sensation seeking will affect the perception of stressors and anxiety, and people with a pronounced need for sensations (which climbers certainly are) will primarily perceive anxiety as a positive, facilitative factor of sports performance.

Keywords: sensation seeking, anxiety, sports climbing

DIFFERENCES IN MOTOR ABILITIES IN ACTIVE VS. NON-ACTIVE STUDENT POPULATION

Dejan Joksimović¹, Slobodan Andrašić², Milan Cvetković¹, Boris Popović¹, Danilo Radanović¹, Dragan Marinković¹, Lidija Marković¹ and Nikola Manolopoulos¹

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

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

UDC 613:796.012.2-057.87

Introduction

Motor abilities present a wide range of physical skills that are essential for daily activities and play a crucial role in an individual's overall physical fitness. The level of physical activity and sports engagement in one's life can significantly influence their motor abilities. This scientific background explores the differences in motor abilities between active and non-active students, shedding light on the physiological, psychological, and sociological factors that contribute to these disparities.

Methods

A total of 91 students (M: 28; F: 63; Aged 20-23) were recruited. The students were grouped based on their engagement in different sports: the Active group (n = 27) and the Non-active group (n = 25). Participants were tested for Broad Jump, Handgrip strength, Seated forward bend, Push-ups, and Sit-ups. Independent samples t-test and Mann-Whitney U test were used in data analysis.

Results

Based on the results of the independent samples t-test, it can be concluded that students engaged in sports achieve higher results in the Broad Jump ($t = 2.50$; $p = 0.01$) compared to students who do not engage in sports, while no statistically significant differences are detected in the other variables. The results of the Mann-Whitney U test based on sports involvement indicate that students engaged in sports can perform more Push-ups ($U = 196.00$; $p = 0.05$) than students who do not engage in sports.

Discussion & Conclusion

The findings of this study contribute valuable insights into the correlation between sports engagement and specific motor abilities among students. Notably, students involved in sports exhibited superior results in broad jumps and push-ups, highlighting the constructive influence of sports engagement on the development of lower body strength and upper body endurance. This underscores the potential benefits of sports involvement in enhancing specific motor abilities and potential health benefits. However, it is crucial to acknowledge that the impact of sports involvement may not be uniform across all motor abilities, necessitating further research to dissect the intricate interplay between sports engagement, various physical performance metrics, and the multifaceted array of contributing factors.

References

1. Haase, A., Steptoe, A., Sallis, J. F., & Wardle, J. (2004). Leisure-time physical activity in university students from 23 countries: associations with health beliefs, risk awareness, and national economic development. *Preventive Medicine*, 39(1), 182–190.
2. Haberman, S., & Luffey, D. (1998). Weighing in college students' diet and exercise behaviors. *Journal of American College Health*, 46(4), 189–191.
3. Leslie, E., Fotheringham, M., Owen, N., & Veitch, J. (2000). A university campus physical activity promotion program. *Health Promotion Journal of Australia: Official Journal of Australian Association of Health Promotion Professionals*, 10(1), 51.
4. Stone, G., Strikwerda-Brown, J., & Gregg, C. (2002). Physical activity levels, sporting, recreational, and cultural preferences of students and staff at a regional university campus. *ACHPER Healthy Lifestyles Journal*, 49(3/4), 39–43.

Keywords: exercise; motor abilities; health; university

INFLUENCE OF MOTOR SKILLS AND ANTHROPOMETRIC CHARACTERISTICS ON SUCCESS IN RHYTHMIC GYMNASTICS: A SYSTEMATIC REVIEW RESEARCH

Doroteja Rančić¹, Tamara Ilić¹, Stefan Stojanović¹ and Andrea Marković¹

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

UDC 796.012.2.412

Summary

Rhythmic gymnastics (RG) is a sport involving both individual and group performances, where participants showcase synchronized body movements while handling various apparatus. Well-developed motor skills enable the acquisition of the basic elements of rhythmic gymnastics, creating a broad basis for achieving optimal results on competition. Since the previous researches about success in rhythmic gymnastics are insufficiently harmonized, the aim of this research was to examine the influence of motor skills and anthropometric characteristics on success in rhythmic gymnastics by systematizing the studies. The relevant literature was searched in the following databases: Google scholar, PubMed, ResearchGate. A total of 1103 respondents participated in the research, i.e. girls who practiced rhythmic gymnastics either in recreational or international level. Based on two criteria (that they were written in the English and that the respondents are in the training process), 15 studies were included in the final analysis of the studies, which were tabulated and discussed. All previous studies that have been taken into account were presented with the following criteria: citations (authors and publication year), participant sample (quantity of participants and age), observed variables, and findings from the study. Based on all of the above and the analysis of the obtained results, it can be concluded that there is a significant influence of motor skills and anthropometric characteristics on success in rhythmic gymnastics. Taking into account the obtained data and results, it can be observed that by improving various motor skills and monitoring anthropometric characteristics, the final result and success of rhythmic gymnasts in competitions can be influenced.

Keywords: competition, evaluation, performance

BLOOD PRESSURE DURING EXERCISE TESTS IN CHILDREN AND ADOLESCENTS

Dragan Radovanović

Faculty of Sport and Physical Education, University of Niš, Serbia

UDC 612.1-053.6

Introduction

A moderate increase in blood pressure is expected during exercise of submaximal and maximal intensity in children and adolescents. Despite the clarified physiological mechanism that causes an increase in systolic blood pressure, there is very little concrete data on changes in blood pressure values depending on the type, duration, and intensity of physical activity.

Methods

Electronic database searches of relevant articles published prior to September 30, 2023 were performed with the use of PubMed, MEDLINE, Google Scholar, and ScienceDirect.

Results

Standardized laboratory stress tests, which include the use of bicycle ergometers or treadmills, were used to evaluate the cardiovascular system of children and adolescents, especially those involved in sports training or competitive sports. Yet, there is not enough data on which to form general recommendations on the introduction of blood pressure measurements during stress tests in assessing the risk of cardiovascular diseases in children and adolescents.

Discussion & Conclusion

In practice, measurement of resting blood pressure identifies children and adolescents with elevated blood pressure (values above the 95th percentile according to current guidelines), who are then referred for additional diagnostic procedures and potential treatment. On the other hand, in children and adolescents with normal resting blood pressure (values below the 95th percentile according to current guidelines) who have additional risk factors for cardiovascular disease (e.g., overweight/obesity, abnormal lipid status, abnormal glucose tolerance/diabetes, family history of cardiovascular disease and/or marked lack of physical activity) stress tests may be useful in the evaluation process. An excessive increase in blood pressure (with or without a correlation with heart rate) during the exercise test is a sign that indicates the necessity for more detailed analyses.

References

1. Alvarez-Pitti, J., Herceg-Čavrak, V., Wójcik, M., Radovanović, D., Brzeziński, M., Grabitz, C., et al. (2022). Blood pressure response to exercise in children and adolescents. *Frontiers in Cardiovascular Medicine*, 9, 1004508.
2. Sasaki, T., Kawasaki, Y., Takajo, D., Sriram, C., Ross, R. D., & Kobayashi, D. (2021). Blood pressure response to treadmill cardiopulmonary exercise test in children with normal cardiac anatomy and function. *The Journal of Pediatrics*, 233, 169–174.e1.

Keywords: stress tests, cardiovascular diseases, risk factors, physical activity

MOTOR SKILLS INFLUENCE ON MORPHOLOGY PARAMETERS IN MALE PRESCHOOL CHILDREN INCLUDED IN THE ARTISTIC GYMNASTICS RECREATIONAL PROGRAM

Dušan Đorđević¹, Miloš Paunović¹, Petar Veličković¹, Mima Stanković¹,
Božidar Marović², Slavoljub Uzunović¹ and Milan Zelenović³

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

² Faculty of Sport and Physical Education, University of Belgrade, Serbia

³ Faculty of Physical Education and Sports, University of East Sarajevo, Bosnia and Herzegovina

UDC 796.012.2:793.3-053.4

Summary

The performance in artistic gymnastics can be determined by the optimal trade-off between physical fitness and extensive technical abilities. Also, a greater fitness level is required, in order to meet the sports standards. Based on the necessity to monitor children's motor development and morphology, we have aimed to examine the influence of motor skills on morphology parameters in male preschool children that are included in the artistic gymnastics recreational program. A total of 19 preschool boys (5.32 ± 0.89 years) were taken into consideration. They were already included in the artistic gymnastics preschool recreational program (3x a week/60 min. per training). Morphology parameters were assessed based on a total of 8 anthropometric characteristics measures: body height, body weight, Body Mass Index (BMI), and adipose tissues: triceps (ATC), biceps (ABC), subscapular (ASB), suprailiac (ASP), and triceps surae (ATS). Likewise, motor skills were assessed using the Eurofit Battery test: flamingo balance test (FBT), plate tapping (PTT), sit and reach (SAR), standing board jump (SBJ), handgrip strength (HGS), sit-ups (SUP), bent arm hang (BAH), backward polygon (BWP) and shuttle run 10x5 (SHR). By implementing the regression analysis, we have identified that only adipose tissue triceps (ATC) have showed to be significant for whole set of variables ($p=0.050$), as well as for the separate variables, handgrip strength (HGS), sit-ups (SUP) and shuttle run 10x5 (SHR) ($p=0.009$; $p=0.026$; $p=0.018$, respectively). In order to obtain more precise results, there is a necessity for more periodic checks and follow-ups, cross-sectional and longitudinal studies. Likewise, as an inexhaustible space of new knowledge for talent identification, spotting young gymnasts who exhibit qualities for potential success in the future are worthwhile.

Keywords: eurofit battery test, impact, skinfold, preschoolers, recreational gymnastics

VALIDITY AND RELIABILITY OF MY JUMP 2 APP FOR MEASURING THE VERTICAL JUMP PERFORMANCE IN FEMALE BASKETBALL PLAYERS

Dušan Stanković¹, Saša Bubanj¹, Stefan Pivač¹, Marko Gušić² and Draženka Mačak²

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

² Faculty of Sport and Physical Education, University of Novi Sad, Novi Sad, Serbia

UDC 796.012.323.2-055.2

Introduction

Basketball is a complex team activity that demands different movement patterns including sprinting, change of direction and jumping. Moreover, the vertical jump is one of the most prevalent movements during a basketball game. The aim of this study was to examine the concurrent validity and reliability of My Jump 2 application for the assessment of vertical jump performance in young female basketball players.

Methods

Athletes (age 15 [0.9] y; weight 62.9 [5.8] kg; height 173.6 [6.1] cm) performed both legs drop jumps (DJ) on Kistler Quattro jump force platform and were simultaneously recorded on a smartphone using the My Jump 2 application. Participants performed 3 jumps and the best result was recorded. Jump height from flight time and contact time data were statistically analysed to evaluate the validity of My jump 2 application and drop jump performance in basketball players. Test-retest reliability was repeated after one week.

Results

My jump 2 application confirmed high validity with the force platform. High test-retest reliability (ICC > 0.88) was observed in DJ height. The results of Pearson correlation coefficient between the force platform and My jump 2 app were ($r = 0.99$) and ($r = 0.98$) for DJ height and DJ contact time, respectively.

Discussion & Conclusion

The My Jump 2 app is a valid and reliable tool for assessing drop jump performance in young female basketball players.

References

1. Cruvinel-Cabral, R. M., Oliveira-Silva, I., Medeiros, A. R., Claudino, J. G., Jiménez-Reyes, P., & Boullosa, D. A. (2018). The validity and reliability of the "My Jump App" for measuring jump height of the elderly. *PeerJ*, 6, e5804.
2. Gallardo-Fuentes, F., Gallardo-Fuentes, J., Ramírez-Campillo, R., Balsalobre-Fernández, C., Martínez, C., Caniuqueo, A., ... & Izquierdo, M. (2016). Intersession and intrasession reliability and validity of the My Jump app for measuring different jump actions in trained male and female athletes. *Journal of strength and conditioning research*, 30(7), 2049-2056.
3. Stanton, R., Kean, C. O., & Scanlan, A. T. (2015). My Jump for vertical jump assessment. *British Journal of Sports Medicine*, 49(17), 1157-1158.

4. Yingling, V. R., Castro, D. A., Duong, J. T., Malpartida, F. J., Usher, J. R., & Jenny, O. (2018). The reliability of vertical jump tests between the Vertec and My Jump phone application. *PeerJ*, 6, e4669.
5. Sharp, A. P., Cronin, J. B., & Neville, J. (2019). Using smartphones for jump diagnostics: A brief review of the validity and reliability of the my jump app. *Strength & Conditioning Journal*, 41(5), 96-107.

Keywords: physical performance, mobile application, jumping, testing, muscle imbalances

EFFECTS OF PLYOMETRIC TRAINING ON PHYSICAL FITNESS AMONG YOUNG TENNIS PLAYERS: A SYSTEMATIC REVIEW

Elzan Bibić¹ and Nataša Branković²

¹ Faculty of Physical Education and Sport, University of East Sarajevo, East Sarajevo, Bosnia and Herzegovina;

² Faculty of Sport and Physical Education, University of Niš, Niš, Serbia

UDC 796.015.132.342

Introduction

In recent years, plyometric training has been extensively investigated in athletes; however, plyometric training's effects on tennis players' physical fitness across youth have been less known.

Methods

The author systematically searched SCOPUS and PubMed electronic databases from inception until October 4, 2023, and the following inclusion criteria: 1) Healthy youth tennis players regardless of gender, aged from 9 to 18, and at any performance level; 2) Experimental studies included effects of plyometric training on physical fitness; 3) Compare a PT intervention to a control or exercise group and single-group trials were also included; 4) One or more physical fitness outcomes; and 5) Full-text and peer-reviewed studies of randomized controlled trials, pre-post or within-subject with repeated measures designs.

Results

The review comprises six studies published between 2013 and 2023, including 240 tennis players of mixed gender. Four studies explored the effects of plyometric training on strength and/or power, four on agility, and three on speed. Two studies involved plyometric training targeting the lower-body and the upper-body musculature, while the remaining studies involved only lower-body exercises.

Discussion & Conclusion

Even though all studies showed the beneficial effects of plyometric training on tennis players' agility, speed, power, and strength from 12 to 18 years old, the reported results and plyometric training programs are inconsistent across the studies. Moreover, none of the studies explored the effects of plyometric training on cardiorespiratory fitness and flexibility of young tennis players. Further experimental research is needed to clarify plyometric training' potential to improve other physical fitness components.

References

1. Wisløff, U., Castagna, C., Helgerud, J., Jones, R. M., & Hoff, J. (2004). Strong correlation of maximal squat strength with sprint performance and vertical jump height in elite soccer players. *British Journal of Sports Medicine*, 38(3), 285–288. <https://doi.org/10.1136/bjism.2002.002071>

2. Rønnestad, B. R., Kvamme, N. H., Sunde, A., & Raastad, T. (2008). Short-Term effects of strength and plyometric training on sprint and jump performance in professional soccer players. *Journal of Strength and Conditioning Research*, 22(3), 773–780. <https://doi.org/10.1519/jsc.0b013e31816a5e86>
3. De Villarreal, E. S., Requena, B., & Newton, R. U. (2010). Does plyometric training improve strength performance? A meta-analysis. *Journal of Science and Medicine in Sport*, 13(5), 513–522. <https://doi.org/10.1016/j.jsams.2009.08.005>
4. Váczai, M., Tollár, J., Meszler, B., Juhász, I., & Karsai, I. (2013). Short-Term high intensity plyometric training program improves strength, power and agility in male soccer players. *Journal of Human Kinetics*, 36(1), 17–26. <https://doi.org/10.2478/hukin-2013-0002>
5. Váczai, M., Rácz, L., Hortobágyi, T., & Tihanyi, J. (2013). Dynamic contractility and efficiency impairments in Stretch-Shortening cycle are Stretch-Load-Dependent after Training-Induced muscle damage. *Journal of Strength and Conditioning Research*, 27(8), 2171–2179. <https://doi.org/10.1519/jsc.0b013e31827da32c>

Keywords: vertical jump, speed, agility, athletes

ACTIGRAPH IN ASSESSMENT OF CHILDREN'S PHYSICAL ACTIVITY - A SYSTEMATIC REVIEW

Emilija Petković¹, Nese F. Sahin² and Ivana Đorđević³

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

² University of Ankara, Sports Science Faculty, Ankara, Republic of Turkey;

³ Palacky University, Faculty of Physical Culture, Olomouc, Czech Republic.

UDC 796.012.1/2-053.2

Introduction

One new method for objective assessment of children's Physical activity is Actigraph, an accelerometer that is rapidly advancing with the development of technological experiences in children researches. Accelerometer expression can be used to predict energy expenditure or metabolic equivalents, which can be calculated by normalizing and resting. To simplify the interpretation of accelerometer data, cut-off points were developed that distinguish intensity categories with descriptive names corresponding to those used in public health forecasting.

Methods

For the purposes of this research, a dialectical approach was used, as well as the following analysis methods and techniques: descriptive method and analysis and systematization.

Results

Scientific papers that were collected (21) systematized in the following directions: According to the population of participants in research: 14 scientific papers were related to school age, 3 scientific papers was related to high school age and 2 papers was related to adolescents; According to the sex of the respondents: in 15 papers, the research included boys and girls, and in one paper, the research was conducted only in boys; According to the method of research: longitudinal and transversal studies with a representative sample of children in some studies and with more than 1000 respondents; the tests in the works refer to the use of actigraphs in the assessment of physical activities of moderate, medium and high intensity (10), assessment of BMI and FMI and different levels of physical activities (1) and sleep and wakefulness (4). Reliability of the Actigraph accelerometer has been determined under normal wear time criteria in a large sample of subjects and accelerometer units, monitoring adults under long-term free-living conditions (1). Validity of actigraphs accelerometers for assessment of physical activity in adults in laboratory conditions was determened (1).

Discussion & Conclusion

The variation in cut-off values derived for different age groups may be partially attributable to the different methodologies used. However, differences in behavioral aspects of independent sedentary and physical activities in different age groups can also have a significant impact on their measurement. The Actigraph accelerometer can be used to identify sedentary behavior and to distinguish between light, moderate and vigorous activity in children. The accelerometer popularity has been increasing because it is easily portable, non-invasive, interesting for children because it is worn according to the principle of a wristwatch. Its use has great potential for determining children's physical or sedentary activity.

References

1. Aadland, E, & Ylvisåker, E. (2015). Reliability of the Actigraph GT3X+ Accelerometer in Adults under Free-Living Conditions. *PLoS ONE* 10(8): e0134606. doi:10.1371/journal.pone.0134606
2. Craig, C., & Clark, T. (2019). Profiling movement and gait quality using accelerometry in children's physical activity: Consider quality, not just quantity. *British Journal of Sports Medicine*, 53(8).
3. Dinesh, J. & Freedson, P. (2013). ActiGraph and Actical physical activity monitors: a peek under the hood. *Med Sci Sports Exercises*, 44 (1): S86–S89.
4. Donaire-Gonzalez, D., de Nazelle, A., Seto, E., Mendez, M., Nieuwenhuijsen, M. J., & Jerrett, M. (2013). Comparison of Physical Activity Measures Using Mobile Phone – Based Cal Fit and Actigraph. *J Med Internet Res*, 15(6): 111. DOI: 10.2196/jmir.2470
5. Kelly, L., McMillan, G.E.D., Fippinger, M., Fillerup, G., & Ridder, J. (2013). Validity of ActiGraph's uniaxial and triaxial accelerometers for assessment of physical activity in adults in laboratory conditions. *BMC Medical Physics*, 13(5): 1-7.

