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### Publisher's Note

Dear Friends,

Welcome to the second annual edition of the "LASE Journal of Sport Science" in 2011. Every year, the Latvian Academy of Sport Education (LASE) is issuing the following two journals. This year for the institution of higher education is special, because at the beginning of the academic year we celebrated its 90<sup>th</sup> anniversary. During the year, we evaluated what has been done in the preparation of sports education specialists and in the development of Sports Science in Latvian and European context. In honour of the 90<sup>th</sup> anniversary of LASE we have organized the International Scientific Conference in Sport Science.

Although the journal is published just for two years, we have observed a great interest from both the practitioners, who study it and integrate the innovations of sport achievements, sport education and health care in their practice, and young sports scientists, who publish their original research in this sports science edition. We are glad to see the increasing competition of submitted works; hence the editorial board has the opportunity to select the best manuscripts for the publication in the journal.

Our higher education institution promotes the cooperation of young scientists and doctoral students with other European universities, thus emerging the generation of inter-university research and publications. We also welcome the idea that second PhD work supervisors of several our PhD students are from abroad. Based on the International Promotion Council in Sport Science, which is currently operating in LASE, students can obtain a PhD degree in different disciplines.

I express my deepest gratitude both to manuscript reviewers and to international journal publishing commission for their great efforts in the preparation of the two journal editions in 2011.

On behalf of the Journal Editorial Board,  
Prof. Juris Grants

## MUSCLE STRENGTH CHARACTERISTICS OF LATVIAN WEIGHTLIFTERS IN SINGLE JOINT MOVEMENTS

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### Abstract

*In the world the weightlifters training process includes development of muscular strength as very important of sportsmen physical condition. In scientific literature can be found guidances of overall muscle strength development, but there is lack of information about research of various muscle strength characteristics. Nowadays, it is technically possible to determine the physical work capacity in reciprocating movements of the joints in the laboratory and obtain standardized data. The aim of our study was to determine peak torque peculiarities of various muscle groups flexors and extensors of Latvian weightlifters comparing with sportsmen of different kind of sports. In the study was investigated the maximal torque in following movements: leg, thigh, torso, upper arm, forearm and foot flexion and extension. Study results were processed by methods of mathematical statistics and Pearson correlation coefficient. There has been found medium correlation between the torso and feet flexors ( $r=0.642$ ), as well as feet extensors ( $r=0.556$ ) and with the combined maximal torque ( $r=0.598$ ). By contrast, the torso extensors are closely related to the thigh flexors ( $r=0.758$ ), as well as medium correlation was observed between the forearm flexors and extensors ( $r=0.555$  and  $r=0.561$ ). Studying the experimental results we concluded that the leading muscle groups of Latvian weightlifters are the torso, thigh and lower leg extensors and foot flexors, this conclusion was approved by contribution of these muscle groups in absolute (56.7%) and relative (56.6%) sum of torque of all muscle groups. So, the essential in weightlifting snatch and clean jerk movements performance of Latvian athletes are level of torque development of torso, thigh, lower leg flexors and foot extensors.*

*In the study we analyzed only the middle and strong correlation results of the maximum torque in test movements. The obtained results of muscle torque in selected Latvian weightlifters muscle movements can be used as a guideline for athletes' training programs individualization as weightlifters model-characteristics. If there is observed insufficient level of strength development in certain muscle groups, related to execution of weightlifting competition exercises, then obtained results of the experiment should be included in training process.*

**Key words:** *muscles, peak torque, dynamometer, weightlifter, isometric force*

## **Introduction**

There is worldwide acceptance that the optimal level of muscle strength development is one of the main foundations of high results in sport (Brown, 2000). Various muscle strength characteristics are one of the athletes most objective physical condition and physical fitness indicators. Analysis of literature source shows that these characteristics according to weightlifters are studied insufficiently (Виноградов, 2009; Frolovs, Krasovs and Upmalis 1987; Zawieja-Koch).

Nowadays, it is important to determine the most effective means of physical work capacity incensement for weightlifters. As the new physical capacity monitoring tools, who simulates single joint reciprocating movements, appears, the study was started in Muscle functional diagnostic center of Latvian Academy of Sport Education, so it were sought to clarify the effectiveness of weightlifters testing program and develop recommendations for weightlifters. The key in this process was to provide development of athletes strict physical readiness direction and to form variety of possible actions of strength development forms.

During experiment the test movement must be sufficiently prolonged for athlete to have time for reaching maximum strength. The time needed to reach the peak torque in studied movement is mainly adjective of isometric testing system flexibility, the athlete's individual characteristics and applied recommendations of execution of necessary muscle contractions. Typically 5 sec lasting isometric contractions allows for almost all the performers to achieve the peak torque (Hood and Forward, 1965; Murray et.al., 1977).

Therefore testing protocols in experiment includes contractions form 2 to 5sec (Andersen and Henckel, 1987). As 5sec are required to reach maximal isometric strength, then it is possible to reach 90% of maximal isometric strength in period of time less than 2sec (Hakkinen, Alen and

Komi, 1985). Analogically reaching maximal peak torque remains for 1sec or less (Hislop, 1963; Murray, 1977).

Following literature sources (Lunnen, Yack and Le Veau, 1981), determination of athletes body position for appropriate joint testing, the angle of motion and angle of joint in tested movement must be standardized. Accordingly, there will be established the means to artificially prevent distorting factors for weightlifters to execute movement with the minimum disruption as result of applying technical means.

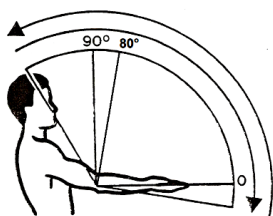
The aim of our research was to determine peak torque peculiarities of various muscle groups flexors and extensors of Latvian weightlifters comparing with sportsmen of different kind of sports.

## Material and methods

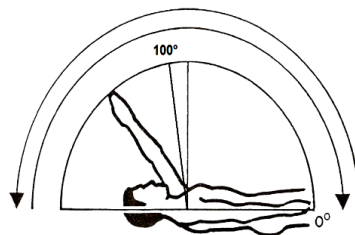
Monitoring of muscles isometric force was carried out on 16 Latvian weightlifters. Athletes training experience was in average  $7.5 \pm 0.7$  years, average age of athletes  $20.5 \pm 1.2$  years, average weight  $58 \pm 4.6$ kg, height  $169.4 \pm 3.5$ cm.

To determine peak torque of 12 muscle groups – upper arm, forearm, thigh, shin, foot and body flexors and extensors – polidynamometric method was used, performed on system REV 9000 (Technogym Italy). Determination of muscle peak torque was held out in the Muscle functional diagnostic center of Latvian Academy of Sport Education from June 2010 till September 2010.

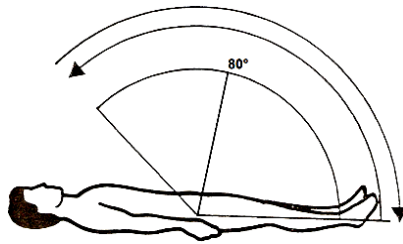
In our research testing of peak torque of flexion and extension movement provided standardization of joint angle (see fig. 1-7), as strength can significantly vary in all amplitude of movement. Practically, joint angle was chosen by the maximal level of torque are close to it in motion amplitude curve.



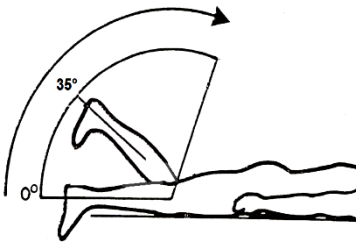
**Figure 1.** Isometric tension of forearm flexors and extensors in angle of 80° (Catani, 1992)



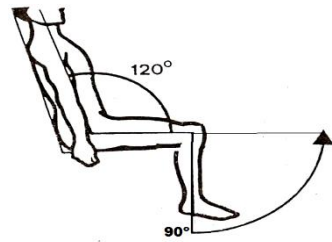
**Figure 2.** Isometric tension of upper arm flexors and extensors in angle of 100° (Catani, 1992)



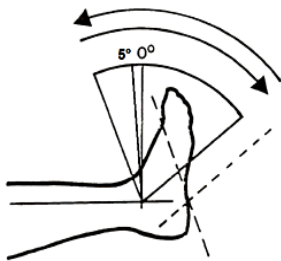
**Figure 3.** Isometric tension of lower extremity flexors and extensors in angle of  $80^0$  (Catani, 1992)



**Figure 4.** Isometric tension of shin flexors in angle of  $35^0$  (Catani, 1992)



**Figure 5.** Isometric tension of shin extensors in angle of  $90^0$  (Catani, 1992)



**Figure 6.** Isometric tension of foot flexors and extensors in angle of  $5^0$  (Catani, 1992)



**Figure 7.** Isometric tension of body flexors and extensors in angle of  $90^0$  (Catani, 1992)

Test protocol begun with stretch movements of muscles flexors and extensors for 5min, 8 minutes warm-up with free motions and 3min special warm-up performed in isokinetic dynamometer REV-9000.

Determination of optimal position in choosed joints can be discutable question.

Test protocol also included three pre-test muscle contractions (Murray et.al. 1980).



Best repeat was chosen as measurement of peak torque (Andersen and Henckel, 1987). Rest periods between sets lasted for 1 minute.

Instructions given to athletes according to performed contraction could affect results of isometric strength test. Considering intensity of strength development where explosive contraction was needed, the main parameter in our experiment was peak torque. Obtained results were processed with methods of mathematical statistics, by the Microsoft Excel addon „Statistics”. For comparison of weightlifters single joint movements with results of sportsmen of other individual kind of sports, we used results, obtained by scientists in previous researches (Баршай, 1973; Малинский, 1999; Дворкин, 2003; Frolovs, Krasovs and Upmalis, 1987).

Results

Correlation analysis of absolute strength between different muscle groups of Latvian weightlifters showed following: there was recognized strong correlation between peak torques of upper extremities as mutually, as between peak torques of lower extremities and body (table 1).

Table 1.

Correlation between peak torques of separate muscle groups of Latvian weightlifters (n=32; r=0,362; p<0,05)

N.	Muscle groups	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1.	Forearm flexors													
2.	Forearm extensors	0,710												
3.	Upper arm flexors	0,658	0,549											
4.	Upper arm extensors			0,630										
5.	Thigh flexors	0,627	0,534											
6.	Thigh extensors													
7.	Shin flexors	0,655												
8.	Shin extensors													
9.	Foot flexors													
10.	Foot extensors													
11.	Body flexors									0,642	0,556			
12.	Body extensors	0,551	0,561			0,758								
13.	Sum of muscle groups peak torque	0,704	0,748	0,667		0,622				0,616		0,698	0,547	

Peak torque of forearm flexors and extensors have strong correlation (correlation coefficient  $r=0,710$ ), forearm flexors and upper arm flexors have medium correlation ( $r=0,665$ ), forearm flexors and thigh flexors medium correlation ( $r=0,627$ ), forearm flexors and shin flexors medium correlation ( $r=0,655$ ) and forearm flexors and body extensors medium correlation ( $r=0,555$ ). Forearm extensors have medium correlation with upper arm flexors ( $r=0,549$ ), with thigh flexors ( $r=0,574$ ) and body extensors ( $r=0,56$ ).

Mentionable is also peak torque correlation between upper arm flexors and extensors ( $r=0,630$ ).

Importance of upper extremity muscles peak torque development of different weight category Latvian weightlifters is characterized with strong correlation between peak torque of forearm flexors and extensors; strong and medium correlation between upper arm flexors and sum of peak torque of all other muscle groups involved in experiment (correlation coefficients accordingly:  $r=0,704$ ;  $r=0,746$ ;  $r=0,667$ ).

Comparision between peak torque of Latvian weightlifters upper extremity muscles and acrobats, powerlifters, gymnasts and freestyle wrestlers with same sport level and experience, shows following results (table 2).

**Table 2.**

Indicators of different muscles peak torque of sportsmen of various kind of sports (Nm) (Баршай, 1973; Малинский, 1999; Дворкин, 2003; Frolovs, Krasovs and Upmalis, 1987)

Muscle group/Kind of sport	Weightlifting	Powerlifting	Acrobatics	Gymnastics	Freestyle wrestling
Forearm flexors	83Nm	85Nm	80Nm	90Nm	70Nm
Forearm extensors	100Nm	105Nm	70Nm	80Nm	65Nm
Upper arm flexors	265Nm	255Nm	190Nm	240Nm	160Nm
Upper arm extensors	350Nm	365Nm	300Nm	340Nm	240Nm

Peak torque of weightlifters muscles is slightly lower than powerlifters' muscles, except upper arm flexors, but higher than freestyle wrestlers and acrobats. Its related to higher upper extremity muscle work in heavy athletics kind of sports.

## Discussion

Analysis of competition exercise technique of Latvian weightlifters (Frolovs, Krasovs and Upmalis, 1987) shows, that main factor for Latvian weightlifters is development of body, thigh, shin extensors and foot flexors, which composes 56,7% of total sum of all muscle peak torque.

Same results were acquired by other scientists (Виноградов, 2009; Zawieja-Koch).

So relation between Latvian weightlifter peak torque of thigh flexors and extensors are 1:3,5; but of shin accordingly 1:3,6. Comparing the proportional relation between analog muscle groups of other kind of sports we can conclude, that specifics of weightlifting exercises stimulates increased development of mentioned muscle groups. For example, for freestyle wrestlers these relations for thigh is 1:0,7; but on shin - 1:2,1 (Малинский, 1999).

Moreover, there was found increasement of peak torque indicators of foot extensors versus flexors (1:2,7), but increasement of body flexor muscles peak torque versus extensors strength was 1:2,1. For Latvian weightlifters and freestyle wrestlers these proportions are respectively 1:4,1 and 1:3,4.

Analysis of correlation shows importance of relations between development of body extensors and flexors peak torque. There was found also medium correlation between body flexors and foot flexors ( $r=0,642$ ), also with foot extensors ( $r=0,556$ ) and sum of all muscle groups peak torque ( $r=0,598$ ). Otherwise, body extensors are related with thigh flexors ( $r=0,758$ ), as with forearm flexors and extensors ( $r=0,555$  and  $r=0,561$ ). Must be mentioned, that foot flexors, having great importance in weight bar push-up phase and jerk phase in weightlifting competition exercises, have medium correlation with sum of peak torque ( $r=0,616$ ).

## Conclusions

Latvian weightlifters are characterized with strong correlation of muscle peak torque of upper extremities as mutually, and between body and lower extremities muscle strength indicators.

Comparing development level of upper and lower arm flexor and extensor muscles peak torque, for weightlifters it is lower than acrobats, gymnasts, powerlifters peak torque, but higher than freestyle wrestlers with same physical condition.

Analyzing results of our research we found, that main muscle groups for Latvian weightlifters are body, thigh and shin extensors and foot flexors, which is approved by the total investment of these muscle groups in whole muscles peak torque absolute (56,7%) and relative (56,6%) indicators. So, the important role in snatch and clean&jerk for Latvian weightlifters are body, thigh, shin flexors and foot extensors strength moment development level.

As the weightlifting is individual kind of sport, obtained results of Latvian weightlifters in single joint movements can be used as base for individualization of sportsmen training program for modeling individual characteristics of weightlifters. If there is observed insufficient level of strength development in certain muscle groups, related to execution of weightlifting competition exercises, then obtained results of the experiment should be included in training process. Then it is possible to choose necessary means for each weightlifter individually, so the training plan can be improved by adding or excluding certain exercises from training plan of weightlifter.

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## ORIGINAL RESEARCH PAPER

# RELATIONSHIP BETWEEN SELF-RATED PHYSICAL ACTIVITY AND HEALTH OUTCOMES IN OLDER ADULTS

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## Abstract

*Inactive people are nearly twice as likely to develop heart disease as those who are more active. This study examines the relationships between self-rated physical activities (PA), heart risk assessments and health related quality of life (HRQOL) in older adults. 359 community dwelling adults aged 60-75 years were recruited for this study (63.5% - female, 36.5% - male). We used interviewer-administered International Physical Activity Questionnaire (IPAQ), short version, the Medical Outcomes Study, short form 36 item questionnaires (SF-36v2). For the measuring of objective health determinants we used the Heart Health Cabinet cardiovascular risk factors assessment data. Findings show that 49.0% of the respondents are "high" physical active, 30.4% are "moderate" and 20.6% have "low" PA level. The study results show high CVD risk. 73.6% of respondents have more than 10% risk of a cardiovascular event occurring over next 10 years. At this study we found out the statistically significant relationship between PA and HRQOL questionnaire SF-36 data (Pearson Correlation PA and PCS  $r=0.499$ ; PA and MCS  $r=0.578$ ;  $p<0.01$ ). The obtained data shows significant correlation between moderate domain of PA and health related variables (with systolic blood pressure  $r=-0.430$  and total cholesterol level  $r=-0.315$ ).*

**Key words:** cardiovascular risk, health related quality of life, older adults, physical activity.

## Introduction

The structure of modern society is changing. Population aging will have essential impact on social, economical and political issues. The United Nations Department of Economic and Social Affairs estimates that in 2006, 21 percent of Europeans were older than 60, but until 2050, nearly 34 percent will be above 60 years old (World Population Ageing 2009). Consequently, the age-related decline in physical and cognitive performance has been the focus of many studies. A general conclusion from this research seems to be that the maintenance of functional capacity, and thereby the independence of the older person, is beneficial for an individual and society alike. Demographic changes lead to the necessity to focus on the prevention of diseases and improving quality of life through nonmedical interventions such as physical activity.

Cardiovascular diseases (CVD) are the largest cause of death in Europe and account for approximately over 4.35 million deaths. It is nearly a half of all deaths (49%) in Europe (Petersen et al. 2005). Risk factors (inactivity smoking, high blood pressure, high blood cholesterol, overweight, and diabetes) greatly increase the chances of developing heart disease.

Physical inactivity (PA) is a modifiable risk factor for CVD and may cause variety of other chronic diseases. A recent systematic review shows the health benefits of physical activity for the reduction of chronic diseases, including hypertension, diabetes mellitus, obesity, cancer, bone and joint diseases, and depression. (Centers for Disease Control 1996). Recent updated studies findings have confirmed reductions in the risk of death from any cause and from cardiovascular disease (Sofi et al. 2008; Nocon et al. 2008).

Physical activity both reduces heart disease risk and enhances health related quality of life (HRQOL) that provides “successful aging”. Older adults’ participation in physical activity can also improve the quality of social life and facilitate independent living. Several authors are summarized the evidences of PA effects on HRQOL in systematic reviews and meta-analyses (McAuley et al. 2006; Netz et al. 2005; Rejeski 2001). Results from the 2001 Behavioral Risk Factor Surveillance System, which include a large sample with a wide range of physical and demographic characteristics, show that people achieving the recommended physical activity level had better physical, functional, social, and psychological well-being characteristics than their less active counterparts (Brown et al. 2003). Despite strong evidences about the benefits of regular physical activity for people of all ages, there is still a high rate of inactivity at the population.

According “Sporting habits of the inhabitants of the Republic of Latvia” survey data, 48.6% percent of Latvian population is not engaging in sport or regular physical activities and at the age group over 55 years it is 68.5% of respondents (SKDS 2007). There are still incomplete data of physical activity level in the over 60 age group.

This study examined the relationships between self-rated PA, health related variables and HRQOL in older adults.

## **Material and methods**

### ***Participants***

The random sampling from official national Population register is not possible according to Latvian legislation on protection of personal data. Thus, the sampling strategies were evaluated by availability and cost-effectiveness. The recruitment of volunteers who visited the Heart Health Cabinets across 5 Latvia regions for cardiovascular risk assessment was chosen. The study samples consisted of 359 respondents 60-75 years old. The mean age  $\pm$  SD of the participants was  $67.3 \pm 7.1$  years. 228 were female (63.5%) and 131 male (36.5%). The sampling diversity criteria (age, gender, place of residence) ensured that samples are a representative of population of Latvia at this age group.

### ***Physical activity***

To assess the level of physical activity we used International Physical Activity Questionnaire (IPAQ), short version (Craig et al., 2003). The items in IPAQ are structured to provide separate domain-specific scores for walking, moderate-intensity, and vigorous-intensity activity. All questions are referred to the previous 7 days. The results were presented as the estimation of energy expenditure in metabolic equivalent-minutes per week (MET-min/week). Although Ainsworth et al. (2006) point to the potential overestimates of the prevalence of the PA showed by the IPAQ, there are numbers of studies that confirm validity and reliability of questionnaire under different socio-cultural conditions in population based studies (Alexander et al., 2006; Hagstromer et al., 2006). The long IPAQ version consists of higher number of questions that increase the overestimating risk. The long version includes the job related domain that is not so relevant to senior population. Considering that reasons and taking into account of the IPAQ committee suggestions that the IPAQ short version is the format of preference for both national and internationally comparable prevalence studies (Craig et al., 2003) the questionnaire short version was chosen.



***HRQOL assessment***

Short form 36 version 2 (SF-36v2) is widely used as an extensive health related quality of life measurement. The SF-36 contains 36 items measuring 8 dimensions of health and well-being. These attributes are combined using a regression equation and standardized to population norms to provide a physical component summary (PCS) and a mental component summary (MCS) (Ware et al. 2000). This is a reliable and valid measure in community-dwelling elderly. Evidences for a high degree of internal consistency and construct validity were obtained in study of sample of 827 older adults (Lyons et al. 1994). A Latvian version of SF-36v2 was used in this study with the permission of the Medical Outcome Trust.

***Health-Related Variables***

The European Society of Cardiology has developed a risk score system (SCORE) using data from 12 European cohort studies covering a wide geographic spread of countries at different levels of cardiovascular risks. SCORE assessment consists of detecting cardiovascular diseases (CVD) risk factors. CVD risk factors assessment is based on untreated level of systolic blood pressure, cholesterol and glucose level, age and smoking status. All measurements were recorded by trained Heart Health Cabinet nurses in 5 consulting rooms across Latvia regions. There are totally 21 Heart Health consulting rooms in Latvia. In 2010, there were more than 23 thousands of people that pass the cardiovascular risk assessment and receive consultation from medical staff (Ministry of Health of the Republic of Latvia Health Inspectorate 2010). SCORE assessment algorithm enables the medical staff to determine the risk of a cardiovascular event occurring over next 10 years. Blood pressure, total cholesterol, glucose concentrations and body measurements were recorded by Heart Health Cabinet nurses. Blood pressure was measured by Aneroid Sphygmomanometer device in sitting position. Total cholesterol and glucose level were measured by The Accutrend Plus system as an express blood strip method. Height was measured using a portable stadiometer, and weight was measured using a calibrated portable scale; body mass index (BMI) was calculated from these measures. Waist-to-hip (WHR) ratio is waist circumference divided by hip circumference. Waist circumference was measured around the narrowest point between the coastal margin and the iliac crest. Hip circumference was measured at the level of the widest diameter around the gluteal region. Body measurements were done with light clothing on and without shoes. Smoking status was obtained by self-report.

### Data Analysis

The data were analyzed with SPSS version 15.0 for Windows. Standard methods: the mean, median, standard deviation (SD) and % were employed for descriptive statistics for each variable. Correlations between continuous variables were tested by the use of Pearson's correlation coefficient. Differences between the participants with low, moderate, and high physical activity and health related variables were analysed with the Chi-square test. The comparison of men and women results of IPAQ questionnaire shows that there are no significant differences between groups in level of physical activity. Therefore, the data were analysed for the whole group throughout the article.

### Results

All data are presented as means, median and standard deviation (SD) (table 1). The results show high risk of a cardiovascular event occurring over next 10 years for these samples. 73% of respondents have more than 10% CVD risk. The average value is 16%. Also the anthropometrical data (BMI and WHR) of the respondents are on the CVD risk zone. Only 26.2% of subjects have a healthy BMI score, but 86.1% have waist-to-hip ratio score which indicate increased health risk (male > 0.95; female > 0.85). There are also many subjects with hypertension (64.1%) and with total cholesterol score above the recommended 5mmol/l level (74.9%).

**Table 1.**

Characteristics of the study respondents

Characteristics	Mean	Median	Standard deviation
Age (years)	67.3	66.5	7.1
Height (cm)	166.95	166	10.2
Weight (kg)	78.29	77	15.7
Body mass index (kg/m <sup>2</sup> )	29.49	30.48	4.25
Systolic (mmHg)	138.1	140	19.8
Diastolic (mmHg)	86.3	90	12.1
Hypertension (%)	64.1		
Waist circumference (cm)	97.6	98	12.1
Hip circumference (cm)	102.3	100	13.1
Waist-hip ratio**	0.95	0.96	0.04
Total cholesterol (mmol/l)	5.5	5.4	0.96
Glucose level (mmol/l)	5	4.9	1.2
Diabetes mellitus (%)	13		
Physical activity (MET-min/week)	4387.2	3786	3426
Sitting time (min/day)	393.7	360	208
SCORE risk (%)*	16		

\*The risk of a cardiovascular event occurring over next 10 years

\*\*Waist circumference (cm) divided by hip circumference (cm)

To estimate the level of physical activity, the short form Latvian version of IPAQ was used, because compared with the long version there is reduced risk to overestimate self-rated activity. The short version systematically underestimates physical activity level, since it consists of fewer questions (7 questions in the short version compared with 27 questions in the long version). The findings show that 20.6% of the respondents have “low” PA level, 30.4% are “moderate” and 49.0% are “high” physically active. Also the median result of total physically activity for the whole sample was quite high - 3786 MET-min/week. The mean value was 4387.2 MET-min/week; (SD=3426). There are many evidences of PA overestimating usage of self reported instruments (Hagströmer et al. 2007). Also for older samples it is relevant (Mahabir et al. 2006). For this reason we examined whether the relationship between physical activity and CVD risk differed according to the type of physical activity performed (table 2).