Keywords: actigraph, children, physical activity

THE ROLE OF PHYSICAL THERAPY IN DORSALGIA

Gabriela Ochiană¹ and Delia-Nicoleta Ochiană²

¹Associate professor, Department of Kinetotherapy and Occupational Therapy,
Faculty of Health, University “Vasile Alecsandri” of Bacau, Romania

² MA student, Department of Kinetotherapy and Occupational Therapy,
Faculty of Health, University “Vasile Alecsandri” of Bacau, Romania

UDC 615.82/.84

Introduction

In the conditions of a sedentary life through the excessive use of both the phone and the laptop, to which is added the majority of daily activities performed in the position with the head and neck flexed, more and more people complain of both cervical and thoracic pain. A static position maintained for a long period of time and incorrect causes muscle imbalances that later turn into muscle contractions, being the starting point of a change in attitude, then structural of the spine. The cervical spine loses its physiological lordosis that influences the curvature in the thoracic area, either in the sense of accentuating kyphosis or even forming a round back.

Studies show that dorsal low and lumbar back pain cause disability in higher percentages of the workforce in Canada, the United Kingdom, the Netherlands, and Sweden than in the United States or Germany. (Manchikanti L, Singh V, Datta S, Cohen SP, Hirsch JA, ASIPP (2009). Comprehensive review of epidemiology, scope and impact of spinal pain. *Pain Physician*.12 (4):E35-70).

Methods

The work hypothesis: it is assumed that by establishing a structured kinetotherapeutic program specific to patients with back pain, we will achieve a reduction in symptoms and an improvement in their posture.

The research subjects were divided into 2 groups with the same symptoms and diagnosis, respectively the experimental group that benefited from electrotherapy and specific techniques and the control group that followed a classic recovery program.

The study was carried out on 6 subjects with the clinical diagnosis of back pain, during 10 sessions and a session duration of 50-60 min. For evaluation, the following were used: VAS pain scale, Adams test, Cyrtometric index, finger-ground index and Ott's sign.

Results

The positive results are highlighted by the decrease in pain according to the VAS scale, the increase in the mobility of the spine according to the mobility indicators and the improvement of the posture.

Discussion & Conclusion

In conclusion, we can state that the hypothesis from which we started was confirmed, thus, the association of electrotherapy with specific techniques applied to the spine, reduces pain, increases mobility and corrects posture, compared to the application of a classical therapy program.

References

1. Crețu, A., (2003) Ghid clinic și terapeutic fizical-kinetic în bolile reumatismale. București:
2. Ionescu, R., (2007), Esențialul în reumatologie. Ediția a 2-a revizuită, Editura Medicală Almatea
3. Lucescu, V. (2009). Marcu, V., Dan, M., & colab. (2006), Kinetoterapie/Physiotherapy, Editura Universității din Oradea
4. Manchikanti L, Singh V, Datta S, Cohen SP, Hirsch JA, ASIPP (2009). Comprehensive review of epidemiology, scope and impact of spinals pain. Pain Physician.12 (4):E35-70
5. Ochiană, G. (2013). Kinetoterapia în afecțiuni neurologice, Bacău: Editura Alma Mater;
6. Stroescu, I., & colab. (1979), Recuperarea funcțională în practica reumatologică, Editura Medicală, București

Keywords: pain, recovery, posture

THE ROLE OF NEUROPROPRIOCEPTIVE FACILITATION TECHNIQUES IN FROZEN SHOULDER RECOVERY

Gabriela Ochiană¹ and Sorin Beres²

¹Associate professor, PhD at Department of Kinetotherapy and Occupational Therapy, Faculty of Health, Sports and Human Movement Sciences, University "Vasile Alecsandri" of Bacau, Romania

² Physiotherapist of "GTL MEDICAL CLINIC" Bacau, Romania

UDC 615.8:796.01

Introduction

Frozen shoulder (stuck shoulder), in medical terms, also known as (secondary) adhesive capsulitis, is a disease characterized by stiffness and pain in the shoulder joint. This diagnosis is based on limitation of shoulder movement. It occurs when the soft tissue surrounding the shoulder joint becomes inflamed and increases in diameter, causing stiffness and, implicitly, pain when carrying out usual activities.

Although it affects many people differently, especially depending on the other conditions they suffer from, the movements that are limited, in ascending order, are: external rotation > abduction > internal rotation.

Demographic studies have shown that the majority of patients with adhesive capsulitis (84.4%) are in the age range of 40 to 59 years, not very different from the worldwide frequency. (Mitsch J, Casey J, McKinnis R, Kegerreis S, Stikeleather J. *Investigation of a consistent pattern of motion restriction in patients with adhesive capsulitis. J Man Manip Ther* 2004;12:153-159).

Methods

This research proposes two hypotheses. The first hypothesis refers to, if full application of myotensive techniques, Slow Inversion (SL), and Slow Inversion with opposition (SLO) can be achieved a rebalancing of the agonist-antagonist muscles as well as an increase in joint mobility;

Second hypothesis proposes that by using neuroproprioceptive facilitation techniques, respectively: Isometric contraction in the shortened zone (ICS), Alternating Isometry (AIS) and Rhythmic Stabilization (RS) an increase in muscle strength and stability can be achieved.

The methods and techniques used applied to the group of patients had an experimental design, in other words, in the sessions with the control group, a program with classical exercises was applied, and in the sessions with the experimental group, neuroproprioceptive facilitation techniques were used.

The study includes 4 subjects, diagnosed with frozen shoulder and similar symptoms, where a control group and an experimental group were created for a duration of 12 sessions of 50-60 minutes. A number of measurement methods were used, such as palpation assessment, Shoulder Pain and Disability Index (SPADI), ROMs tests, manual muscle testing techniques, and specific functional tests.

Results

A series of positive results are identified, such as in terms of improving muscle tone, increasing range of motion, muscle strength and reducing pain on the SPADI scale.

Discussion & Conclusion

We can conclude that the proposed recovery objectives were achieved by the experimental group, where PNF techniques were performed, but also by the control group, where a classical exercise program achieved positive results, however, the results obtained in the 2 subjects of the experimental group are superior, in terms of decreasing pain, increasing joint mobility and muscle strength, and reducing difficulty in performing activities.

References

1. Balint T., (2007), Evaluarea aparatului locomotor, Editura Tehnopress Iași;
2. Breckenridge JD, McAuley JH., (2011), Shoulder Pain and Disability Index(SPADI), J Physiother; 57(3):197;
3. Mitsh J, Casey J, McKinnis R, Kegerreis S, Stikeleather J. Investigation of a consistent pattern of motion restriction in patients with adhesive capsulitis. J Man Manip Ther 2004;12:153-159.
4. Ochiană, G., Metode și tehnici de reeducare neuromotorie, Note de curs, Bacău;
5. Robănescu N. și colab., (2001), Reeducarea neuro-motorie, Editura medicală, București.

Keywords: PNF, Frozen shoulder recovery, active exercises

EFFECTS OF DIFFERENT LOADING TYPES ON EMG ACTIVITY OF UPPER BODY MUSCLES DURING BENCH PRESS THROW EXERCISE

Goran Janković¹, Danica Janičijević², Aleksandar Nedeljković¹, Milos R. Petrović¹, Marko Cosić¹ and Amador Garcia-Ramos³

¹ University of Belgrade, Faculty of Sport and Physical Education, The Research Center, Belgrade, Serbia.

² Faculty of Sports Science, Ningbo University, Ningbo, ZJ, China.

³ University of Granada, Faculty of Sport Sciences, Department of Physical Education and Sport, Granada, Spain.

UDC 796.012:612.766

Introduction

Our previous studies have shown different concurrent validity of force-velocity relationship parameters obtained during bench press throw exercise with different type of load (Cosić et al., 2021; Janković et al., 2023). However, it remains unclear if the possible underlying neural mechanisms that affect force-velocity relationship parameters could originate from different EMG activity of dominant upper body musculature. Based on different muscle architecture, we hypothesized the highest EMG activity of *m. Pectoralis major* (i.e., typical pennate muscle) for gravitational type of load (W, rubber bands pulling the barbell downward), as well as the highest EMG activity of *m. Triceps brachii* (i.e., typical fusiform muscle) for inertial type of load (I, rubber bands pulling the barbell, which is equalized to the weight of the added plates upward). In addition, *m. Deltoideus anterior* (i.e., multipennate muscle) should show the highest EMG activity for combined type of load (W+I, weight of the plates).

Methods

A total of 13 resistance-trained men (body mass, 87.7 ± 11.2 kg and body height, 183.9 ± 6.4 cm) performed bench press throws using 3 types of loads (i.e., gravitational, inertial and combined type of load) against 30 to 80 kg. In addition, telemetric surface electromyography (EMG; Trigno™, Delsys Inc., USA) of the active upper body muscles (i.e., *m. Pectoralis major*, *m. Deltoideus anterior* and *m. Triceps brachii*) has been recorded. The integrated EMG activity (iEMG) has been used for further analysis.

Results

The repeated measures ANOVA and bonferroni post-hoc test revealed higher iEMG activity in *m. Pectoralis major* ($F=4.74$, $p<0.05$) when gravitational type of load has been used. On the other hand, higher iEMG activity in *m. Triceps brachii* ($F=11.80$, $p<0.001$) and *m. Deltoideus anterior* ($F=6.01$, $p<0.01$) was obtained with inertial type of load.

Discussion & Conclusion

iEMG activity of dominant upper body muscles is affected by load type. The architecture of active muscles could explain the obtained differences. Namely, the pennate muscles such as *m. pectoralis major* enables production of higher forces which are correlated with both gravitational and combined types of loads. On the other hand, the fusiform muscles such as *m. triceps brachii* provides higher movement velocity which is correlated with inertial type of load.

References

1. Cosic, M., Knezevic, O.M., Nedeljkovic, A., Djuric, S., Zivkovic, M.Z., Garcia-Ramos, A. (2021) Effect of Different Types of Loads on the Force-Velocity Relationship Obtained During the Bench Press Throw Exercise. *J Strength Cond Res.* 35(9):2401-2406.
2. Jankovic, G., Janicijevic, D., Nedeljkovic, A., Petrovic, M.R., Cosic, M., Garcia-Ramos, A. (2023) Effects of Different Loading Types on the Validity and Magnitude of Force-Velocity Relationship Parameters. *Sports Health.* doi: 10.1177/19417381231182131.

Keywords: electromyography, architecture, force-velocity relationship

EFFECTS OF YOGA EXERCISES ON PHYSICAL FITNESS: SYSTEMATIC REVIEW

Gulseren Yurekli¹ and Fatma Celik Kayapinar¹

¹ Exercise and Sports Sciences Department, Faculty of Health Sciences,
Izmir Demokrasi University, Izmir, Turkey

UDC 615.851.86

Summary

Physical fitness refers to the ability of your body systems to work together efficiently to ensure that you are healthy and able to perform activities of daily living, and it is important to be able to perform these activities with minimal effort. Yoga is an ancient philosophy of life with origins in India, and today it is considered as a comprehensive exercise program that affects the mind with proper body positioning and combines concentration, relaxation, breathing and physical exercises. The aim of this study was to conduct a systematic review of the literature examining the effects of yoga exercises on physical fitness. The study was conducted by systematic review of the relevant literature according to the general survey model. The findings of the study were obtained by searching the keywords "yoga" and "physical fitness" in PubMed, Web of Science and EBSCO databases for English studies published in the last five years as of September 2023. Eleven articles that met the selection criteria determined by the researcher were included in the study. In the majority of the articles reviewed, it was concluded that yoga exercises improve physical fitness parameters, have positive effects especially on strength, flexibility and balance parameters, and are an exercise approach that can be applied in various age and disease groups. In conclusion, yoga exercises are an effective exercise approach that can be used to improve physical fitness.

Keywords: yoga, physical fitness, strength, flexibility, balance

DIFFERENCES IN AGILITY PERFORMANCE IN FUTSAL PLAYERS

Hrvoje Ajman¹, Zoran Špoljarić² and Dominik Mateo Rončević³

¹ Josip Juraj Strossmayer University of Osijek, Faculty of Kinesiology Osijek,
Drinska 16a, Osijek, Croatia

UDC 796.012.21.322

Summary

In this paper, the testing of various manifestations of agility in futsal, a sport characterized by intense activity, rapid changes in tempo and complex technical-tactical elements, was carried out. The aim of the paper is to determine whether there is a connection between morphological characteristics and agility tests and whether there is a difference between minor and adult players in the performance of agility tests. The sample of respondents consisted of junior futsal club Osijek, which included a total of 18 players of average age (17.06 ± 1.16 years), height (177.73 ± 9.03 cm) and mass (69.18 ± 8.66 kg). The sample of variables consists of six tests. Two tests are related to morphological characteristics (body height and body weight), while four tests are related to agility. The research results showed statistically significant moderate to high correlations between different variables ($p < 0.05$). Analysis of group statistics reveals that minor players on average achieve better results in most tests, except for the T-test of agility and reactive agility test knowing that they go left first, where adult players record better results. There are statistically significant differences in agility between minor and adult players in the 10-meter sprint test, which measures a certain aspect of agility, minor players proved to be superior to their adult counterparts, with an average time of 1.72 seconds, which is statistically significant ($p < 0.05$) faster, the same applies to the reactivity tests (first on the right) and the reactivity test. These results suggest that minor players have an advantage in some manifestations of agility and reactivity compared to adult players, which may be crucial for planning training and developing strategies to improve player performance in the future.

Keywords: futsal, reactive agility, sprint speed

ASSESSING STANDING LONG JUMP DISTANCE: ACCURACY OF KINOVEA-BASED VIDEO ANALYSIS

Jelena Aleksić¹, Nikola Maksimović¹, Lucija Fajž, Anastasija Kocić^{1,3},
Dragan M. Mirkov¹ and Olivera M. Knežević¹

¹ Faculty of Sport and Physical Education, Research Center,
University of Belgrade, Belgrade, Serbia;

² Faculty of Kinesiology, University of Osijek, Osijek, Croatia

³ University of Arts, Belgrade, Serbia

UDC 796.012.112

Summary

The assessment of the Standing Long Jump provides valuable insights into an individual's lower body explosive strength. Compared to traditional methods of measuring (i.e., measuring tape), Kinovea-based video analysis allows frame-by-frame analysis after testing completion, and its user-friendly interface ensures that no extensive experience is necessary to utilize the tool effectively.

This study aimed to assess intra-rater and inter-rater reliability of Kinovea for measuring Standing Long Jump distance, as well as concurrent validity compared to the traditional measuring method (i.e., tape measurement). The study included 10 healthy male football players who completed three repetitions of Standing Long Jump with a rest period of around 1 minute between each trial. Subsequently, Kinovea software (version 0.9.5) was utilized to measure the distance for each jump by 2 raters separately.

The results indicated excellent intra-rater reliability (SEM= 0.788-1.176 cm, CV%= 0.34-0.5, ICC= 0.997-0.999, $p < 0.05$) and no significant differences within the repeated measurements for rater 1 ($F= 0.447-2.93$, $p > 0.05$) and rater 2 ($F= 2.04-0.585$, $p > 0.05$) across all jump trials. The Two-way RM ANOVA indicated no significant main effects or interactions for raters and measurement sessions, indicating excellent inter-rater reliability and concurrent validity compared to the tape measurements.

The findings of this study confirm that Kinovea-based video analysis can be used as a reliable and valid tool for measuring Standing Long Jump distance and implies its broader application in measuring other types of horizontal jumps frequently assessed in sports and rehabilitation.

Keywords: video analysis, standing long jump, lower body strength, explosive strength, sports performance

DURATION OF TENNIS MATCHES IN UNDER 12 AGE GROUP

Josip Cveničić¹, Lucija Faj¹ and Ozana Brkičić¹

¹ Faculty of kinesiology Osijek, J. J. Strossmayer University of Osijek

UDC 796.342.093-053.2

Summary

Tennis is a physically demanding sport. A tennis career consists of numerous matches that start at different age categories, ranging from junior levels to playing in senior tournaments. This article reports the examination and analysis of the duration of tennis matches in age of under 12 between girls and boys. The research follows all matches that took place during weekend on one official tournament. All achieved results were included in the official competition ranking by the Croatian Tennis Federation, considering the age of the players. The analyzed sample consists of 46 matches in both categories. The descriptive statistics were collected from these matches, over the course of two competitive days. The lasting matches are varying in both categories from 24 minutes to 79 minutes, but at the end they are similar in average. The average duration of a single match in the boys' group was 45.53 minutes, whereas in the girls' group, it was 43.31 minutes. Along with analyzing the duration of matches between the genders, the differences in the tournament are minimal and not significant in both tournament phases ($DUR=0.44$, $p \geq 0,05$). Junior tennis player under 12 years of age accumulates a total of 225 minutes of playing time during one official tournament on the weekend. Compare to other sports in this age category, young tennis players spend much more competitive minutes, it emphasizes the importance of age-appropriate training and competition schedules to avoid overexertion and potential injuries among these tennis players. Coaches and organizers can use this information to plan tournaments more effectively, ensuring equitable playing time for all participants and creating a supportive environment for young athletes to develop their skills and enjoy the sport.

Keywords: tennis, tournament, match duration, under 12

GENDER DIFFERENCES IN THE SELF-EFFICACY OF PHYSICAL EDUCATION TEACHERS ACCORDING TO INCLUSION IN TEACHING - THE EXAMPLE OF MONTENEGRO

Igor Tomić^{1,2}, Nada Šakotić³, Miljan Hadžović⁴ and Marko Aleksandrović⁴

¹ Paralympic Committee of Montenegro, Podgorica, Montenegro,

² Resurs center for children and youth "Podgorica", Podgorica, Montenegro,

³ Faculty of Philosophy, University of Montenegro, Nikšić, Montenegro,

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

UDC 355.233.22(497.16)

Summary

The aim of this research is to establish differences in the level of self-efficacy between physical education teachers of primary schools of both genders in Montenegro according to inclusion in teaching. The sample of respondents consisted of 173 physical education teachers of primary schools in Montenegro, 128 (~74%) male and 45 (~26%) female. The assessment of self-efficacy was carried out through the "Situational-specific Self-Efficacy and Physical Educators Scale" questionnaire, which was developed and validated by Block, Hutzler, Barak & Klavina (2013). The Serbian language version was validated and used in the research of Jovanović, Kudláček, Block & Đorđević (2014). The questionnaire begins with general instructions, an explanation of the theory of self-efficacy and examples for using the rating table when giving answers. The research consists of four parts. The parameters of descriptive statistics were calculated: mean value, standard deviation, minimum and maximum score. The Mann-Whitney U test was used to determine statistically significant differences in the self-efficacy of Montenegrin physical education teachers in relation to gender. No difference was found between physical education teachers of Montenegro, male and female, in the level of self-efficacy towards inclusion in physical education classes. The significance of this research lies in the fact that this is one of the first scientific information on the state of the self-efficacy level of physical education teachers according to the inclusion in Montenegro.

Keywords: self-efficacy, PE teachers, inclusion, gender differences

THE EFFECTS OF KINESITHERAPY AND NEUROREHABILITATION WITH „NEUROBLAST“ PORTABLE DEVICE IN A PATIENT WITH MULTIPLE SCLEROSIS: A CASE REPORT

Ivan Ćuk^{1,2}, Anastasija Kocić¹, Marija Grujić² and Marko Grujić²

¹ Faculty of Sports and Physical Education, University of Belgrade, Belgrade, Serbia;

² Neuroblast d.o.o., Belgrade, Serbia;

UDC 615.825:796.012.6

Introduction

Multiple sclerosis (MS) is a neural disorder characterized by inflammation, demyelination, and neurodegeneration and is the most common cause of acquired nontraumatic neurological disability. Numerous studies have shown a positive impact of exercise and kinesitherapy on improving muscle function in individuals with multiple sclerosis. In addition, exercising with the help of audio-visual devices can further increase neural activation and enhance brain neuroplasticity, thereby improving muscle function. This study aimed to examine the effects of kinesitherapy training with and without the portable neurorehabilitation device „Neuroblast“ on the contractile abilities of leg muscles in a patient with MS.