**Table 2.**  
Pearson correlation coefficients comparing physical activity with health related variables

	SCORE risk	Systolic blood pressure	Total cholesterol level	WHR	BMI
PA walking	-0.220	-0.206	-0.094	-0.395**	0.157
PA moderate	-0.296*	-0.430**	-0.315*	-0.180	-0.011
PA vigorous	-0.033	-0.046	-0.056	-0.135	0.203

\*\*Correlation is significant at the 0.01 level (2-tailed)

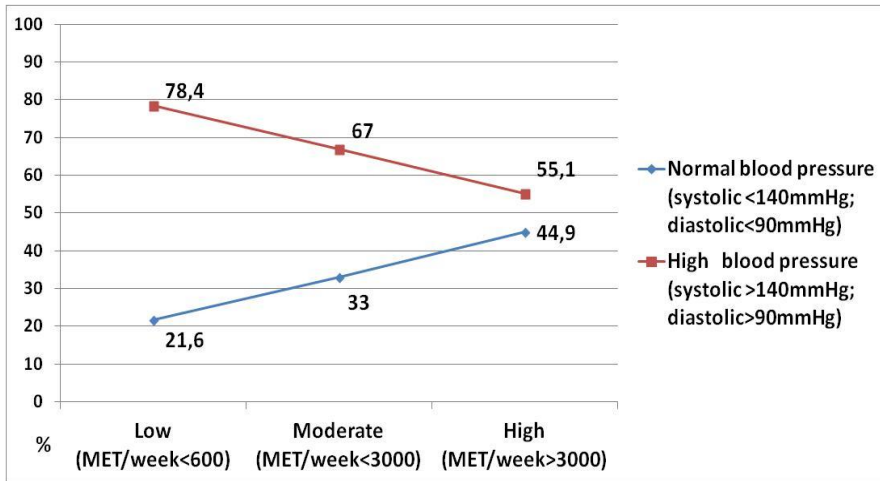
\*Correlation is significant at the 0.05 level (2-tailed)

As the results show there is a correlation between moderate PA and cholesterol level ( $r=-0.315$ ;  $p>0.05$ ), systolic blood pressure ( $r=-0.43$ ;  $p>0.01$ ), and SCORE risk assessment ( $r=-0.296$ ;  $p>0.05$ ). There is also statistically significant relationship between walking PA and waist-to-hip ratio results ( $r=-0.395$ ;  $p>0.01$ ). We found no significant correlations between vigorous PA domains and any other CVD risk factors.

The results of this study show a significant relationship between a self-reported level of physical activity and blood pressure. Figure 1 illustrates the statistically significant differences ( $p<0.05$ ) between the total physical activity level and blood pressure reduction. There are 78.4% of respondents with high blood pressure (systolic  $>140$ mmHg; diastolic $>90$ mmHg) who are sedentary, but 44.9% persons with “high” PA level have normal blood pressure. Although the study results justify the

benefits of physical activity for cardiovascular health, there are still problematic questions about PA dose-response relationship.

The data from figure 1 show the tendency of reducing a blood pressure, but still 55.1% of respondents with “high” PA level have high blood pressure. Also results of IPAQ and CVD risk assessment show that people with high CVD risk (21-40%) mostly have “moderate” (37.1%) or “high” (38.6%) total physical activity level.



**Figure 1.** Relationship between physical activity level and blood pressure assessment

This leads to the assumptions that, firstly, the used thresholds of total PA levels are not connected with health benefits and, secondly, the concomitant factors (heredity, illness, environment etc.) are more substantial determinants of health status. Further research is needed to develop evidence-based cut-off points of required total physical activity for health benefits in the older adult population.

Next, we computed relationships between HRQOL assessment results with other variables. The data from SF-36v2 questionnaire indicate that 55% of Latvian population at this age has physical component summary (PCS) below the General Population Norm. The score below the norm of mental component summary (MCS) is 52%. Only 13% of respondents reported better health than average.

We found the most significant correlation between two aggregated factors of SF-36v2 (PCS and MCS) and total physical activity level (table 3).

**Table 3.**

Pearson correlation coefficients comparing SF-36v2 results with total physical activity and health related variables

	Physical activity	SCORE risk	Systolic blood pressure	Total cholesterol	WHR	BMI
PCS	<b>0.499**</b>	-0.045	-0.375**	-0.082	-0.387**	-0.072
MCS	<b>0.578**</b>	-0.058	-0.097	-0.336*	0.014	0.173

\*\* Correlation is significant at the 0.01 level (2-tailed)

\* Correlation is significant at the 0.05 level (2-tailed)

Study data show the statistically significant correlation between IPAQ results and HRQOL questionnaire SF-36v2 data (Pearson Correlation PA and PCS  $r=0.499$ ; PA and MCS  $r=0.578$ ;  $p>0.01$ ). There are also some interactions between PCS and health related variables (systolic blood pressure and WHR).

## Discussion

Cardiovascular disease has been the leading cause of death in the EU. Clinical trials have demonstrated that lowering blood pressure reduces incidence of heart attack and death from cardiovascular disease. Physical inactivity is a major risk factor for cardiovascular disease, and persons who are less active and less fit have a 30% to 50% greater risk for high blood pressure (American Heart Association 2009). Whelton and colleagues (2002) in the meta-analysis study showed that an aerobic exercise has an impressive blood pressure-lowering effect: 3.84 mm Hg for systolic blood pressure and 2.58 mm Hg for diastolic blood pressure. Wing and colleagues (1998) reported even much larger reduction in blood pressure. Maintaining the reached physical activity level for prolonged time is an essential element for the maximum benefit of exercise on blood pressure. However associations between physical activity and blood pressure have been inconsistent in cross-sectional studies. There are some studies which have observed an inverse association between physical activity and blood pressure among both genders (Hickey et al. 1975; Burke et al. 1992), but other studies did not support these findings (Sesso et al. 1999).

In younger persons, hypertension often results from a higher cardiac output state, whereas in older persons, hypertension more often results from increased peripheral vascular resistance and large artery stiffening. Several

considerations may explain the smaller than expected correlation between PA and health related variables. First, there is a progressive increase in arterial stiffness with aging that contributes to systolic hypertension (Berry et al. 2004). This elevated arterial stiffness is primarily due to a replacement of elastic fibers in the large arteries by less distensible collagen and calcium. These aging changes in arterial structure may not be amenable to modification by physical activity or exercise training. Ferrier and colleagues (2001) also found that exercise training did not improve arterial compliance in persons with systolic hypertension. Some of the study's results were significant for diastolic blood pressure (Stewart et al. 2005). They found a greater reduction in diastolic blood pressure among exercisers despite their normal baseline. Second consideration, it remains unclear whether the lack of association among physical activity and health related variables is a result of overestimating of total PA that lead to computing errors or the mentioned amount of the physical activity is not sufficient for CVD risk reduction.

As Hawken and colleagues (2005) found WHR can be used as a CVD risk predictor. WHR has been found to be a more efficient predictor of mortality in older people than waist circumference or BMI for persons aged over 75 years (Price et al. 2006). The excess health risk associated with a high BMI declines with increasing age (Calle et al. 1999). Our findings support this statement and results show that WHR has a statistically significant correlation with SCORE risk (0.449  $p > 0.01$ ), but we did not find any correlation between BMI and CVD risk.

Our findings approve the theoretical relationship between physical activity and HRQOL. This study results concur with recently conducted meta-analysis that addressed the effects of physical activity on psychological well-being in older adults (Kelley et al. 2009). Our data show the statistically significant correlation between IPAQ results and HRQOL questionnaire SF-36v2 data. Respondents who report higher physical activity report significantly less limitation in all physical scores and higher vitality scores.

Our study has several limitations. The main problem is that physical activity level was obtained by a questionnaire. Using this method, the results of total physical activity might potentially overestimate. As with any questionnaire approach, the responses were dependent on respondent recollection and how attentive subjects may have been in their responses. The second problem is a sampling of participants as they were community dwelling persons without mobility limitations.

## Conclusion

The most of the respondents' IPAQ results refer to "moderate" or "high" PA level, but there is a risk of overestimating of the total activity at this age group. Our findings approve the theoretical relationship between physical activity and HRQOL. Study results indicate the statistically significant relationship between total physical activity level and subjective and objective health variables. People with higher physical activity level have lower CVD risk and reported better health-related quality of life. We found out that mainly moderate PA domain has statistically significant correlation with health related variables. A quality of life is an important component of "successful aging" for older persons. Our findings reveal that persons who are more active reported higher level of life satisfaction. The results of the study are representative in Latvian elderly population and could provide the important background for future research.

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ORIGINAL RESEARCH PAPER

# SMART MOTION CAPTURE SYSTEM MEASURING MOVEMENTS OF PROFESSIONAL STANDARD SPORTS DANCERS IN PROMENADE POSITION

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## Abstract

*The Smart motion capture has become the main method for measuring movements of the dancers. Motion capture provides 'snapshots' of the complexity of movement patterning. Standard sport dancers keep partners' body contact and move complicatedly in a couple during competitive performance. In fact, partnering and posture are main factors for judging to achieve top results at competitions. We have explored how complexity can be mapped to specific variables for analysis such as joint angles, and what such analyses both reveal and mask in relation to the choreographic practices involved. We have used the highly accurate Smart Motion Capture System 2011 for measuring sport dancers' kinematic parameters. The main aim of our research was to determine the kinematic parameters of Professional Standard Sport dancers with Smart Motion Capture System in promenade position. Kinematics is described for Slow Waltz, Tango, Slow Foxtrot and Quickstep. For this purpose we have measured and analyzed data of hip and knee angles. Results show that the*

*angles are different in each Standard dance. In tango both knees angles behave in a very similar way. It is clearly visible that they follow the tempo. Finally, profile of kinematic characteristics in promenade position was proposed as performance model in dance sport which is useful for developing sport dancing training techniques and methodologies.*

**Key words** *Standard dance sport, hip and knee kinematics, promenade position, smart motion capture system*

## **Introduction**

Dance sport is a highly technical sport, in which performance is characterized by specific dexterity, coordination, harmony in movements and synchronization with the partner. To dance means to move the body in time with the music and to perform actions with the body or its parts. To define dance sport actions and movements is not particularly easy, because it can be made in an endless number of directions and often involve several parts of the body. All movements in compositions were made in partners' contact. It is important to have a performance profile in order to plan the training.

Dance sport is increasing its popularity and it becomes to be considered as a real sport. Albeit it exists many studies on the kinematic characteristics of classical dancers [1], very few studies exists on sport dance [2]. Partnering, which requires couple to keep close body contact, and posture are main judging criteria to achieve top results, based on International Dance Sport Federation (IDSF) Judging System [4],[5]. Knowledge of these aspects could be of help for couples' matching and for improving the dance technique through the assessment of relevant parameters. Unfortunately, it is nearly impossible to analyze kinematic characteristics of competitive couples during real competitions and performances of standard dances due to the fact that partners are wearing long dresses. Thus special laboratory tests for 3D analysis of standard sport dance couples are needed. In our study dancers knees and hips kinematics are described for every dance, which has promenade position in compositions of Standard Sport dancing program: Slow Waltz, Tango, Slow Foxtrot and Quickstep. Viennese Waltz is not present in our study, because this dance has no promenade position at all.

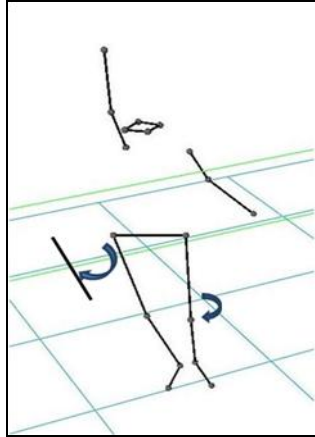
## Material and methods

The investigation included four main sessions:

1. Static and dynamic calibrating of Motion Capture SMART system 2011;
2. Adjusting markers to subjects;
3. Determine angles between partners' flexion and extension of knee and determine angles of hip line transversal plane in promenade position during Standard dances sequences;
4. Recorded data processing and statistical analysis.

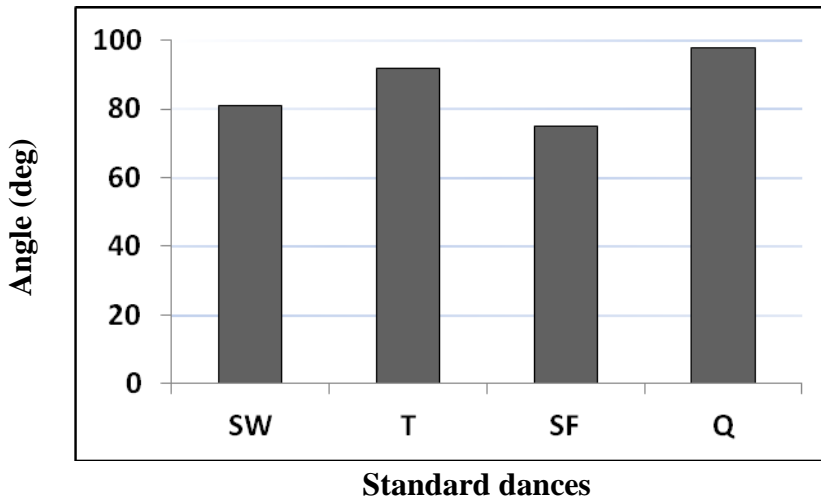
First, we have configured cameras and made the static and dynamic space calibration. Second, we have recorded necessary initial parameters of subjects. Third, we have adjusted markers on the joints of each dancer and measured biomechanical parameters of partners' contact in promenade position during Standard dances.

Sixteen professional level dancers (8 female and 8 male athletes) participated in the study. Dances were completed in accordance with the IDSF Competition rules [7] and all couples danced to the same music and same basic compositions with promenade position included. Biomechanical parameters of hip alignment in promenade position and knees flexion/extension were computed during Slow Waltz, Tango, Slow Foxtrot and Quickstep using Smart Motion Capture System. Videos were captured with 10 high performance infra-red cameras (Bts Engineering, Italy) using reflective markers and a sampling frequency of 250 Hz. A model consisting of 18 markers (Fig.1) were used for the computation, allowing recording the movements of the body of one dancer at time, while only the hip of the partner were marked. According to definition of International Standard for Anthropometric Assessment of ISAK (International Society for the Advancement of Kinanthropometry) edited in 2006, markers were placed in following positions: head (four markers), acromiale point (shoulder), radiale point (elbow), stylium (wrist), trochanterion (hip), tibiale laterale (knee), lateral malleolus (ankle). Hip angles between hips of the couple in the transversal plane (from above) and right and left knees excursion angles in all the style were computed in 3D and the absolute value was considered using the Smart Analyzer software ver. 4.3.3 and reported according to ISB standards in reporting kinematics data [3].



**Figure 1.** 3D model of standard sport dancer with connected 18 markers.  
Results

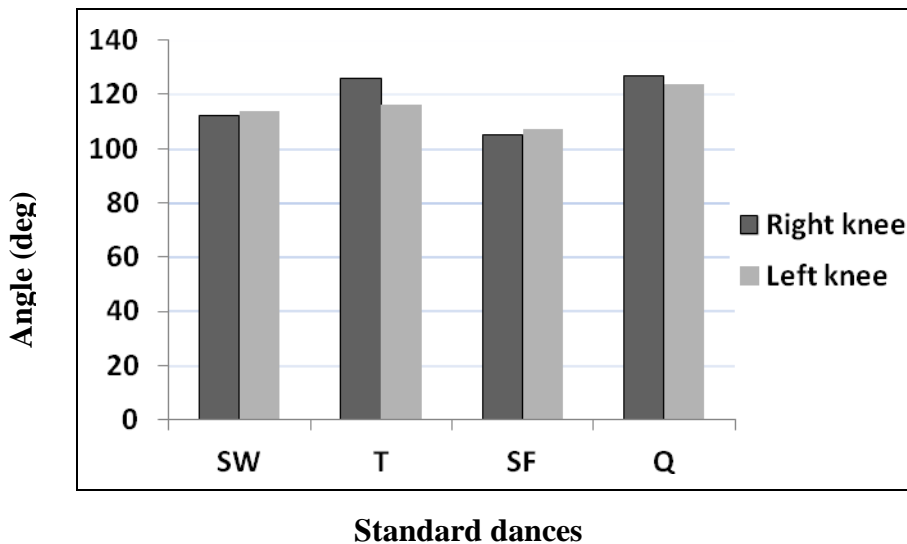
Results for biomechanical parameters of knee flexion-extension and hip alignment in promenade position were summarized. After processing recorded data, we established that there was a statistical difference between partners' flexion and extension of knees. Angle of partners' hip line transversal plane in promenade position is bigger in quicker dances like Tango and Quickstep and smaller during Slow Waltz and Slow Foxtrot (Fig. 2).



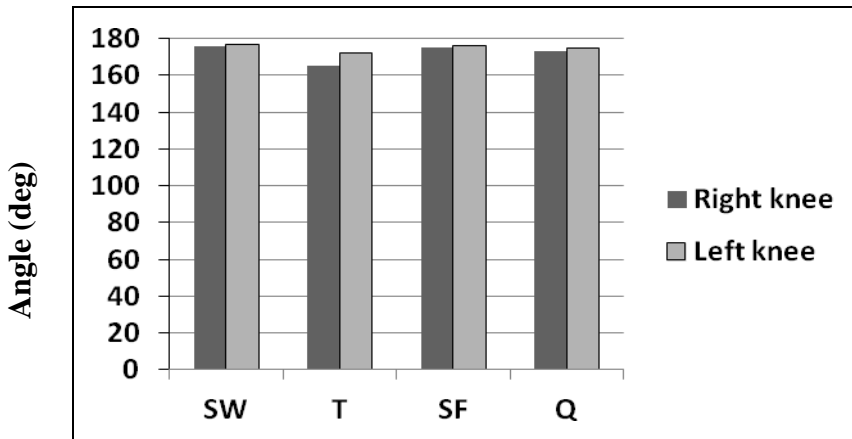
**Figure 2.** Maximal angles between dancers' hips in standard dances in promenade position (SW – Slow Waltz; T – Tango; SF – Slow Foxtrot; Q – Quickstep)

Above results represent threshold of maximum angle between partners' hip line transversal planes that were acceptable during performing promenade position: 81° for Slow Waltz, 92° for Tango, 75° for Slow Foxtrot and 98° for Quickstep. Furthermore, in promenade position near this threshold couples reached maximum speed of movement without losing timing. After additional tests, where couples were forced to exceed this threshold, asynchronous movements appeared and partners were not able to continue dancing synchronously, so that contact was lost.

As far as knee angles of promenade position are concerned (Fig. 3 and 4), deeper squats were observed during slower dances, such as Slow Waltz – 112° and Slow Foxtrot – 105°, where left knee were relatively more straightened (for 2° in both dances) than the right knee. In Tango we observed the biggest difference in knee angles between right and left leg, where the difference exceeded 10°, while lowest squat was observed at 116° knee angle for left leg and 126° knee angle for right leg. Finally, in Quickstep knee angles were significantly wider in comparison with other dances, with 124° and 127° for left and right leg accordingly. Maximum knee angles of promenade position prove that dancers maximally straightened legs to (up to 177°) during slower dances: Slow Waltz and Slow Foxtrot, but in Quickstep and especially in Tango, legs remained slightly bent in promenade position (Fig. 4).



**Figure 3.** Dancers' minimum knee angles in standard dances in promenade position (SW – Slow Waltz; T – Tango; SF – Slow Foxtrot; Q – Quickstep)



### Standard dances

**Figure 4.** Dancers' maximum knee angles in standard dances in promenade position

(SW – Slow Waltz; T – Tango; SF – Slow Foxtrot; Q – Quickstep)

### Conclusions

In conclusion, biomechanical characteristic was proposed as performance model in Standard sport dances. Slower dances (Slow Waltz and Slow Foxtrot) enable deeper squats and smaller angles between dancers' hips in promenade position, while in dances with faster tempo (Tango and Quickstep) legs remain relatively straightened and position is more open in hips. The given results might be useful for matching the couples for sport dance performance. We have also proposed applicable biomechanical parameters for improving dancing technique.

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## ORIGINAL RESEARCH PAPER

## ESTIMATION OF BODY MASS INDEX IN TEAM SPORTS ATHLETES

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E-mail: [inese.pontaga@lspa.lv](mailto:inese.pontaga@lspa.lv), [janis.zidens@lps.lv](mailto:janis.zidens@lps.lv)**Abstract**

*The aim of our investigation is to prove that an increased body mass index (BMI) in football and handball players does not always give evidence about overweight or obesity, but may appear due to skeletal muscles hypertrophy, and that higher body mass index does not influence the vertical jump height in athletes. 29 male football players and 20 handball players participated voluntary in the investigation. The anthropometrical characteristics and the body mass composition are measured by the bioelectrical impedance analysis method using the Body Composition Analyzer „X – Scan Plus”. Vertical jumps heights are measured on special platform “PD 3A”. The significant correlation is determined between the BMI and the lean body mass ( $r=0.36$ ,  $p<0.05$ ), as well as, between the BMI and the body fat content in % ( $r=0.54$ ,  $p<0.003$ ) in the football players. This proves that high BMI can be caused by growth of the body fat content and by skeletal muscles hypertrophy. The BMI is close to the upper border of norm in football players ( $23.4\pm1.4$  kg/m<sup>2</sup>) and handball players ( $24.2\pm1.7$  kg/m<sup>2</sup>) from the team of students. The overweight can be determined due to high BMI ( $25.1\pm2.9$  kg/m<sup>2</sup>) in handball players from Murjani Sports Gymnasia, but this is due to high lean body mass. The body fat content in handball players ( $13.6\pm2.8$  %) is in norm. The vertical jumps height is not possible to predict from the value of the BMI because the significant correlation between the BMI and the height of vertical jumps is not determined in team athletes ( $p>0.05$ ).*

**Key words:** *body mass index, lean body mass, fat content, football, handball, vertical jump*

## Introduction

Human body contains different tissues. The main of them are muscles (35 - 50 % from the body weight), bone tissues and internal organs. These tissues together form body lean mass (LM). It provides all body movements, strength and power production. Other kind of tissues is fat (7 - 20 % from the body weight in males), which is passive body mass. Increase of the body fat content causes overweight or obesity in people.

Body mass index (BMI) is a useful screening tool for overweight and obesity diagnostics in children, adolescents and adults. BMI can be detected quickly and inexpensively. It is possible to calculate using the equation (McArdle W.D. et al., 2000):  $BMI = m \text{ (kg)} / h^2 \text{ (m}^2\text{)}$ ; where:  $m$  – a body mass in kg,  $h$  – a height of athlete in m. BMI correlates with adult morbidity and mortality. High BMI is associated with increased risks for hypertension, atherosclerosis etc. (Witt K. and Bush E., 2005). BMI gives evidence about overweight if its value varies from 25 to 29.9  $\text{kg} / \text{m}^2$ , but obesity can be determined if BMI is greater than 30  $\text{kg} / \text{m}^2$  (Mathews E.M. and Wagner D.R., 2008).

Human body parts proportions and body mass composition are not taken into account if anybody determines BMI from tables of norms. There are from 12 to 15 % of fat tissue in young male's body in norm, and from 25 to 28 % of fat in young female's body (McArdle W.D. et al., 2000). The body mass index depends not only on the fat content in the human body, but also on the muscles and bones mass, as well as, on the water content in the body of athletes. High value of the BMI can be estimated as overweight in athletes with great skeletal muscles mass. It means that training in many sports specializations causes increase of the body mass index (Ode J.J. et al., 2007). High value of the BMI is observed in weight lifters, body builders, rowers, professional football and handball players etc. For example, the mean body mass index in seven defensive linemen from a former National Football League Super Bowl team is 31.9  $\text{kg} / \text{m}^2$ , but the mean BMI in all players of the team is 28.7  $\text{kg} / \text{m}^2$  (McArdle W.D. et al., 2000). However, their fat content – 18 % for linemen and 12.1 % - average for the team, misclassified them for fatness using only BMI as the overweight standard. The body mass composition in football players depends on their specific role during the game: linemen, goal keepers, backs, forwards, midfielders etc. (Melchiorri G. et al., 2007). From the data from Wittich A. et al. (2001) the fat content in the body of football players varies from 6.1 % to 19.5 %, and it depends on the position of the football player in the game: the midfielders have a significantly higher percentage of fat ( $13.5 \pm 3.3$  %) than backs or forwarders ( $11.0 \pm 2.3$  %). These authors determined significant

positive correlation between age and fat content in the body of football players. BMI in basketball players differs from its value in football players. For example, the mean BMI in USA National Basketball league players is only 24.5 kg/ m<sup>2</sup> (upper limit of norm) (McArdle W.D. et al., 2000).