Methods

The subject was a 36-year-old female diagnosed with MS. Tensiomyography testing of several leg muscles was conducted initially (T1), after six weeks of a combination of kinesitherapy and neurorehabilitation with „Neuroblast“ (T2), and after six weeks of kinesitherapy only (T3). The training volume remained the same through all 12 weeks. Both descriptive (Mean) and comparative (Repeated ANOVA with LSD post hoc) statistical techniques were applied to muscle contractile velocity (Vc) variable.

Results

Repeated ANOVA showed the significant main effect [$F_{(1,7)} = 10.8, \eta^2 = 0.39, p < 0.01$]. The Vc at T2 (0.240 m/s) was significantly higher ($p < 0.01$) than the Vc at both T1 (0.190 m/s) and T3 (0.192 m/s). No significant differences were observed between T1 and T3.

Discussion & Conclusion

People with neurodegenerative diseases should undergo kinesitherapy and neuroplasticity training, which can improve neuro-muscular function, but these effects are not long-lasting. Therefore, continuous neurorehabilitation with devices such as Neuroblast is necessary to make these effects more permanent, thus improving the patient's quality of life. Future research should involve more participants to generalize the findings to a broader population while including more muscle groups, especially for the upper body and core.

References

1. Motl, R. W., Sandroff, B. M., Kwakkel, G., Dalgas, U., Feinstein, A., Heesen, C., ... & Thompson, A. J. (2017). Exercise in patients with multiple sclerosis. *The Lancet Neurology*, 16(10), 848-856.
2. Hötting, K., & Röder, B. (2013). Beneficial effects of physical exercise on neuroplasticity and cognition. *Neuroscience & Biobehavioral Reviews*, 37(9), 2243-2257.
3. Macgregor, L. J., Hunter, A. M., Orizio, C., Fairweather, M. M., & Ditroilo, M. (2018). Assessment of skeletal muscle contractile properties by radial displacement: the case for tensiomyography. *Sports Medicine*, 48, 1607-1620.

Keywords: neuroplasticity, exercise, brain, neurodegenerative, muscle

SPORTS INJURIES IN BASKETBALL: A SYSTEMATIC REVIEW

Ivana Anđelković¹ and Slađan Karaleić²

¹ Faculty of Sports and Physical Education, University of Niš, Serbia

² Faculty for Sports and Physical Education, Leposavić, University of Priština, Serbia

UDC 796.323.2:616.001

Summary

Injuries are an integral part of sports, both at the professional and recreational levels. The most common injuries in basketball are ankle, finger and knee injuries, but there can also be painful spasms in the back and abdominal muscles. The subject of this research is studies focused on sports injuries in basketball. The aim of this review is to electronically search for and collect relevant literature from 2000 to 2016 in the following databases: PubMed, SCIndex, Google Scholar, sports science journals and relevant literature that could address the research question. The search was conducted using a combination of keywords related to sports injuries. Descriptive methods were applied to analyze the obtained data. A total of 10 studies were included in the systematic review. The analysis of the results showed a difference between males and females in injuries. In females, lower back injuries, knee injuries, upper extremity injuries, and anterior cruciate ligament injuries were more common in percentage terms. In males, meniscus injuries and jumper's knee were more common. Partially viewed, the highest number of injuries was present in the knee joint (38.01% - 29.32%) and the ankle joint (21.03% - 17.28%) with a higher percentage in males, and the most common type of injuries was joint sprains and ligament strains. The results also showed that injuries were most common in positions 2 and 3 (shooting guard and small forward), followed by positions 4 and 5 (centers), and least common in position 1 (point guard). The constitution of the basketball player's musculoskeletal system and the structure of the basketball game largely explain the presence of the highest number of injuries in the lower extremities. The modernization of tools for assessing the physical status and fitness of basketball players contributes to a decrease in the number of injuries from year to year.

Keywords: sports injuries, basketball, knee, ankle

IMPLICATIONS OF AGE AND GENDER DISPARITIES IN STRENGTH TRAINING AMONG CHILDREN AND ADOLESCENTS

Izet Kahrović, Benin Murić, Oliver Radenković, Omer Špirtović, Raid Mekić and Ilma Čaprić

State University of Novi Pazar, Department of biomedical sciences,
Studies program Sports and physical education, Serbia

UDC 796.012.11:316.47-053.6

Summary

When designing a strength training program, a physical fitness expert must take into account gender differences in muscle capabilities, the level of fitness, as well as the effects that these differences have on each individual. The aim of this study was to determine the implications of age and gender differences in strength training for children and adolescents. A review of studies was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher, Liberati, Tetzlaff, & Altman, 2009). The following databases were used for literature search: Google Scholar, Medline, Science Direct, PubMed, Web of Science, and Research Gate. A total of 68 studies met the defined criteria for inclusion in the systematic review and further analysis. Numerous osteogenic benefits and essential factors of physical activity contribute to the growth and development of the skeletal system in boys and girls during this age period. Children who regularly engage in physical activities involving their body weight and participate in exercise programs that include strength training with external resistance experience an increase in bone density. Participation in such programs during the preadolescent period allows boys and girls to achieve strength gains and other abilities greater than the ordinary gains resulting from growth and maturation. Recent research has clearly shown that if the volume and intensity of exercise are appropriate for their age, boys and girls can increase muscle strength beyond the limits achievable through mere growth and maturation.

Keywords: exercise, strength, training, children, adolescents, individually or in combination

EFFECTS OF PROGRAMMED TRAINING ON EXPLOSIVE STRENGTH OF VOLLEYBALL PLAYERS

Katarina Nejić¹, Dragan Nejić¹, Vladan Savić², Andrijana Zafirovska Misovski³
and Joško Milenkoski³

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

² Faculty of Physical Education and Sport, University of East Sarajevo, Bosnia and Herzegovina

³ Faculty of physical education, sport and health - University Ss Cyril and Methodius, Macedonia

UDC 796.012.112.325

Introduction

Motor abilities are conditionally defined as latent motor structures responsible for an infinite number of motor reaction manifestations that can be measured and described. The development of motor abilities is just one of many tasks on the way to creating a versatile personality of volleyball players, capable of creative self - realization and competitive process management. In order to achieve a high level of performance of an element, a player is required not only to improve the technical – tactical elements, but also a high level of motor abilities i.e., explosive strength, speed, and agility. Jumping is one of the most important factors on which success in volleyball depends, thus it becomes clear that it needs to be developed as much as possible for athletes to achieve maximum sports results in this collective sport.

Methods

The sample of subjects in this research consists of 40 volleyball players of junior age in the volleyball clubs: OK "Topličanin" (n = 20) from Prokuplje and OK "Nis" from Nis (n = 20). Subjects were divided into two groups: experimental group 1 (E1, n = 20) and experimental group 2 (E2, n = 20). Experimental group 1 consists of volleyball players from OK "Topličanin" from Prokuplje, who, in addition to basic specific - situational training, also had plyometric training sessions twice a week for six weeks. Experimental group 2 consists of volleyball players from OK "Niš" from Niš, who had only specific - situational training sessions in that period. The research is longitudinal, comprising the initial and final measurements. The experimental treatment lasted six weeks and was realized in the preparatory period. The three tests were used to assess the explosive strength: 1) Squat jump 2) Countermovement Jump 3) Counter Movement Jump/Arm Swing.

Results

Mancova analysis was used to compare different subsamples of subjects at the initial and final measurements. The results of the research show that volleyball-specific-situational training followed by plyometric training significantly improves motor skill explosive strength.

Discussion & Conclusion

Experimental group 1 in our study showed a statistically significant improvement compared to experimental group 2 between the initial and final measurements in terms of explosive strength. By comparing the effect size of the experimental treatment based on the partial eta squared (Partial Eta Squared) between CMJ (Partial Eta Squared = .077), CMJa (Partial Eta Squared = .006) and SJ (Partial Eta Squared = .063), it can be observed that the largest value, and therefore the largest effect was recorded in the CMJ test, followed by the SJ test, while the smallest effect was recorded in the CMJa test.

References

1. Borràs, X., Balius, X., Drobnic, F., & Galilea, P. (2011). Vertical jump assessment on volleyball: a follow-up of three seasons of a high-level volleyball team. *The Journal of Strength & Conditioning Research*, 25(6), 1686-1694. <https://doi.org/10.1519/jsc.0b013e3181db9f2e>
2. Trajković, N., Milanović, Z., Sporiš, G., Milić, V., & Stanković, R. (2012). The effects of 6 weeks of preseason skill - based conditioning on physical performance in male volleyball players. *The Journal of Strength & Conditioning Research*, 26(6), 1475-1480. <https://doi.org/10.1519/JSC.0b013e318231a704>
3. Ziv, G., & Lidor, R. (2010). Vertical jump in female and male volleyball players - A review of observational and experimental studies. *Scandinavian Journal of Medicine and Science in Sport*, 13(3), 332-339. <https://doi.org/10.1111/j.1600-0838.2009.01083.x>

Keywords: junior, explosive strength, plyometric training

FUNCTIONAL FITNESS AND QUALITY OF LIFE IN PEOPLE WITH COVID-19

Marko Đurović¹, Dejan Madić¹, Katarina Praznik^{2,6}, Ana Sršen³,
Mia Perić⁴ and Boro Štrumbelj^{5,6}

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

² Swimming club Velenje, Slovenia,

³ Swimming club Natator, Zagreb, Croatia,

⁴ Faculty of Kinesiology, University of Split, Croatia,

⁵ Faculty of Sport, University of Ljubljana, Slovenia,

⁶ Swimming Association of Slovenia, Slovenia.

UDC 796.015.132:616-036.21

Summary

The COVID-19 pandemic put millions of individuals worldwide into difficulties due to the disease as well as the huge economic and social impacts. While the respiratory and systemic symptoms of COVID-19 have received significant attention, its consequences on functional fitness and quality of life in affected individuals have emerged as areas of concern and interest. Understanding how COVID-19 affects the relationship between these abilities in those who have contracted the virus is important for assessing the long-term health implications of the pandemic. Specifically, understanding the vital role of functional fitness in enhancing the quality of life for people with COVID-19 becomes increasingly crucial. Therefore, the aim of this study was to analyze the functional fitness of post-COVID-19 patients and its relationship with quality of life. This research is a part of the project "Post-COV Swim" financed by the Erasmus sport small-scale partnership. The project's primary focus is on water-based exercises for individuals recovering from COVID-19 and aims to assess their impact on various aspects of participants' well-being (mental, physical, physiological). The study included the 46 participants who had been infected with COVID-19. Participants were tested for fitness components (6 min walk, 2 min walk, sit and reach, handgrip strength and the 30-second chair stand) and quality of life (The EQ-5D-5L tool). We found significant negative correlation between 6 min walk and mobility ($r = -0.561$, $p < 0.01$; Table 2) and between 6 min walk and self care ($r = -0.575$, $p < 0.01$). In addition, we found significant negative correlation between handgrip strength and quality of life ($p < 0.05$). In conclusion, there is a negative correlation between functional fitness and quality of life in post-COVID-19 patients.

Keywords: 6 min walk, 30-second chair stand, mobility, self-care, post-COVID-19

RELATIONSHIP BETWEEN FUNCTIONAL FITNESS AND THE SEVERITY OF COVID-19 SYMPTOMS

Marko Đurović¹, Tomislav Okičić¹, Boštjan Jakše², Barbara Gilić³, Robert Marčun⁴, Goran Dimitrić⁵ and Dorica Šajber^{6,7}

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

² Independent researcher, Ljubljana, Slovenia,

³ Faculty of Kinesiology, University of Split, Croatia,

⁴ University clinic of respiratory and allergic diseases Golnik, Slovenia,

⁵ Faculty of Sport and Physical Education, University of Novi Sad, Serbia,

⁶ Swimming Association of Slovenia, Slovenia,

⁷ Faculty of Sport, University of Ljubljana, Slovenia.

UDC 796.015.132:616-036.21

Summary

The COVID-19 pandemic has profoundly impacted global health, affecting millions of individuals worldwide. The pandemic has posed significant challenges to public health and profoundly influenced the fitness and overall health of individuals worldwide. One of the key areas of interest in this context is the intricate relationship between clinical symptoms and physical fitness in the post-COVID-19 condition. Therefore, the aim of this paper was to explore the relationship between functional fitness and the severity of COVID-19 symptoms. This research is a part of the project "Post-COV Swim" financed by the Erasmus sport small-scale partnership. The project's primary focus is on water-based exercises for individuals recovering from COVID-19 and aims to assess their impact on various aspects of participants' well-being (mental, physical, physiological). The study included the 46 participants who had been infected with COVID-19. Participants were tested for fitness components (6 min walk, 2 min walk, sit and reach, handgrip strength and the 30-second chair stand) and the severity of Covid symptoms (mild, moderate and severe/life-threatening). There was a significant relationship between left handgrip strength and severity of symptoms ($r = -0.521$, $p < 0.01$) and between handgrip strength max and severity of symptoms ($r = -0.438$, $p < 0.01$). It can be concluded that the poor muscle strength was associated with greater severity of symptoms in patients with post-COVID-19 condition.

Keywords: post-COVID-19, handgrip, strength, pandemic

PLAYING LEVEL AND POSITION DIFFERENCES IN BODY CHARACTERISTICS AND PHYSICAL FITNESS PERFORMANCE AMONG ELITE AND SUB-ELITE FEMALE HANDBALL PLAYERS

Maša Antonijević¹, Sonja Antonijević², Stefan Mijalković¹, Borče Daskalovski³,
Goran Nikovski³ and Saša Milenković¹

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

² Faculty of Sport and Physical Education,
University of Pristina–Kosovska Mitrovica , Leposavic, Serbia

³ Faculty of Physical Education, Sport and Health,
University "St. Cyril and Methodius", Skopje, Macedonia

UDC 796.071.322
796.012.2-055.2

Summary

The primary aim was to compare the physical and performance characteristics of elite and sub-elite female handball players. The secondary aim was to compare physical characteristics and motor abilities between playing positions. Team handball is a high-intensity, body-contact sport that requires both aerobic and anaerobic fitness. Thirty-two female handball players (18 elite, first Serbian league and 14 sub-elite, third Serbian league), were recruited and tested during a week in season training period. The following variables were measured in both groups: countermovement jump, countermovement jump with arm swing, squat jump, speed 10, 20 and 30 m, agility T-test, handball throwing and hand grip with dominant hand. Results indicated that there was a statistically significant differences in both t-test (speed 10, 20 and 30m, agility t-test, countermovement jump, countermovement jump with arm swing, the speed of throwing the ball with and without goalkeeper) and ANOVA (body height and body mass). Understanding these differences can inform training programs, player selection, and position-specific coaching strategies to enhance overall team performance and player development.

Keywords: motor abilities, team sport, professional handball players, playing position

EFFECTS OF PLYOMETRIC TRAINING ON PHYSICAL PERFORMANCE IN ADOLESCENT MALE BASKETBALL PLAYERS

Mila Jovanović¹, Maša Antonijević¹ Stefan Đorđević¹, Sonja Antonijević² and Dušan Nikolić³

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

² Faculty of Sport and Physical Education,
University of Pristina–Kosovska Mitrovica, Leposavic, Serbia,

³ Academy of Vocational Studies South Serbia,
Department of the High School for Teachers, Bujanovac, Serbia

UDC 796.015.132
796.323.2-055.1

Summary

For researchers, coaches, and athletes, improving performance in vertical jumping is very important because the ability to jump more than an opponent can be an advantage in team competitions and many individual sports. The purpose of this study was to determine the effects of a 6-week plyometric training program during the season on the development of explosive strength and sprint in young basketball players. A total of fifteen male participants were included in this study (mean \pm SD; age: 14.60 ± 0.50 years). Explosive power and speed were estimated using field tests: jump against movement (CMJ) and jump from squat (SJ) force and sprint speed at 10m, 20m, 30m. There is a statistically significant difference between the initial and final measurements in CMJ ($p=0.001$, $d= 0.30$) and SJ ($p=0.001$, $d=0.48$). Based on the obtained results, the height of the CMJ increased after the experimental program (= 39.4) compared to the initial measurement (= 37.6), while the height of the SJ at the final measurement was 28.1 and the initial 26.5. This suggests that plyometric training is an effective way to improve strength and speed for young basketball players and that it can be included in physical fitness programs. the application of plyometric training does not lead to an improvement in running speed. These results can help in further research as well as coaches to find an adequate plyometric program and the duration of the program, as well as when applied to regular basketball training, which is related to improving the speed of basketball players.

Keywords: speed, basketball, explosive power, strength, plyometric program

BREASTSTROKE ELITE SWIMMERS: AGE-PERFORMANCE COMPETITIVE CAREER QUANTITATIVE MODEL PROFILING

Milivoj Dopsaj¹ and Klara Šiljeg²

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

² University of Zagreb Faculty of Kinesiology, Zagreb, Croatia.

UDC 797.212.2

Summary

The modeling procedure represents the process of objectifying the most likely outcome of the observed phenomenon. One of the problems in the sports training system is defining the potential for peak performance and career duration of a swimmer. The main aim of this study is career performance profiling in elite breaststroke swimmers of both gender in 50m pool. Non-experimental research was conducted. For the purposes of selecting the subjects for this research, the specific criteria was chosen. The sample consisted of: 31 males, and 23 females. Best annual Performance (time) vs Age relation, as an absolute model relation and 2). Delta values of Best annual Performance (%) vs Age relation, as a relative (standardised) career performance trajectory was calculated using the polynomial equation. All the defined Age vs Performance models were highly statistically significant as an explanation of the common variance of the examined space at the level of R² - 96.80% for 50m female to 99.79% for 100m male. In relation to men, the results showed the following: for the selected sample, the peak career performance at 50, 100 and 200m occur in the age of 31.9, 23.5 and 24.3 years, at the level of result values of 26.99, 1:00.85 and 2:09.60 min:sec, respectively. Considering female swimmers, for the selected sample, the peak career performance at 50, 100 and 200m occur in the age of 29.5, 30.3 and 31.2 years, respectively, at the level of result values of 30.48, 1:06.73 and 2:23.74 min:sec. Based on the obtained results, it can be concluded that the elite result in the breaststroke, as a biological potential of the body for the Peak Performance for 50, 100 and 200m at elite male and female swimmers can be obtained at chronological age from 23.5 till 31.9 years. The level of 99% of the career peaking, can be maintained in a time span of 7.5 to 8.6, and 4.4 to 7.5 years for male and female swimmers, respectively, regardless to distances.

Keywords: swimming, breaststroke, peak performance, age, carier

DIFFERENCES IN PLANTAR FLEXOR STRENGTH CHARACTERISTICS IN YOUNG FEMALE VOLLEYBALL PLAYERS MEASURED DURING TWO TYPES OF CONTRACTIONS: CLASSIC AND IMPULS

Milivoj Dopsaj¹, Nikola Majstorović¹ and Aleksandar Borisavljević¹

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

UDC 796.325:612.471-055.2

Summary

The aim of this work is to determine the differences in the mechanical characteristics of the muscle force of the plantar flexors obtained in two different models of muscle strain: classical and impulse methods, in young female volleyball players and control group. (abstract could be in a form of structured abstract). Non-experimental research was conducted using laboratory testing methods. The measurement was carried out using the dynamometry method. 31 subjects participated in the research, (14 young female volleyball players (OK DIF Akademia, Belgrade) and 17 randomise selected different sports and physically active control group of young females. The plantar flexors were tested in accordance with the standardized procedure. A five variables were measure per each test model (Classic vs Impuls) and per tested group (Volleyball vs Control): Fmax – maximal force, RFDmax - maximal explosive force; RFDFmax – basic explosive force; tFmax – the time required for the achievement of maximal force; and tRFDmax – time required for the achievement of maximal explosive force. The percentage difference - delta (Δ) between test model according to subsample group represented an analysed variabed (Index_RFDmax, Fmax_delta, RFDmax_delta, RFDFmax_delta, tFmax_delta, and tRFDmax_delta). Based on the obtained results, it can be claimed that statistically significant differences between the deltas (Δ in %) were established for the variables: Index_RFDmax, tFmax_delta and RFDFmax_delta at $p = 0.045, 0.000$ and 0.000 , respectively. The results of this study indicate that the measurement of the different characteristic/mechanical dimensions of strength manifestation - Fmax and RFDmax from the metrological aspects needs different testing procedure i.e. specific instructions during the testing process. Research has given initial results that indicate that training can influence the improving the manifestation of rapid and strong contraction (RFD), and a given contractile ability has its own measure of trainability (Index_RFDmax).

Keywords: volleyball, dynamometry, plantar flexors, muscle contractile ability

THE ASSOCIATION BETWEEN EATING ATTITUDES AND AGE GROUPS AMONG FEMALE BASKETBALL PLAYERS

Mima Stanković¹, Ivana Bojić¹, Ilma Čaprić², Borko Katanić¹, Vladan Milić², Adem Preljević² and Oliver Radenković²

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

² Faculty of Sport and Physical Education, University of Novi Pazar, Novi Pazar, Serbia

UDC 613.2:796.323.2-055.25

Summary

Playing sports, in addition to guiding the athlete towards a healthy lifestyle, provides personal satisfaction and fulfilment that facilitates finding meaning and integration in the community. The aim of this research was to determine the association between eating attitudes and age groups among female basketball players. A sample of 67 female participants, were taken at the level of the whole of Serbia sample of 67 subjects, which make up 3 subsamples of the group, i.e. GR1 < 18 (n=28), GR2 19-21 (n=18), GR3 > 22 (n=21) years. The criterion for selecting participants was: age over 13 years, female participants who play basketball and are active. Based on the inclusion criteria in the study, a sample of 67 participants was taken who filled out online questionnaires about eating habits EAT-26 (Eating Attitudes Test). Based on the chi-square test, a significant association between eating attitudes and age groups was determined for 23 out of 26 statements. The association was absent only for items 11, 13 and 16. In addition, significant relations were observed between age groups and dieting scale ($\chi^2=0.694$, $p=0.000$), bulimia & food scale ($\chi^2=0.516$, $p=0.000$) and oral control scale ($\chi^2=0.621$, $p=0.000$). More investigation is required into the psychometric characteristics of tests like the EAT-26 in populations of female athletes. Given that the final model was inspired by an exploratory process, it is obvious that one should take these results with some caution.

References

1. Currie, A. (2010). Sport and eating disorders-understanding and managing the risks. *Asian Journal of Sports Medicine*, 1(2), 63–68.
2. Homan, K. J., Crowley, S. L., & Sim, L. A. (2019). Motivation for sport participation and eating disorder risk among female collegiate athletes. *Eating disorders*, 27(4), 369-383.
3. Michou, M., & Costarelli, V. (2011). Disordered eating attitudes in relation to anxiety levels, self-esteem and body image in female basketball players. *Journal of Exercise Science & Fitness*, 9(2), 109-115.
4. Shanmugam, V. i Davies, B. (2015). Clinical perfectionism and eating psychopathology in athletes: The role of gender. *Personality and Individual Differences*, 74, 99-105.
5. Sundgot-Borgen, J. i Torstveit, M. K. (2010). Aspects of disordered eating continuum in elite high-intensity sports. *Scandinavian Journal of Medicine & Science in Sports*, 20(s2), 112-121.

Keywords: team sport, women's, EAT-26

THE RELATIONSHIP BETWEEN NETWORK SOCIETY, PHYSICAL ACTIVITY AND NUTRITION

Mine Turğut¹, Emre Yamaner², Emel Gökmen³ and Ümran Sarıkan¹

¹ Bartın University, Bartın, Turkey;

² Hitit University, Çorum, Turkey;

³ Tokat Gaziosmanpaşa University, Tokat, Turkey

UDC 796.08:613.2:64.013

Introduction

The inclusion of digital technology and automation in lives due to the increasing spread of digital technology and automation affects lifestyles (physical activity, nutrition, etc.). The age we live in, which is called the network society, allows information, communication and interaction to be faster and easier. On the other hand, technological tools, which have an effect that both facilitates and complicates life in certain aspects, undoubtedly have a negative impact on nutrition and physical activity participation levels. The fact that individuals can access everything quickly and easily causes them to stay in their comfort zone. This brings physical inactivity and can lead to a series of health problems. In this context, this research aimed to investigate and evaluate the relationship between physical activity and nutrition in the network society. The reason for this paradigm is the popular culture. Each of the scientific and technological developments affects the life of the social field.

Methods

A literature review study was performed to answer the questions regarding the PICO criteria (population, application, comparison and results) by using the keywords "nutrition", "network society and physical activity", and "physical activity" in the context of nutrition, physical activity and network society in various databases (Pubmed, Scopus Web of Science (WOS) and Sport Discuss databases). The articles obtained as a result of the database review were screened and some of them were used in the systematic review.

Results

In the results of the research, it was observed that the relationships established in the network society, especially with new media tools at the centre of lives, negatively affect physical activity and nutrition.

Discussion & Conclusion

On the other hand, the wrong nutrition styles shared on social media also affect the habits of individuals. Finally, any information presented on social media can be shared by thousands of people without being checked for accuracy or inaccuracy. This is due to being part of an increasingly widespread network. However, on the other hand, if new media tools are used to share information that a healthy life requires physical and mental integrity and that participation in physical activity and dietary habits can be revised, healthy individuals can be enabled in the social field. In this case, it cannot be ignored that the correct usage of new media tools has the potential to directly affect participation in physical activity and nutrition.

Keywords: network society, physical activity, nutrition

METHODS FOR ASSESSING MICROCIRCULATORY, HEMORHEOLOGICAL CHANGES AND OXYGEN TRANSPORT IN ATHLETES OF VARIOUS SPORTS DISCIPLINES

Nadia Antonova¹ and Ivan Ivanov^{1,2}

¹ Department of Biomechanics, Institute of Mechanics to the Bulgarian Academy of Sciences, Akad. G. Bonchev str., Bl.4. 1113 Sofia, Bulgaria;

² National Sport Academy "Vasil Levski", Studentski grad, Sofia, Bulgaria

UDC 796.012.6:612.1

Summary

Studies on microcirculation, hemorheological changes and oxygen transport occurring during physical activity and sport are overviewed. The aim of the work is to make a comparative analysis of the methods for researching the microcirculatory and hemorheological changes in athletes from different sports disciplines and different physical activities and ages. Assessment of microcirculatory changes in athletes practicing cyclical sports (running - marathons and skiing) and acyclical sports (weightlifting (weightlifting) and figure skating), highly skilled rowers, during the period of high-intensity sports training, as well as at rest was done. An analysis of the adaptation reserves of the microvascular bed in individuals with different physical activities and exercises was performed. The density of functioning capillaries, the average diameter of capillaries, microvascular perfusion, the blood flow velocity in the capillaries, heart rate, as well as the influence of low-energy laser radiation on the blood microcirculation system, age, duration of training, type of sports disciplines was evaluated. Based on the results, maximal oxygen consumption (MOC - VO₂ max) was calculated and used to determine the level of physical performance. The body's functional reserves are restored to an anaerobic support mechanism as a result of training. The revealed changes that occur directly during muscle activity are stored in the body subsequently even after its completion. Accumulating for a long time, they gradually lead to the formation of a more economical type of microvascular response, which, in turn, can be a criterion for the athlete's functional sports orientation. The hemorheological changes during physical exercise were analyzed depending on the type, duration, intensity, and cyclicity of the physical activities. to develop additional indicators and criteria for the assessment of physical and functional orientation and workability and their applications.

Keywords: training, perfusion, oxygen supply, blood viscosity, physical efficiency

TRADITIONAL GAMES AND FORMS OF PHYSICAL EXERCISE AND COMPETITION AND THEIR SIGNIFICANCE

**Nebojša Randelović¹, Danijela Živković¹, Zvezdan Savić¹, Andela Đošić¹,
Ljiljana Bjelaković¹ and Saša Pantelić¹**

¹ Faculty of Sport and Physical Education, University of Niš

UDC 796.012.6:316.7

Summary

Abstract: Folk rites, rituals, customs and traditions represent a significant part of general and national cultures, actually certain patterns of behavior characteristic of the development of certain social communities, but also of the entire human society in different periods of time. These patterns are still present today and they represent a significant cultural heritage of different social communities. In order to understand their sources, one should study the history of the people, their culture and everyday way of life. Many peoples and social communities have managed to preserve their culture, customs, rites, rituals and traditions of their ancestors over the centuries. In the course of centuries of history, many peoples have created a system of education in which appropriate physical activity and physical exercise were present. Possession of appropriate psychophysical abilities were considered necessary qualities of members of those communities. Sports (exercise) traditions have been created since ancient times. They were perfected in accordance with the economic activity of man, in accordance with the perfection of his reason. During earlier eras, various games and skills were developed, which today constitute a heritage from the past and are an expression of folk creativity in the field of physical exercise within sports and recreation. The international professional public recognized the value of traditional games and sports and took important steps towards their preservation and revival around the world. These activities are motivated not only by the need to preserve such games and sports in the growing world globalization and general commercialization of modern sports, but also to preserve the traditional ethical values and rules of fair play that were an integral part of these games. Also, traditional games found their place in the tourist offer in the form of traditional manifestations of national and international importance. There are over 3,000 traditional games in the world that are or have the potential to be an element of the tourist offer.

Key words: traditions, folk rites, physical exercise, nation, culture

THE DIFFERENCES IN THE PROFESSIONAL WORKING PHYSICAL PREPARATION OF THE FIREFIGHTERS OF THE REPUBLIC OF SERBIA FROM DIFFERENT REGIONS

Nemanja Samardžić¹ and Dragan Klisarić¹

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

UDC 796.015-057.36(497.11)

Summary

The aim of this study was to determine the differences in the professional physical preparation of firefighters from the Republic of Serbia from different regions. 101 healthy and physically active firefighters participated in the study. The following tests were applied: Beep test (BP), Modified Step test (MS), Fireman Polygon test (FP), Fireman Equipment Carry test (FEC) and Casualty Drag test (CD). The testing was carried out using a randomized method. The pause between tests was 10 minutes. The results of the analysis of differences showed that in the Fireman Equipment Carry test (FEC) there is a significant difference ($p < 0.05$) between the Belgrade-East Serbia region, Belgrade-Vojvodina, Belgrade-West Serbia, Eastern Serbia-Vojvodina and Vojvodina-Western Serbia; the effect size was $d = -0.891, -2.424, -0.754, -1.074, 1.161$ for all regions, individually. In addition, in the Casualty Drag test, significant differences ($p < 0.05$) were determined between the regions of Belgrade-Vojvodina and West Serbia-Vojvodina; the effect size was $d = 2.061$ and 0.823 , individually. Based on the results of the differences and determined effect sizes in the Fireman Equipment Carry test (s), it can be concluded that firefighters from the Belgrade region are more agile and stronger than firefighters from the regions of Eastern Serbia, Vojvodina and Western Serbia. Firefighters from the region of Vojvodina are less agile and strong compared to firefighters from the region of Western Serbia. Based on the established differences and effect sizes in the Casualty Drag test (CD), it can be argued that firefighters from the Belgrade region are stronger and more powerful than firefighters from the Vojvodina region, the same applies to firefighters from the West Serbia region compared to firefighters from the Vojvodina region. It is recommended that the regions that achieved worse results in the Fireman Equipment Carry test (FEC) and Casualty Drag test (CD) include training procedures through work plans and programs in order to improve professional work physical preparedness.

Keywords: firefighters, differences, testing, regions, abilities

IDENTIFICATION OF THE STANDARDS FOR TALENTED CHILDREN IN SPORT

Nenad Stojiljković¹ and Milovan Bratić¹

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

UDC 796.015.83-053.2

Introduction

Support, selection and properly directing children to the appropriate sport is one of the most important and certainly most challenging questions posed to professionals. Proper guidance enhances the efficiency of athletes who can thus utilize their potential purposefully in kinesiological activities that are compatible with their anthropological specificities. TALENT Project aim is to promote equal education, preventing exclusion, supporting Dual Careers, creating new pattern of behavior for the benefit of young talented children's and preparation for Long Life learning and professional sport from childhood. TALENT Project focuses on standards for recognition and awareness increase about sporting talent and the spread of the dual-career concept from the first grades of school talented sport youths from 12-16. Within this project one of the aims is to collect information about how teachers and coaches identify talented children and what they usually do to support and encourage them.

Methods

The informations about talent identification procedures in Serbia were collected through focus-groups. The interviews were conducted through the focus group methodology that has the main advantage to take information directly from people who are expert in the field by developing a dynamic discussion. Each focus group lasted 1 hour and involved 20 of participants (10 of interviewed PE teachers and 10 of interviewed coaches).

Results

The focus group participants of PE teachers were a diverse mix of teachers with varying years of experience, educational backgrounds, and professional affiliations. Their experience levels ranged from 4 to 30 years, with backgrounds spanning institutions such as primary schools, medical schools, high schools of mechanical engineering, and gymnasiums. The coaches who participated in the focus groups varied in terms of their years of coaching experience, sports specializations, and educational backgrounds. Some had extensive coaching experience, ranging from 3 to 18 years, and were associated with sports clubs or national teams.

Discussion & Conclusion

In the focus group discussions, participants highlighted the absence of a structured system for identifying sports talents in schools, emphasizing the challenges of motivating children to participate in sports. They identified factors like technology, financial constraints, and declining discipline as obstacles. Cooperation between schools and sports associations, along with mass competitions, was suggested to boost student involvement. The role of parents was recognized, both as positive contributors and potential sources of pressure. The participants emphasized the complexity of measuring talent, particularly in complex sports like football and basketball, and recognized the absence of a definitive formula for selection. They discussed varied criteria for

talent selection. The importance of hard work in achieving success was highlighted, citing examples of dedicated individuals who excelled despite perceived lack of talent.

References

1. European Commission (2012). EU guidelines on dual careers of athletes: Recommended policy actions in support of dual careers in high-performance sport.
http://ec.europa.eu/sport/library/documents/dual-career-guidelines-final_en.pdf
2. Johnston, K., Wattie, N., Schorer, J., & Baker, J. (2018). Talent identification in sport: a systematic review. *Sports medicine*, 48, 97-109.
<https://link.springer.com/article/10.1007/s40279-017-0803-2>

Keywords: youth athletes, selection, dual-career, school sport

EXPLORING FACTORS INFLUENCING ATTITUDES AND MOTIVATION IN SCHOOL SPORTS: A COMPARATIVE STUDY OF ADMINISTRATIVE DISTRICTS, ENGAGEMENT FREQUENCY, AND SCHOOL TYPES

Nikola Stojanović¹, Vukašin Rajković¹, Zvezdan Savić¹, Petar Mitić¹ and Vladimir Antić¹

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

UDC 796.01:37.013.3:159.946

Summary

This study investigated whether attitudes and motivation towards school sports varied among administrative districts, school types (elementary vs. high school), and engagement frequencies in school sports. The study employed the newly developed Attitudes and Motivation Toward School Sports Questionnaire (AMTSSQ). The AMTSSQ was administered to participants, and the responses were analyzed to assess attitudes and motivation. The study employed the Kruskal-Wallis ANOVA to examine differences in attitudes and motivation across engagement frequencies. Mann-Whitney tests assessed variation in attitudes and motivation between schools (elementary vs. high) and administrative districts (Niš and Novi Sad). Rank biserial correlations were calculated to quantify the strength of associations. The Kruskal-Wallis ANOVA indicated no statistically significant differences in attitudes related to the importance and development of school sports based on engagement frequency ($X^2 = 2.70$, $p = .026$). Similarly, no significant differences were found for motivation ($X^2 = 5.40$, $p = .07$). The Mann-Whitney tests demonstrated that attitudes and motivation were significantly higher among primary school students when compared to their counterparts in high schools ($p = .001$ and $p < .001$, respectively). Rank biserial correlations showed slight positive associations for attitudes and motivation concerning school type (0.15 and 0.21, respectively). Regarding the administrative district, there was a small positive correlation of 0.001 with attitudes and a slight negative correlation of -0.08 with motivation. Our study found that while administrative districts and engagement frequency did not significantly influence attitudes and motivation towards school sports, the type of school (elementary vs. high) had a significant impact, with weak positive associations. These results suggest that school type plays a more prominent role in shaping attitudes and motivation in this context.

Keywords: educational institutions, student engagement, regional variations, attitudinal disparities, comparative research

INFLUENCE OF EXTRA-CURRICULAR SPORTS ACTIVITIES IN STIMULING EXPLOSIVE FORCE AND CONCENTRATE CAPACITY AT PRIMARY SCHOOL CHILDREN IN A RURAL ENVIRONMENT

Nicolae Ochiană¹ and Călin Miron²

¹ University "Vasile Alecsandri", Bacău, Romania.

² Secondary school "Emil Braescu", Magura, Bacău, Romania;

UDC 796.012.112:371.31:312.92-053.5

Introduction

The rural environment was and is constantly changing. Is it different from the urban one? Definitely YES! Values, possibilities, potential, interests are different. However, the village is no longer what it was 50 or 100 years ago. It is important that the latest development information and directions reach the village. Education has become the means by which the rural environment can be rapidly transformed in all fields. The mindset has changed and people have understood the advantage that education gives to those interested. The standard of living has increased and implicitly the study conditions have improved.

The theoretical importance of the work consists in the fact that it carries out a proper analysis regarding the ability to concentrate and the development of motor qualities in children from the rural environment in accordance with the extracurricular physical activities performed by the subjects.

Practical importance: the content of the paper represents a pleading for parents and young people to exercise as much as possible in their free time.

Methods

Working hypothesis: in the research carried out, the starting point is that the explosive force and the ability to concentrate are influenced by the extracurricular sports activities carried out by the subjects.

The aim of the work is to carry out a proper analysis of the correlation between the measurable values of the ability to concentrate attention, explosive force and the extracurricular sports activity performed by subjects from the rural environment.

This paperwork meant to be an exhortation addressed to those who work with children for the development of basic motor skills and the stimulation of extracurricular sports activities.

The research intended to be a gateway that facilitates the creation of better relationships, closely linked between teachers and students, but at the same time a means to facilitate and streamline the process of developing motor skills through participation in extracurricular sports activities.

Results

Following the results obtained, we can state that:

Explosive strength develops differently in boys and girls at this age. Scores obtained showing a plus for girls. The development of the explosive force is uneven, the values obtained showing differences between the upper train and the lower train,

Discussion & Conclusion

The hypothesis from which we started was partially verified. The correlation of the values obtained in the 2 exposure force evaluation tests with the answers given to question no. 8 in the questionnaire showed that 78.57% of the subjects located in the first half of the ranking are those who practice extracurricular sports activities in free time. Following this correlation, we can state, based on the data obtained by us, for the studied sample, that the explosive force is influenced and can have significantly higher values in children who practice sports activities during extracurricular activities.