The average fat content in female long distance runners' body 15.2 % is significantly lower than its value in the same age sedentary females – 26 % (Pollock M.L. et al., 1977). Male endurance runners have extremely low body fat content – only approximately 3 %. These endurance runners represent the lower end of the fat – to – lean continuum for top flight athletes. It gives them some advantages in long distances running: improves heat dissipation during sport load and allows to maintain thermal balance because the isolation layer of fat tissues is thin; the greater amount of fat tissues forms passive body mass, which causes increase of energy cost to bear the additional weight.

Thickness of skinfolds in champion wrestlers is smaller than in elite wrestlers. It means that elite wrestlers have greater lean mass in the body. The mean fat content in their body is  $11.0 \pm 4.0$  % (from Minnesota and Nebraska high schools) (Clarke K.S., 1974, Housh T.J. et al., 1989).

Mean fat content in the body of bodybuilders is 9.3 %, in weight lifters – 9.1 %, but in the Olympic level weight lifters – 10.8 % (McArdle W.D. et al., 2000). These athletes can be estimated as “overweight” using only BMI as criterion of obesity. The skeletal muscles mass in body builders is higher by 16 kg in comparison with the height and weight norm. The muscles mass in weight lifters is by 15 kg higher than in norm. All these athletes have increased body mass index due to great lean body mass.

One of the methods to determine fat content in the body is skinfolds thickness measurement by kalipometer. This gives possibility to estimate the fat tissue amount, but does not allow directly measurement of the skeletal muscles mass in the body.

A small, alternating current flowing between two electrodes passes more rapidly through hydrated fat – free body tissues (lean body mass) with greater electrolyte content (lower electrical resistance) in comparison with fat tissues. Therefore bioelectrical impedance analysis is useful method to determine the human body mass composition (McArdle W.D. et al., 2000, Bovell D. et al., 1996). Increase of the body weight can be due to additional amount of skeletal muscles in trained athletes or due to growth of the fat content in the body (Witt, K. A., and Bush E. A., 2005, Temfemo A. et al., 2009).

The aim of the present investigation is to prove that an increased body mass index in football and handball players does not always give

evidence about overweight or obesity, but may appear due to skeletal muscles hypertrophy, and that higher body mass index does not influence the vertical jump height in athletes.

## Material and Methods

Twenty nine male football players from the team “Skonto” (Riga), 11 male handball players from the team of Latvian Academy of Sports Education (LASE) (Pontaga I. and Zidens J., 2006) and nine young male handball players from Murjani Sports Gymnasia (Rusko D. and Pontaga I., 2009) participated voluntary in the investigation. The study was performed in conformity with the standards of the Ethics Committee of the Latvian Council of Sciences. The measurements of football players and LASE handball players were performed in the laboratory of the Latvian Olympic team, and the measurements of handball players from Murjani Sports Gymnasia - in the Latvian Sports Medicine Agency.

The standard conditions during the tests were: the air temperature in the room was  $22^{\circ} \pm 2^{\circ} \text{C}$ , the measurements should be performed approximately two hours after eating and within 30 minutes of voiding. The body mass composition was measured by the bioelectrical impedance analysis method using the Body Composition Analyzer „X – Scan Plus” (Jawon Medical, Korea).

Every athlete had to stay straight on the platform of the apparatus during the measurements. All athletes were weighted by the scales included in the Body Composition Analyzer. The height was measured by special ultrasound device (UHM – 101) build in the Body Composition Analyzer. Body mass composition is estimated by measurement of the electrical resistance to a small, alternating current flowing between four electrodes: two electrodes are positioned below the feet of every athlete and two electrodes are hold in the hands. The duration of measurement was one minute. The obtained data were automatically processed by Dr. Lukasaki body mass composition formula taking into account the height, body mass, gender, age and body tissues electrical resistance of every examined athlete. The characteristics measured and calculated by the Body Composition Analyzer are: the body mass, height, body mass index, lean body mass and fat content in the body in percentages. The error of measurement of the equipment was  $\pm 4 \%$ .

Vertical jumps heights are measured on special platform (PD. 3A, Moscow, Russia). Two kinds of jumps are performed: from standing position on the apparatus platform: 1) with the knees at the angle  $90^{\circ}$  and the hands on hips (SJ) and 2) from the standing position and before to

jumping counter - moved until the knee was flexed approximately to 90° and free movements of the arms (CMJ). Every kind of jumps repeated five times, and the best results (highest SJ and CMJ) are taken into account.

The mean values and standard deviations were calculated for all determined characteristics in football players and young handball players. The relationships between the body mass index (BMI), the body lean mass, body fat content and the height of jumps (SJ and CMJ) are determined.

## Results

The mean anthropometrical characteristics of the football and handball players are shown in the Table 1. The mean height of all team sports players is above 180 cm. The mean body weight is close to 80 kg in football players and LASE handball players, but in young athletes from Murjani Sports Gymnasia the mean weight is greater -  $86.3 \pm 8.2$  kg. The mean value of the body mass index is close to the upper border of norm in football players and LASE handball players, but in the players from Murjani Sports Gymnasia the BMI gives evidence about overweight. The differences between the mean values of every characteristic in three groups of athletes are not significant ( $p > 0.05$ ).

**Table 1.**

The mean anthropometrical characteristics of team sports athletes

Sports specialization	Age, years ( $\pm$ SD)	Height, cm ( $\pm$ SD)	Body mass, kg ( $\pm$ SD)	Body mass index, $\text{kg/m}^2$ ( $\pm$ SD)
Football (Skonto)	$23.6 \pm 5.1$	$183.7 \pm 7.3$	$79.3 \pm 8.0$	$23.4 \pm 1.4$
Handball (LASE)	$20.0 \pm 1.0$	$186.7 \pm 8.1$	$84.7 \pm 11.1$	$24.2 \pm 1.7$
Handball (Murjani)	$17.6 \pm 1.0$	$182.4 \pm 7.1$	$86.3 \pm 8.2$	$25.1 \pm 2.9$

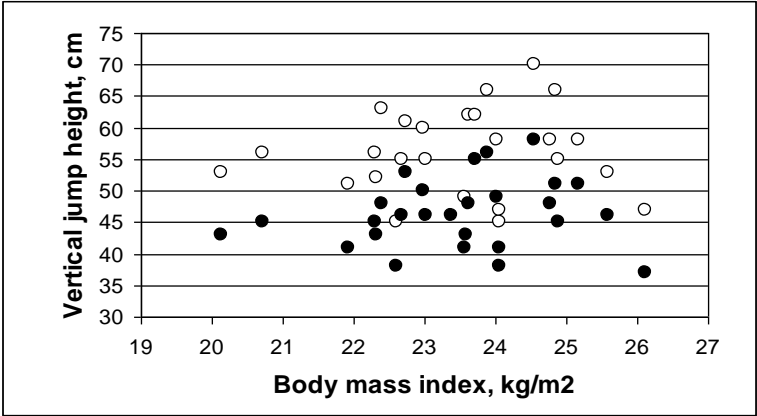
Body mass composition analysis by bioelectrical impedance measurement allows us to estimate the main reasons of the BMI growth in team athletes. The BMI shows overweight in young handball players ( $25.1 \pm 2.9 \text{ kg/m}^2$ ), but this is due to high lean body mass, Table 2. The lean body mass is significantly greater in the handball players than in the football players,  $p < 0.05$ . The body fat content in handball players ( $13.6 \pm 2.8 \%$ ) is significantly lower in comparison with football players ( $18.4 \pm 3.7 \%$ ), but the BMI in football players is not significantly higher ( $p > 0.05$ ).

**Table 2.**

The body mass composition in male football and handball players

Sports specialization	Body mass index, kg/m <sup>2</sup> (±SD)	Lean body mass, kg (±SD)	Fat content, % (±SD)
Football (Skonto)	23.4 ± 1.4	64.6 ± 6.1	18.4 ± 3.7
Handball (Murjani)	25.1 ± 2.9	73.9±5.2	13.6±2.8
Signif. of diference	$p > 0.05$	$p < 0.05$	$p < 0.05$

The correlation between the body mass index in the football players (Fig.1.), the handball players from the LASE team (Fig.2.) and squat jump height is not statistically significant ( $p > 0.05$ ), as well as, the correlation between the BMI and counter – movement jump height ( $p > 0.05$ ).



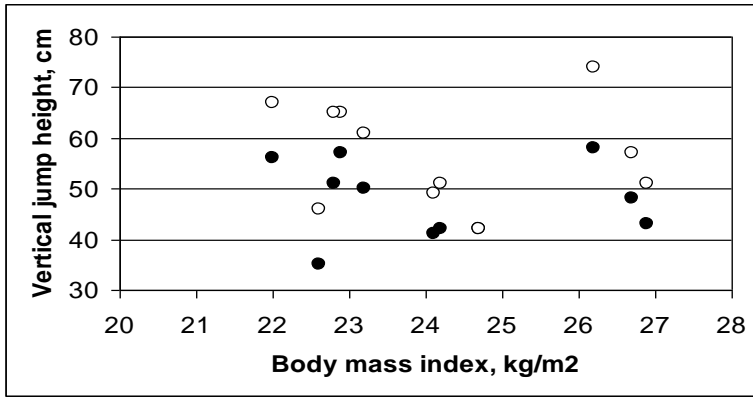
**Figure1.** Relationship between the body mass index in the football players and the vertical jump height

Relationship between the body mass index in the football players and the vertical jump height from static squat position is not significant (●), coefficient of correlation  $r = 0.14$ ;  $p > 0.05$ ;

Relationship between the body mass index in the football players and the vertical jump height with previous squat and movements of arms is not statistically significant (○),  $r = 0.08$ ;  $p > 0.05$

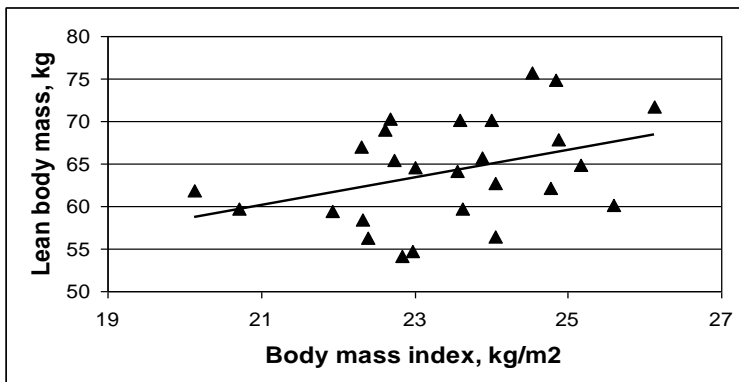
Relationship between the body mass index in the handball players (Fig.2.) and the vertical jump height from static squat position is not significant (●), coefficient of correlation  $r = -0.08$ ;  $p > 0.05$ ;

Relationship between the body mass index in the handball players and the vertical jump height with previous squat and movements of arms is not statistically significant ( $\circ$ ),  $r = -0.11$ ;  $p > 0.05$



**Figure 2.** Relationship between the body mass index in the handball players and the vertical jump height

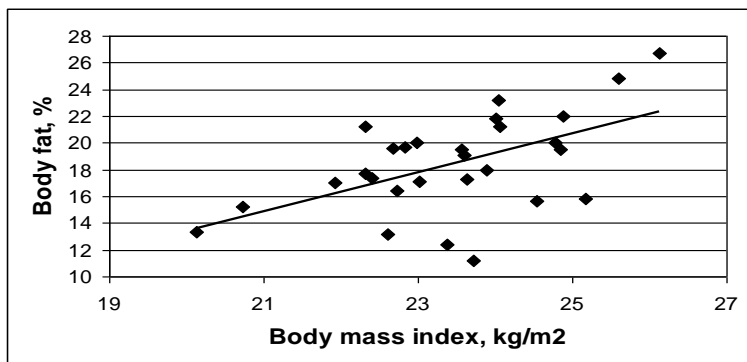
The significant relationship is determined between the body mass index in the football players and the lean body mass (correlation coefficient  $r = 0.36$ ,  $p < 0.05$ ), Fig.3. This means that increase of the BMI in the athletes can be explained by growth of the skeletal muscles mass. The similar significant relationship is detected between the body mass index and the fat content in the body in % ( $r = 0.54$ ,  $p < 0.003$ ), Fig.4. Therefore the increased value of BMI depends also on the greater content of fat tissue in the body.



**Figure 3.** Relationship between the body mass index (BMI) and lean body mass (LM) in football players



Relationship between the body mass index (BMI) and lean body mass (LM) in football players:  $LM \text{ (kg)} = 26.57 + 1.62 \cdot BMI \text{ (kg/m}^2\text{)}$ ; where:  $r = 0.36$ ; standard error of the regression equation  $S_{xy} = 5.70 \text{ kg}$ ;  $p < 0.05$



**Figure 4.** Relationship between the body mass index (BMI) and body fat content (BF) in football players

Relationship between the body mass index (BMI) and body fat content (BF) in football players:  $BF \text{ (\%)} = 1.45 \cdot BMI \text{ (kg/m}^2\text{)} - 15.55$ ; where:  $r = 0.54$ ;  $S_{xy} = 3.13 \text{ kg}$ ;  $p < 0.003$

## Discussion

Our results are in positive agreement with the data of many other authors (Melchiorri G. et al., 2007, Ode J.J. et al., 2007, Wittich A. et al., 2001) opinion concerning estimation of the body mass index value with caution in athletes. The body mass index depends not only on the body fat content, but also on skeletal muscles mass. From our data: the significant correlation is determined between the body mass index and the lean body mass ( $r = 0.36$ ,  $p < 0.05$ ), as well as, between the BMI and the body fat content in % ( $r = 0.54$ ,  $p < 0.003$ ) in the football players. High value of the MBI can be estimated as overweight in athletes with skeletal muscles hypertrophy.

Some authors determined high BMI in high qualified football players (the mean value-  $28.7 \text{ kg/m}^2$ ), which can be misclassified than overweight or fatness of these athletes (McArdle W.D. et al., 2000). However the fat content in their body  $12 - 18 \%$  was in norm. Sutton L. et al. (2009) determined that the body composition is important for elite English football players, but homogeneity between players at top professional clubs results in little variation between individuals. The body

fat content depends on inheritance: the non-Caucasian players demonstrated significantly lower percent body fat ( $9.2 \pm 2.0\%$ ) than the Caucasian players ( $10.7 \pm 1.8\%$ ). The body mass composition in football players depends on their specific role during the game (linemen, goal keepers, backs, forwards, midfielders etc.) (Melchiorri G. et al., 2007). The midfielders have a significantly higher percentage of fat than backs or forwarders (Wittich A. et al. 2001). The body mass index ( $23.4 \pm 1.4 \text{ kg/m}^2$ ) and body fat content ( $18.4 \pm 3.7 \%$ ) in Latvian highly qualified football players is close to the upper border of norm. This can be explained by the young age of our players ( $23.6 \pm 5.1$  years) in comparison with elite international level football players, because the significant positive correlation between age and fat content in the body of football players is determined (Wittich A. et al. 2001).

The height and weight of our handball players correspond with these characteristics in European National level players (Gorostiaga E.M. et al., 2005, Rannou F. et al., 2001.). Our athletes are 2 – 4 cm shorter and have approximately 10 kg less weight (the team handball players of Latvian Academy of Sports Education) and 8 kg less weight (the team from Murjani Sports Gymnasia) in comparison with the Spanish International level handball players (Gorostiaga E.M. et al., 2005). This can be explained by lower qualification and young age (17 – 21 year old) in Latvian handball players in comparison with International level professional players. The skeletal muscles mass must be larger in elite professional handball players than in our amateur level handball players. The BMI ( $25.1 \pm 2.9 \text{ kg/m}^2$ ) is high in young handball players from Murjani Sports Gymnasia, but this is due to high lean body mass. The body fat content in handball players ( $13.6 \pm 2.8 \%$ ) is in norm.

The muscle power characteristic of our athletes (counter – moved jump height) coincides with the data of Spain players (Gorostiaga E.M. et al., 2005). The significant correlation between the BMI and the height of vertical jumps (squat jump and counter – moved jump) is not determined in Latvian football and handball players ( $p > 0.05$ ). This means that the vertical jumps height is not possible to predict from the value of the BMI. The main reason of the BMI increase is skeletal muscles mass growth or hypertrophy due to long term training in handball or football. This allows maintain the same vertical jump height in team players with smaller and larger body weight.

## Conclusions

1. The significant correlation is determined between the body mass index and the lean body mass ( $r = 0.36$ ,  $p < 0.05$ ), as well as, between the BMI and the body fat content in % ( $r = 0.54$ ,  $p < 0.003$ ) in the football players. This means that high body mass index can be caused by growth of the body fat content and by increased skeletal muscles mass (muscles hypertrophy).
2. The body mass index mean value is close to the upper border of norm in football players ( $23.4 \pm 1.4 \text{ kg/m}^2$ ) and handball players ( $24.2 \pm 1.7 \text{ kg/m}^2$ ) from the team of Latvian Academy of Sports Education.
3. The overweight can be determined due to high BMI ( $25.1 \pm 2.9 \text{ kg/m}^2$ ) in young handball players from Murjani Sports Gymnasia, but this is due to high lean body mass. The body fat content in handball players ( $13.6 \pm 2.8 \%$ ) is in norm.
4. The significant correlation between the BMI and the height of vertical jumps (squat jump and counter – moved jump) is not determined in football and handball players ( $p > 0.05$ ). This proves that the vertical jumps height is not possible to predict from the value of the BMI.

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## ORIGINAL RESEARCH PAPER

## CORRESPONDENCE OF NUTRITIONAL SUPPLEMENTS USED BY ATHLETES TO THEIR SPORT AIM AND REGULATED DEMANDS FOR SAFETY

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### Abstract

*The current study was devoted to the problem of nutritional supplementation among amateur and professional athletes. The aim of the study was to evaluate the used food supplements in two aspects: adequacy to expected results and compliance with regulated demands for supplements. Participants were 145 athletes: 21 professional and 124 amateur athletes (75 males, 70 females). For the purpose of the study we used the questionnaire of 26 items that comprised three blocks: a kind of sport and profile of trainings; use of nutritional supplements; confidence about the results and safety of use. For the evaluation of supplements' compliance with the regulated demands the analysis of supplement market was carried out. The main conclusions were: part of athletes take food supplements inappropriately and unnecessary; part of food supplements was not registered in Latvia and /or does not correspond to regulated demands, for that reason the use was not safe.*

**Keywords:** *sport, athletes, nutrition, nutrition supplements, ergogenic aids, use purposes, food safety, compliance with legislative demands of the Republic of Latvia and the European Union.*

## Introduction

Alimentary aids are widely used to increase physical working capacity in sport. Both nutritional products with definite content and a wide variety of nutritional supplements serve as ergogenic aids (Maugham, 1999). Supplementation practices vary between sports and individual athletes however there is evidence that some athletes use a large number of supplements concurrently, often in doses that are very high in comparison with normal dietary intakes (Burke, Read, 1993). An absence of compelling regulation has led to considerable variation in concentrations, terminology and combinations of supplements, even within the same country, making a choice of adequate supplements difficult (Molinero, Marquez, 2009).

It can be foreseen that the number of amateur and professional athletes, who use nutritional supplements, is going to increase. Both athletes and coaches need to understand for what reason each of nutritional supplements is used, what its influence is and how safe is the use of the corresponding product.

## Material and methods

*Aim of the research* is to evaluate trends in the use of nutritional supplements among athletes in two aspects: as to the adequacy of the purpose set forth by the athletes and the compliance with the legislative demands, in force in the Republic of Latvia.

### *Objectives of the research*

1. To evaluate:
  - the popularity of nutritional supplements among athletes having different age – men and women, as well as among professional and amateur athletes;
  - the sources of information, according to which the choice of nutritional supplements is made;
  - objective justification that athletes take into account when choosing nutritional supplements;
  - the correspondence of the chosen products with the purpose set forth by athletes;
  - user assurance about the safety of products and the results of using them.
2. To evaluate the compliance of the nutritional supplements used with the legislative demands in force in the Republic of Latvia: corresponding label, recommended doses and indication about nutritional value and health claims, as well as about safety.

### ***Participants and research methods***

The research is carried out as cross-sectional research. Non-randomized purposeful sample is chosen for the research. The sample of the respondents involves the visitors and coaches of the sport club „Sportima”, as well as students from the Latvian Academy of Sport Education (LASE) regularly doing sport. 289 persons were involved in the study. The age of the respondents is 18-40 years. For data analysis the respondents were divided into three age groups: 18-24, 25-30 and 26-40 year old. An inquiry was carried out in the 1st quarter of the year 2010. A questionnaire was used to reach the aim of the research. 145 valid questionnaires were obtained in the inquiry. The response rate in the sports club can be evaluated as good (57.5%) and in LASE - as very high (90%).

Market research was carried out to evaluate nutritional supplements used in sport. To evaluate the compliance of the products with regulated demands the information in Internet shops and in the shops “*Veselības pasaule*” (The world of health), “Prosport”, Ltd., and “Vipsport”, Ltd, was analyzed.

For the evaluation of the products the following criteria are used:

- registration in Latvian Food Centre;
- registration of health claims label in Health Inspection;
- the correspondence of vitamin dose, which is in user instructions, with recommended daily doses;
- the adequacy of the text on the label.

RASW Statistics software is used for data procession.

### **Results**

#### ***The correspondence of nutritional supplements, used by athletes, with their objectives***

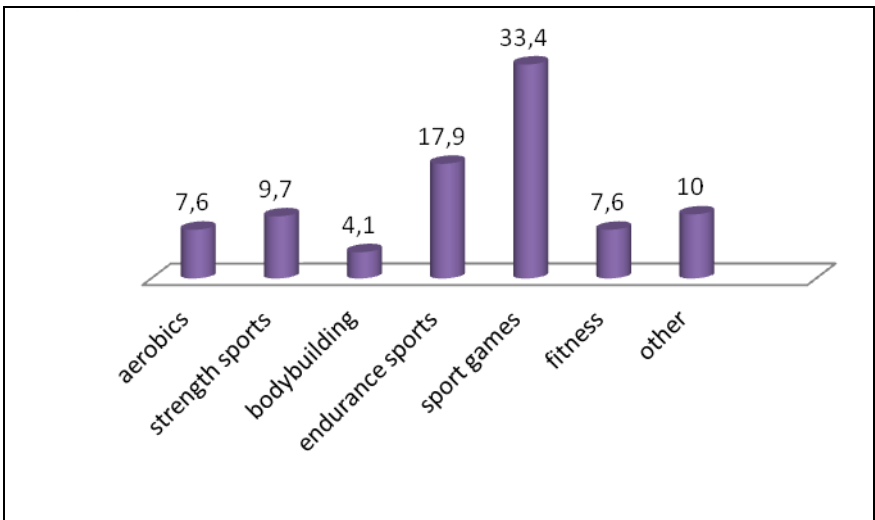
Participants of the inquiry basically are amateurs (80%) and professional athletes (20%). 48.3% of the participants are women and 51.7% are men. The majority of the respondents (75.8%) are people between 18 and 30 years of age. The respondents have sufficiently large sporting experience: only 21.7% of the respondents do sports less than 5 years, 31.7% - from 5 to 10 years, and 46.7% - more than ten years. All of the inquired people are involved in regular sports trainings, only a small part of them train at least twice a week, a third of the athletes attend workouts three times a week, but 45% of the inquired people train 5-6 times a week.

Most of the athletes are engaged in sport games (football, volleyball, hockey, badminton, basketball, and handball), a significant proportion of the athletes represent cyclical sports (swimming, rowing, triathlon, cycling, running, athletics, cross country skiing, etc.) (see Fig. 1). A large proportion



of respondents (48.3%) believe that it is unnecessary to use food supplements (FS), if the traditional diet is balanced; a little more than a quarter (26.9%) consider that nutritional supplements are necessary for everyone who is engaged in doing sports, the rest of the respondents think that nutritional supplements are needed only in professional sports.

More than half of the respondents, who use nutritional supplements, mention the duration of the use: "more than six months" (62.7%); 19.4% of the respondents use a supplement for more than one and less than six months, while 17.7% have recently embarked on using it and do it for the first month. 48 of 124 amateurs use nutritional supplements, but among professionals the proportion of the persons who answered the question in the affirmative, is higher.