The correlation of the results (quality element) obtained at the Dam Test with the answers given to question no. 8 in the questionnaire showed that only 14.28% of the subjects located in the first half of the ranking are those who practice extracurricular sports activities in free time. Following this correlation, we can state, based on the data obtained by us, for the studied sample, that there is no clear influence of the practice of sports activities, in free time, on the ability to concentrate.

References

1. Badea, E., (1997), Caracterizarea dinamică copilului și a adolescentului de la 3 la 17-18 ani, Ed. Tehnică București;
2. Cucoș, C., (2002), Timp și temporalitate în educație. Elemente pentru un management al timpului școlar, Ed. Polirom, Iași, pag. 92;
3. Balica, M., Bălan, A., (2006), Raport privind situația respectării drepturilor copilului în România, Salvați copiii, <http://www.salvaticopiii.ro>;
4. Ionescu, D., Popescu, R. (2011). Activități extrașcolare în ruralul românesc. Dezvoltarea de competențe cheie la copiii și tineri, Ed. Universitară, București, p. 10, 14.

Keywords: extra-curricular sports activities, explosive force, concentrate capacity, primary school children, rural environment

EFFICIENCY OF DYNAMIC GAMES AND RELAYS RACE WITH TABLE TENNIS ELEMENTS IN THE DEVELOPMENT OF PSYCHOMOTRICAL SKILLS OF SECONDARY SCHOOL CHILDREN

Nicolae Ochiană¹ and Mihaela Ciubotariu²,

¹ Associate professor, PhD at Department of Physical Education and Sport Performance, Faculty of Health, Sports and Human Movement Sciences, University "Vasile Alecsandri" of Bacău, Romania;

² Physical education teacher at Secondary school "Tristan Tzara", Moinești, Bacău, Romania.

UDC 796.386-053.6

Introduction

Many parents, and not only, emphasize and "push the child" towards the quantity of information and not its quality, towards intellectual activities and less on physical ones. These ideas and concepts should be forgotten and yet they are present.

Is it important for children to participate in physical and sports activities at school? Clearly Yes! How do we manage to attract children? Constantly looking for new methods and means to attract them to come with pleasure and eagerness to the "physical education class".

Methods

We considered that table tennis can be used both as a means and as a method. The study carried out by us wanted to show whether the use of specific means of dynamic games and relays with elements from table tennis can contribute to the development of psycho-motor skills by achieving the physical education and sports lesson objectives in a different way.

Results

The values of the Student test, the "t" criterion calculated between the results obtained at the initial and final tests indicated statistically significant values for the field of physical education and sports ($p < 0.01$) for the components of both groups, but with higher values for experimental group components in all control samples.

Discussion & Conclusion

We consider our hypothesis to be substantiated, in the sense that if on the components of a class in the gymnasium (secondary school) cycle, we will act with a series of means specific to dynamic games and relays with table tennis elements then the level of development of psycho-motor skills will know superior values.

References

1. Albu A., Albu C., (1999), *Psihomotricitatea - Bazele generale ale psihomotricității*, Ed. „Spiru Haret”, Iași, p. 3-6;
2. Epuran M., (2013), *Motricitate și psihism în activitățile corporale. Prolegomene la o metateorie a activităților corporale, ludice, gimnice, agonistice, recreative, compensatorii*, Ed. FEST, volumul 2. București;
3. Ochiană, N., (2017), *Teoria și practica tenisului și tenisului de masă, curs studii de licență*, Ed. Alma Mater, Bacău, p.54-60;
4. ***, (2017), *Anexa nr.2 la ordinul ministrului educației naționale nr.3393/28.02.2017*, Ed. MEN, București.

Keywords: dynamic games; relays; table tennis; psychomotor skills

DIFFERENCES IN THE STRENGTH OF YOUNG JUDOKAS IN RELATION TO WEIGHT CATEGORIES: A REVIEW

Nikola Milošević¹, Sara Perković, Filip Nurkić¹ and Igor Nurkić¹

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

UDC 796.853.23-053.6

Introduction

During a judo fight, judokas need strong arms, but the strength of the trunk and leg muscles are equally important, along with other motor, functional, and cognitive abilities. Competitions are divided according to weight categories, so body composition has a great influence on the general strength of the judoka, as well as on the performance of the judo fight itself. This study aims to systematize knowledge about differences in the strength of young judokas in relation to weight categories.

Methods

Articles published from 2012 to 2022 were searched in the following databases: Google Scholar, PubMed, SCIndeks, KoBSON. The following terms were combined to design the search strategy: strength types, judo age categories, weight categories.

Results

The most common age of the respondents was cadets and juniors. The results of the studies showed differences in different types of strength: trunk strength was higher in the heavier categories, while maximal dynamic strength was higher in the lighter categories. Also, differences in strength were found in competitors of the same weight category in favor of the better-ranked competitors.

Discussion & Conclusion

Considering there is not enough research that looks at the differences between the weight categories of judokas, To observe all the differences and similarities in the strength structure of young judokas and to discover the potential possibilities of improving the strength of young judokas in the future, it would be necessary to do more detailed research. It should include adequately designed strength training on a sample of judokas of both sexes, different age, and rank.

References

1. Branco, B. H., Marcondes, V. A., de Paula Ramos, S., Badilla, P. V., & Andreato, L. V. (2022). Effects of supplementary strength program on generic and specific physical fitness in cadet judo athletes. *Journal of Strength and Conditioning Research*, 36(10), 2816-2823.
2. Šimenko, J., Karpljuk, D., & Hadžić, V. (2022). Monitoring of eccentric hamstring strength and eccentric derived strength ratios in judokas from a single weight category. *International Journal of Environmental Research and Public Health*, 19(1), 604.
3. Turnes, T., Silva, B. A., Kons, R. L., & Detanico, D. (2022). Is bilateral deficit in handgrip strength associated with performance in specific judo tasks?. *Journal of Strength and Conditioning Research*, 36(2), 455-460.

Keywords: strength types, judo age categories, weight categories

IMPACT OF BODY COMPOSITION ON THE FUNCTIONAL ABILITY OF ATHLETES

Nikola Milošević¹, Mirsad Nurkić¹, Amel Mekić², Sara Perković¹,
Filip Nurkić¹ and Igor Nurkić¹

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

² Faculty of Sports and Physical Education, University of Sarajevo,
Sarajevo, Bosnia and Herzegovina

UDC 796.012.11.4

Introduction

The analysis of body composition occupies a special place in sports sciences because it is one of the elements that make up the physiological profile of an athlete. It has been established that body composition plays an important role in elite sports. This study aims to systematize knowledge about how significant the influence of body composition is on the parameters of functional abilities.

Methods

Assessment of body composition will be carried out using Omron BF 214. Anaerobic capacity will be evaluated using the professional interactive trainer ELITE-IT DIRETO XR.

Results

The respondents will be athletes with many years of experience. A total of 22 respondents aged 18 to 23 will participate in this research. The results of research show that excess weight affects physical fitness. The research provides results that show that there is a statistically significant influence of body composition on the parameters of functional abilities.

Discussion & Conclusion

Body composition indicators are especially important in establishing a balance between training loads. Indicators of body composition have special significance in the process of selecting young athletes and their inclusion in an adequate system of preparation and development. The assessment of body composition indicators at the end of the competitive period and at the beginning of the preparatory period provides accurate indicators of the objective state of the athlete's sports form.

References

1. Franchini, E., Nunes, A. V., Moraes, J. M., & Del Vecchio, F. B. (2007). Physical fitness and anthropometrical profile of the Brazilian male judo team. *Journal of physiological anthropology*, 26(2), 59-67.
2. Sterkowicz, S., Lech, G., Pałka, T., Tyka, A., Sterkowicz-Przybycień, K. L., Szyguła, Z., & Kłys, A. (2011). Body build and body composition vs. Physical capacity in young judo contestants compared to untrained subjects. *Biology of Sport*, 28(4).
3. Vardar, S. A., Tezel, S., Öztürk, L., & Kaya, O. (2007). The relationship between body composition and anaerobic performance of elite young wrestlers. *Journal of sports science & medicine*, 6(CSSI-2), 34.

Keywords: body composition, functional abilities, training process, athletes...

THE EFFECTS OF NEUROMUSCULAR FATIGUE ON FUNCTIONAL MOVEMENT AND BALANCE PERFORMANCE IN FOOTBALL PLAYERS

Ozkan Guler¹, Nese Sahin¹, Hamza Küçük², Ozkan Isik³, Sally Salam and Abbas Ali⁴

¹ Ankara University, Faculty of Sport Sciences,

Department of Coaching Education Ankara/Turkiye

² Ondokuz Mayıs University, Yaşar Dogu Faculty of Sport Sciences,

Department of PE and Sport Teaching, Samsun/Turkiye

³ Balikesir University, Faculty of Sport Sciences,

Department of Coaching Education Balikesir/Turkiye

⁴ Ankara University, Institute of Health Sciences Ankara/Turkiye

UDC 796.012.322:612

Introduction

Football is a popular game with more than 240 million licensed athletes in the world. Many high-intensity movements are repeated hundreds or even thousands of times in the football game. These movements are repeated at high intensities from the beginning to the end of the football match. Fatigue during the match disrupts the patterns of these movements and increases the risk of injury. Many non-impact injuries in football competitions are caused by the deterioration of movement techniques as a result of fatigue. Improper movement technique causes football players to do the work by expending more energy and putting more load on the muscles, tendons and ligaments. The aim of this study is to examine the effects of neuromuscular fatigue on functional movement analysis total score and balance ability.

Methods

28 professional football players participated in the study voluntarily. A 10-meter running and vertical jump test was used to assess neuromuscular fatigue in football players. Functional movement skills were made with the functional movement imaging method. Balance skill was measured with the modified Y balance test. Statistical analysis of the data obtained in the study was carried out with the t-test in paired samples.

Results

According to the t-test results in paired samples, the average functional movement total scores of the football players who participated in the study were 15.64 ± 2.34 while they were at rest, while the functional movement analysis total scores after fatigue were 13.78 ± 2.29 . balance test score before fatigue 95,11 Balance score after fatigue while 93,18 detected.

Discussion & Conclusion

It was statistically determined that fatigue negatively affects functional movement and balance skills ($p < 0.042$). Preventing or reducing fatigue in footballers affects functional movement and balance skills and increases the risk of injury. Therefore, delaying fatigue and accelerating recovery may be important to prevent injuries.

Keywords: balance, functional movement, football, fatigue

DIFFERENCES IN MOTOR ABILITIES OF GYMNASTS IN RELATION TO CHRONOLOGICAL MATURITY

Petar Veličković¹, Saša Veličković¹, Miloš Paunović¹,
Dušan Đorđević¹ and Božidar Marović²

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

² Faculty of Sport and Physical Education, University of Belgrade, Serbia

UDC 796.015.52.4-055.1

Summary

The aim of this research was to determine the differences in motor abilities of gymnasts in relation to chronological maturity. The sample of participants were consisted of 15 gymnasts, aged 7 to 13 years, active members of the Gymnastics club "Niš". The participants were divided into groups based on their age, where the 1st group was consisted of 6 competitors (7-8 years old), the 2nd group was consisted of 5 competitors (9-10 years old) and the 3rd group was consisted of 4 competitors (11-13 years old). The sample of variables were consisted of variables to assess explosive leg strength (countermovement jump (CMJ), countermovement jump with arm swing (CMJa) and long jump (LJ)), flexibility (stick shoulder turn (ST), forward split (FS) and sit and reach (SR)), and balance (flamingo balance test (FT), Y test (YT) and Bass test (BT)). Basic descriptive parameters, the Kolmogorov-Smirnov Z and ANOVA were taken into account for statistical data processing. The results of the study have showed significant differences between the 1st (7-8 years) and 3rd (11-13 years) group and the 2nd (9-10 years) and 3rd (11-13 years) group in all variables of explosive leg strength (CMJ, CMJa, LJ), and significant differences between the 1st and 2nd groups in the CMJa and LJ. In balance variables, the results have showed significant differences between the 2nd and 3rd group (YT and BT), but also significant differences between the 1st and 3rd group (YT). The obtained differences are mostly in favor of older gymnasts, which can be largely attributed to the length of training experience. Whether maturation has an effect on the manifested differences should be further investigated.

Keywords: explosive strength, range of motion, balance, men's gymnastics, maturation

PSYCHOLOGICAL COMPONENTS OF INTEREST IN THE PROFESSION OF SPORTS TEACHER

Polina Tsonkova¹ and Dimitar Nikolov²

¹ Humanitarian high school “St.Cyril and St.Metodius”, Veliko Tarnovo, Bulgaria

² Faculty of Pedagogy, “St.Cyril and St.Metodius” University of Veliko Tarnovo, Bulgaria

UDC 159.946.5:796.011

Summary

This theoretical exploration delves into the complex nature of professional interest within the sports teaching profession, unveiling its core psychological components. Professional interest, a multifaceted and evolving construct, takes shape during the process of professional self-determination under the pervasive influence of the external environment. It is epitomized through a comprehensive dedication to one's chosen career, extending beyond mere vocation. The framework of professional interest is outlined into four key components: the emotional, motivational, intellectual, and volitional aspects, collectively offering a holistic understanding of an individual's vocational passion. Moreover, this research sheds light on a set of mechanisms designed to effectively manage professional interest in the context of career development and growth. These mechanisms include the Accumulation and Upgrade mechanism, the Support mechanism, the Contradiction Resolution mechanism, the Bottom-Up mechanism, and the Top-Down mechanism, each with a distinct role in nurturing and sustaining professional interest. Recognizing and implementing these mechanisms is essential in aligning one's personality with their chosen profession. By comprehending the nuances of professional interest and applying these strategies, individuals can optimize their professional growth and fulfillment within the sports teaching field. This presentation offers valuable insights into the foundations of professional interest and its practical applications in career development, making it a significant contribution to the field of sports pedagogy and professional development, providing a comprehensive framework for enhancing effectiveness and fostering personal and career growth.

Keywords: professional interest, sports and educational activities, psychological mechanisms

ANALYSIS OF SUCCESSFUL JUMPS AT THREE DIFFERENT HEIGHTS IN JUMPING COURSES

Predrag Ilić¹ and Nemanja Stanković¹

¹ Faculty of Sport and Physical Education, University of Niš

UDC 798.4

Introduction

The study aimed to assess whether significant differences exist in the success rates of jumping hurdles across various parkour heights. The study considered several variables, including the total number of faults, jumps over hurdles, standing jumps, bypassing hurdles, disqualifications, rider falls, single jump faults, and compound jump faults.

Methods

A total of 229 starts ($n=229$) were observed during ten selected show jumping events held in Zagreb (December 18, 2022) and Osijek (June 30, 2023) as part of open club competitions. The heights of the hurdles ranged from 105 cm to 140 cm. Among all the starts, 153 (66.8%) were conducted at heights between 105 cm and 115 cm, 49 (21.4%) at heights ranging from 120 cm to 125 cm, and 27 (11.8%) at heights from 130 cm to 140 cm.

Descriptive statistics were computed, and the distribution of the results was assessed using the Kolmogorov-Smirnov test. The Kruskal-Wallis test was employed to calculate mean ranks and identify statistically significant disparities in hurdle jumping performance across varying heights. Additionally, the Mann-Whitney U test was utilized to detect significant differences between heights, with a significance level set at $p < 0.05$.

Results

The results unveiled noteworthy distinctions in two variables: standing on the hurdle ($p = 0.024$) and exclusion from the match ($p = 0.023$) across the three different parkour heights. Furthermore, the Mann-Whitney U test highlighted significant disparities in hurdle standing ($p = 0.014$) and exclusion from the match ($p = 0.012$) between parkour heights of 105 - 115 cm and 120 - 125 cm. However, no statistically significant differences were observed when comparing the heights of 105-115 cm with 130-140 cm or 120-125 cm with 130-140 cm, concerning standing on the hurdles and exclusion from the match.

Discussion & Conclusion

Given that more errors occurred at the lower hurdle height range (105-115 cm) compared to the higher range (120-125 cm), the authors posit that these discrepancies stem from variations in rider rankings and, consequently, the quality of horses. Specifically, lower-ranked riders may have competed over lower hurdles, while higher-ranked riders tackled a greater number of obstacles. This study can be valuable for trainers in devising training plans that consider both rider rankings and hurdle heights.

Keywords: equestrian sport, show jumping, parkour height, performance analysis

DIFFERENCES IN PHYSICAL FITNESS IN ADOLESCENTS IN RELATION TO GENDER

Rade Jovanović¹, Nebojša Trajković², Vladimir Ristić²,
Miloš Ignjatović³ and Nataša Zelinčević Vukajlović⁴

¹ Department of physical education, Medical faculty, University of Niš, Serbia;

² Faculty of sport and physical education, University of Niš, Serbia

³ Primary school Kralj Aleksandar I, Gornji Milanovac, Serbia

⁴ KMC Banja Luka, Bosnia and Herzegovina

UDC 796.015.132-053.6

Introduction

Overall, 81% of children and teenagers do not meet the World Health Organization recommendations for moderate-intensity aerobic activity and strength training according to the appropriate age group (Guthold, Stevens, Riley, & Bull, 2020) and most adolescents have sedentary habits (Bossmann, Woll & Wagner, 2022). It is necessary that young people see physical activity as a basic culture of living, which aims to preserve health in adulthood (Cvetković, 2018).

The **aim** of this investigation was to determine if there are any differences in physical fitness in adolescents in relation to gender.

Methods

This investigation was performed on 40 adolescents both genders, aged 15-17, that are attending first or second year of "9. maj" high school in Niš. The following tests were used for determination of the adolescents physical fitness: sit and reach flexibility test, sit up 30s test, grip strength test, 4x10 running agility test and long jump test. Statistical analysis was performed by an unpaired t-test.

Results

Out of 40 adolescents, there were 20 (50%) male and 20 (50%) female adolescents, mean aged 16, 03±0, 22. The results showed the following: sit and reach test ($p=0, 9770$); 30 sec abs test ($p<0, 0001$); sake grip test ($p<0, 0001$); 4x10 running test ($p=0, 0015$); long jump test ($p<0, 0001$). All physical fitness tests showed the statistically significant difference between boys and girls in favor of boys.

Discussion & Conclusion

Cvejić, Pejović, & Ostojić (2013) conclude that physical fitness is a significant indicator of the health of children and adolescents and also a good predictor of health in later life. In the recent years interest in the evaluation of physical form has increased in the public domain.

The main conclusion is that the male adolescents were in better physical form than female adolescents in the high school "9. maj" in Niš.

References

1. Bossmann, T., Woll, A., & Wagner, I. (2022). Effects of Different Types of High-Intensity Interval Training (HIIT) on Endurance and Strength Parameters in Children and Adolescents. *International Journal of Environmental Research and Public Health*, 19 (11), 6855.
2. Cvejić, D., Pejović, T., & Ostojić, S. (2013). Assessment of physical fitness in children and adolescents. *Facta Universitatis: Series Physical Education & Sport*, 11(2).
3. Cvetković, N. (2018). *Uticaj visokointenzivnog intervalnog treninga i rekreativnog fudbala na parametre zdravstvenog fitnesa dečaka sa povišenom telesnom masom. The effect of high-intensity interval training and recreational football on health-related fitness parameters in overweight male children.* Докторска дисертација. Ниш: Факултет спорта и физичког васпитања.
4. Guthold, R., Stevens, G. A., Riley, L. M., & Bull, F. C. (2020). Global trends in insufficient physical activity among adolescents: a pooled analysis of 298 population-based surveys with 1·6 million participants. *The Lancet Child & Adolescent Health*, 4 (1), 23-35.

Keywords: physical form, gender, adolescents

THE RELATIONSHIP BETWEEN INTERNAL AND EXTERNAL LOAD IN VERTICAL JUMP SESSIONS: THE IMPACT OF TRADITIONAL AND CLUSTER SET STRUCTURES

**Radenko Arsenijević¹, Filip Kojić², Predrag Božić^{3,4}, Milan Matic⁵,
Bobana Berjan Bačvarević⁶, Saša Jakovljević⁵ and Nemanja Pažin^{5,6}**

¹ Faculty of Sport and Physical Education, University of Priština in Kosovska Mitrovica, Leosavic, Serbia;

² Teachers Education Faculty, University of Belgrade, Belgrade, Serbia;

³ Serbian Institute of Sport and Sports Medicine, Belgrade, Serbia;

⁴ Faculty of Sport and Physical Education, University of Montenegro, Niksic, Montenegro;

⁵ Faculty of Sport and Physical Education, University of Belgrade, Belgrade, Serbia;

⁶ Faculty of Management in Sport, Alfa BK University, Belgrade, Serbia

UDC 796.015

Introduction

In the realm of athletic training and performance optimization, comprehending the intricate interplay between internal and external training loads is of paramount importance. This study investigates the association between internal and external load measures in vertical jump sessions, employing two set structure methods: traditional and cluster.

Methods

The study involved 11 physically active participants. Vertical jump sessions comprised 144 jumps divided into 12 sets, with a fixed number of 12 jumps per set for the traditional structure and varying for the cluster structure (from 6 to 18 jumps). External load variables (i.e., number of jumps, total vertical distance, and average jump height relative to the maximum height) and subjective (i.e., rate perceived exertion for legs and breath) and objective (i.e., heart rate) assessments of internal load were employed.

Results

Subjective variables of internal load exhibited a very high association with external load variables for both applied set structures ($r=0.90-0.99$). In contrast, objective variable of internal load generally displayed a weaker relationship, ranging from low ($r=0.26-0.31$) for the cluster set structure to moderate and high ($r=0.68-0.83$) for traditional set structure.

Discussion & Conclusion

The results highlight the intricate relationship between internal and external load measures during vertical jump sessions, with subjective variables showing exceptionally high associations across set structures. The choice of set structure significantly influences the correlation between internal and external load, emphasizing the need for coaches to consider set structure when optimizing training strategies.

References

1. Haff, GG. (2010). Quantifying workloads in resistance training: a brief review. *Prof Strength Cond*, 19, 31-40.
2. McLaren, S. J., Macpherson, T. W., Coutts, A. J., Hurst, C., Spears, I. R., & Weston, M. (2018). The Relationships Between Internal and External Measures of Training Load and Intensity in Team Sports: A Meta-Analysis. *Sports Med*, 48(3), 641-658.
3. Moreno, S. D., Brown, L. E., Coburn, J. W., & Judelson, D. A. (2014). Effect of cluster sets on plyometric jump power. *J Strength Cond Res*, 28(9), 2424-2428.
4. Scott, B. R., Duthie, G. M., Thornton, H. R., & Dascombe, B. J. (2016). Training Monitoring for Resistance Exercise: Theory and Applications. *Sports Med*, 46(5), 687-698.

Keywords: set configuration, undulating variant, training volume, monitoring training load

CORRELATION BETWEEN ECCENTRIC HAMSTRING STRENGTH AND SPEED IN ADOLESCENT FOOTBALL PLAYERS

Radovan Gladić¹, Bojan Rašković¹, Dragan Marinković¹, Miodrag Spasić², Nikola Foretić²,
Dejan Madić¹, Patrik Drid and Borislav Obradović

Faculty of sport and physical education, University of Novi Sad, Novi Sad, Serbia
Faculty of kinesiology, University of Split, Split, Croatia

UDC 796.012.2.322-053.6

Introduction

Success in football depends on many factors; however, speed is an essential motor skill in overall sports performance and is desirable in every position on a football team. During a sprint, the eccentric strength of the hamstring muscles plays a significant role in the backswing phase movement. This research aims to determine the correlation between the eccentric strength of the hamstring muscles and speed in adolescent football players.

Methods

A total of 58 adolescent football players (Aged 20-23) were recruited for this research. The respondents are well-trained players of the football club "RFK Novi Sad 1921" from Novi Sad. Participants were tested on speed at 20m (Microgate-Witty GATE) and Eccentric strength of the hamstring muscles (Chronojump Force Sensor). Bivariate correlation analysis - Pearson's correlation was used in data analysis.

Results

Based on the results, there is a statistically negative correlation between eccentric strength of the hamstring muscles and speed in adolescent football players ($r=-0.38$; $p=0.00$). Moreover, there is an inverse relationship between strength performance and sprint performance in adolescent football players.

Discussion & Conclusion

The findings from this study indicate that there exists a meaningful correlation (-38%) between eccentric strength and an athlete's speed. These results agree with previous research indicating a weak negative correlation between sprint performance and average eccentric hamstring strength in football players. However, there is still limited evidence regarding the association between eccentric hamstring strength and athletic performance. In summary, this research not only reaffirms the connection between eccentric strength and speed but also underscores the indispensable role of strength and conditioning coaches in nurturing the holistic development of adolescent football players, preparing them for the senior league, and safeguarding their well-being through injury prevention strategies.

References

1. Brúnn, D., Liška, D., Švantner, R., Franek, V., Sýkora, J., & Pupiš, M. (2022). Association Between Hamstrings Eccentric Strength and Sprint Performance in Football Players. *Sport Mont*, 20(2), 103-109.
2. Claudino, J. G., Cardoso Filho, C. A., Bittencourt, N. F. N., Gonçalves, L. G., Couto, C. R., Quintão, R. C., Reis, G. F., de Oliveira Júnior, O., Amadio, A. C., Bوللوسا, D., & Serrão, J. C. (2021). Eccentric Strength Assessment of Hamstring Muscles with New Technologies: a Systematic Review of Current Methods and Clinical Implications. *Sports medicine - open*, 7(1), 10.
3. Seitz, L. B., Reyes, A., Tran, T. T., Saez de Villarreal, E., & Haff, G. G. (2014). Increases in lower-body strength transfer positively to sprint performance: A systematic review with meta-analysis. *Sports Medicine (Auckland, N.Z.)*, 44(12), 1693-1702.
4. Howard, R. M., Conway, R., & Harrison, A. J. (2018). Muscle activity in sprinting: A review. *Sports Biomechanics*, 17(1), 1-17.

Keywords: football; speed; strength; motor abilities; correlation

EFFECTS OF PHYSICAL ACTIVITY ON THE BALANCE OF OLDER ADULTS

Raid Mekić^{1,2}, Izet Kahrović¹, Benin Murić¹ and Omer Špirtović¹

¹ University of Novi Pazar, Study Program in Sports and Physical Education, Novi Pazar, Serbia,

² Faculty of Sport and Physical Education, University of Niš, Niš, Serbia

UDC 796.012.412-053.8

Summary

This research aims to collect relevant studies related to the effects of physical activity on the balance of older adults. The objective of this study is to determine the impact of physical activity on the balance of older adults. To collect data on the effects of physical activity on the balance of older adults, the following electronic databases were utilized: PubMed/Medline, PEDro, SCIndex, ScienceDirect, Google Scholar, journals in the field of sports sciences, as well as relevant literature that could address the research question. The following keywords were used during the search: Exercises of balance, proprioception, exercise in the water, balance of the elderly. It was concluded that multidimensional exercise has a positive influence on the balance development of older adults. Proprioceptive physical activities have the most significant impact on balance control among older adults. Research on aquatic exercises indicates that lower body water-based or land-based exercise programs contribute to balance improvement. High-intensity strength training can safely and effectively strengthen the lower limb muscles, leading to significant enhancements in balance and a reduced risk of falls among older adults. In summary, physical activity has numerous positive effects on preserving the health and quality of life of older individuals. Future studies should be well-designed and provide detailed and precise reports.

Keywords: exercises of balance, proprioception, exercise in the water, balance of the elderly

SPINE INJURIES IN VOLLEYBALL - LOW BACK PAIN

Rašid Hadžić¹, Jovica Petković¹, Kosta Goranović¹ and Marko Joksimović¹

¹ Faculty of Sport and Physical Education, University of Montenegro, Podgorica, Montenegro

UDC 796.325:616.001

Summary

Volleyball is a limited contact sport that requires a combination of fitness and technical skills. Players must be able to master various skills, including serving, passing, setting, hitting (or spiking), blocking and at the same time have the strength and endurance to repeat the same skills several times during the match. The highly explosive nature of the game creates numerous opportunities for acute injury, while the repeated jumping, moving and hitting required as part of volleyball-specific skills contribute to the often-encountered overuse injuries. Spine injuries in volleyball are not uncommon, with the incidence of low back pain estimated at between 10-14% of all volleyball-related injuries, making it the fourth most common injury in volleyball. In addition to the stresses that a volleyball player commonly encounters via the kinetic chain and alterations in normal mechanics, a volleyball player's spine is also subjected to stresses through the repetitive volleyball-specific motions required in the sport, in particular the spike. An attacker will often repeat the hitting motion hundreds of times a week during the season through practice, warm-up, and games. The rapid extension during the approach, combined with the hyper-rotation and oblique extension to cock the hitting arm followed by the rapid counter rotation and forced flexion, produce forces that will cause strains, sprains, and possibly overload of bone-causing stress fracture. Repetitive hitting in volleyball players has been associated with overuse injuries of the back, including lumbar strains, facet syndrome, pars fractures, and even disc herniations. Other factors that can contribute to spinal injuries in volleyball include different ages, skill levels, and the variety of surfaces on which volleyball is played.

Keywords: spine, kinetic chain, joint, foot, volleyball

COMBINED EXERCISE PROGRAMS FOR OLDER ADULTS - SYSTEMATIC REVIEW

Romina Herodek¹ and Aleksandra Ilić²

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

² Faculty of Sport and Physical Education, University of Novi Sad, Serbia

UDC 796.015.132-053.8

Summary

Aerobic training and strength training are two primary types of exercise being able to reduce blood pressure and lipid levels, increase cardiovascular fitness, and have a positive impact on the size, function, and thickness of artery walls. The combination of aerobic exercise and strength training, known as concurrent training (CT), has received special attention in the scientific literature due to its potential for antagonistic muscle adaptation. The aim of the research is to determine through a literature review whether combined exercise programs influence changes in various parameters of motor and functional status in older adults. Electronic databases such as Google Scholar, Web of Science, and PubMed were searched to gather available literature in English between 2013 and 2022. Finally, a total of 15 studies were included in the qualitative analysis. Men and women between the ages of 40 and 86 participated in the study, with sample sizes ranging from 20 to 123, for a total of 973 individuals. In all studies, participants underwent a combined or concurrent training program of varying durations (from 8 weeks to 12 months). The most commonly used approach was combined training, followed by concurrent training, combined with aqua fitness, high-intensity interval and vibration training, along with whole-body electrostimulation. Based on the obtained data, it can be concluded that there are positive statistically significant differences in the parameters of motor and functional status for the majority of groups of participants after the duration of a specific combined or concurrent training program. The results of this systematic review provide additional evidence supporting the use of combined exercise as an effective method for improving the motor and functional status of older adults.

Keywords: training, older, physical fitness, functional status

CHANGES IN BODY COMPOSITION UNDER THE INFLUENCE OF DIFFERENT DIETARY PATTERNS - SYSTEMATIC REVIEW

Romina Herodek¹, Mladen Živković¹, Aleksandra Ilić² and Aleksandra Catić Đorđević³

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

² Faculty of Sport and Physical Education, University of Novi Sad, Serbia,

³ Faculty of Medicine, University of Niš, Serbia

UDC 613.2:796.01-053.8

Summary

Ensuring a nutritious and environmentally sustainable diet is one of the largest worldwide issues. The phrase "vegetarian diet" refers to four different eating regimens: semi-vegetarian, lacto-ovo-vegetarian, lacto-vegetarian, and vegan. The other eating strategies known as intermittent or religious fasting can have a significant negative influence on physical health even if it is often done for spiritual reasons. The aim of this research is to examine the literature and assess the effects of various plant-based eating patterns, intermittent or religious fasting, and other lifestyle choices on body composition. A systematic review of the literature was conducted using Google Scholar, Web of Science, and PubMed. The following criteria were used to evaluate the papers: they had to have been peer-reviewed and published between 2013 and 2022, be in English, be of an experimental character, and involve adult subjects. Based on the defined criteria, 20 articles from the final analysis were chosen and provided for analysis. All studies included a total of 1414 individuals, who were split equally between the sexes and ranged in age from 18 to 80. It may be inferred from the findings that various plant-based dietary regimens affect body composition characteristics as determined by instruments that work on the principles of dual-energy X-ray absorptiometry (DEXA) and bioelectrical impedance (BIA). It may be inferred from the findings that various plant-based dietary regimens affect body composition characteristics as determined by instruments that work on the principles of DEXA and BIA. Following a specific plant-based nutritional regimen led to statistically significant beneficial variations in body composition indices among all participant groups, according to the data acquired.

Keywords: plant-based diet, body composition, adults

GENDER-BASED DIFFERENCES IN SELECTED VERTICAL JUMP PARAMETERS AND THEIR VARIABILITY: A CROSS-SECTIONAL STUDY

Sara Aščić¹, Klara Findrik¹, Iva Macan^{1,2} and Marin Marinović^{1,2}

¹Faculty of Kinesiology, Josip Juraj Strossmayer University of Osijek, Osijek, Croatia,

² Faculty of Kinesiology, University of Zagreb, Zagreb, Croatia.

UDC 612.76:796.012.11

Summary

The aim of this study is to examine differences in the variability of selected parameters in vertical jumps between males and females to gain insights into the characteristics of explosive strength performance between male and female individuals. By comparing the differences in the coefficient of variation between males and females, we aim to mitigate the influence of higher average jumps in males.

Exclusion criteria for entry into the study included any musculoskeletal injuries within the past year and any other health issues. We analyzed 32 male and 15 female students using the Optogait system. Key parameters included flight time, jump height, power output, reactive strength index and pace. The study also assessed variability within these parameters using the coefficient of variation.

Shapiro Wilk W test was used to test normality. Since the data did not follow a normal distribution based on the results of the Shapiro-Wilk W tests, non-parametric statistics were used for subsequent analyses. To compare differences between male and female students, an initial assessment of variance homogeneity was conducted. Homogeneous results were evaluated using the Mann-Whitney U test. Statistical significance was set at $p < 0.05$. Statistically significant gender disparities were observed. Men outperformed women in several parameters: flight time ($p=0.00$), jump height ($p=0.00$), power output ($p=0.00$), and reactive strength index ($p=0.00$). Women excelled in pace ($p=0.00$) and the reactivity index ($p=0.04$). Importantly, the analysis of the coefficient of variation revealed that both genders exhibited similar levels of performance consistency, despite mean differences. This study underscores gender-based variations in vertical jump parameters, with men demonstrating superior explosive strength, while women exhibited strengths in jump rhythm and certain performance aspects.

Keywords: vertical jump, explosive strength, performance variability

THE DIFFERENCE IN THE POSTURAL STATUS OF THE SPINAL COLUMN IN FOOTBALL PLAYERS OF DIFFERENT CATEGORIES

Stefan Đorđević¹, Bojan Jorgić¹, Saša Milenković¹, Mila Manić¹,
Miljan Hadžović¹ and Aleksandar Stamenković¹

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

UDC 796.322:615.82/.84

Summary

The aim of this research was to find the difference in the postural status of the spinal column among football players of different categories. The study included 69 soccer players who had been involved in the training procedure for at least three years. Male respondents aged 12 to 14 years (U14=24), 14 to 16 years (U16=24), and 16 to 18 years (U18=21) were included in the group of participants, which was separated into three age groups. The results indicate the statistical significance of the difference in the sagittal plane (Sig=.014) for category U14, and no statistical analysis indicates difference in the frontal plane of the spinal column (Sig=.167). For the U16 category, neither in the sagittal nor in the sagittal plane (Sig=.683) neither in the frontal plane of the spinal column (Sig=.102). For the U18 category, statistical analysis shows that neither in the sagittal plane (Sig=.275) nor in the frontal plane was there a statistically significant difference (Sig=.275). Future research should consider longitudinal studies and investigate additional factors, such as training intensity, playing position, and injury history, which may contribute to postural variations among football players. In conclusion, this study provides valuable insights into the postural status of the spinal column in football players across different age categories. While significant variations were observed, the absence of statistically significant differences between age groups suggests that age alone may not be the primary determinant of these variations. Addressing spinal deformities in young athletes should remain a priority to promote their long-term health and athletic success.

Keywords: team sport, postural disorders, kyphosis, lordosis

THE 800 AND 1500 METERS RUNNING TECHNIQUE ANALYSIS: A SYSTEMATIC REVIEW

**Stefan Mijalković¹, Daniel Stanković¹, Fatma Nese Sahin²,
Ana Stanković³ and Aleksandar Raković¹**

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

² Faculty of Sport Science, Ankara University, Turkiye;

³ High school “Dušan Trivunac Dragoš”, Svrljig, Serbia

UDC 796.422.14

796.012:612.766

Summary

This aim of this study was to conduct a comprehensive systematic review focusing on the running techniques employed in the 800 and 1500 meters. To achieve this, we meticulously examined recent literature by searching electronic databases such as PubMed, Google Scholar, and ScienceDirect. A stringent set of inclusion criteria was applied, resulting in the inclusion of 14 studies published within the last 25 years. These selected studies are presented in a structured tabular format, offering essential information including the primary author, year of publication, details about the respondent sample (comprising both male and female participants, totaling 311 individuals), monitored variables, and the outcomes of these investigations. The synthesized findings consistently demonstrated that middle-distance runners achieved higher speeds when making ground contact with the forefoot or midfoot. In contrast, slower runners predominantly employed a heel-first landing technique, often accompanied by a more pronounced forward body lean. Fatigue-induced alterations included increased stride lengths, greater maximum knee flexion during the swing phase, and enhanced maximum thigh angles during hip flexion. The key takeaway from this systematic review is that more successful middle-distance runners exhibited a heightened level of efficiency in their hip joint function. These findings have significant implications for both athletes and coaches, offering valuable insights into optimal running techniques that not only enhance performance but also reduce the risk of injury during middle-distance running events.

Keywords: athletics, track and field, middle-distance running, biomechanics

CORRELATION BETWEEN VERTICAL JUMP, SPEED, COD AND REACTIVE AGILITY IN ADOLESCENT SOCCER PLAYERS

Sreten Marković¹, Dino Mujanović² and Rifat Mujanović³

¹ Faculty of sport and physical education, University of Nis, Serbia;

² Faculty of Sport and Physical Education, University of Novi Pazar, Novi Pazar, Serbia;

³ Faculty of Sport and Physical Education, University of Novi Sad, Serbia

UDC 796.012.12.322-053.6

Introduction

Testing the physical ability of football players has many benefits in young age categories. Here are some important reasons: recognition and selection of young football players, determination of "strong" and "weak" sides of football players' physical preparation, monitoring, and evaluation of training effects, giving feedback to players about their progress and state of training, motivating players to train more and more intensively. Therefore, the aim of the research is to determine the relation and influence of vertical jump, speed and speed of change of direction of movement in football players in the cadet age.

Methods

The work method is experimental with one group of football players ($n = 53$) of the cadet category ($15.96 \pm .854$ years old), whereby testing the mentioned motor abilities, the connection and their influence on the ability of reaction agility is determined.