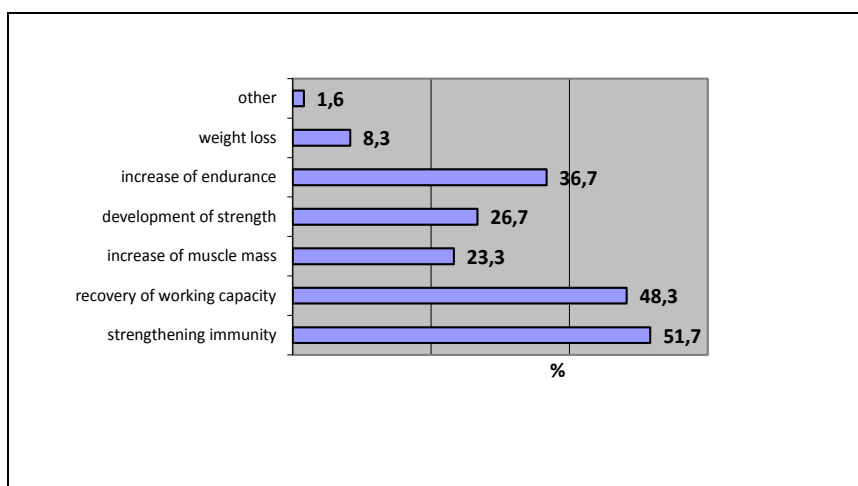
**Figure 1.** Distribution of respondents in accordance with sports they are involved in (percentage of respondents)

Analyzing the popularity of food supplements in different age groups, it is found that the highest proportion of food supplement adherents are in the age group 31-40 years, but the lowest - in the age group 25 to 30 years (see Table 1). Among women the popularity of food supplements is slightly higher than among men, but overall significant difference in the habits of using them has not been observed.

**Table 1.**  
Use of nutritional supplements in different groups of athletes

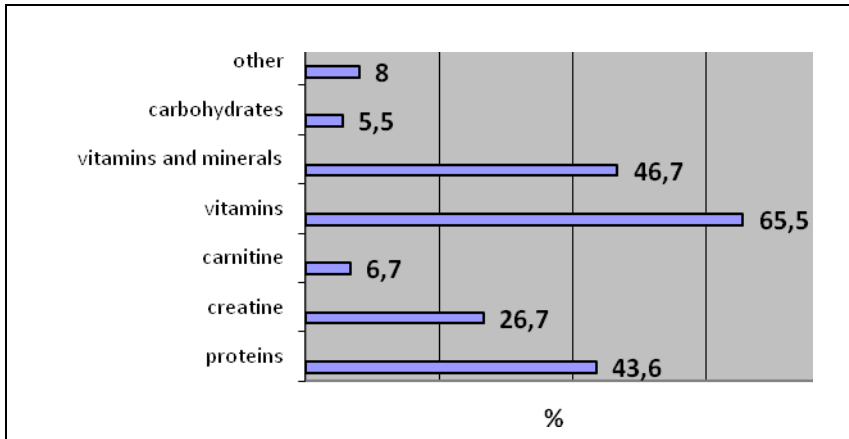
Groups of athletes	Percentage of users of food supplements
Amateurs	38.7
Professionals	57.1
18-24 year olds	40.5
25-30 year olds	20.8
31-40 year olds	42.9
Length of doing sports: up to 5 years	29.5
5-10 years	30.4
more than 10 years	43.8

The inquired participants had an opportunity to name two goals of using FS. Most often as the first goal athletes mention strengthening the immunity, which is followed by rapid recovery of working capacities and the increase of endurance. About one quarter of the athletes named other objectives: promoting the development of strength and the increase of muscle mass. A small proportion of the respondents selected nutritional supplements for weight loss (see Fig. 2).



**Figure 2.** The main purpose of using nutritional supplements (percentage of respondents)

To achieve the goals set forward most commonly used products are proteins, amino acids, creatine monohydrate, carnitine or food supplements containing it, vitamins and minerals (see Fig. 3).



**Figure 3.** Choice of nutritional supplements (percentage of respondents)

Since only a small percentage of athletes were able to name the nutritional supplement, it is not possible to assess accurately the adequacy of the chosen food supplement to the objectives of its use. The analysis of the choice of dietary supplements in connection with a kind of sport shows that there is a tendency to choose adequate dietary supplements. People involved in strength sports, for example, more frequently choose creatine and protein or amino acids. It is more difficult to make any assumptions about sport games and endurance sports, because there is not found expressed dominance of a certain group of products. Creatine is also used in endurance sports, this choice is difficult to justify.

The inquiry revealed that 36.7% of athletes use FS following their coach advice. A sufficiently large proportion of athletes (25%) seek for information in mass media, 16.7% responded that they selected product in accordance with other athlete recommendation. The impact of trade representatives is less than expected - 8.3%.

Mostly athletes named one place of purchasing the product, some of them mentioned two places. 36% of respondents as the places of purchasing product named a definite shop, 10% - the Internet, 17% - a sports club. Half of the respondents cited "other places", including the purchase of food supplements from the coach. Several athletes indicated that the dietary supplement was given to all team members without information about its origin and/or composition.

Athlete responses suggest that athletes virtually have no information on the regulations of the dissemination of dietary supplements, as well as about

using them safely. A very high proportion of athletes are convinced that all dietary supplements are registered in Latvia/Europe (85.3%), adequately tested (85.2%), doses are adequate and safe (80.3%) and products do not contain harmful impurities (65.6%). Obviously, paying for supplements, most of the athletes rely on the competence of coaches or authors, publishing articles in media, and the compliance with ethical principles.

Slightly more than half of the respondents are satisfied with the results of using FS (very satisfied: 16.4% and almost satisfied: 44.3%), despite the fact that the majority (70%) do not have objective, field and laboratory tests confirming the data about the use of FS. One third (29.5%) admitted that they could not evaluate the results. Tenth of the respondents are unsatisfied with the results of the use of FS.

Since insufficient number of respondents made it impossible to determine whether the differences in different age and gender groups were statistically significant, the results of the research should be regarded as trends in the use of food supplements.

### ***Compliance of nutritional supplement with regulated demands***

In the research the compliance of nutritional supplements, offered by three limited liability companies – *Veselības pasaule*, *Prosport* and *Vipsport* - was evaluated with the regulated demands: registration in Latvian Food Centre; compliance with the Regulations of the Latvian Cabinet of Ministers (CM) on minimum safety and labeling requirements for dietary supplements and registration procedure of dietary supplements (2005), the Regulation on nutritional value and food additives indications (Regulation No. 964 of the LR Cabinet of Ministers of 23 November 2004 "Regulations on food products labeling"; Regulation No.146 of the LR Cabinet of Ministers of 6 February 2010 "Minimum safety requirements for food supplements and food products, in which are used food additives"), compliance with the Regulation of the European Commission on nutritional value and health claims on foods (Regulation No. 1924/2006 of the European Parliament and Council of 20 December 2006 on the nutrition and health claims on food labels).

Dietary supplements manufactured and registered in the European Union and Member States of European Economic Area and consisting solely of vitamins and minerals mentioned in Annex 1 of the CM regulation No.725 "Regulations on the minimum safety and labeling requirements for dietary supplements and the registration procedure of dietary supplements", may be imported for dissemination and disseminated in Latvian, in a written notice informing Latvian Food Centre and the Food and Veterinary Service and sending them a sample label of food supplement label. Other dietary

supplements, to which this condition does not refer, are allowed to be imported and distributed in Latvia only after their registration in accordance with the procedure of Latvian Food Centre. Unfortunately, some products that distributors sell as dietary supplements could not be found in the Register of food centers. Food supplement registration is very important also in the aspect that it serves as a proof that products are manufactured in a company in which implemented and maintained food safety system is ensured.

A number of products in labeling and advertising contain health claims, but none of the analyzed products is in the Register of Health Inspectorate. In 2008, the European Commission received European Union Member States lists with more than 44,000 health claims, including around 500 Latvian health claims. In cooperation with the European Food Safety Authority, the submitted documents will be evaluated up to the end of 2011, therefore health claims, which are in labeling and advertising of nutritional supplement products, but are not included in the Register of Health Inspectorate, do not allow expressing judgments about non-compliance with mandatory requirements.

Analyzing food product labels, it has been found that claims about the nutritional value more correspond to the content of proteins, vitamins and minerals, but the energetic value and carbohydrate content is not indicated, suggesting that in fact the nutrition claim does not meet the Cabinet of Ministers Regulations on food labeling. In labeling of several nutritional supplements, indicating the composition, food additive claim does not correspond to the requirements of normative acts. In accordance with the requirements the number of E substance and name of the group, for example, acidity regulator (or another group), E 330, etc. should be indicated.

The biggest vendor of nutritional supplements, used in sports, in Latvia is „*Veselības pasaule*”, Ltd. In Latvian Food Centre 21 dietary supplement of the company is registered, although the company product range is wider. In eight of the registered products the amount of vitamins exceeds the recommended daily intake, although, in accordance with the requirements of normative acts, label text contains warning "do not exceed the acceptable daily intakes". Formally the requirements of normative acts are taken into consideration, but in fact the consumer information is contradictory.

Two other companies – *Prosport, Ltd.* and *VipSPORT, Ltd.* - offer nutritional supplements, of which a significant proportion is not included in the register of the Food Center, and food for athlete consumption with

health claims, which are not in the Register of Health Inspectorate. Due to the fact that in consumer information there are no indications about the groups of products, (food supplement or other product group), the number of food supplements for distribution cannot be accurately determined. In the group of such products there are complexes of vitamins and minerals, amino acids, complexes of proteins and amino acids, and other products that could be classified as dietary supplements. The information about the products available to consumers contains indications, which suggest or imply that the products or the ingredients have a positive impact on health and working capacity.

## Discussion

There is a wide variety of literature reflecting the results of studies on the influence of various food supplements and ergogenic aids on the athlete working capacity (Burke LM, Read RS., 1993; Maughan R.J. , 1999; Dale M., Ahrendt M.D., 2001; Williams M.H., 2004) The motives for the use and usefulness of their use is evaluated less, however, statements in which this problem is analyzed from both the sports nutrition and ethical aspects can be found. One of the studies analyzing motives for the use of supplements in sports was carried out by Burns R.D. et al (2004). Survey of 236 university student athletes was conducted to determine supplement use. Results showed that 88% used one or more nutritional supplements. Primary sources of nutritional information were athletic trainers (40%), strength and conditioning trainers (24%).

Studies of dietary practices of athletes report that several ergogenic aids have really proved convincingly effective, such as sports drinks and creatine monohydrate (Randy E., Eichner M.D., 1997). At the same time, despite the very wide application, research does not justify vitamin mega dose, the effectiveness of carnitine, chromium picolinate and many other products (Gilbert N., 2009; Rodriguez N.R, Di Marco N.M, Langley S., 2009). The position of the American Dietetic Association and the American College of Sports Medicine that physical activity, athletic performance, and recovery from exercise are enhanced by optimal nutrition and supplementation is not necessary at all.

Burke LM, Read RS. (1993) stress that supplementation practices vary between sports and individual athletes however there is evidence that some athletes use a large number of supplements concurrently, often in doses that are very high in comparison with normal dietary intakes.

Molinero O. and Marquez S (2009) warn that the absence of compelling regulation has lead to considerable variation in concentrations, terminology

and combinations of supplements, even within the same country, making it extremely difficult to conduct detailed studies concerning nutritional supplementation in sport.

Nutritional supplement marketing and advertising are powerful, while both amateur athletes and professional athletes' knowledge of the influence of various alimentary aids on the body in most cases is inadequate. Some authors draw attention to coach incompetence in nutritional issues and unethical behavior, distributing food supplements in partnership with manufacturers and distribution companies (Gilbert N., 2009). In the materials of recent international sports congresses and conferences the necessity is emphasized to prepare good sports nutrition specialists, as well as widely educate coaches and all-level athletes (Kalman D.S., Campbell B., 2004). This would help both to evaluate and modify the athletes' daily diet, and adequately choose food supplements and ergogenic aids.

## Conclusions

1. Food supplement use is common both among amateur and professional athletes: a half of athletes participating in the survey turned out to be food supplements users.

2. Most often athletes use nutritional supplements to strengthen immunity, accelerate the recovery of working capacities, and increase cardio-respiratory endurance.

3. The most popular groups of dietary supplements are vitamins and mineral complexes, proteins and amino acids.

4. The choice of nutritional supplements is based on athlete belief in product safety, coach recommendations and information in advertising materials. However, the necessity of the use of food supplements is not always justified and safe, because:

- a. large percentage of athletes (45.9 %) do not evaluate actual diet before making the decision about the use of dietary supplements;
- b. frequently products without information about their origin and composition are used;
- c. majority of athletes (69.5 %) lack objective data certifying the results of the use;
- d. a wide variety of products, which can easily be overdosed, are available in the market.

5. Although in general food supplements correspond to regulated demands, in connection with shortcomings in legislation and incomplete

consideration of legislative acts some aspects of the dissemination of food supplements can be evaluated as risky:

- a. in the content of a number of food supplements doses of vitamins and minerals exceed the recommended daily intake, because of this there is a risk of excessive intake of these substances;
- b. inadequate indications about food additives and nutritional value are found on the labels of several dietary supplements;
- c. considering that the list of health claims has not yet been published, it is possible that the information on dietary supplements, not included in the Register of Health Inspectorate, is not yet available, therefore their compliance with health claims cannot be evaluated.

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## ORIGINAL RESEARCH PAPER

## THE PHYSICAL ACTIVITY OF HIGH SCHOOL STUDENTS IN BIAŁA PODLASKA INCLUDING SEX OF THE RESPONDENTS

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### Abstract

*Despite a tangible increase in the health-related awareness of active participation in physical culture, the vast majority of the society does not notice any dependency between health and physical activity. The study was conducted with the method of a diagnostic survey in the form of International Physical Activity Questionnaire. The research sample consisted of 212 respondents linked with education. Results obtained were subject to a statistical analysis using Statistica 7.0 software. There was shown that boys had higher physical activity ( $p = 0.049$ ) than girls. However, girls were more active in the area of professional work (with no evidence of significance), while boys in the area of sports and recreational activities at the level of  $p = 0.044$ , particularly in intensive activities ( $p < 0.001$ ). There were no differences in the activeness associated with movement and housework. In domestic works, girls, to a greater extent were engaged in working at home ( $p < 0.001$ ) while boys in the activities of the high intensity ( $p = 0.049$ ).*

**Key words:** *physical activeness, IPAQ, school youth*

### Introduction

Movement should accompany us, regardless of age, sex or profession. However, it should be noted that the amount of physical exertion should be adjusted individually (Starosta, 1997). Directed and intentionally undertaken physical activeness leads to the development of conscious pro-health attitudes, extremely important for a healthy lifestyle. Its level should provide the stabilization of health condition or its improvement. On this basis, it can be concluded that all physically inactive individuals

demonstrate their activeness at a level lower than required to maintain a satisfactory condition of health.

As a natural stimulus, physical activity may influence the entire body, affecting positively functions of all organs. It is an axis of the whole strategy of healthy lifestyle which can be built on condition that the undertaken effort is below the critical value, is moderate and appropriately dosed, and its loads are being increased gradually and systematically (Baj-Korpak et al. 2010). The physical activeness unites an individual with nature and – temporarily – is one of the few forms of individual's contact with natural environment, a part of its niche in the specified natural and social environment.

Despite a tangible increase in the awareness of healthy lifestyle and the need for active participation in the physical culture, the vast majority of the society do not notice any dependency between health and physical activity. Only a few find deficiency of physical activeness to be one of the most detrimental factors to health (Kantoma et al. 2008; Litwiniuk et al. 2004; Booth et al. 2002, Blair et al. 2001, Bouchard et al. 1994), whilst physical activity is one of the basic needs of individuals at every stage of their life.

Various authors, in their own way, determine a minimum level of physical activeness. According to some, the insufficient physical activeness indicates the effort which does not exceed the intensity of 4-5 units on the Metabolic Equivalent of Task (MET) scale or does not produce the additional 500 kcal of energy expenditure per week. For others, the insufficient physical activity defines as the energy expenditure associated with the physical activity lower than 10% of the total daily energy expenditure (Varo, Martinez-Gonzalez and de Irala-Estevez 2003).

Regular physical activity is considered to be an effective means of promoting physical and mental health (Chakravarthy, Joyner and Booth 2002). In addition, it has a positive effect on our organism and promotes the values strengthening health. There has been proved a positive correlation between physical activeness and improved mood, better self-perception and higher self-esteem (Raglin, Wilson and Galper 2007). Undertaken physical activeness also has an influence on the reduction of depression and anxiety (Harris, Cronkite and Moos 2006).

Considering the arguments given above, the measurement of physical activeness becomes a thought-out challenge for researchers from around the world. The formation of positive habits of spending free time, of recuperation and active recreation, directly requires the knowledge of the

current level of society's participation in the wider physical culture (Huk-Wieliczuk et al. 2003a, 2003b).

Examining the issue of human physical activity, there should be a focus not only on the activities deliberately and consciously undertaken during free time, but also on physical effort undertaken within the activities connected with work, school activities, housework or with moving from place to place (Baj-Korpak et al. 2010). Considering the issue of human physical activity, there should be a focus not only on activities that are undertaken consciously and deliberately as in the case of school youth during school activities, housework or moving from place to place (Strawbridge et al. 2002), but primarily on after-school physical activity, which raises the level of physical fitness and health as well as constitutes an important factor in shaping human personality (Cynarski et al. 2005, Litwiniuk et al. 2007, 2009).

## **Materials and methods**

### ***Procedure***

This paper was aimed at determining the physical activeness of the secondary school youth in Biała Podlaska. The aim was also to clarify whether there is a differentiation in the physical activeness between sexes and whether any differences concern particular areas of the activity. The following questions were asked:

1. Were there any differences in physical activity between girls and boys of secondary schools in Biała Podlaska?
2. In which areas did differentiations in physical activity appear between sexes?
3. In the structure of activity areas, which ones were preferred by girls and which ones by boys?

The study was conducted with the method of diagnostics survey using an International Physical Activity Questionnaire (IPAQ), the long version.

Contemporarily, the IPAQ seems to be a genuine measuring method, even referred to as the only real method to be used in surveys of vast populations in developed and developing countries. It is the most reliable tool for measuring physical activity in various groups or populations of adults. It is claimed that nowadays the IPAQ is one of the most credible and widely applied methods used to determine the physical activity in the world (Welk, 2002). The expenditure was computed by multiplying the frequency and duration of physical effort by the corresponding intensity expressed in MET unit (metabolic equivalent) here 1 MET corresponds  $O_2$  consumption

at rest and accounts for 3.5 ml O<sub>2</sub>/kg body mass/min (Baj-Korpak, Soroka and Korpak, 2010).

**Participants**

The questionnaire survey consisted of 212 secondary school pupils aged from 17 to 19 of whom 117 were girls, while 94 were boys.

**Statistical analysis**

The results obtained were subjected to a statistical analysis – student *t* test was used to determine significant differences between the physical activities expressed in MET and sex variable.

**Results**

When examining physical activity of the secondary school students, it was found that between sexes significant differences occurred at  $p = 0.049$  in the overall activity. Among boys it amounted in average to 7252.1 MET-minutes/week, while among girls to 6691.3 MET-minutes/week (Tab.1).

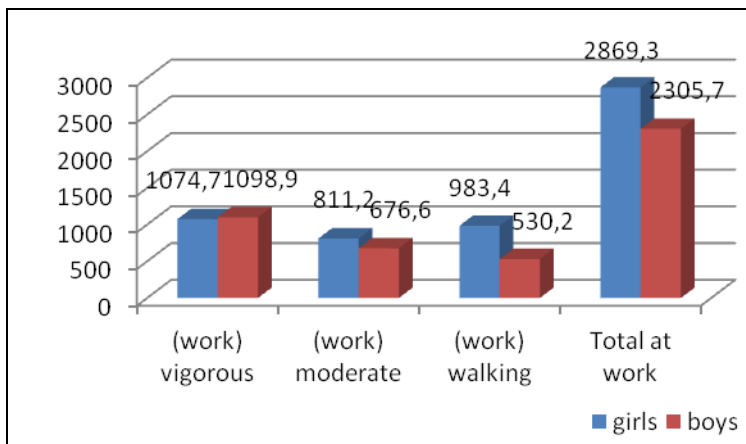
**Table 1.**

Differentiation of physical activity in particular fields of life and the type of activity considering sex of the respondents (U Mann-Whitney test)

Develop the categories	Girls		Boys		Z Value	p Value
	Total rang	n	Total rang	n		
Work-vigorous	12235.0	117	10131.0	94	-0.378	0.704
Work-moderate	12309.5	117	10056.5	94	-0.209	0.833
Work - walking	11770.5	117	10595.5	94	-1.432	0.151
Total at work	11835.5	117	10530.5	94	-1.289	0.197
Transport-	12814.5	117	9551.5	94	0.935	0.209
Transport-	12569.5	117	9796.5	94	0.380	0.703
Total for	12803.5	117	9562.5	94	0.911	0.362
Chores-intensity	11647.0	117	10719.0	94	-1.958	<b>0.049*</b>
Chores-moderate	11793.5	117	10572.5	94	-1.419	0.155
Chores-moderate	14076.0	117	8290.0	94	3.797	<b>0.001*</b>
Total from	13083.0	117	9283.0	94	1.548	0.121
Leisure-walking	12487.0	117	9879.0	94	0.194	0.845
Leisure-intensity	10895.0	117	11471.0	94	-3.503	<b>0.001*</b>
Leisure-moderate	11542.5	117	10823.5	94	-2.013	<b>0.044*</b>
Total in leisure	10771.0	117	11595.0	94	-3.703	<b>0.001*</b>
Total Physical	11542.0	117	10824.0	94	-1.961	<b>0.049*</b>

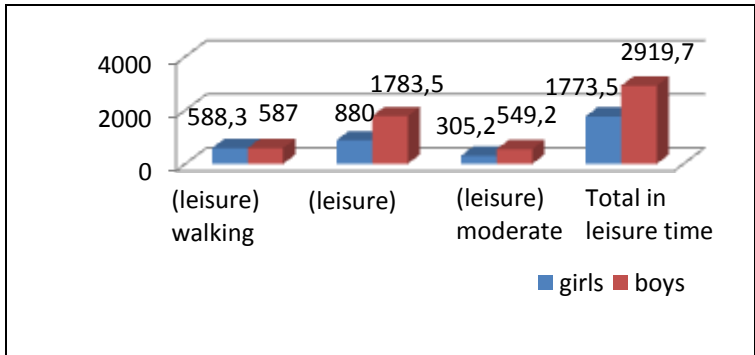
\* means level of essentiality  $p < 0.05$

There were no significant differences in physical activity associated with work, which in the case of students took the form of school duties. In this area, the most active were girls who reached the average at the level of 2869.3 MET-minutes/week, whereas boys 2305,7 MET-minutes/week. Girls showed greater activeness in walking 983.4 MET-minutes/week and in moderate activities 811.2 MET-minutes/week, comparing to boys who reached respectively: 530,2 MET-minutes/week i 676,6 MET-minutes/week (Fig.1).



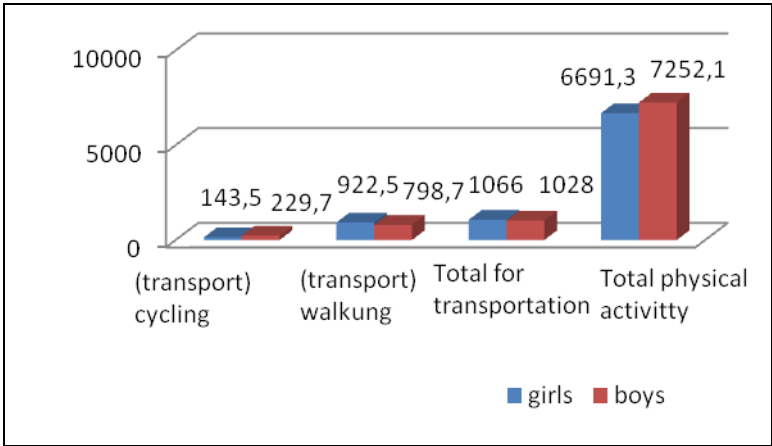
**Figure. 1.** Physical activity linked to work (education) considering sex of the respondents (in MET-minutes/week)

Particular areas of activeness also indicated significant differentiations between sexes. The most noticeable differences occurred in a field related to spending free time. In boys, the overall sport and recreational activeness reached the level of 2919.7 MET-minutes/week and was significantly higher ( $p < 0.001$ ) than among girls who attained the level of 1773.5 MET-minutes/week. In particular types of sport and recreational activeness, the greatest differences at the level of significance  $p < 0.001$  appeared in the actions of high intensity, which proved to be higher among boys at 1783.5 MET-minutes/week than among girls MET-minutes/week 880.0. Additionally, significant differences at  $p = 0.044$  occurred in moderate sports and recreational activities, which in the case of boys were higher 549.2 MET-minutes/week than in the case of girls 305.2 MET-minutes/week. In this area, just walking as a form of recreation had for both sexes the comparable values (Fig. 2).



**Figure 2.** Physical activeness of students during leisure time considering sex of the respondents

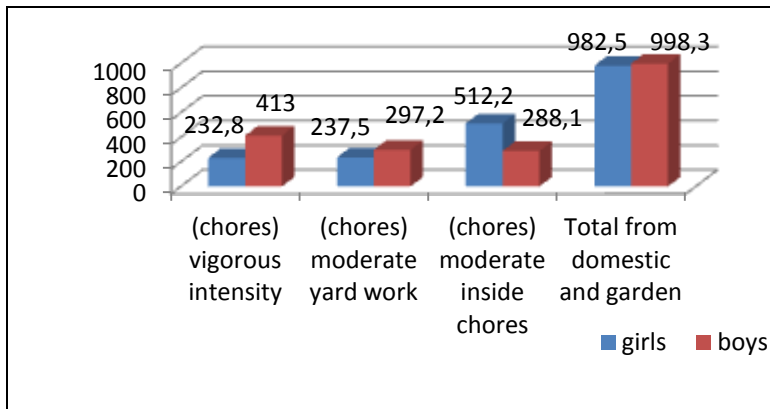
The smallest differences between sexes occurred in the area of movement. Girls showed minimally higher activeness at the level of 1066.0 MET-minutes/week than boys 1028.0 MET-minutes/week. In particular types of activeness in this area the differences were insignificant (Fig. 3).



**Figure 3.** Physical activity linked to the movement of respondents and the overall physical activeness considering sex (in MET-minutes/week)

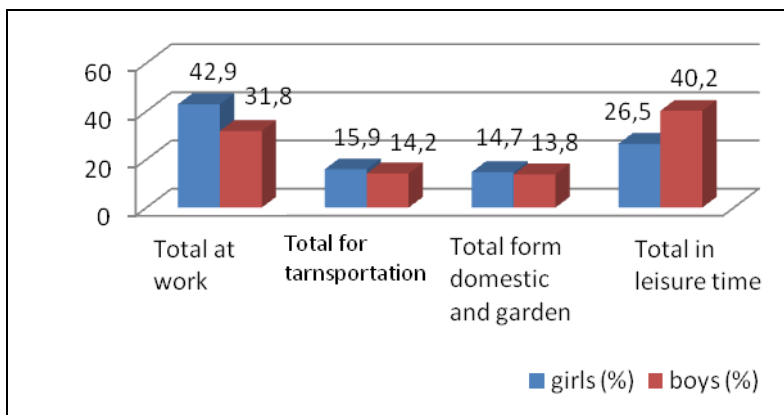
In general activity connected with housework, no significant differences in physical activity between the sexes were shown as girls received an average at the level of 982.5 MET-minutes/week, while boys slightly higher 998.3 MET-minutes/week. However, differences in the particular types proved to be significant, and in the case of the activities

connected with the cleaning housework of a moderate intensity appeared at significant level of  $p < 0.001$ . In this case girls showed much greater activity at the level of 512.2 MET-minutes/week than boys - 288.1 MET-minutes/week. However, boys were significantly at  $p = 0.049$  more active in the work of high intensity reaching an average of 413.0 MET-minutes/week, comparing to girls - 232.8 MET-minutes/week (Fig.4).



**Figure 4.** Physical activity of students associated with housework considering sex of the respondents (in MET-minutes/week)

Examining particular areas of physical activity, there was shown that the greatest differentiations of significant character between sexes at  $p < 0.001$  in the share of the structure occurred in the activities associated with work and with spending free time (Fig.5).



**Figure 5.** Participation of particular areas in the physical activity of young people considering sex of the respondents



Girls were more active at work (study) engaging 42.9% of their activity in this area of functioning, comparing to 31.8% of boys, whereas boys 40.2% of their physical activity devoted to sport and recreational activities, comparing to 26.5% of girls.

## Discussion

Scientists trying to determine the structure of physical activity within particular socio-occupational groups face a severe methodological problem trying to compare results obtained from findings of other researchers. These difficulties are posed chiefly with the application of varied terminology (Biernat, Piątkowska and Gajewski 2006) as well as with the fact that carried investigations are conducted using different methods and often different research tools.

The study presented in this paper was conducted with the use of long version of the IPAQ. Comparison was made between the results gained using the short version and those gained using the total energy expenditure in the longer version of the questionnaire (Biernat et al. 2008). Worth mentioning is the fact that in shorter version respondents declared the total physical activity without division into categories, which is the longer version of the IPAQ.

A comparative analysis of the level of declared physical activity with sex of the respondents used as the criterion, demonstrated men to be more active. The literature presented the regularities, which showed that women had lower physical activity than men (Talbot, Metter 2000), which was also showed in this paper. Girls showed significantly lower general activity than boys, who were substantially more active in sports, in intensive activities ( $p < 0.001$ ) and moderate ones ( $p = 0.044$ ). In domestic work, boys were more active in intensive activities around the house ( $p < 0.001$ ), while girls in housework demonstrated moderate intensity ( $p = 0.044$ ). Additionally, studies on physical activity in 20 countries showed similar dependencies. Men more often defined themselves as more active than women and these differences concerned especially young people of secondary school age (Bauman et al., 2009). Studied physical activity of women confirmed that it decreased with their age. Studies showed that every second young woman under 20 years was not active in accordance with general guidelines, while after 20 years of age these proportions were declining (Belandier et al. 2004). Conducted studies showed the lack of physical activity or its significant reduction among young people, associating it with their emotional problems. It was suggested that research should be conducted to determine the mechanisms responsible for the effect of physical activity on the

treatment of emotional problems of young people. This applied both, to girls and to boys (Kantomaa et al. 2008). Health behaviours associated with physical activity of young people were comparable to behaviours of older people in different countries. Low physical activity was transferred to low activity of adults and vice versa ([www.health.gov/pagviolelines](http://www.health.gov/pagviolelines), 2008). It was suggested that the lack of physical activity caused obesity, which raised to a global problem and affected all countries in the world. Physical activity in most countries was insufficient to ensure the healthy functioning of societies (Currie et al. 2004). Despite such claims, the studies should be systematically carried out that would show the current state of health of inhabitants of particular country as well as various social groups, one of whom is a group of young people of secondary schools, who are surveyed in this paper. Early detection of dangers can protect from the consequences of the lack of activity and thus obesity and health problems.

## Conclusions

A thorough analysis of physical activity declared by the respondents enabled formulating the following conclusions:

1. Boys showed higher physical activity of a significant differentiation, compared to girls.
2. Girls were more active in the area of professional work (school activities), while boys in the area of sports and recreational activities. There were no differences in activities connected with movement and housework. Girls were more closely engaged in the work at home, while boys in the activities of high intensity.
3. In the structure of activity including the areas of activity between sexes no significant differences appeared in professional work (more active girls) and in spending leisure time (more active boys).

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## ORIGINAL RESEARCH PAPER

## A MULTIDIMENSIONAL FACTOR MODEL FOR TEAM PREPARATION IN BASKETBALL

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E-mail: [e.malinauskas@lkk.lt](mailto:e.malinauskas@lkk.lt)**Abstract**

*Aim of the research: development of a scientifically proven multidimensional factor model for team preparation for youth basketball championships and evaluation of its contents in youth basketball team cohesion and psychological stability for its optimisation.*

*Methods of the research: Group Environment Questionnaire test (adapted version), players' psychological stability test, discussion, testing, documental material analysis, pedagogical experiment and mathematical statistics. The research was carried out from year 2007 to year 2009 (N=131). During the research, a statistically credible, mutually correlative link was determined between team cohesion, players' psychological stability, overall physical training and game performance indices, as well as between the three factor structure multidimensional model for team preparation for youth basketball. Team cohesion structure consisted of three components with weight in factors above 0.5 (GI-T  $r=0.839$ ; GI-S  $r=0.853$ ; ATG-T  $r=0.577$ ; ATG-S  $r=0.726$ ). Psychophysical factor structure consisted of two components: overall physical condition ( $r=0.701$ ) and emotional stability ( $r=0.652$ ). Self-regulatory factor structure consisted of two components – self-regulatory skills ( $r=0.787$ ) and motivational component ( $r=0.823$ ). The multidimensional factor model team training for championships optimises team cohesion, players' psychological stability and, therefore, also team performance is improved. It was concluded that in both experimental and control group there were no statistically credible differences between teams ( $p>0.05$ ), this verifies that the teams were homogeneous. In the experimental group (before and after the experiment) there were statistically significant differences in all team cohesion and psychical stability scales. The changes in indices are statistically significant ( $p<0.05$ ).*

**Key words:** *multidimensional factor model, team cohesion, players' psychological stability.*

## Introduction

Basketball is one of the most popular sports, not only in Latvia and Lithuania, but also in other parts of the world. In high ranking competitions psychical tension increases and players are not always capable of concentrating their attention during the championship, sometimes not even during a single game and are not able to eliminate the stress caused by various elements during the most important moments of the game. Sports scientists mention a players' ability to regulate one's own psychical condition as one of the criterions of a player's psychological stability (Мильтман, 1990; Moran, 2004; Jowett, Lavallee, 2007; Malinauskas, 2010).

Term "psychological stability" characterises a player's ability to deal with stress, not give up when they are facing difficulties and bad luck, their ability to continue playing till the end of the game even in extreme situations (Блюменштейн, Мильтман & Худадов, 1997). Psychological stability consists of the player's emotional stability, self-regulatory skills, motivational energy component and performance stability, which is characterised by the player's ability to concentrate for longer periods of time in action. The basis of psychological stability consists of a player's physical training, former championship experience, level of self-regulatory skills development, belief in oneself and ability to structure one's aims (Malinauskas, 2001). In psychological stability development a wide variety of methods are used. The different tasks are: autogenic training, visual relaxation, self-suggestion, psychological consulting, methods of dialogue, neuromuscular relaxation, and training under a high level of tiredness (Morris, Summers, 2003).

In team and other sports, cohesion is considered to be a major factor in promoting team efficiency; sports specialists frequently link a team's success to it. Team cohesion level and, therefore, also their results in championships is a matter of major importance in modern dynamic sports, when different ways of improving results are constantly sought. Research shows that team cohesion correlates positively with team performance (Carron, Widmeyer & Brawley, 2002; Vazne, Rudzitis; 2007; Vazne, 2008; Vazne, Rudzitis & Larins, 2008; Vazne, 2010). Team players' faith in their ability to reach their goals, as those players are able to keep their concentration ability even if they score less, maintain power of concentration and fighting spirit even if the circumstances are bad (Feltz,

Lirgg, 1998). Meanwhile cohesion might not just improve team work, but also it can increase the level of team cohesion after a successful game.

Nowadays basketball is characterised by a dynamic playing style, high level of movement activity and growing tension in the most important moments of the game, it requires the players to use their maximum speed, power and functional mobilisation.

One of the main tasks in youth athletes' training is development of optimal physical ability, because based on good physical condition they will also be able to perform at other tasks better. Physical training is one of the most important parts of the basketball training process. On the one hand, it promotes an athlete's personality development, body strength, development of physical qualities and improvement of functional possibilities; on the other hand, it also develops the qualities which are necessary to achieve great results in this kind of sport.

In basketball, physical training is linked closely to other kinds of training – technical, tactical and also psychological (Moran, 2004). Physical training, if it is focused and carried out according to didactical requirements, has effect on every age and qualification group – it improves players' skills, it also acts as a basis of players' psychological stability (Озепов, 2002).

Insufficient strength and speed will not allow the player to use the methods of basketball of our times; those must be done in high speed. Lack of strength will make the player feel tired faster and, therefore, create problems with skilled movements. The player will lose throw accuracy, height of jumps and start speed.

Basketball coaches' practical experience shows that it is difficult to maintain team cohesion and players' psychological stability during championships. Especially, in Olympic Games, world championships and other tournaments, the competing teams are usually equally well trained, both physically, technically and tactically.

Research aim: development of a scientifically proven multidimensional factor model for team preparation for youth basketball championships, and evaluation of its contents in youth basketball team cohesion and psychical stability for its optimisation.

Subject of the research: youth basketball team cohesion and players' psychological stability development in the process of training for championships.

### **Material and methods**

Research methods consisted of: test, discussion, documental material analysis, pedagogical experiment and mathematical statistics. This research was carried out from year 2007 to year 2009, total number of

respondents was 131. Group Environment Questionnaire test (to determine team cohesion in sports). To determine team cohesion level a Group Environment Questionnaire (GEQ) test developed by Canadian psychologists A. Carron, L. Brawley and Widmeyer was used (Widmeyer, Brawley, Carron, 1985; Carron, Widmeyer, Brawley, 2002). Theoretical basis of the GEQ test consists of sports dynamics (Carron, Widmeyer, 1997; Murphy, 2005). GEQ helps to research impact of environment (group and individual) on team cohesion (Brawley, Carron, Widmeyer, 1985), this is one of the most widely used methods in the world to research team cohesion. GEQ has been used in cohesion researches of many teams and the results prove that GEQ can be used to obtain varied information in sports science also those results indicate high validity of obtained results (Carron, Bray & Eys, 2002; Brawley, Carron & Widmeyer, 1987; Sprink, Carron, 1992; Dion, Evanss, 1992).

During this research the Group Environment Questionnaire, developed by the Canadian scientists was adapted for usage in the Latvian environment. After adaptation, the adapted test version in Latvian was used. In the research cohesion evaluation criteria were used, developed by the author during its standardisation process (Vazne, 2008). The evaluation criteria respondent base consisted of Latvian youth basketball league team players of 2007 and 2008, who participated in the European basketball championship (Cronbach's alpha coefficient 0,762).

Psychological Stability test (Мильман, 1990) was used. Psychological Stability test helps to evaluate a specific player's personality trait such psychological stability. This test is based upon a multidimensional model; it consists of four scales: emotional stability in championships, self-regulatory skills, energetic component of motivation, and performance stability during championships (Malinauskas, 2008). Analysis of the test results helps to determine the dominant emotional reactions during the training period, before an important championship in long term.

Discussions were carried out based on standardised questions; results were used as a supplementary aid of quality data interpretation.

Testing (overall physical condition determination tests was used). In years 2007 and 2008 a check-up of basketball players' physical condition during training period for European championship was carried out. The result evaluation was based upon criteria developed at the Latvian Academy of Sport Education (Rudzītis, Lāriņš, 2008).

In order to evaluate players' performance during championships, a championship technical protocol analysis was carried out. Twelve Latvian



youth basketball teams' games technical protocol analysis was carried out after the European championship (six teams after championship in year 2007 and six teams after championship in year 2008). The efficiency coefficient calculation was based upon a formula developed by Preobrazhensky (Преображенский, 1970).

Pedagogical experiment was carried out from January till May, in year 2008. Aim of the pedagogical experiment: team cohesion and psychological stability determination in both experimental and control groups, multidimensional factor model content for team preparation for youth basketball championships usage impact on team cohesion and players' psychical stability evaluation. Object of the pedagogical experiment: team training process for most important championships of the season. Subject of the pedagogical experiment: 17 year old female basketball players. Methods of the pedagogical experiment: questionnaire (GEQ, Psychological stability test); discussions; mathematical statistics.

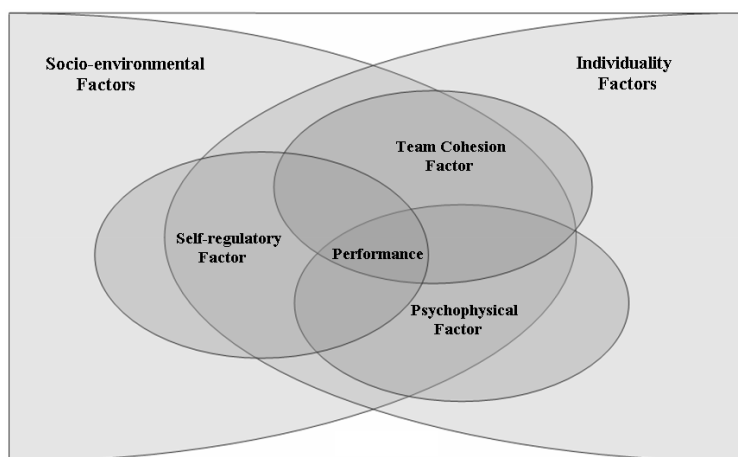
### **Research procedure**

The Group Environment Questionnaire was adapted for the Latvian sports environment (team sport). To determine test credibility Cronbach's alpha coefficient was used, for test validity determination a factor analysis was used. Pilot researches after GEQ adaptation showed that there were statistically credible correlation coefficients between players' individual cohesion scales and team performance in championships, thus proving that there is a positive mutual connection between team cohesion and performance in championships ( $p < 0,01$ ). (Vazne, Rudzitis, 2007). Each basketball team's cohesion level, psychical stability and overall physical training levels were determined in years 2007 and 2008 during training period before the European championship. Individual profiles for each team were developed and analysed for both years 2007 and 2008 (Vazne, 2008). A three factor structure was used: "team cohesion factor", "self-regulatory factor" and "psychophysical factor" (results of respondents in years 2007 and 2008, U-18, U-20 age groups). Team cohesion structure consists of three components with its weight in factors above 0.5 (GI-T  $r=0.839$ ; GI-S  $r=0.853$ ; ATG-T  $r=0.577$ ; ATG-S  $r=0.726$ ). Psychophysical factor structure consists of two components: overall physical condition ( $r=0.701$ ) and emotional stability ( $r=0.652$ ). Self-regulatory factor structure consists of two components – self-regulatory skills ( $r=0.787$ ) and motivational component ( $r=0.823$ ) (Vazne, 2008). A multidimensional factor model was developed and its contents used for training a youth basketball team. Model contents were developed according to factor analysis' results, also by evaluation of important mutual links between team cohesion, players'

psychical stability, overall physical training and performance results in championships (efficiency coefficient and ranking) ( $p < 0,05$ ). During the research (published in Ph.D. Dissertation by Z.Vazne) contents were developed for each of the above-mentioned factors (Vazne, 2009).

### Results of the research

The “Multidimensional factor model for team preparation for youth basketball championships” has two independent and four dependent variables (Fig. 1): Two independent variables “Socio-environmental Factors” and “Individuality Factors” consist of “Social environment”, which consists of the micro-environment (upbringing in family, closest friends, relatives) and the macro-environment (which consists of sports club, school, society, championship level, etc); “Individuality”, which includes gender, age, athlete’s personal characteristics, etc. Four dependent variables are “team cohesion”, “self-regulatory factor”, “psychophysical factor” and “performance”. “Team performance factor” consists of four cohesion scales. “Self-regulatory factor” consists of two scales characterising player’s psychical stability – self-regulatory and motivational component. “Psychophysical factor” consists of overall physical training and emotional stability as means of player’s psychical stability. “Performance” is an integral, affected by all above-mentioned.



**Figure 1.** Multidimensional factor model for team training for basketball championships (by Vazne, 2009)

This model can be regarded as a multidimensional factor model for team training for championships in basketball, because it is based upon many factor structures which are connected to each other.

First, *team cohesion factor* – team cohesion is evaluated as: multidimensional, as team sports are based on more than just one factor; dynamic, as team cohesion is not a constant, it can change as time goes by; instrumental, as it reflects team development and reasons of its existence; emotional, as it is linked to emotional factors which influence players' individual value scale and attitude.

Second, according to *psychological stability* definition, psychical stability is multidimensional, as it characterises players' abilities to: understand and know how to regulate one's own emotional conditions; carry out emotional control; know how to maintain self-confidence and believe in oneself; regulate consciously one's own psychical condition; keep up the spirit till the end of the game even if the conditions are not favourable.

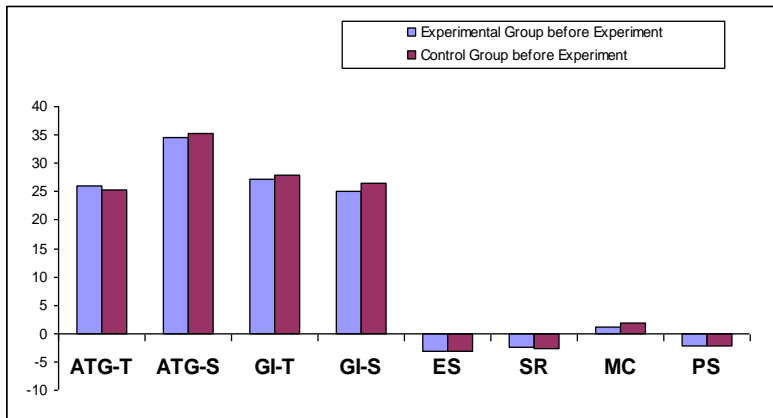
Third, overall physical condition is characterised altogether by speed, strength, endurance, coordination and prowess. In this research it was estimated in grades. Emotional stability during championships is one component of psychical stability and it is characterised by players' ability to keep the fighting spirit in difficult circumstances.

Model contents were developed according to factor analysis results, also by evaluation of important mutual links between team cohesion, players' psychical stability, overall physical training and performance results in championships (efficiency coefficient and ranking;  $p < 0.05$ ).

During the pedagogical experiment, a multidimensional factor model for players' training for championships content implementation impact on team cohesion and psychological stability evaluation in both experimental and control groups was carried out as follows: homogeneity tests in experimental and control groups, and a part of the model contents and programme for team cohesion and psychical stability components improvement was chosen. After the programme implementation the dynamics of results were evaluated in both experimental and control groups and its link to team's rank in final tournament.

Team cohesion is characterised by two scale indices: ATG-T, ATG-S (individual attractions to group task accomplishment and individual attachment to group in social tendency), GI-T, GI-S (group integration for task accomplishment and group integration in social tendency). Team's psychical stability is characterised by: emotional stability (ES), self-regulatory skills (SR), motivational component (MC) and performance stability (PS).

In the experimental group GI-T indices ( $26.08 \pm 4.1$ ) are regarded as low ones (Fig. 2).



**Figure 2.** Experimental and control group team cohesion and psychological stability scale indices in the beginning of the experiment (n=24)

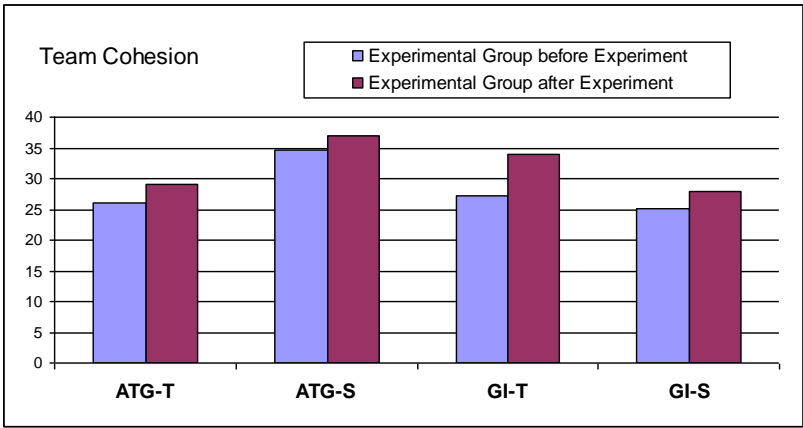
*Psychological stability scale contents (ES – emotional stability; SR – self-regulatory skills; MC – motivational content). Team cohesion scale contents (ATG-T – individual attractions to group task accomplishment; ATG-S – individual attractions to group in social tendency; GI-S – group integration in social tendency; GI-T – group integration for task accomplishment).*

After analysing individual answers it can be concluded that team players have a tendency to have different points of view regarding team goals and task implementation, as well as that the team cooperation style is not open and there is a "blaming process" between the girls in case of bad performance. Other team cohesion indices are average.

In experimental group emotional stability indices ( $-3.08 \pm 1.31$ ) and self-regulatory skills indices ( $-2.5 \pm 2.39$ ) are below average. This indicates that the team is below average in understanding its emotional conditions, therefore, more prone to provocations during championships and negative emotional reactions in stressful situations. Low self-regulatory skills also affect this. Motivational component is below average ( $1.25 \pm 2.0$ ). Performance stability is below average, it indicates that the team players probably have problems with attention stability in long term. Control group indices are similar to those of the experimental group. T-criterion (*Independent Samples Test*) for independent team comparison (both experimental and control groups) shows that team cohesion and psychological stability indices have no significant differences between teams ( $p > 0.05$ ), it means that the groups are homogeneous.

Before the multidimensional factor model implementation for preparing, individual discussions with each of experimental group players were carried out in order to get to know them and to determine each player's individual needs. Individual training plans were developed. After those, content implementation team cohesion and psychological stability tests were repeated and analysed.

In Figure 3 are shown experimental group indices before and after content implementation. After dynamics evaluation of the indices it can be concluded that indices have improved in all cohesion structures in the experimental group.