The data obtained from this research are processed with the statistical program SPSS 20.0 ("Statistical Package for the Social Sciences"). To obtain the connection and influence in the tests of vertical jump, speed, speed of change of direction of movement and reaction agility of football players, the statistical method of multiple regression analysis was applied, which shows the connection of the variables of vertical jump, speed and speed of change of direction of movement affect the reaction agility of football players. Through Pearson's correlation method, it is shown how the mentioned abilities are interconnected, and by the statistical method of multiple regression analysis (stepwise method), which has the task of showing a unique predictor that has the most influence on reaction agility in this research work on this group of respondents. The results that are presented show the connection of the three mentioned variables to the variable of reaction agility and each one shows how much it affects only reaction agility.

Results

Correlation between vertical jump, speed, speed of change of direction of movement and reaction agility was tested using the Pearson correlation method of all key variables for this work. Every variable is closely related to almost everyone, especially where we see that the correlation coefficient in all agility tests is related to 20 meter speed with correlation coefficients of .000* and .001*. The only place where the number of the correlation coefficient is higher, that is, which shows a lower correlation, is the vertical jump with the speed of changing the direction of movement to the left with a correlation coefficient of .224 and vertical jump and reaction agility with a correlation coefficient of .129.

Regarding the relationship between vertical jump, speed and speed of change of direction of movement and reaction agility, the results from the vertical jump test with a value of .705 have the least impact on the reaction agility of soccer players, then the speed at 20 meters has a greater impact on the reaction agility with a value of .701. The speed of changing the direction of movement, which is agility, in this case pre-planned, where the players knew in advance where they should go (right and left), as well as the well-known Illinois test, have an impact on the reaction agility of soccer players with a correlation coefficient of .235 to the left. and the highest association of the correlation coefficient with the speed of change of direction of movement to the right with a value of .082. correlation coefficient.

The results showed that the speed of changing the direction of movement is related to the reaction agility of football players with a correlation coefficient ($p = 0.03$), but with repetitive sprints the connection is not so significant ($p = 0.46$) and it was concluded that for the speed of changing the direction of movement, i.e. agility, you should work in the training process of specific exercises for the development of this ability.

Discussion

The purpose of this study is to examine the relationship and influence of vertical jump, speed, and speed of change of direction of movement in cadet football players. In the vertical jump test, the results showed that reaction agility had the least impact, while in the speed tests there was a greater correlation. The greatest influence, unique in relation to the influence of other variables, on reaction agility is the agility itself, which is predetermined and the unique predictor for reaction agility is the speed of changing the direction of movement to the side where the dominant leg (CoD right) is present, in this work and in the case of the right leg, which was also shown in the research by Henry, Dawson, Lay, & Young, (2016) on a sample of 31 football players of Australian citizenship. For more accurate and better results, a larger number of samples will be required.

Conclusion

Based on the obtained results and the hypothesis of the research, it can be concluded that the vertical jump, speed and speed of change of direction of movement have a positive effect on the reaction agility of cadet age footballers and that the hypothesis was partially confirmed.

References

1. Nobari, H., Silva, A. F., Clemente, F. M., Siahkhouian, M., García-Gordillo, M. Á., Adsuar, J. C., & Pérez-Gómez, J. (2021). Analysis of fitness status variations of under-16 soccer players over a season and their relationships with maturational status and training load. *Frontiers in Physiology*, 11, 1840.)
2. Henry, G. J., Dawson, B., Lay, B. S., & Young, W. B. (2016). Relationships between reactive agility movement time and unilateral vertical, horizontal, and lateral jumps. *Journal of Strength and Conditioning Research*, 30(9), 2514-2521.

Keywords: agility, football, team sport, young

MOTOR CAPABILITIES OF HANDBALL PLAYERS IN RELATION TO THE POSITION IN THE TEAM

Stefan Pivač¹, Jovan Radenković¹ and Saša Bubanj¹

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

UDC 796.015.132.325

Introduction

Handball is a complex, team sport, for the successful playing of which, in addition to anthropometric characteristics, technical and tactical elements, a high level of motor skills is a crucial factor. The aim of the research was to determine the differences in motor skills in relation to the position in the team.

Methods

The sample of respondents consisted of 16 handball players (age: 16.75 ± 1.29 ; body mass: 83.52 ± 14.05 kg; body height 181.15 ± 7.4 cm) divided into three subsamples in relation to their position in the team (goalkeepers, wings and defenders). Testing included tests of explosive power (CMJ, CMJA, SJ), speed (5, 10 and 20 m) and agility (T-test, Zig-Zag and slalom test). All players had a minimum 5 years of experience in training

Results

By one-way analysis of variance (ANOVA) and using the Tukey HSD test, statistically significant differences ($p < 0.05$) were found only in the T-test ($p = 0.042$) and the slalom test ($p = 0.033$) between wing players and goalkeepers.

Discussion & Conclusion

In conclusion, wing players have better results in agility (T-test), than goalkeepers. Therefore, these results can be useful for coaches in order to improve motor skills and agility of every position in handball. Further research should use specific handball tests with larger sample size.

References

1. Cavala, M., & Katić, R. (2010). Morphological, motor and situation-motor characteristics of elite female handball players according to playing performance and position. *Collegium antropologicum*, 34(4), 1355-1361.
2. Chaouachi, A., Brughelli, M., Levin, G., Boudhina, N. B., Cronin, J., & Chamari, K. (2009). Anthropometric, physiological and performance characteristics of elite team-handball players. *Journal of sports sciences*, 27(2), 151-157. <https://doi.org/10.1080/02640410802448731>
3. Zapartidis, I., Kororos, P., Christodoulidis, T., Skoufas, D., & Bayios, I. (2011). Profile of young handball players by playing position and determinants of ball throwing velocity. *Journal of Human Kinetics*, 27(1), 17-30.
4. Čižmek, A., Ohnjec, K., Vučetić, V., & Grujić, I. (2010). Morphological differences of elite croatian female handball players according to their game position. *Hrvatski športskomedicinski vjesnik*, 25(2), 122-127.
5. Haugen, T. A., Tønnessen, E., & Seiler, S. (2016). Physical and physiological characteristics of male handball players: influence of playing position and competitive level. *The Journal of sports medicine and physical fitness*, 56(1-2), 19-26.

Keywords: agility; speed; explosive power; handball; positions

COMPARING QUALITY OF LIFE IN PROFESSIONAL SOCCER PLAYERS AND PHYSICALLY ACTIVE UNIVERSITY STUDENTS: A CROSS-SECTIONAL STUDY

Tijana Purenović-Ivanović¹, Milan Zelenović², Anja Petrović¹ and Ljiljana Bjelaković¹

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

² Faculty of Physical Education and Sport, University of East Sarajevo, East Sarajevo, Bosnia and Herzegovina

UDC 796.322:613-057.87

Quality of life (QoL) is defined as individuals' perceptions of their position in life in the context of the culture and the value systems in which they live and in relation to their goals, expectations, standards, and concerns. It is a multidimensional concept that represents an individual's overall satisfaction with his or her life and general sense of well-being. Regular physical activity, i.e. sport offers numerous health benefits and research has demonstrated that individuals can benefit from regular physical activity, whether they participate in vigorous exercise or some type of moderate health-enhancing physical activity, and thus enhance their QoL. The main objective of this research was to examine and compare the QoL of 22 male professional soccer players and 26 male PE students, aged 18–35. Their baseline characteristics (age, body height and mass, and body mass index) were established, as well as their QoL (all of four domains– 1. physical health, 2. psychological health, 3. social relationships, and 4. environment) which was assessed by WHOQOL-BREF questionnaire. The data were analyzed (descriptive statistics, Kolmogorov-Smirnov test, independent samples t-test) using SPSS 21.0, and the obtained results showed the absence of statistically significant between-group differences ($p > 0.05$). However, slightly higher QoL values (domain 1: 17.43 vs 17.03; domain 2: 16.97 vs 16.38; domain 4: 15.8 vs 15.6) were recorded in professional soccer players; only in the case of domain 3 (social relationships) PE student scored better (16.6 vs 16.2). Overall, both samples are satisfied with their QoL, which could indicate once more indisputable benefits of sport and physical activity in general.

Keywords: health status, well-being, professional athletes, PE students

INVESTIGATION OF THE RELATIONSHIP BETWEEN NATURE AND MOOD OF INDIVIDUALS PARTICIPATING IN ECORECREATIVE ACTIVITIES

Ümran Sarıkan¹, Mine Turğut² and Zülbiye Kaçay³

¹ Ankara University, Turkey;

² Bartın University, Turkey;

³ Çanakkale Onsekiz Mart University, Turkey

UDC 796.5

Introduction

Eco-recreational activities have gained importance as a free time activity where the physical and mental being interacts with nature. Mood is the emotional state of the individual and it has an impact on perception and interpretation of the world. In this context, the world of meaning created by the individual in his relationship with nature also affects his mood. The aim of the study was to examine the relationships between nature and moods of individuals participating in eco-recreational activities.

Methods

The study group of the research comprised 314 people aged between 18-45, selected by random sampling method. In addition to the personal information form created by the researcher for data collection, "Relationship with Nature scale" developed by Terry et al. (1999; 2003) and adapted to Turkish by Soylu et al., (2021) and "Being Related to Nature" scale developed by Nisbet, Zelenski and Murphy (2009) to determine the level of adults' relationship with nature was used. The hypotheses created within the scope of the research were tested using t-test for independent samples, ANOVA and Pearson Correlation analysis methods.

Results

As a result of the findings, no significance was determined between the participants' relationship with nature and their mood according to the gender variable ($p > 0.05$). On the other hand, it was observed that the state of being in touch with nature and the mood levels of individuals participating in eco-recreational activities were positively related ($p < 0.05$).

Discussion & Conclusion

It is thought that eco-recreational activities have many positive effects on individuals. Especially in the age of technology and speed, exercise/physical activities performed in touch with nature in order to engage in mental activity on an event or phenomenon, make strategic decisions and relax the body are considered important for the good mood of individuals.

Keywords: ecorecreation, activity, nature, mood

ANALYSIS OF DIFFERENCES IN MORPHOLOGICAL CHARACTERISTICS AND MOTOR-FUNCTIONAL ABILITIES IN JUNIOR DANCERS

Velibor Srdić

Pan-European University "Apeiron", Banja Luka, Bosnia and Herzegovina

UDC 796.012.2:793.3-053.6

Summary

The research was conducted on a sample of 84 subjects - young dancers of both sexes, aged 11-16 years old, randomly divided into two groups, the experimental group (N = 44) with whom a three-month experimental program was implemented and the control group (N = 40) who trained according to the standard dance program. The respondents were recruited from 4 different dance academies.

The research used 15 morphological variables, 8 motor variables, 7 functional variables and 1 variable used to assess the level of success in performing specific movement structures in dance so that together they form a battery of 31 measuring instruments.

The main goal of the research was to determine the differences in morphological characteristics, motor and functional abilities between the experimental and control group of subjects - juniors in dance in the initial and final measurements.

To determine the differences between the experimental and control groups of subjects in the initial and final measurements at the multivariate level, a multivariate analysis of variance was applied (MANOVA). For each applied variable, at the univariate level, differences were tested for dependent and independent samples (ANOVA), which can occur through two time points (initial and final measurement), as well as differences between the control and experimental groups in the initial and final measurement.

The obtained results point to the conclusion that there were statistically significant differences between the subjects of the experimental and control groups in the final measurement and globally they are somewhat greater in favor of the experimental group.

Keywords: experimental program, dance, morphological characteristics, motor abilities, functional abilities

IMPACT OF MORPHOLOGICAL CHARACTERISTICS AND MOTOR-FUNCTIONAL ABILITIES ON THE EFFICIENCY OF PERFORMING MOVEMENT STRUCTURES IN DANCE AMONG YOUNG DANCERS

Velibor Srdić¹ and Osmo Bajrić¹

¹ Faculty of Sports Sciences, Pan-European University "Apeiron",
Banja Luka, Bosnia and Herzegovina

UDC 796.012.2:793.3-053.6

Summary

The goal of the research was to determine the significance and relative size of the influence of morphological characteristics, motor and functional abilities marked as an input or predictor set on the effectiveness of the implementation of a composite test in dance that serves to assess the success in the realization of dance structures of movement in dance, marked as an output or criterion set.

The sample of respondents consisted of 84 young dancers of both sexes aged 11-16 from The respondents were recruited from 4 different dance academies. The research used a set of 15 variables for the assessment of morphological characteristics, a set of 8 variables for the assessment of motor abilities and a set of 7 variables for the assessment of functional abilities marked as a predictor set and a composite test that assessed the level of success in the performance of dance movement structures marked as a criterion.

To determine the significance and relative size of the influence of morphological characteristics, motor and functional abilities marked as a set of predictors on the efficiency of the implementation of the composite test in dance, which serves to assess the success in the realization of dance structures of movement in dance, marked as a criterion, a regression analysis was applied.

The obtained results of the regression analysis show a statistically significant influence of the selected predictor variables on the success in the realization of dance movement structures ($R = 0.76$). The results of the research provided useful information about the most informative morphological characteristics and motor-functional abilities for success in the performance of specific dance structures, and thus their role for success in dance.

The obtained research results can serve as a significant orientation in better programming of training work in dance with young dancers, which must be taken into account in the selection of training activities when programming training work.

Keywords: dance, subjects, morphological characteristics, motor and functional abilities, regression analysis

ANALYSIS OF FACTORS THAT INFLUENCE SUCCESS IN HANDBALL

**Vladimir Ristić¹, Uroš Nikolić¹, Rade Jovanović², Anja Obradović³
and Danijela Ljubojević⁴**

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

² Department of physical education, Medical faculty, University of Niš, Serbia

³ Faculty of sport and physical education, University of Novi Sad, Serbia

⁴ Institute for Educational Research, Beograd, Serbia

UDC 796.325

Introduction

Handball is an aerobic-anaerobic sport, of acyclic character, where the collective success is given contribution by physically well-prepared and technically trained individuals, who are tactically integrated into a whole that constitutes a team (Ferrari, Sarmiento & Vaz 2019). The analysis of handball game mechanics is a complex and multidisciplinary task that encompasses the elements of technique, tactics, biomechanics, kinematics, physics and psychology.

The aim of this research is to review the available literature which pertains to the analysis of the success factors influencing the game of handball.

Methods

To collect previous research pertaining to the „analysis of success factors influencing handball”, all available written literature will be reviewed, as well as the following electronic databases: PubMed / Medline, Google Scholar, SCIndeks, DOAJ - Directory of Open Access Journals. Academic papers, in the time period from 2000 to 2023, we used as a filtering factor. The databases were searched by way of using the following keywords: "handball performance", "match analysis handball", "game analysis in handball", "statistics in handball", "tactical analysis in handball".

Results

With offense as the main point of study, a group of authors states that the dominant factors are the shooting percentages success from the 6 and 9-meter line and the success percentage of the attack against an unorganized opponent defense. In addition, some research papers emphasize the dominant role of offensive back players in deciding match outcomes. On the other hand, having in mind factors that lead to successful defense, authors found a correlation between controlled aggressiveness and success. Controlled aggressiveness is characterized by an increased number of defensive fouls in the 9-meter zone, which did not require an additional penalty. (Bilge, 2012; Hatzimanouil et al. 2017).

Discussion & Conclusion

By analyzing, classifying and processing the selected papers, it is difficult to single out a single most successful and dominant model which confidently leads to success in handball. According to some authors, the offensive is the dominant factor, others emphasize defense, while the latest research by some authors points to counter offensives and offensives against an unorganized opponent defense as leading factors that contribute to success in handball. (Gryko et al, 2018; Meletakos & Bayios, 2010).

References

1. Ferrari, W. R., Sarmiento, H., & Vaz, V. (2019). Match analysis in handball: a systematic review. *Montenegrin Journal of Sports Science and Medicine*, 8(2), 63-76.
2. Hatzimanouil, D., Giatsis, G., Kepesidou, M., Kanioglou, A., & Loizos, N. (2017). Shot effectiveness by playing position with regard to goalkeeper's efficiency in team handball. *Journal of Physical Education and Sport*, 17(2), 656.
3. Gryko, K., Bodasiński, S., Bodasińska, A., & Zieliński, J. (2018). Offensive and Defensive Play in Handball in a 2-Year World Championship Cycle: Characteristics and Tendencies. *Polish Journal of Sport and Tourism*, 25(3), 10-16.
4. Meletakos, P., & Bayios, I. (2010). General trends in European men's handball: a longitudinal study. *International Journal of Performance Analysis in Sport*, 10(3), 221-228.

Keywords: handball performance, game analysis in handball, handball game

TREATMENT OF LOW BACK PAIN WITH DIFFERENT METHODS: A SYSTEMATIC REVIEW AND META-ANALYSIS

**Vanja Dimitrijević¹, Bojan Rašković¹, Nikola Jevtić², Dejan Viduka³,
Nachiappan Chockalingam⁴, Patrik Drid¹ and Borislav Obradović¹**

¹ Faculty of Sports and Physical Education, University of Novi Sad, Novi Sad, Serbia,

² Scolio Centar, Novi Sad, Serbia,

³ Faculty of Applied Management, Economics, and Finance in Belgrade,

University of Business Academy, Novi Sad, Serbia,

⁴ Centre for Biomechanics and Rehabilitation Technologies, Staffordshire University, UK

UDC 615.8

Introduction

Back pain is the most common musculoskeletal cause of physical problems. In the West and throughout the world in the second half of the 20th century low back pain (LBP) is one of the main problems of the health care system. The goal of our research is to determine the effects of applying various conservative (non-surgical) treatments, mostly based on the use of certain motor movements (exercises), on patients with LBP using a meta-analysis.

Methods

This study has been developed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement. Our systematic search included the PubMed, Cochrane Library, Web of Science, and Google Scholar databases searched in January 2023 under PROSPERO registration number: CRD42022371282. The key search terms were: "Low back pain", "Back pain", "SF-36", "VAS", "VASP", "Roland-Morris", "Oswestry Disability Index", and "conservative treatment". The risk of bias was determined for each randomized trial using the Cochrane Risk of Bias Tool, and the methodological index for non-randomized studies (MINORS). The outcomes included SF-36 Mental, SF-36 Physical, VAS, Roland-Morris, and Oswestry Disability Index. R 4.0.5 software was used, and standardized mean difference (SMD) and 95% confidence intervals (CI) were calculated for continuous outcomes, random model.

Results

Twenty-five studies were included. Depending on the outcome being measured, the effect size of different methods in treating low back pain varies from small to large as follows: SF-36 Mental (SMD = 0.39, $p < 0.0001$), SF-36 Physical (SMD = 0.55, $p < 0.0001$), VAS (SMD = -0.84, $p < 0.0001$), Roland-Morris (SMD = -0.45, $p < 0.0001$), and Oswestry Disability Index (SMD = -0.61, $p < 0.0001$).

Discussion & Conclusion

This meta-analysis is the only such study that evaluated the effect size of different low back pain treatment methods based on these outcomes. Previous meta-analyses address LBP problems, however, these meta-analyses were not designed to evaluate the effect size according to the outcomes; SF-36 Mental, SF-36 Physical, VAS, RM, and ODI. This meta-analysis indicates the positive effects of applying different methods in the treatment of low back pain. The biggest limitation of our study is that we did not perform any subgroup analysis, and this will be our biggest incentive for future research.

References

1. Coulter, I. D. et al. Manipulation and mobilization for treating chronic low back pain: a systematic review and meta-analysis. *Spine J.* 18, 866–879 (2018).
2. Franke, H., Franke, J. D. & Fryer, G. Osteopathic manipulative treatment for nonspecific low back pain: A systematic review and meta-analysis. *BMC Musculoskelet. Disord.* 15, (2014).
3. Hu, H. T. et al. Is dry needling effective for low back pain? *Med. (United States)* 97, (2018).
4. Quentin, C. et al. Effect of home exercise training in patients with nonspecific low-back pain: A systematic review and meta-analysis. *Int. J. Environ. Res. Public Health* 18, (2021).
5. Searle, A., Spink, M., Ho, A. & Chuter, V. Exercise interventions for the treatment of chronic low back pain: A systematic review and meta-analysis of randomised controlled trials. *Clin. Rehabil.* 29, 1155–1167 (2015).
6. Kim, B. & Yim, J. Core stability and hip exercises improve physical function and activity in patients with non-specific low back pain: A randomized controlled trial. *Tohoku J. Exp. Med.* 251, 193–206 (2020).