**Figure 3.** Team cohesion scale indices in the beginning of the experiment and at the end of the experiment

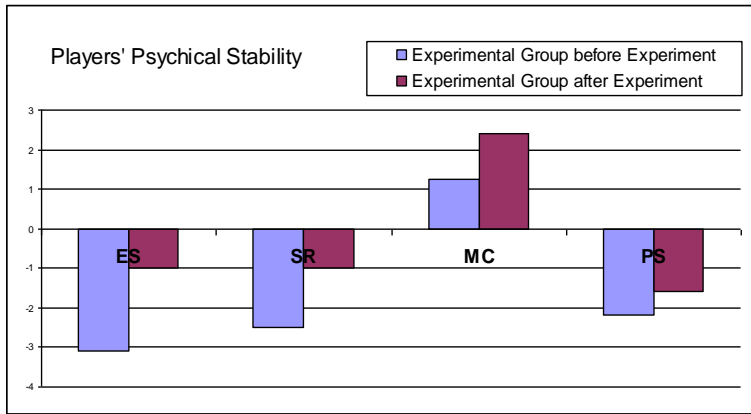
*Team cohesion scale contents (ATG-T – individual attractions to group task accomplishment; ATG-S – individual attractions to group in social tendency; GI-S – group integration in social tendency; GI-T – group integration for task accomplishment).*

Also, in indices of players' psychological stability, the results are higher in all its structures. Changes in the beginning of the experiment and at the end of the experiment, after the content was implemented, are statistically valid ( $p < 0.05$ ) (Fig.4).

Before the pedagogical experiment in both experimental and control groups it was determined (using a T-test) that there is no significant difference between teams ( $p > 0.05$ ), this indicates team homogeneity.

Analysis of results of discussions allows concluded that for players the most important influence on performance is linked to ability to "cope" with stress before important championships, and also it is linked to self-

confidence. As the most important factor in team performance improvement players mention team cohesion.



**Figure 4.** Players' psychological stability scale indices in the beginning of the experiment and at the end of the experiment

*Psychological stability scale contents (ES – emotional stability; SR – self-regulatory skills; MC – motivational content).*

In the experimental group (before and after the experiment) there were statistically significant differences in all team cohesion and players' psychological stability scales. Changes in indices are statistically valid ( $p < 0.05$ ). In the control group there were insignificant changes, but, when tested with T-test's conditional sets, it was determined that those differences are not statistically significant

( $p = 0.34 \dots 0.93$ ). Respondents in the experimental group, when the content was implemented, ranked as the second best in the final tournament (in previous researches it was statistically proven that there was a tight link between team cohesion, psychological stability scales and team performance). There were no changes in control group.

## Discussion

By analysing the data of the basketball players in the beginning of the experiment and at the end of the experiment we established that multidimensional factor model for team training for basketball championships was confirmed.

The approbated team training system, which is based upon scientifically tested evaluation criteria, can be applied in sports science (it

is recommended to use it during team training process). Results of the research suggests to develop team performance prognosis and show "a way to go" to improve this performance. Experimentally tried and tested multidimensional factor model content can be used in team training for a championship (Vazne, 2008).

The consequences of the present study may be grounded by researchers proving that team cohesion positively correlates with team performance (Carron, Widmeyer & Brawley, 2002, Vazne, Rudzitis & Larins, 2008) and by researches proving that the players' ability to regulate one's own psychical condition as one of criterions of player's psychological stability (Morran, 2002, 2004; Jowett, Lavallee, 2007; Malinauskas, 2010).

### ***Limitations and further suggestions***

The present research not only revealed some tendencies of team training in basketball, but also discovered the perspectives for further research. Another factor that may influence youth basketball players' team training is the kind of sport - basketball. A multidimensional factor model was created and its contents used in training of a youth basketball team. It was established that in the basketball players' respondent groups (age 18 to 20) team cohesion, psychological stability and overall physical condition components determination was predominant. Multidimensional factor model team training for championships contents implementation optimizes team cohesion, players' psychological stability and also improves team performance. Correlations between model variables were established only in basketball – this is the kind of sport that requires communication between team members. We suggest analysis of tendencies of teams in sports where there is less communication required between the players.

### **Conclusions**

Statistically credible mutually correlative link determination between team cohesion, players' psychological stability, overall physical training and performance indices, as well as the three factor structure promoted development of scientifically proven multidimensional factor model for team training in youth basketball. Team cohesion structure consisted of three components with its weight in factors above 0.5 (GI-T  $r=0.839$ ; GI-S  $r=0.853$ ; ATG-T  $r=0.577$ ; ATG-S  $r=0.726$ ). Psychophysical factor structure consisted of two components: overall physical condition ( $r=0.701$ ) and emotional stability ( $r=0.652$ ). Self-regulatory factor structure consists of two components – self-regulatory skills ( $r=0.787$ ) and motivational component ( $r=0.823$ ).

A multidimensional factor model team training for championships contents implementation optimises team cohesion, players' psychological stability and therefore also improves team performance. It was concluded that in both experimental and control groups, after evaluation of team cohesion and players' psychological stability indices, there were no statistically credible differences between teams ( $p > 0.05$ ). This verifies that the teams were homogeneous. In the experimental group (before and after the experiment) there were statistically significant differences in all team cohesion and psychical stability scales. Changes in indices are statistically significant ( $p < 0.05$ ).

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REVIEW PAPER

## PROBLEMS OF SUCCESSFUL LUGE SPORTSMEN CAREER DEVELOPMENT

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### Abstract

*The article aims to evaluate the problematic stages of successful luge sportsmen career development and current situation in luge sport. Several recognized psychology theories are used, evaluated and related to successful luge sportsmen career development in Latvia. The author analyses results of a survey conducted among Latvian and Russian junior team members of luge sport to draw conclusions which contribute to further development of luge sport in Latvia.*

**Key words:** *Luge sport, Sportsmen career*

### Introduction

Luge sport is an elitist Winter Olympic sport with a long tradition in Latvia. Latvian luge sportsmen have received awarded prizes in all Winter Olympic Games. But, in order to let this tradition continue, magnificent effort must be contributed in luge sport and sportsmen career development at its very root.

Luge sport is quite extreme sport with corresponding factors of high risk, number of accidents, psychological instability and fear factor; all causing considerable problems of trainee attraction to the sport and their selection at the beginning stage of the luge sport. Productive selection in luge sport is hindered by economical and social factors and their interaction. Luge sport is one of the most financially expensive sports with a specific sports track designed to practice and compete. Therefore it is impossible to take part in this sport without the financial support of the country as well as living nearby the track.

Aim of research: summarize theoretical conclusions and results of empirical investigation and analyze the essential problems of successful luge sportsmen career development

### **Investigation methods:**

1. Theoretical: analysis of literature and information resources.
2. Empirical: conducting a questionnaire and statistic processing of its results.

**Theoretical guidelines:** Participation in scientific conferences, study of educational and psychological literature, afterthoughts of discussions and individual conversations have established conviction that it is highly necessary to activate the dialogue about successful luge sportsmen career development. Sportsman's career – it is successive and systematic work aimed at high achievements and continuous development and perfection in the chosen sport.

Psychologist *V. Filin* divides sportsman's career in four phases:

1. Initial preparation phase.
2. The phase of undertaking sport specialization.
3. The phase of in-depth sport specialization.
4. Sports performance improvement phase:
  - First big success zone,
  - Optimum capability zone,
  - The zone of maintaining high achievements (*Филин, 1974*).

Development of sportsmen career is not easy; it is a complicated multi-effect process, which develops individually in its own way. Sports psychologist *N. Stambulova* has described seven main crises during sportsmen career:

1. Crisis of undertaking sport specialization.
2. Transitional crisis undertaking in-depth sport specialization in the chosen sport.
3. Transitional crisis from mass sports to high achievements sports.
4. Transitional crisis from junior to adult sports.
5. Transitional crisis from the amateur to professional sport.
6. Transitional crisis from the peak of sports achievements towards career decline and career exit.
7. Final crisis of active sports career exit (*Stambulova, 1999*).

At the end of a luge sportsmen's career in Latvia, it is important to note that only a few sportsmen can become a coach, since this type of sport is not widely spread throughout the country. The majority of

sportsmen will have to think about their further source of income, because even reaching the top ranks of the world the financial resources will not be enough to sustain their further life.

The psychologist points out the exact demands for the specific sport which influence the sportsmen career:

- General demands and conditions of sports activities. These are competition, rivalry, the need for self-improvement, increase of physical and mental load and the need of specialization;
- Specific requirements of the chosen sport. These include specific demands of the microenvironments, sportsman's psychological state, psychomotor requirements, correspondence level of mental characteristics, communicative demands and demands for trainer's personality;
- Individual factors of sports activities. These relate to giftedness, training conditions, influence of social, micro- and macro-environments, and sportsman's individual character traits.

The most significant sportsmen career development factors are linked to the improvement process of sportsman's personality:

- Independence and the ability to organize and manage their activities purposefully are an integral part of the sportsman's growth;
- Self-analysis is an important part of the sportsman's personality improvement process, because only by sportsman understanding himself, his own potential and real opportunities helps the sportsmen assess themselves and move on in their career;
- The process of self-development is the key element of motivation. The term "motivation" implicates a set of motives that encourages and justifies personal activities, actions, behaviors, attitudes, needs and interests (*Abele, 2009*).

Expressions of motivation are:

- Activity directed at personality;
- Individual effort, its quantity in purposeful activity (overcoming obstacles);
- Persistence to achieve the goal at given time period.

Quite often we observe and encounter lack of motivation among junior sportsmen, especially the lack of inner motivation, what hinders junior sportsmen to develop and reach high results. In the Coaches Handbook it says that sportsman's performance depends not only on his skills, abilities and resources, but also the motivation (*Trenera rokasgrāmata, 2004*).

Motivation is a human psychological characteristic, which includes the factors that create, promote and support human behavior in a particular work. In its turn, motivation is 'means' to get the men work better. Sportsmen will work to their full potential if they can perform self-realization, feel psychologically comfortable and envisage potential development in their activities and the career. Sportsman with a high level of performance motivation it is important to be recognized at his work. Career development mainly depends on sportsman's own desires, skills and abilities to move forward. Sportsman with a high level of performance motivation is able to realize their individual development needs by deepening his knowledge and professional skills (*Ильин*, 2009). Results indicate that a sportsman who is constantly showing initiative, willingness to work, is setting new goals when the current target is reached is more prone to professional career development in this direction.

To a large extent sportsman's career rise is influenced by several environmental factors:

**Socio-psychological factors:**

- Positive and appropriate work and rest climate is one of the most important factors. A good cooperation model between general schools and sports schools is a sports boarding school, or special sports classes in general schools, which helps to combine education with professional sports. This solution facilitates everyday life of the sportsman, his trainer - teacher, and his parents for productive work and facilitates achievement of set targets. A boarding school or special sports classes promotes wider sportsmen selection, comprising the area of whole Latvia.
- It is very important that the family and the general school support the sportsmen and ensure close and understanding cooperation. All three components of this system are expected to ensure corresponding work climate to facilitate achievement of the planned targets.
- For the trainer to ensure professional training process, he should preferably be professionally educated in sports education, general education and psychology, be a strong personality with organizational skills as well as experience and professional skills in luge (*Trenera rokasgrāmata-2*, 2006).
- Sportsman's formation is the result of long and systematic work. Every sportsman has to grow and develop his personality (individuality) physically, intellectually, emotionally and socially.

- The impact of socio-economic environment has very important impact on the development of luge sport at the state and municipal level.

In Latvia the first obstacles in successful luge sportsmen career development are encountered at luge sport specialization start-up phase when facing specific difficulties of luge sport. From my own personal experience and from dialogues with my colleagues – trainers and sportsmen, the majority point out the following:

- Aerodynamic overload after specialized training in luge track on ice and head and back pains afterwards.
- Fear of injury, which create psychological instability during training.

These reasons are essential when talented trainees terminate their sports career. During this period, much depends on the trainer's individual educational and psychological skills, helping the sportsmen to overcome this phase, the relative difficulties and obstacles.

### **Empirical results**

Considering the most important state investments in the development of luge sport infrastructure and financial planning from year 2002 up to now, it should be noted that the founded State agency „Latvian Children and Youth Luge Sport School” (Latvijas bērnu un jauniešu kamanīņu sporta skola) is an institution with analytically well stated by-laws un self-sustainable financial budget and created positive changes and opened opportunities for Latvian children and youth luge sport development. More specific with the analysis:

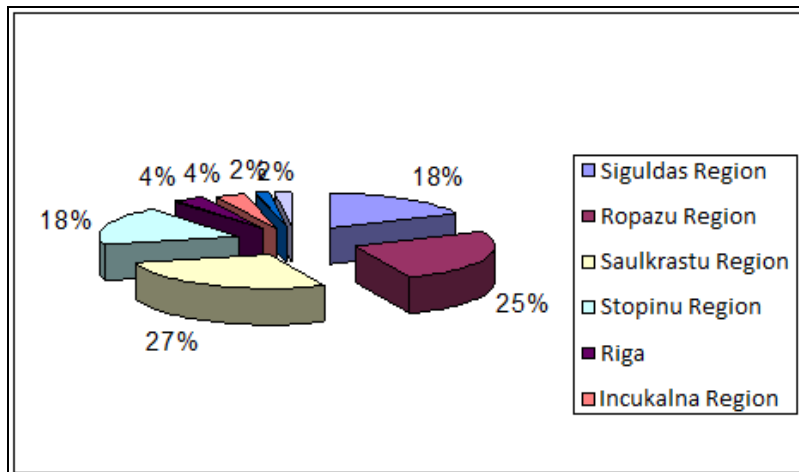
- This provided opportunity to open boarding school for 20 trainees with state ensured financing,
- This provided co-financing for feeding of the trainees,
- This allowed agency to obtain a transport vehicle (micro-bus) to assist educational and training process,
- Promoted participation of trainees at international level competitions (3 or 4 contests per season),
- Ensured possibility to obtain new and qualitative inventory (sports sleighs and spare parts) for each trainee corresponding to their physical parameters.

This socio-economic environment contributed to a meaningful children and youth luge sport high level performance, which has now been materialized in the results of Latvian national team level. In this season five trainees are getting trained for the Youth Olympic Games in Innsbruck and they are also Latvian national team candidates.

Unfortunately we can talk about this well created environment and success in the past as due to the state financial crisis all specialized State sport agencies were closed, including the Children and youth Luge Sport State Agency with state financing (Cabinet of Ministers Order No.813). Only thanks to the fact that Latvian Children and Youth Luge Sport School is the only one in Latvia, it was possible to maintain its functioning as a branch of Murjani Sports Gymnasium, but with much less state financing. This is the second season when school trainees cannot participate at international competitions outside Latvia. The boarding school is also closed and to admit, all these factors lead to the following:

1. Considerable decrease in the number of sport school's trainees;
2. Lost opportunity to attract children living in different parts of Latvia to luge sport.

Specific training conditions can be ensured only in Sigulda Bobsleigh and Luge Track with artificial ice. Therefore, considering the above situation, wide geographic selection of sportsmen is limited. Riga region has absolute dominance of 94.5 % (namely Sigulda and the places in its vicinity). Only 2 % or just one sportsman from all Children and Youth luge sport school trainees is from Jekabpils region. Let me stress once again, that Sigulda and its surrounding places provide majority selection, thus regional selection of potential sportsmen is minimal and this thus endangers the future of Latvia luge sport. (See fig.1)



**Figure 1.** Geographical location of sportsmen



3. Limited financial means is the main reason of limited training time in the ice track;

4. Sports pedagogues –trainers are leaving for better paid jobs as no perspective and future is clear to obtain necessary financing.

The above situation is not favorable for positive results and high achievements of future luge sport.

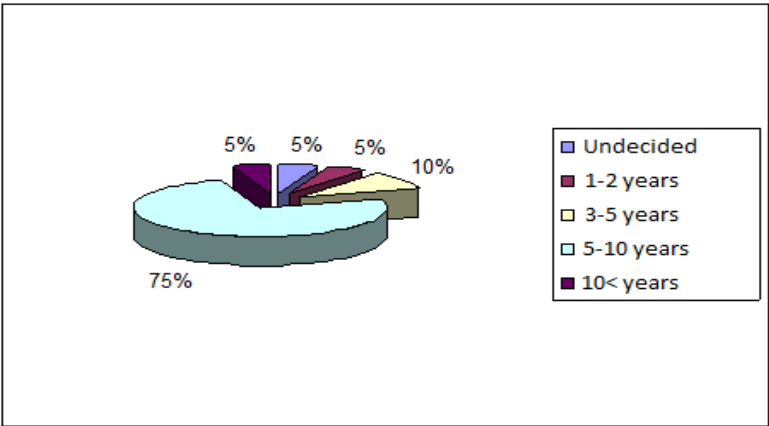
In order to find out the future development of luge sport and sports career today, anonymous survey was conducted among 30 respondents – sportsmen of Latvia luge sport aged between 14 till 23 (average age 18.5 years), (men 28, women 2). (Tab.2)

**Table 2.**

Experience of Sportsmen at different level competitions

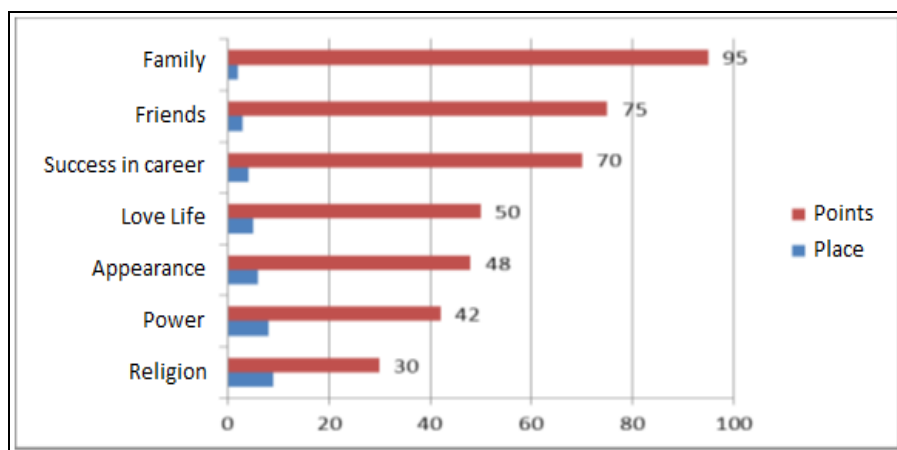
Competitions of local area	0	0%
Competitions of regional level	0	0%
State level competitions	10	50%
Europe level competitions	0	0%
Worldwide competitions	10	50%

The results show that the sportsmen who have had good performance at the state level competitions, are engaged in the sport not less than 5 years (figure 3), are motivated to move up in their professional sports career and show willingness to increase their level of education and experience support from their families (figure 4).



**Figure 3.** Duration of sportsmen active career (by years and %)

Sportsmen were offered to evaluate their value priorities and friends, family and career were pointed out as the most important.



**Figure 4.** Value priorities among luge sportsmen

Keeping in mind the future development of luge sportsmen career, a question about their plans for the next three years was asked and the results stated that career is the most important (100%), followed by family and good education almost for everybody – 90% (Tab.3)

**Table 3.**

The most important values of sportsmen in three year time span

Family	28	<div style="width: 90%;"></div>	90%
Career	30	<div style="width: 100%;"></div>	100%
Education	28	<div style="width: 90%;"></div>	90%
Appearance	0	<div style="width: 0%;"></div>	0%
Religion	0	<div style="width: 0%;"></div>	0%
Love Affairs	0	<div style="width: 0%;"></div>	0%

## Conclusion

Conducting theoretical and empirical investigation the author makes the following conclusions:

1. The main factors contributing to successful sportsmen career are factors of personal development and material and technical base.

2. Investments in material and technical infrastructure in luge sport in Latvia could be classified as sufficient during the time period from 2002-2010, however, starting from year 2010 – as insufficient.
3. Sportsmen point out family, education and career as the most important values in their self-evaluation.
4. Sportsmen of Latvia luge sport orient themselves towards national and world level competitions which clearly point out the importance of this sport in Latvian sports life.
5. The main problems of successful career development are family support, presence of friends and reliable partners in sport activities and financials feasibility to engage in training and competition process.

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## REVIEW PAPER

SPORT CLASSES FOR SUSTAINABLE STUDENT  
HEALTH PROMOTION

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**Abstract**

*Sports is the only school subject which seeks to prepare children for a healthy lifestyle and focuses on their overall physical and mental development, as well as imparting important social values such as fairness, self-discipline, solidarity, team spirit, tolerance and fair play. At present it is necessary to implement changes in the orientation of physical education as a subject, taking into account children health and social needs and expectations. The aim of the research was to evaluate reaching the objectives, set forth in public health policy documents to promote Latvia student health, revising the means for reaching the objectives concerning quality in sports classes. The material and methods of the research included content analysis of policy documents, conceptions, programmes, investigations. The results and main conclusions: schools strive to formally reach the objectives of physical education, set forth in public health policy documents, but there are reserves in improving the means of assuring quality, and widening the space of possibilities for students in closer relationship among all parties, involved in student health promotion. As a result of the research suggestions for the improvement of the quality of sport education to promote student health in long term are worked out.*

**Keywords:** *Physical education, sports class, student health promotion, assessment of student achievements.*

**Introduction**

Recently, with the development of information technologies and the increase of study load children and youngsters become more sedentary –

they spend more time, working on a computer or doing home tasks rather than do sports or participate in other physical activities (State Health Promotion Agency 2004, 2007a). Because of this there is no wonder that due to the lack of movements young people face such problems as obesity (State Health Promotion Agency 2007b), posture and cardiovascular system disorders, as well as other health problems, caused by sedentary and emotionally strained study regimen (State Health Promotion Agency 2008).

For successful growth a human body needs sufficient movement activity and balanced diet (World Health Organization 2008). Movements promote the development of regulating and coordinating mechanisms of the CNS, as well as the processes of the body humoral regulation (World Health Organization 2010).

Insufficient physical condition of Latvia students and their health indicators justify the necessity to investigate the causes and work out the strategy for promoting student health, as well as evaluate reaching objectives, set forth in policy documents, concerning the sphere of society health, revising the quality of means used for reaching the objectives.

## **Material and methods**

The material and methods of the research included content analysis of international and national-level policy documents, conceptions, programs, investigations related to student physical activity promotion.

## **Results and discussion**

### ***Exploration of political context of Latvia***

Children health as a fundamental right is referred in many international and national-level policy planning documents. Numerous documents, strategies, plans and regulations have been developed and accepted by the Latvia Government in the course of the last several years, intending to develop, improve and reform the health care system in Latvia (Tragakes et al. 2008). There is a problem that Latvia people do not consider the importance of physical activities as a health-promoting factor (State Health Promotion Agency of Latvia 2004). Since 2006 the Latvia Government announced the objective to pursue investments in promotion of healthy lifestyles, including physical activities and sports. Latvia approved the following international documents related to children physical activity promotion:

- Declaration of the Rights of the Child (*Adopted by UN General Assembly Resolution 1386 (XIV) of 10 December 1959*) which envisages that the member states should create possibilities for children and more

favourable conditions for health promoting physical activities. The child shall be entitled to grow and develop in health. The child shall have the right to adequate nutrition, housing, recreation and medical services. The child shall have full opportunity for play and recreation, which should be directed to the same purposes as education; society and the public authorities shall endeavour to promote the enjoyment of this right.

- A World Fit for Children (2002) calls for the mobilization and allocation of new and additional resources at both national and international levels for promoting a healthy lifestyle among children and adolescents. Children should get the best possible start in life. Their survival, protection, growth and development in good health and with proper nutrition form the essential foundation of human development.

- The Global Strategy on Diet, Physical Activity and Health (2004) addresses two of the main risk factors for non-communicable diseases, namely, diet and physical activity. School policies and programmes should support the adoption of healthy diets and physical activity. Schools should protect student health by providing health information, improving health literacy, and promoting healthy diets, physical activity, and other healthy behaviours. Schools are encouraged to provide students with daily physical education. Equally important is the need to put in place effective mechanisms for evaluating the efficacy of prevention of non-communicable diseases.

- European Strategy for Child and Adolescent Health and Development (2005) gives insight in children health problems and the most successful solutions of them in European countries and how to carry out different activities in order to improve children health: policies, programmes and health systems should be in place to work towards the following target: healthy lifestyle development – adequate diet, physical activity, oral hygiene. Our investment in the next generation is also a matter of encouraging healthy lifestyles. Sufficient physical activity and a nutritionally balanced diet are the foundation stones for good health.

- The focus of the Global Recommendations on Physical Activity for Health (2010) is primary prevention of non-communicable diseases (NCDs) through physical activity at population level, because physical inactivity is now identified as the fourth leading risk factor for global mortality. For children and young people aged 5–17 years old physical activity includes plays, games, sports, transportation, recreation, physical education or planned exercise, in the context of family, school, and community activities.

The sub-goals of the programme Conformable for Children Latvia 2004-2007, accepted by the order Nr. 646 of LR MK, envisage facilitation of healthy lifestyle: qualitative health care available for all children, environment and infrastructure friendly for children.

The programmes accepted by the orders of MK in the field of education and science policy, youth policy and sports policy which include the facilitation of physical activities are as follows:

- Education Development Basic Positions for 2007–2013, the aim of this document is to provide every inhabitant with a possibility to obtain qualitative lifelong education in accordance with individual interests, abilities and the needs of state economic development, and the tasks, connected with schoolchildren education about healthy diet, reproductive health, different addictions, exercises, a.o.;
- National Sports Development Programme for 2006–2012 with the aim to create conditions for healthy, physically and mentally developed individuality;
- Youth Policy State Programme for 2009-2013 with the aim to improve youth life quality, facilitating their initiatives, participation in making decisions and social life, supporting work with youth and making it easier for children to become adults.