Keywords: Low back pain, SF-36, VAS, Roland-Morris, Oswestry Disability Index, Meta-analysis

THE INFLUENCE OF PHYSICAL TRAINING ON ATHLETIC PERFORMANCE AND INJURY PREVENTION IN YOUTH SPORTS

Yang Huipeng¹ and Zeyu Liu¹

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

UDC 796.015:616.001

Abstract: This paper examines the substantial influence of physical training on athletic performance and injury prevention in youth sports. Recognizing the increasing popularity of youth sports and the corresponding rise in injury rates, the paper emphasizes the critical need for proper physical training to not only enhance performance but also mitigate injury risks. It begins by analyzing the role of physical training in youth athletic development, emphasizing aspects such as strength, flexibility, endurance, coordination, and balance. It further delves into the specific components of training regimes, including warm-ups, cool-downs, skill development, strength and conditioning programs, and rest periods, that are crucial for optimizing performance and preventing injuries. The paper also highlights the implications of overtraining and specialization at an early age, drawing attention to their potential for causing physical and psychological harm. Furthermore, it explores the positive long-term impacts of effective physical training, including lifelong fitness, reduced risk of chronic diseases, and the development of a healthy relationship with physical activity. The research concludes with recommendations for coaches, parents, and youth athletes on creating balanced, age-appropriate, and safe training programs.

Keywords: injury prevention, youth, strength and conditioning, overtraining, fitness

TRAINING PROGRAM FIRST STAGE IN THE RECOVERY OF AN ATHLETE (SWIMMER) AFTER MYOCARDITIS - A CASE REPORT

Yuliyana Zlatkova¹ and Krasimira Zlatkova¹

¹ South-West University "Neofit Rilski", Blagoevgrad, Bulgaria

UDC 612.2:797.2

Summary

The coronavirus infection can affect different organs and systems. One of the most common complications are myocarditis. Swimming is a sport that requires good functioning of the respiratory and cardiovascular systems. Monitoring the response of the cardiovascular system to exercise can be followed with various tests such as the treadmill test, the Martinet test and the Lean test. The purpose of this report is to present a program for restoring the functional capabilities of the cardiovascular system in an athlete (swimmer). The program we implement includes running and climbing stairs. The duration of the applied program is 17 days. During the first 8 days, the load includes running 2 km, and climbing 63 steps with a height of 14 cm. During the remaining 9 days, the subject runs 5 km and climbing of 126 steps. The heart rate is monitored before training, immediately after it and in the first, second and third minutes. The time for which the distance is covered is also tracked. Before the intensive training, the ejection fraction was 60%, and then – 62%. According to the treadmill test, the patient recovered the values of arterial pressure and heart rate at the 4th minute. The applied Martinet test shows a recovery of the values again at the 4th minute. In the Lian test, the score equates to poor cardiovascular health. The application of running exercises and exercises on stairs leads to adequate training of the cardiovascular system. The functional condition and endurance to load improves.

Keywords: cardiovascular system, myocarditis, test, heart rate, blood pressure

FITNESS TRACKERS - VALID TECHNOLOGY OR ADVANCED MARKETING?

Zoran Milanović^{1,2,3}, Nenad Stojiljković¹, Ljubomir Pavlović^{1,2},
Vladimir Antić¹ and Nemanja Stanković¹

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

² Science and Research Centre, Institute for Kinesiology Research, Slovenia,

³ Faculty of Sports Studies, Masaryk University, Czech Republic

UDC 796.015.132

Introduction

Wearable activity trackers have increased in popularity over the past decade due to their multiple benefits, such as low-cost, user-friendly interface and health promotion. Many of them are designed to support behaviour changes and increase physical activity, one of the major problems of modern society. In line with that, the global wearable activity tracker market reached \$2.8 billion in 2020 (Ferguson et al., 2022), with a continuous increase each year. But do all roads lead to Rome? The scientific and medical communities show scepticism about the validity and effectiveness of some commercially available wearable activity trackers. Therefore, the purpose of this study was to determine the validity of the most popular wearable activity trackers for step counts in different conditions.

Methods

Thirty-three participants (Mean±SD Age: 21.56±3.22 yrs; body height: 178.42±9.58 cm; body weight: 72.80±14.11 kg; BMI: 22.67±2.65 kg/m²) were included in this study. The average stride length of the participants was 71.75±9.59 cm. Each participant performed three bouts of treadmill walking at a different speed, including a slow pace (3.22 km/h), moderate pace (4.83 km/h), and fast pace (6.44 km/h) (Ainsworth et al., 2000). Each stage lasted 5-min with 1-min passive rest period between each velocity. Wearable activity trackers were mounted according to the instructions provided by the manufacturer; therefore, Polar V800 was placed on the right hand (wrist position), Omron HJ-203-EK was worn in pant's pocket, attached to the hip and around the neck, the mobile was worn in right or left pocket for Accupedo and Pedometer app measurement, and Optojump bars were positioned on treadmill edge. In addition, one camera was installed next to the treadmill in case of disagreement between manual counters.

Results

A small, non-significant ($r=0.25$, $p<0.05$), correlation was observed between manual counting and the Omron pedometer placed in the pocket at a speed of 6.44 km/h. In addition, the Accupedo app showed weak steps correlation with manual counting at all speed conditions (3.22, 4.83, and 6.44 km/h). All other wearable activity trackers showed moderate to high correlation with manual counting at each speed level.

Discussion & Conclusion

Moderate to high validity and accuracy were observed for most tested wearable active trackers during standard walking speed. However, limited accuracy was evident for lower and higher speed testing conditions. The development of wearable technology should take into account standardized validation measures in different conditions, including both lab and free-living environments. In addition, manufacturers should emphasize testing conditions for their products because it impacts overall results.

References

1. Ainsworth, B. E., Haskell, W. L., Whitt, M. C., Irwin, M. L., Swartz, A. M., Strath, S. J., Emplaincourt, P. O. (2000). Compendium of physical activities: an update of activity codes and MET intensities. *Medicine and Science in Sports and Exercise*, 32(9; SUPP/1), 498-504.
2. Ferguson, T., Olds, T., Curtis, R., Blake, H., Crozier, A. J., Dankiw, K., Dumuid, D., Kasai, D., O'Connor, E., Virgara, R., & Maher, C. (2022). Effectiveness of wearable activity trackers to increase physical activity and improve health: a systematic review of systematic reviews and meta-analyses. *The Lancet. Digital health*, 4(8), e615–e626.

Keywords: fitness tracker, step counts, technology, validity

DIFFERENCE IN EXPLOSIVE STRENGTH BETWEEN TYPICALLY DEVELOPING CHILDREN AND CHILDREN WITH DEVELOPMENTAL DISABILITIES

Zvonimir Tomac¹, Zoran Špoljarić¹ and Matej Išasegi¹

¹ Faculty of Kinesiology, Josip Juraj Strossmayer University of Osijek, Croatia

UDC 796.012.2:159.922.76

Summary

The motor skills of children, including strength, speed, flexibility, coordination, precision, balance, and agility, play a crucial role in their physical development and bodily functionality. Children aged 7 to 11 go through a period of rapid development, shaping their motor, cognitive, social, and emotional skills. The aim of this study is to determine if there is a difference in explosive strength between typically developing children and children with developmental disabilities. The sample consisted of 56 participants aged 7 to 12, with an equal number of males and females. The sample included 40 typically developing children and 16 children with developmental disabilities attending the Ivan Štark Center for Education and Training in Osijek. The variables examined included morphological dimensions (height and weight) and three tests of explosive strength (standing long jump, 2kg medicine ball throw, 25-meter sprint). The research results indicate a statistically significant difference in the conducted tests, while there is no difference in morphological characteristics between the two groups.

Keywords: deficit, motor abilities, differences, students

MATERIAL AND SPACE EQUIPMENT OF PRIMARY AND SECONDARY SCHOOLS FOR THE IMPLEMENTATION OF PHYSICAL EDUCATION TEACHING

Živorad Marković¹, Antonio Antonov¹ and Jelena Jančić³

^{1,3} University of Kragujevac, Faculty of Education in Jagodina, Serbia

² National Sports Academy "Vassil Levski", Sofia, Bulgaria

UDC 371.311:796.02-053.5

Introduction

Physical education classes are in educational and extracurricular process significantly different from other school subjects, first by intensive motor activity of students. Physical education classes are held in very different conditions and hence with different results. The goal of this study was to research material and space conditions of primary and secondary schools, which condition the planning, and the realisation of programme contents of Physical education classes.

Methods

For the categorization of school building a six level scale was applied (Petrovic et al., 1995). The sample consisted of 30 primary schools with 15524 students and 25 secondary schools with 20172 students from the region of Sumadija and Pomoravlje.

Results

The greatest number of primary and secondary schools with their material space equipment belong to the third and the fourth category. Only 30.01% of observed primary schools and 40.00 % of secondary schools belong to the first and the second category where teachers can plan and realise all Physical Education programme contents.

Discussion and Conclusion

The fact that worries is that only 20.00 % of primary and 40.00 % of secondary schools have a big gym for Physical Education, while not all other schools have even outdoor courts. The courts in primary schools have mostly concrete floor, while in secondary schools, asphalt floor. The realisation of programme contents in athletics is partially conditioned by contemporary situation that only 10.00 % of primary and 8.0 % of secondary schools have athletic 200-metre lane, long jump pit, and shot put court. A very small number of schools has free space. The problem also exists with equipment storage room, changing rooms and teachers cabinets. The general conclusion is that the situation in schools has not been changed since 1995. The equipment of school buildings for the Physical Education classes demands attitudes and the participation of students in the realisation of programme contents of Physical Education classes.

References

1. Marković, Ž. (2016). Material spacious conditions of the buildings for the realization of physical education. In G. Cirovic (ed.), *International Monograph Sports Facilities – Modernization and Construction – SPOFA 16* (pp. 238–250). Belgrade: University of Belgrade, Faculty of Sport and Physical Education.
2. Petrović, Z., Kebin, V., Ban, D. (1995). Kategorizacija školskih objekata za fizičko vaspitanje. *Fizička kultura*, (3-4), 249–254.
3. Subić, S. (2016). *Strateški pravci razvoja školske sportske infrastrukture u Republici Srbiji*. Beograd: Fakultet organizacionih nauka

Keywords: material space conditions, primary school, secondary school, physical education class

Author index

A

Abbas Ali · 98
Adam Kyselica · 25
Adem Preljević · 85
Ahmet Yasuntimur · 45
Aleksandar Borisavljević · 84
Aleksandar Nedeljković · 66
Aleksandar Raković · 114
Aleksandar Stamenković · 29, 113
Aleksandra Aleksić Veljković · 26, 27
Aleksandra Catić Đorđević · 111
Aleksandra Ilić · 110, 111
Alina Ababei · 30
Amador Garcia-Ramos · 66
Amel Mekić · 97
Ana Lilić · 43
Ana Penjak · 39
Ana Sršen · 79
Ana Stanković · 114
Anastasija Kocić · 70, 73
Anđela Đošić · 34, 88
Andrea Marković · 32, 53
Andrijana Zafirovska Misovski · 77
Anja Lazić · 35, 37
Anja Obradović · 32, 122
Anja Petrović · 118
Antonio Antonov · 131
António J. Figueiredo · 17
At. Andreev · 40
Ayten Altunsaray · 41
Azize Bingöl Diedhiou · 41

B

Barbara Gilić · 80
Benin Murić · 76, 108
Bojan Jorgić · 45, 113
Bojan Rašković · 106, 124

Borče Daskalovski · 81
Boris Popović · 51
Borislav Obradović · 106, 124
Borko Katanić · 26, 85
Boro Štrumbelj · 79
Boštjan Jakše · 80
Božidar Marović · 55, 99
Branislav Majkić · 42, 43
Bülent Duman · 44
Burak Gönültaş · 45

C

Călin Miron · 93
Cătălina Ababei · 46
Cristina Cadenas-Sánchez · 35

D

Damir Pekas · 48
Danica Janičijević · 66
Daniel Stanković · 50, 114
Danijela Ljubojević · 32, 122
Danijela Živković · 34, 88
Danilo Radanović · 51
Dejan Joksimović · 51
Dejan Madić · 79, 106
Dejan Viduka · 124
Delia-Nicoleta Ochiană · 62
Dimitar Nikolov · 100
Dino Mujanović · 115
Dominik Mateo Rončević · 69
Dorica Šajber · 80
Doroteja Rančić · 32, 53
Dragan Klisarić · 89
Dragan M. Mirkov · 70
Dragan Marinković · 51, 106
Dragan Nejić · 77
Dragan Radovanović · 54
Dragana Berić · 37

Draženka Mačak · 56
Dušan Đorđević · 55, 99
Dušan Nikolić · 82
Dušan Stanković · 35, 56

E

Elzan Bibić · 58
Emel Gökmen · 86
Emilija Petković · 60
Emre Yamaner · 86

F

Fatma Celik Kayapinar · 68
Fatma Nese Sahin · 114
Filip Nurkić · 96, 97

G

Gabriela Ochiană · 62, 64
Goran Dimitrić · 80
Goran Janković · 66
Goran Nikovski · 81
Gulseren Yurekli · 68

H

Hamza Küçük · 98
Hrvoje Ajman · 69

I

I. Kolev · 40
Ig. Zazirnyi · 40
Igor Jelaska · 39
Igor Nurkić · 96, 97
Igor Tomić · 72
Ilma Čaprić · 76, 85
Ismail Ilbak · 45
Iva Macan · 112
Ivan Čuk · 73
Ivan Ivanov · 87
Ivana Anđelković · 75
Ivana Bojić · 85
Ivana Đorđević · 60
Izet Kahrović · 76, 108

J

Jelena Aleksić · 70
Jelena Žanić Mikuličić · 39
Josip Cvenić · 71
Joško Milenkoski · 77

Jovan Radenković · 117
Jovica Petković · 109
Jovica Peulić · 26

K

Kamenka Živčić · 27
Katarina Herodek · 27
Katarina Nejić · 77
Katarina Praznik · 79
Klara Findrik · 112
Klara Šiljeg · 83
Kosta Goranović · 109
Krasimira Zlatkova · 127

L

Laura Capranica · 19
Lidija Marković · 51
Ljiljana Bjelaković · 88, 118
Ljubomir Pavlović · 128
Lora Kostić · 43
Lucija Faj · 70, 71
Lucija Milčić · 27
Luka Radosavljević · 42

M

Marija Grujić · 73
Marin Marinović · 112
Mario Baić · 48
Marko Aleksandrović · 45, 72
Marko Cosic · 66
Marko Đurović · 79, 80
Marko Grujić · 73
Marko Gušić · 56
Marko Joksimović · 109
Maša Antonijević · 81, 82
Matej Išasegi · 43, 130
Mia Perić · 79
Mihaela Ciubotariu · 95
Mila Jovanović · 82
Mila Manić · 113
Mila Vukadinović Jurišić · 42
Milan Cvetković · 51
Milan Zelenović · 55, 118
Milivoj Dopsaj · 83, 84
Miljan Hadžović · 72, 113
Miloš Ignjatović · 102
Miloš Paunović · 55, 99

Milos R Petrović · 66
Milovan Bratić · 90
Mima Stanković · 55, 85
Mine Turгут · 86, 119
Miodorag Kocić · 37
Miodrag Spasić · 106
Mirsad Nurkić · 97
Mladen Živković · 34, 111

N

Nachiappan Chockalingam · 124
Nada Šakotić · 72
Nadia Antonova · 87
Nataša Branković · 58
Nataša Jovanović · 26
Nataša Zelinčević Vukajlović · 102
Nebojša Randelović · 34, 88
Nebojša Trajković · 48, 102
Neda Karaleić · 43
Nemanja Samardžić · 89
Nemanja Stanković · 101, 128
Nenad Stojilković · 90, 128
Nese F. Sahin · 60
Nese Sahin · 98
Nicolae Ochiană · 93, 95
Nikola Ćirić · 50
Nikola Foretić · 106
Nikola Jevtić · 124
Nikola Majstorović · 84
Nikola Maksimović · 70
Nikola Manolopoulos · 51
Nikola Milošević · 96, 97
Nikola Simonović · 32
Nikola Stojanović · 92
Nuri Berk Güngör · 44

O

Oliver Radenković · 76, 85
Olivera M. Knežević · 70
Omer Špirtović · 76, 108
Osma Bajrić · 121
Ozana Brkić · 71
Ozkan Guler · 98
Ozkan Isik · 98

P

Patrik Drid · 106, 124

Petar Mitić · 92
Petar Veličković · 55, 99
Polina Tsonkova · 100
Predrag Ilić · 101

R

Rade Jovanović · 102, 122
Radovan Gladić · 106
Radu Ababei · 46
Raid Mekić · 76, 108
Ranko Rajović · 21
Rašid Hadžić · 109
Rifat Mujanović · 115
Robert Marčun · 80
Romina Herodek · 110, 111

S

Sally Salam · 98
Sara Aščić · 112
Sára Kocourková · 25
Sara Perković · 96, 97
Saša Bubanj · 56, 117
Saša Milenković · 81, 113
Saša Pantelić · 34, 88
Saša Veličković · 99
Slađan Karaleić · 75
Slađana Stanković · 32
Slavoljub Uzunović · 27, 55
Slobodan Andrašić · 51
Sonja Antonijević · 81, 82
Sorin Bereş · 64
Špela Bogataj · 37
Sreten Marković · 115
Stefan Đorđević · 82, 113
Stefan Mijalković · 81, 114
Stefan Pivač · 56, 117
Stefan Stojanović · 45, 53
Stevan Stamenković · 29

T

Tamara Ilić · 53
Tijana Purenović-Ivanović · 34, 118
Tomislav Okičić · 42, 80

U

Ümran Sarikan · 86, 119
Uroš Nikolić · 122

V

Vanja Dimitrijević · 124
Velibor Srđić · 120, 121
Vladan Milić · 85
Vladan Savić · 77
Vladimir Antić · 92, 128
Vladimir Ristić · 102, 122
Vukašin Rajković · 92

Y

Yang Huipeng · 126
Yuliyana Zlatkov · 127

Z

Zeyu Liu · 126
Živorad Marković · 131
Zoran Milanović · 42, 128
Zoran Špoljarić · 69, 130
Zülbiye Kaçay · 44, 119
Zvezdan Savić · 88, 92
Zvonimir Tomac · 130

J

Jelena Jančić · 131

CIP - Каталогизација у публикацији
Народна библиотека Србије, Београд

796/799(048)

SCIENTIFIC Conference "FIS Communications 2023" in physical education, sport and recreation (24 ; 2023 ; Niš)

Book of Abstracts / XXIV Scientific Conference "FIS Communications 2023" in physical education, sport and recreation, (Niš, Serbia, october 19-21, 2023) ; [editor in chief Nenad Stojiljković]. - Niš : Universtity, Faculty of sport and physical education, 2023 (Niš : Medivest). - 136 str. ; 21 cm

Tiraž 100. - Str. 6: Foreword / Nenad Stojiljković. - Bibliografije uz pojedine apstrakte.

ISBN 978-86-81474-26-6

а) Спорт -- Апстракти б) Физичка култура -- Апстракти

COBISS.SR-ID 128102921