Latvia also participates in the WHO programme Healthy Schools.

### ***Sports classes***

The acquisition of basic education is compulsory. It starts in the calendar year when a child turns seven. The content of the compulsory basic education programme is determined by the State Basic Education Standard. Anyone, without any age limits, has the right to acquire secondary education programmes, if he/she has a certificate attesting basic education. There are four-direction general secondary education programmes: comprehensive; humanities and social sciences; mathematics, natural sciences and technology; and professionally-oriented ones. The content of the compulsory general secondary education programme is determined by the State General Secondary Education Standard.

All schools have sports classes two times a week. Schools also organize mass physical activities such as sports days and games for their students. Additionally, many students engage in extracurricular activities after school classes.

Increasing the number of sports classes is one of the most direct policies to increase student physical activity. Strategies for the improvement of student health are focused on qualitative sport education at school. The

focus of School Policy Framework (World Health Organization 2008) is put on policy-makers encouraging the provision of the following:

- Physical education classes contribute to the overall daily physical activity of students throughout the school years;
- The majority of the physical education class time is actually spent on physical activity. This includes aerobic endurance, strength, flexibility, and coordination activities;
- A variety and choice of physical education classes is offered so that each student age, gender and disability needs and interests are taken into consideration;
- Physical activity is enjoyable, developmentally appropriate, promotes fair play and encourages maximum participation of all students;
- Students learn about physical activity and health, and develop the confidence and skills for lifelong participation in physical activity;
- Physical education teachers are well-qualified and properly trained;
- Adequate safety precautions are established and enforced to prevent injuries and illness resulting from physical activity;
- Undertaking or withholding of physical activity is not used as punishment.

Research shows that quite often physical education teachers dose workload in a uniform fashion, disregarding student physical and functional development (Hardman, Marshall 2000). Adequate physical workload in sports classes activates body physiological processes, promotes adaptation abilities and increases body functional reserves. Sedentary lifestyle or inadequate workload can promote student health disorders and even negatively influence the indicators of body individual physical and functional development (Jansone, Krauksts 2005). If the dosage and intensity of physical workload for all students is uniform, then there is the possibility of negative influence on health characteristics of particular individuals (Patte, Shepard 1989).

Choosing the workload, a teacher should dose it for physically weaker and stronger students, because individualized approach will help to adapt more successfully to biological changes in body, rejoice in physical activities, promote future raise of competitiveness in the conditions of contemporary market economy (Malina, 2004).

The results, obtained in the framework of LASE research project The Implementation of Sport Education in Latvia Schools for Sustainable



Student Health Promotion (2008) confirm that the indicators of student (Grade 6, Grade 8 and Grade 11) physical development and functional and physical condition, considering schoolchildren age and gender, show remarkable result dispersion or variation. This finding means that schoolchildren are very different as to the indicators of their physical development, and functional and physical condition.

There are correlative connections between the indicators of schoolchildren physical development and functional and physical condition, which confirm the dependence of schoolchildren physical condition on the peculiarities of their physical development. Therefore, the approach to schoolchildren during pedagogical process and the assessment of schoolchildren achievements in sports classes should be individualized.

Scientist Ann Susan Capel (2000) considers that testing school student physical condition, and comparing it with the norms in sports classes does not promote the formation of positive attitude to the participation in physical activities in the duration of the whole life span. This conclusion is affirmed by Kondrtajuka, Lismane and Sauka (2010) investigation, stating that the number of school students, who are released from taking state exam in Sports increases with every year; in Grade 12, for example, more students are released from taking the state exam in Sport than in Grade 9 – in the study year 2007/2008 per 4.6 % more, and in the study year 2008/2009 – per 5 % more. Doctors confirmed that release from sports classes really is asked for. We can conclude that family doctors support non-attendance of sports classes. The main justification – if requirements in sports classes cannot be met and they create stress it should be the cause for the release.

Scientist Ann Susan Capel (2000) states that although in Great Britain and the USA schools student health strengthening programme is implemented, in schools the previous tendency to assess student results is maintained (the fulfilment of the norms of physical condition), not the amount of physical activities and their connection with student health.

The conclusion can be drawn that student assessment in Sports subject is a problem not only in Latvia, but also in other countries. The assessment of student achievement is essential in reaching educational aims in Sports subject.

The assessment of student achievement always includes comparison. Usually there are three ways, how to make assessment:

- comparing with the achievement of other students (normative assessment);

- comparing with student previous assessment in the same activity or task (formative assessment);
- comparing with previously set criteria (criterial assessment).

Assessment in Sports can be made, when a student is ready for it.

Considering that student physical health indicators depend on the peculiarities of student physical development, it is necessary to revise what is understood under student achievement in a sports class. The normative assessment, in which student physical preparedness is compared with that of others, does not promote learning in the majority of children. This is especially true for those, who do not reach high results, because it shows that their abilities in sports are not high, and most probably in future they will avoid sports classes in order not to bring shame upon themselves. Therefore, normative assessment promotes negative experience and “excludes” students from participation in physical exercises, rather than attracts them. Increasing student personal control over their achievement in sports, i.e. carrying out the formative assessment, students will develop understanding that the requirements in Sports subject are personally meaningful. The formative assessment is child-centred, since its aim is to evaluate the growth of each child. Therefore, to reach the aim of Sports subject – to strengthen and improve student health promoting student participation in systematic physical activities it is necessary to increase student personal control over their achievement in sports.

In the framework of LASE research project The implementation of sport education in Latvia schools for sustainable student health promotion (2008) it is confirmed that student attitude to sports in the majority of cases is positive, the awareness about the role of sports in the growth of the personality has also increased, but sports classes outside school are admitted to be more attractive.

Emotionally positive assessment of a sports class shows negative dynamics: it decreases from 67.7% in Grade 5 to 46.4% in Grade 7, and drops to 37.8% in Grade 9; this fact reveals sports class inadequacy to student needs. To develop positive attitude to sports classes it is necessary to improve the quality of sports classes both listening to student suggestions and considering psycho emotional factors, relating to student age group.

Taking into consideration that now in Sports subject new Standard (2008/2009) is being implemented, the contents of which asserts that a sports class is meant for strengthening health, further research is needed in how the new Standard is being implemented, whether the improvement of student health is really reached.

The results obtained in the framework of LASE research project The implementation of sport education in Latvia schools for sustainable student health promotion (2008) confirm that large variety as to student (Grade 6, Grade 8 and Grade 11) physical development, functional and physical condition is observed. High result variety as to student age and gender in all indicators of student physical development, and functional and physical condition asserts high result variation. This finding means that students are very different as to the indicators of physical development, functional and physical condition. In general there are correlative relations between the indicators of student functional and physical condition, this finding means that the indicators of physical condition depend on the peculiarities of student physical development.

## **Conclusions**

These results mean that in Sports subject students need individual pedagogical approach and the assessment of the achievements. The assessment of the achievements is essential in reaching educational aims to strengthening health in Sports subject.

Schools strive to formally reach the objectives of physical education, set forth in public health policy documents, but there are reserves in improving of means of assuring quality, and widening the space of possibilities for students in closer relationship among all parties, involved in student health promotion.

As a result of the research suggestions for the improvement of the quality of sport education to promote student health in long term are worked out.

The suggestions for the improvement of the quality of sport education to promote student health in long term are as follows:

1. In the Standard of Sports subject: to increase the amount of physical activities, foreseeing and implementing three obligatory sports classes.
2. Self-government and educational institutions manager competence: to increase the variety of physical activities, accessible to students and inhabitants.
3. In further education of the managers of self-government and educational institutions: to include themes about the importance of physical activities in promoting children and youngster health and versatile their implementation possibilities in self-governments, as well as about sports education implementation regulating documents.

4. In teacher further education: to include themes about the importance of physical activities in promoting children and youngster health and versatile opportunities of their realization in pedagogical process.
5. In sports teacher further education: to improve competences in individual approach to children of different physical condition in pedagogical process and the assessment of achievement in sports classes.
6. In higher education institution: to broaden the horizons of future sports pedagogue professional competence, promoting sports pedagogue innovative activities in promoting students' having different physical condition health.
7. Within a Grade: to promote student body awareness and understanding (motivation, self-confidence, physical competence, understanding and knowledge, maintaining physical activities individually at adequate level during the life span) by increasing student personal control (the amount of physical activities and health) over their achievements in sports.

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REVIEW PAPER

## BASIC EDUCATION LEARNERS' INTEREST IN PHYSICAL EDUCATION: THEORETICAL ASPECTS

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### Abstract

*The research data produced by European scholars reveal a significant insufficiency of physical activity of young learners. This is one of the reasons for the deterioration of learners' health and physical fitness. To improve this situation, greater attention must be paid to the development of children's interest in physical education. The article is based on the analysis of theoretical literature. Theoretical literature analysis results in determining and describing three topics that characterize the theoretical aspects of the interest that basic school learners show in physical education: (1) the understanding of the notion of interest in physical education; (2) kinds and levels of interest in physical education; (3) opportunities of developing the interest in physical education for basic education learners. The above mentioned topics particularize the understanding of the notion of interest in physical education, locate the indicators of interest in physical education, and reveal the opportunities of developing the interest in physical education for basic education learners.*

**Key words:** *interest in physical education, learners, attitude, needs, development*

### Introduction

Good health is a way how people can stay socially active and facilitate the cultural, social, and economic development of the society. However, the good health indicators in Latvia are still lower than those in other European Union member states. According to the data of the Health Economy Centre, in 2010 only about 60% of school learners were recognized to be in a good health condition (Veselības ekonomikas centrs, 2011). Only about 46% of learners got sufficient physical activity and the

level of their physical training was going worse as compared to the average indicators of the preceding years. There are a growing number of learners having problems with bearing, excessive weight (only 4.9% of learners in Latvia have a correct bearing), heart diseases and other ailments caused by sedentary life (Gobica, et al., 2011). Research shows that children and adolescents who are physically active enough have a greater probability of being physically active also when they reach adult age (Malinra, 2001; Tammelin & Nayha, 2003). Hence, habits of healthy lifestyle in the period of school age may affect health and its indicators (e.g. being overweight) also in adulthood.

Scientific research by a number of authors (Кисапов, 2007; Трофимова, 2004; Ābele, 2007 etc.) demonstrates a decrease in the basic school learners' interest in physical education and sports activities. Already in ancient Greece the philosophers like Socrates and Aristotle acknowledged the great importance of sports activities in an individual's life and health including it even in school academic programs and realizing that sports improves not just the physical health but also the spiritual balance (Ābele, 2009).

Chen & Ennis (2004) emphasized that without a motivating strategy physical education teachers find it difficult to get learners involved in healthy and active lifestyle. The teacher usually pays the basic attention in physical education lessons to teaching how to move and developing physical qualities but they do not pay sufficient attention to the development of learners' continuous and stable interest in physical education and sports (Shen & Chen, 2006).

Though interest is the main motivating factor of learning, teachers still do not have a clear understanding of its potential role in the development of learner's personality (Chen & Darst, 2002). Teachers usually think that learners either have or do not have interest, and it is impossible to state how to facilitate its growth and development, especially for learners without learning motivation (Ennis et al., 1997; Lipstein & Renninger, 2006).

Taking into consideration these conditions, the aim of the present article is to study the three topics that characterize the theoretical aspects of the interest that basic school learners show in physical education: (1) the understanding of the notion of interest in physical education; (2) kinds and levels of interest in physical education; (3) opportunities of developing the interest in physical education for basic education learners.



## Material and methods

The article provides analysis of theoretical literature.

## Results and discussions

### *Understanding of the notion of interest in physical education*

Interest in physical education is an issue that has been studied little, while already the classics of education studies acknowledged the importance of interest in education. They emphasized that the process of learning must be designed so that it would arouse interest. Helvetius has stated that the same as the physical world is subject to the laws of motion, the spiritual world is subject to the law of interest. Upon the earth interest is the most powerful magician that can considerably change in our eyes the image of any object. Rousseau emphasized that interest is a driving force of child's development, while Declorat thought that interest is an inner drive that is common for all people, inquisitiveness being the outer manifestation of interest. However, interest may be both conscious and unconscious. According to Herbart, interest has the decisive role in the development of human's spirituality and it is created by learning. Learning is transient, but interest should be sustained all life long. This idea of Herbart is especially significant thinking of lifelong education and the fact that in a democratic society everybody must assume responsibility for one's fate, personality development, professional career choice and career development (Пискунов, 1981).

Interest has been widely studied in pedagogy and psychology; hence the understanding of interest differs. According to Shorokhova (Шорохова, 2007), the interpretations of the notion of interest are classified into three groups.

The first group unites those accounts of the notion of interest that characterize interest as an attitude (e.g. Ковалев, 1988; Морозова, 1979; Люблинская, 1971; Щукина, 1971 etc.). Morozova (Морозова, 1979) and Kovalyov (Ковалев, 1988) consider that interest is a stable emotional attitude. According to Lyublinska (Люблинская, 1971) and Morozova (Морозова, 1979), interest is the relation of cognition between subject and object based on the reflex of research (Люблинская, 1971). Shchukina (Щукина, 1971) pointed out that interest is a specific attitude of an individual to the world based on its significance and emotional attraction. Dneprov (Днепров, 1998) pointed out that the account of this interest is close to the social position that determines the attitude of a personality towards objects and has a personal significance.

The second group interprets interest as a specific drive of personality (Рубинштейн, 2000). In Bondarevskiy's (Бондаревский, 1985) interpretation it is a specific drive of cognition. Gordon and Nezaimov have characterized interest as a totality of emotional and will processes enhancing the activity of the functioning of consciousness and action (Амбурцев, 1998). Shchukina (Щукина, 1971) pointed out that interest is a drive of selecting psychic processes in relation to objects and the external environment. Markova (Маркова, 1986) considers that interest is an activity drive, while according to Zeer (Зеер, 1990) it is manifested in a conscious tendency of personality to focus attention, thoughts, and action on an emotionally attractive object. Focusing an individual's attention on object means arousing the individual's interest. Later on the notion of goal object attraction was consolidated (Henkhauzens, 2003).

In the third group interest is explained as a motive or need. Interest is treated as a motive by several scholars, e.g. Zinchenko, Mescheryakova (Зинченко & Мещерякова, 1997); Petrovskiy, Yaroshevskiy (Петровский & Ярошевский, 1990); Rean, Kolominskiy (Реан & Коломинский, 2000); Rubinstein (Рубинштейн, 2000), etc. Zinchenko and Mscheryakova (Зинченко & Мещерякова, 1997) pointed out that interest is a state of motivation. Petrovskiy and Yaroshevskiy (Петровский & Ярошевский, 1990) consider that interest is a motive that is an inner stimulus of personality for cognition processes but stimulus is in turn related to meeting one's needs (Реан & Коломинский, 2000). Matyukhina (Матюхина, 1984) and Shchukina (Щукина, 1979) point out that interest is a motive of learning activity. Several scholars, e.g. Petrovskiy and Yaroshevskiy (Петровский & Ярошевский, 1990), Platonov (Платонов, 1981), Zimnyaya (Зимняя, 1997) explain interest as emotional experience of the need of cognition that provides the personality directedness. Kiknadze thinks that need arouses experience only when in its realization an individual faces subjective or objective difficulties. When satisfying a need does not face any obstacles, interest does not arise. Hence, according to this author, interest reflects contradictions between needs and the conditions of their satisfaction (Ильин, 2002).

In their understanding of interest researchers agree that: (1) interest is the basis for a child's all-rounded development (Выготский, 2000, Морозова, 1979); (2) interest possesses the positive attitude of learner's choice to diverse sides of learning (Маркова, 1986; Ковалев, 1988); (3) interest may be stated by the learner's emotional tone and attention towards the object of interest (Hidi, 2000; Петровский & Ярошевский, 1990; Щукина, 1971); (4) interest possesses an expressed component of will

manifested in learner's desire to learn as much as possible, constantly search for novelty, concentration of attention (Маркова, 1986; Щукина, 1988, Hidi, 2000); (5) interest is marked by expressions of thinking activity, i.e. questions asked by learners, their active involvement in class without teacher's directions and demands, correction of mistakes and additions, desire to make clear what they do not understand (Hidi, 2000; Щукина, 1979); (6) interest is a totality of intellectual, emotional, volitional expressions of a personality with thinking processes as its nucleus (Зинченко & Мещерякова, 1997; Hidi, 2000; Щукина, 1971); (7) the main features of interest are that interest refers to objects and is conscious (Рубинштейн, 2000; Щукина, 1971).

Proceeding from the ideas of physical education researchers (Ильин, 2000; Трофимова, 2004; Дуркин, 1995), we may conclude that all above mentioned accounts of interest refer also to interest in physical education. Gruyev (Груев, 1977) concerning interest in relation to the sphere of physical education suggests the following elements of learners' interest in physical education: the attractive sides of physical education, personal active attitude, ideal athlete, favourite sports, desire to win (achieve results), beauty of one's body. Interest in sports and physical education is characterized by broadness (interest in several kinds of sports), depth (special interest in one kind of sports), stability, motivation, effectiveness (Ильин, 1987).

### ***Kinds and levels of interest in physical education***

People have very diverse interests, as diverse as human action. However, interests may be classified uniting them according to certain features.

According to the research of Rubinstein, English, and Maslow, Gomezo et al. (2003) has made a conclusion that the main mechanism of spreading life interests and their functioning is acquiring information in the form of skills or knowledge. Thus he classifies interests in two groups: information interests and physical activity interests.

Information interest is characterized as a deliberate striving of a personality for information with the aim of making it personal knowledge. Knowledge is applied by means of person's behaviour (Гомезо, et al., 2003). For instance, a learner does not play football but he regularly watches football games and sports programs, reads the latest news on football, mixes with football fans and thus is in the know of recent events in the lives of football teams, national teams, players, coaches, and referees as well as information about football stadiums, cities, organizations, and other.

Physical activity interest is a deliberate striving of a personality for continuous learning and developing new skills that enable successful performance of activity (Гомезо, et al., 2003). The basic questions of this interest are – “what should I do?” and “how to do it?” For instance, in football a learner tries to improve and develop skills of dribbling and serving a ball to reach a standard of these elements.

Gomez (Гомезо, et al. 2003) points out that if a personality has developed an interest about a certain life sphere activity, s/he may set a goal of learning the basic skills of this sphere. In the process of learning them, a new goal is set – to improve the existing skills in certain activities. In case of a positive result, the skill is improved and the person sets a new goal in its development, and so on. A progression chain is formed: goal – skill – goal, etc. The development of physical activity interest may incite the development of information interest. For instance, when an athlete goes to contest to another city or country, s/he memorizes the design of the stadium, the city, the team they played with, certain players of the competitor team – all this is information that builds up his/her information interest. Therefore physical activity interest is developed mainly in relation to information interest, helping each other's development. In this case an athlete will have both kinds of interest oriented at the respective kind of sports s/he plays. Information interest may develop without attracting physical activity interest. Person may not be interested in learning a certain skill but s/he may be interested in the information that is formed as a result of using skills of other persons. This may sometimes lead to fanaticism.

Several researchers (Рубинштейн, 2000; Грыев, 1977) have classified interests according to the kind of activity into passive and active interests.

Passive interest is that of observing when a person is satisfied with a perception of the object s/he is interested in and may be characterized with the word “I like it”. For instance, a learner is interested in different components of physical education but s/he does not get involved in any sports activities. This means that the learner enjoys watching or listening to, e.g. sports contests, festivals (in case of an opportunity) but does not try to get actively involved in this, raise new knowledge and skills on the object that attracted his/her interest. Active interest is that of activity when a person does not confine him/herself to observing but takes action to master the object of interest. For instance, the learner not only watches and listens but gets actively involved in different physical activities and procedures of tempering one's body. Active interest is an impetus for personality

development, stimulator of knowledge, skills, abilities, and character. Passive interest may turn into the active but may remain as it is.

Depending on the stability of interest, several researchers (Shen & Chen, 2006; Hidi, 2000; Renninger, 2000; Морозова, 1979, etc.) divide it into the following categories: 1) situative, episodic; 2) personal, stable.

Situative interest is a short-term action in a particular context and a particular moment. Situative interest is related to the personality strivings. Interest may arise ad hoc and unawares as the consequence of the object's emotional attraction, and only then comes awareness of its significance that may be caused by many conditions: needs, community demands, capacities. For instance, a basketball ball seemed emotionally attractive to a learner thus inviting to perform different physical exercises with it. Next time the same object may seem indifferent and temporarily uninteresting to the learner.

Personal interest is defined as an individual's long standing striving for particular objects and events (Renninger, 2000) and thus personalities are formed in the whole life course (Морозова, 1979). For instance, a person whose interest in sports arose during the first physical education classes at school is striving to satisfy this interest throughout his/her life.

Interest formation and development are among the basic tasks of education. Working at this problem, Rubenstein (Рубинштейн, 2000) determined the direction of the basic tendency of interest development in the process of learning: from information interest to that of physical activity; from uncertain interest to differentiated interest (about certain subjects); from passive to active interest; from situative to personal interest; from episodic to stable interest. Therefore teachers need to understand the development of learner's interest in order to form an efficient learning strategy for the development of interest.

Analyzing the research on the development of interest, the author of the present paper argues that there is no unified research terminology that reflects the development of interest. Some authors (e.g. Repkin, Shchukina, 1971, etc.) characterizing interest development in their work mention levels of interest development while others (e.g. Leontyev, 1972, Маркова, 1986, etc.) mention stages of interest development, though the characteristics of these notions is essentially similar.

For instance, Leontyev (1972), proceeding from the interest orientation towards the content of learning, singled out three levels of interest development for children. The first stage is characterized by the fact that a child has not formed differentiated (personal) interest about the content of the lesson or tasks of learning. The second stage is characterized

by the fact that a child develops a differentiated (personal) interest about a particular content of learning. In the third stage a child develops and deepens personal interests about a particular content of learning (Синякова, 2003).

Repkin in stating the level of interest development proceeded from reaching the goal of learning of a learner: (1) situative interest related to subjected goals of learning; (2) stable interest related to a set final goal; (3) selectivity of interest when a learner with different means independently reaches the goals of learning (Синякова, 2003).

Shchukina (Щукина 1971) determining the levels of interest development proceeded from the process side. She singled out the following levels of interest: low, medium, high.

A low level of interest is characterized by the child having curiosity. Desire for knowledge is based on the object's emotional attraction (new facts, unusual phenomena, lack of evaluative judgements). At the medium level the learner forms cognitive interest manifested by the solution of the set problems and questions, search for reasons/factors, cognition of the features of objects or phenomena. A high level of interest is characterized by the learner using knowledge in practice, cognizing the cause-consequence relation and regularities, getting involved in research activities.

Despite the fact that researchers have different approaches in stating the level of interest, they have a common opinion of what characterizes a particular level of interest development.

A low level of interest is characterized by a very low dynamic. Interest is not stable; it is incidental and oriented at the novelty and distinctiveness of the subject, aimed at using the information. The medium level of interest is not sufficiently stable either. If at this level of learner's interest development the back-up of pedagogical influence slackens, there is a temporary loss of the interest object, no sufficient emotional tone, but then this cognition interest may return to the previous level. A high interest development level is characterized by a very high dynamic. Cognition interest is transformed into a personality trait and does not disappear even if there is no object or action of interest for a long time. This kind of interest is typical of a creative, inquisitive personality with distinctly expressed activity of cognition.

On the basis of Shchukina's classification (Щукина 1971), Пуйн (Ильин 1987) singled out three levels of development of interest in sports: low, medium, and high.

A low level of development is characterized by the lack of learners' interest in sports, but for a reflective passive interest (that of a fan). Learners

lack any knowledge on sports, they do not have any sports accomplishments, they often miss physical education classes or attend them just to get a grade, being passive in classes and performing just simple tasks suggested by the teacher; they usually have a poor academic performance.

A medium level of interest development refers to learners who demonstrate general interest in sports. They willingly attend physical education classes and perform tasks suggested by the teacher; they are physically active and get good and excellent grades. They participate in sports events of their class and school and have rather extensive knowledge in the sphere of sports.

A high level of interest development refers to learners who have a narrow interest in going in for one particular kind of sports. They have high accomplishments in the selected kind of sports and profound knowledge in the history of sports. These learners usually have high academic accomplishments in physical education classes. However, Илин (Ильин 1987), proceeding from his observations of school reality, considered that learners who go in for sports may often have contradiction between their interests and purposefulness and tasks set for them in physical education classes. In this respect learners with a high interest in sports have a careless attitude to physical education classes and cause teachers no less difficulty than learners with a low interest development level. Therefore the medium level of interest in sports development is most favourable for a teacher of physical education. The classified levels of interest development in physical education (class) may be used as landmarks when forming education strategies for learners' interest development.

### ***Opportunities of developing the interest in physical education for basic education learners***

Learners' interests must be driven to objectively justified goals based on the tasks of education in the process of learning. Interests should not become a fetish or be ignored; they should be taken into consideration and developed. Development of interests partially takes place by way of channeling them in a desirable direction. The existing interest of the learner is developed in compliance with the needs of the process of learning. Development of interest for a basic school learner depends on factors that facilitate personality development. In educator's work it is especially significant to develop in learners interests that are valuable for the society (Рубинштейн, 2000) including interest in sports and physical education.

According to Shchukina (Щукина, 1988), a teacher may use three kinds of stimulation in the development of learners' interest in physical education. The first kind of stimulation is the content of the academic

subjects: innovation of this content and the acquired knowledge, novelty, bond with history, applied orientation of knowledge and skills, modern scientific accomplishments, etc. The second kind of stimulation is realized in the organization of the process of learning: diversity of teaching methods and forms of lessons, creation of problem situations, elementary research, creative work, etc. The third kind of stimulation is based on the factor of communication and concerns relations among the learners and between learners and a teacher in the process of learning: emotional comfort, teacher's emotionality, pedagogical optimism, mutual support, etc.

Kisapov (Кисапов 2007) points out that, in order to efficiently form and develop basic education learners' interest in physical education, the following conditions must be observed in schools:

1. in the formation of the official documents (programmes) of the subject of physical education, learners' preferences in certain kinds of sports must be respected;
2. organization of physical education classes respecting learners' interests in sports;
3. the competence of physical education teacher in the kind of sports selected by learners;
4. making physical education classes more 'sport-like';
5. getting involved teachers of other subjects, senior grade learners and children's parents in organizing extra-curricular sports events;
6. introducing a non-grade system in school for the evaluation of learners' performance in physical education lessons;
7. designing situations for successful performance of learners.

Basic school learners' interest in physical education differs, e.g. in relation to improving health, forming good bearing, developing physical and will qualities. Interests for girls and boys differ. Girls often think about a beautiful figure and movements, suppleness, while boys pay more attention to the development of stamina, speed, and bodily force. Teachers must respect these aspects of learners' interests. The development of learners' interest in physical education greatly depends on whether the learner is satisfied with the physical education lessons, doing physical exercise. If learners are satisfied with physical education at school, they develop a positive and active attitude towards sports that is characterized by the understanding of the significance of physical education lessons and looking forward to them in order to satisfy their needs for physical activities. This interest will not disappear if it is satisfied. Just on the contrary, a stable or personal interest in sports will develop (Ильин, 1987; Трофимова, 2004; Амбурцев, 1998). Thus interest enhances a learner's energy that simplifies



the performance of action, stimulates will-power, patience, persistence, and determination.

Trofimova (Трофимова, 2004) emphasized that an appropriate structure of a physical education lesson facilitates learners' interest in it. Weak load of learners in lessons and low demands set by the teacher give rise to boredom, lack of discipline, and poor attendance of lessons.

Developing learners' interest in physical education, a teacher must use both the progressive methods of learning (e.g. project method, cooperation method, etc.) and traditional ones: method of strictly regulated exercise, games and contests. For instance, Amburtsev (Амбурцев, 1998) states that the use of methods of exercise in different correlations affect basic school learners' interest in physical education and their cognition activity in different ways. Learners simultaneously develop: (1) interest in sports, (2) capacities of strength and speed, (3) physical activity and cognition grows if strictly regulated exercise method is used for 55% but game and contest method – 45% of all lesson duration. If any of these methods is used more than 75-80% of the total duration of lesson, learners' interest in physical education falls.

To develop an active interest in sports for learners, a teacher must systematically provide information on the process of mastering physical activities and perfecting them. This information must reveal the significance of the exercise and opportunities of its use. For instance, starting to teach support jump over a buck, it is not an end-in-itself, but numerous repetition of the exercise develops children's muscle force, coordination of movement and capacity to get orientated in space. When learner acquires new skills of a movement it is very important for a teacher to provide systematic, scientifically based knowledge. Learners' interest in sports is also stimulated by teacher's questions inciting their thinking and wit (Трофимова, 2004; Дуркин, 1995; Амбурцев, 1998).

Trofimova (Трофимова, 2004) emphasizes that one of the factors of the development of learners' interest in sports is implementation of inter-subject links in physical education lessons. This knowledge meets learners' needs of cognition and makes the process of physical education more attractive. Teacher cannot develop a stable interest in learners if they do not have knowledge about their organism, criteria of physical development assessment, norms and regimes of healthy lifestyle.

It is necessary for the learner to be responsible for his/her academic performance in classes and be able to explain one's failures by insufficient effort for achieving a goal instead of a lack of physical abilities. Learner must be oriented to an appropriate result to be reached that is treated as

success and victory over oneself both by the learner and the teacher, classmates, and parents. Each learner needs to select individual progressing and adequate results: adequate exercises, tasks, demands, etc. that enhance the learner's inner motivation. For instance, in a physical education lesson each learner has minimal tasks set individually: stronger learners have more complex tasks than weaker ones. While performing their tasks, learners by teacher's help produce self-assessment of their learning accomplishment. Irrespective of the result, learners must be praised and supported by the teacher (Кисапов, 2007; Трофимова, 2004; Амбурцев, 1998 etc.).

One of the reasons of learners' dissatisfaction with the physical education lessons is lack of emotionality in them. Many authors (Амбурцев, 1998; Shen & Chen, 2006; Hidi, 2000 etc.) suggest in this respect the following solutions: the aesthetic attraction of learners, teacher, and sports base; use of musical accompaniment; expressive and easily perceivable explanation of the task and the course of the lesson; innovation in physical education lesson by changing methods of organizing learners' work, e.g. change of the place and means of falling in and switching places; inclusion of new nontraditional exercises in the content of physical education lessons; variations of the physical load.

Durkin (Дуркин 1995) pointed out the necessity of using visual aids in physical education classes: learning cards, stands, and technical means. Visuality is one of the efficient means of information provision and acquisition that facilitates the development of learners' interest in sports. Therefore it is necessary to use it from the first stages of the development of learners' interest in sports.

Learners' cognition interest development is stimulated by the independent work (home tasks). Checking results and supporting learners are compulsory conditions for it.

Learners' interest in sports may be formed and developed not only in physical education lessons but also extra-curricular sports events by getting involved in them teachers of other subjects, senior grade learners, children's parents, athletes, and sports veterans. If the school staff and learners' parents have an active lifestyle, children are also much more motivated for physical activity and get involved more often in various sports events. Cooperation with experienced participants of these events improves learners' knowledge about traditions, history, sports accomplishments of their school, town, and country, thus stimulating the development of their interest in physical education and sports (Кисапов 2007).

According to Durkin (Дуркин 1995), learners' interest is aroused also by the information aids used at school: posters about planned and past

sports events; lectures on topics that are of interest for learners; meeting popular athletes and sports veterans; sports festivals and parties.

Hence, we may conclude that teacher's competence has the main role in the development of learner's interest in sports.

## Conclusions

1. The analysis of theoretical literature revealed the whole complexity and diversity of the conception of interest that accounts for the diverse interpretations of the notion of interest. Three groups of such interpretations may be distinguished: 1) interest as a personality attitude (Ковалев, 1988; Морозова, 1979; Щукина, 1971, etc.); 2) interest as a specific drive of personality (Рубинштейн, 2000; Маркова, 1986; Henkhauzens, 2003 etc.); 3) interest as a motive or need (Зинченко & Мещерякова, 1997; Рубинштейн, 2000; Ильин, 2002; Hidi, 2000, etc.).
2. Interest in sports and physical education is a specific personality drive that determines a conscious, stable, and active attitude to sports to satisfy one's personally significant needs.
3. Interest in sports is classified according to: 1) the mechanism of functioning; 2) kind of action; 3) interest stability.
4. Levels of interest in sports are classified according to: 1) interest orientation at the content of learning; 2) learner's achievement of the goal of learning; 3) the process of interest development.
5. The process of learning is based on the learner's interest; it forms the learner's feeling of satisfaction, active and positive attitude to sports characterized by realizing the significance of the physical education lesson and looking forward to it in order to satisfy one's needs for physical activities.
6. Teacher's competence is the main factor affecting the development of learners' interest in sports. For the development of learners' interest in sports and physical education it is necessary to get involved all social institutions related to physical education: family, school, sports organizations, and mass media.

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## SHORT COMMUNICATION

Review of Agita Ābele monograph  
**"FOUNDATIONS OF SPORTS PSYCHOLOGY"**



ISBN 978-9984-46-017-8  
 [In Latvian. P. 295]

The monograph of LASE professor of Agita Ābele "Foundations of Sports Psychology" that was created as a summarization of sport psychology's theoretical basis and the author's research and practical work experience is an important written work with lasting value in both theoretical and practical aspect.

High performance sport nowadays is associated with very high, even extreme physical loads, maximum personal capacity. Besides these major requirements in the field of athlete physical, technical and tactical preparation, increases also psychological burden, with which the athletes themselves cannot always cope. The tension of both competitions and training, and the individual and social problems of athlete personality form a rather wide range of psychological issues that significantly affect the success of athlete activity. In recognition of this, coaches increasingly often focus on the issues of athlete psychological preparedness, help and support. Training of the development of different age athlete's psychological skills causes an increasing interest among children, youth and high performance level sports coaches.

The involvement of sports psychologist in sports training and competition process for the promotion of athlete results is a self-evident thing in many national sports schools, sports clubs, teams and national teams. Therefore, the increase of sports specialist professional competences is closely linked to understanding of the fundamental issues of psychology and the application of its basic insights in the training process. Not all coaches will be able to involve sports psychologists in their workouts, but many issues of psychological preparedness can be solved also by coaches, athletes and athletes' parents themselves.

Sports psychology, being no "miracle" in raising the athlete performance, can nevertheless offer for every coach and athlete opportunities of improving the quality of their lives and careers.

First Part of the Monograph focuses on the characteristics of athlete and coach personalities, including the issues of personal development,



mental processes, states and individual characteristics. The second part is devoted to athlete preparation to competitions and key psychological issues of athlete preparation process, as well as to practical issues of player and coach activities. The third part could be more attractive to the representatives of team sports and to those readers who are interested in social-psychological issues in sport – peculiarities of athlete activity in teams and the formation of the relationships between people involved in sports. The fourth part in its turn gives an insight in psychological help and the necessary support to different age and level athletes, including both those who have just started their athlete lives and those who are at the top of their sportive achievements.

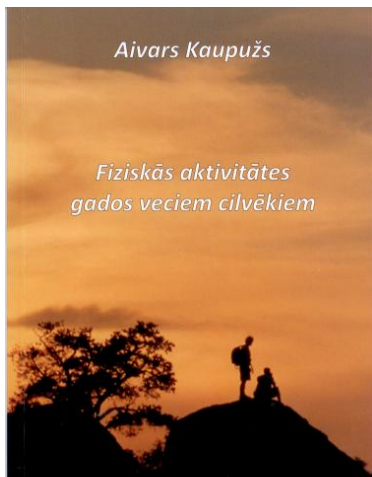
Although at the beginning of the monograph there is a reference: "Psychology for education", having covered the issues involved, and got acquainted with the author's own and other professional opinions, everyone engaged in practical pedagogical coaching process will find in the Monograph personally important and significant insights.

The monograph is intended not only for sports professionals, but also for a wide range of sports-related readership. I recommend this substantial Monograph, the motto of which should be "Psychology for education and sports", to each and every coach as a useful tool in their work.

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## SHORT COMMUNICATION

Review of Aivars Kaupužs book  
**“PHYSICAL ACTIVITIES FOR OLDER ADULTS”**



ISBN 978-9984-44-026-2  
 [In Latvian. P. 88]

Throughout the world, and especially in Europe, as well as in Latvia in recent decades are observed significant demographic changes. Major changes in population structure are associated with a strong aging of the country's population. With improved health care and socio-economic conditions, increases the predicted life expectancy. The increased proportion of older people, in today's economic conditions they create additional difficulties for the national social security and health care systems. Such demographic changes cause also social problems, because reduces the working population.

Therefore securing older people health, work capacity and social welfare are not only theoretical, but also practical, nationally important issues.

The book by Aivars Kaupužs, the student of doctoral studies at the LASE, based on extensive literature analysis, is systematized gerontological knowledge about the body's aging process and its causes. As one of the main factors influencing this process is analyzed the role of physical activity, its effect on major organ systems and the maintenance of work capacity. The benefits of physical activities in keeping healthy are shown vividly. The collected material provides multilateral information on the methods of evaluating the physical preparedness, as well as the minimum physical activity required for older people. Practically important are recommendations for the promotion of physical activity for older people, summarized in the book. The developed study aid "Physical activity for elder persons" can be recommended as a study aid for students, sports specialists, organizers of the classes of physical activities, physical therapists, social care workers, as well as a wide range of readers.

Viesturs Lāriņš  
 PhD, Professor  
 Latvian Academy of Sport Education

## SHORT COMMUNICATION

### Review of Juris Grants book “LET US LEARN SKIING!”



ISBN 978-9934-8138-2-5

[In English P. 141]

The book by Juris Grants “Let us Learn Skiing!” is the English translation of the book in Latvian “Mācīsimies slēpot!” which was first published in 2007.

The book includes study material in skiing on mastering the ways of moving in skiing with pictures and video. There is also the text placed in the margin of the pages, which will definitely attract attention reflecting origins of skiing, insights in the history of skiing in Latvia and interviews with athletes and veterans, who consider this sport as life-long stimulus.

The author pays attention to the educational process in skiing planned by the teacher, as well as students’ individual reaction and action. As prof.

J.Grants points out, in this process both the teacher and the student are active and influence each other. Thus interaction in outdoor education process is understood as mutual cognition of learning subjects in the process of teaching and learning, where the exchange of information, ideas and behavioral patterns take place, as well as the changes of opinions, evaluations, self-evaluations and attitudes. Teaching and learning philosophy is based on three different models of pedagogical interaction: on behaviorist philosophy, cognitive theories and a humanistic attitude towards a student.

The principle “learning by doing” is implemented by performing 51 way of movement in cross-country skiing (classified in ten groups) using exercises and control tasks, thinking about the acquired, doing self-assessment and assessing others, using the acquired knowledge and skills in practice.

The methodological basis of the book is formed by conclusions of various Western and Eastern authors about the methodology of teaching and learning, education philosophy, terminology and classification of skiing.

In my opinion the book is mainly meant for sports higher education institution students acquiring the basis of cross-country skiing and skiing didactics, as well as for general education teachers, their students and everyone interested in learning skiing basis. Prof. J. Grants has with this well written book made valuable contribution to cross-country ski technique, learning and teaching process.

Johnny Nilsson  
PhD, Assoc. Professor  
Swedish School of Sport and Health Sciences (GIH)

## CURRENT NEWS



### Latvian Academy of Sport Education

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*LASE 4th PhD and Master Student Scientific Conference*  
*"Theory and Practice in Sport Science"*  
**15 March, 2012 Riga, Latvia**

*LASE 64th Student Scientific Conference.*  
**5 April, 2012 Riga, Latvia**

*International Scientific Conference in Sport Science*  
**12 April, 2012 Riga, Latvia**

The official languages of the Conference are Latvian and English for oral and poster presentations. The information is placed on the website: [www.lspa.lv](http://www.lspa.lv)



## OSRESS 2012

Outdoor Sports and Recreation Education Summer School 2012  
*Outdoor Games from the Historical Perspective in Latvia*  
**August, 2012 Madona, Latvia**

**Organizers:** Latvian Academy of Sport Education and Latvian Association of Outdoor Education and Recreation **in collaboration with** Jozef Pilsudski University of Physical Education in Warsaw, Faculty of PE in Biala Podlaska, Poland, State College of Computer Science and Business Administration in Lomza, Poland, Swedish School of Sport and Health Science, Sweden and University of Malaga, Spain.

The information is placed on the website: [www.lspa.lv](http://www.lspa.lv)

## CONGRATULATION



We congratulate Inga Liepiņa, the student of doctoral studies at the Latvian Academy of Sport Education, to have defended her thesis “Promotion of balance abilities for sport climbers” (Sport Science) at the Latvian Academy of Sport Education on December 13, 2011. Supervisor prof. D. Krauksta.

Phd Inga Liepiņa lecturer of the Department of Skiing, Shooting, Orientation, Tourism and Recreation in Latvian Academy of Sport Education. Expert in Riga methodological centre of leisure time education. Pedagogue at the sport tourism group, children and youth centre “Rīgas skolēnu pils”.



We congratulate Aivars Kaupužs, the student of doctoral studies at the Latvian Academy of Sport Education, to have defended his thesis “Health-enhancing physical activities for 60-75 years Old seniors” (Sport Science) at the Latvian Academy of Sport Education on December 13, 2011. Supervisor prof. V. Lāriņš.

Phd Aivars Kaupužs Lecturer of Rezekne Higher Education Instituion Study Course: ”Sport”.

## GUIDELINES FOR CONTRIBUTORS

### Instruction to Authors

The **LASE Journal of Sport Science** is a journal of published manuscripts in English from various fields of sport science. It covers the following types of papers:

- ✓ *original research papers* (maximum 12 standard pages of typescript, including tables, figures, references and abstract),
- ✓ *review papers* commissioned by the Editor (maximum 20 standard pages of typescript, including documentation),
- ✓ *short communications* (maximum 3 standard pages of typescript plus two table or figure and up to 5 references),
- ✓ *letters to the Editor* delivering an opinion or a comment to published manuscripts (maximum 2 standard pages of typescripts),
- ✓ *current news* (information on conference, abstracts of PhD. theses and Post-Doc. theses, book reviews, biographical notes),
- ✓ *advertisements* that may be covered on separate pages of the journal (prices are subjects to individual negotiations).

Papers must be accompanied by the following submission letter (form available at journal's website), signed by all Authors: "The undersigned Authors transfer the ownership of copyright to the **LASE Journal of sport science** should their work be published in this journal. Authors state that the article is original, has not been submitted for publication in other journals and has not already been published except in abstract form, preliminary report or thesis. Authors state that they are responsible for the research that they have carried out and designed; that they have participated in drafting and revising the manuscript submitted, which they approve in its contents. Authors also state that the reported article (if it involves human experiments) has been approved by the appropriate ethical committee and was undertaken in compliance with The Helsinki Declaration."

Research papers and short communications will be sent anonymously to two reviewers. Depending on the reviewers' opinion, the Editors will make a decision on their acceptance or rejection. The Editors' decision is ultimate.

#### Manuscript specification

Articles must be submitted in English and only to the **LASE Journal of Sport Science**.

Authors should observe the ethics of manuscript preparation (avoiding duplicate publication, inaccuracy of citations, fraudulent publication, plagiarism and self-plagiarism).

Copyright will be owned by the publisher: **LASE Journal of Sport Science**. A properly completed Transfer of Copyright Agreement must be provided for each submitted manuscript. A form is available at journal website.

Authors are responsible for the factual accuracy of their papers, for obtaining permission to reproduce text or illustrations from other publications and for an ethical attitude regarding the persons mentioned in the manuscript.

#### Format

Document format – Microsoft Word 97-2003 or 2007.

Page format – 210x297 mm (A4). Text – single column (font Times New Roman, letter size 12 pt), line spacing – Single, paragraph alignment – Justified, left margin – 20mm, right margin – 20mm, bottom margin – 25mm.

### Style

Papers must be written in a clear, concise style appropriate to an international readership. Familiar technical terms may be used without explanation. Acronyms and abbreviations are likely to need full presentation at least once.

### Content

Research or project reports, case studies of practice, action research reports, and reports on teaching practice or techniques will be accepted.

Research reports should include a description of the practical application(s) of the ideas tested, while reports of teaching practice or techniques should contain an explanation of the theoretical foundation underlying the practice or technique in question.

Material in the form of illustrations or photos is welcomed. This material should be accompanied by text clearly setting out its philosophical or practical origins or implications. All material should be clearly referenced to its sources.

The manuscripts should be arranged as follows: title page, abstract and body text

**Title page** should contain: title of the paper, first and last names of authors with affiliation, first and last name of corresponding authors with postal address, telephone, fax and e-mail.

**Abstract** (up to 250 words) consisting of the following sections: justification and aim of the study, material and methods, results, conclusions, as well as 3-6 key words, should be provided before the body text.

**Body text** should be sectioned into: Introduction, Material and Methods, Results, Discussion, Conclusions, Acknowledgements (If necessary) and References. In articles of others types, the text should follow in a logical sequence and headings of its particular sections should reflect issues discussed therein.

*Introduction* – should be short and concise; it should introduce readers into research problems addressed in the study as well justify undertaking the research and specify its aim.

*Material and methods* – should describe the subject of the study (in the case of human subjects data should include their number, age, sex and any other typical characteristics) and methods applied in a sufficiently exhaustive way to enable readers to repeat the experiments or observations. For generally known methods only references should be given, whereas detailed descriptions are to be provided for new or substantially modified methods.

*Results* – should be presented in a logical sequence in the text, tables and figures. Data collated in table and figures should not be repeated in the text which should summarize the most important observations.

*Discussion* – should emphasize new or important aspects of experimental results and discuss their implications. Results of own studies are to be compared with findings described in the respective domestic and international references used by the Authors.

*Conclusions* – should be started in points or descriptively and should be logically connected with objectives stated in the *Introduction*. Statements and conclusions not derived from own observations should be avoided.

*References* – following instructions for Authors on References (APA style).

### Citing in-text

Following artificial text shows different types of in-text citation:

Claessens (2010) found evidence that attention will be given to multi-compartment models, such as the 3-water, 3-mineral and 4-compartment models, to assess percentage of body fat. However, Raslanas, Petkus and Griškonis (2010) noted that Aerobic physical load of low intensity got 35.1 % of total trainings time. Research on physical loading also focused on identifying the basis of many years' research of physical activity (Bytniewski et al. 2010). According to Ezerskis (2010), "... heavy physical loads had the undulating character

depending on the dynamics of workloads...” (p. 71) yet girls are more ascertained that the Track & Field training helps to develop courage.

### **Instructions for Authors on References (APA style)**

This document describes standards for preparing the references in the APA style. The following sections give detailed instructions on citing books, journal articles, newspaper articles, conference papers, theses, web pages and others.

Please provide all the required elements in the references to your paper. Please pay particular attention to spelling, capitalization and punctuation. Accuracy and completeness of references are the responsibilities of the author. Before submitting your article, please ensure you have checked your paper for any relevant references you may have missed.

A complete reference should give the reader enough information to find the relevant article. If the article/book has DOI number, the author should include it in the references. And most importantly, complete and correct references may allow automatic creation of active links by the MetaPress technology that we use for making the electronic version of our journal. Active reference linking is regarded as the greatest benefit of electronic publishing and it adds a lot of value to your publication.

Additional information about APA style writing is found on LASE web page: <http://www.lspa.lv/>.

**Tables** – should be prepared on separate pages (saved in separate files) and numbered using subsequent Arabic letters. They should be provided with titles (above). Every column in a table should have a brief heading and more extensive explanation should be given under the table, e.g. statistical measures of variability.

**Figures** – should be prepared in an electronic form and saved in separate files. A separate page should be provided with legends to figures, authors’ names, manuscript’s title, and consecutive number of figure with “bottom” or “top” identification. Photographs or other illustrative materials may be submitted in an electronic form (\*.tif, \*.jpg, image resolution: 300 or 600 dpi) or any other form suitable for final technical typesetting by the Editorial Office. In the appropriate places in the text consecutive numbers of tables or figures should be provided in parentheses, e.g. (Tab. 1) or (Fig. 1). Places of insertion of the illustrative material should be marked with pencil on the margin of the typescript.

**General principles** – the Editorial Office reserves for itself the right to correct stylistic errors and to make necessary changes (abridgements) in the text without Author’s knowledge. Articles not accepted for publication are not returned. Manuscripts not prepared following *Instruction to Authors* will be sent back to Authors for revision. Galley proofs of manuscripts will be sent to Authors for proofreading. It is the Author’s responsibility to return the proof within one week. Each Author will receive free-of-charge one copy of the issue in which their work appears.

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### **Submission of manuscripts**

The articles should be sent to:

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## Reviews of article in 2011

**Agita Ābele (Latvia)** PhD, Professor Latvian Academy of Sport Education  
**Miklos Banhidi (Hungary)** PhD, Professor, University of West Hungary  
**Rolf Carlson (Sweden)** PhD, Professor, Swedish School of Sport and Health Sciences  
**Algirdas Čepulėnas (Lithuania)** PhD, Professor, Lithuanian Academy of Physical Education  
**Albrecht Claessens (Belgium)** PhD, Professor, Katholieke Universiteit Leuven  
**Leonīds Čupriks (Latvia)** PhD, Professor, Latvian Academy of Sport Education  
**Ruta Dadeliene (Lithuania)** PhD, Professor Vilnius Pedagogical University  
**Andra Fernāte (Latvia)** PhD, Assoc. Professor, Latvian Academy of Sport Education  
**Juris Grants (Latvia)** PhD, Professor, Latvian Academy of Sport Education  
**Uldis Grāvītis (Latvia)** PhD, Professor, Latvian Academy of Sport Education  
**Juri Hanin (Finland)** PhD, Professor, Research Institute for Olympic Sports  
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**Jānis Židens (Latvia)** PhD, Professor, Latvian Academy of Sport Education