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ORIGINAL RESEARCH PAPER

THE RELATIONSHIP BETWEEN PHYSICAL ACTIVITY AND EXERCISE MOTIVATION OF THE FIRST YEAR STUDENTS FROM REZEKNE AUGSTSKOLA

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Abstract

The aim of this research is to assess the physical activity (PA) and exercise motivation of the first year students from Rezeknes Augstskola. The study further explored the relationship between results of International Physical Activity Questionnaire (IPAQ) and The Behavioural Regulation in Exercise Questionnaire – BREQ-2. The initial sample of 110 students was reduced to 98 participants (26 males, 72 females). Mean age of participants – 19.4±2.2 years. Findings show that 81.5% of the respondents are "high" physical active, 17% are "moderate" and 1.5% have "low" PA level. But only one third of respondents take part in leisure time activities. Intrinsic (10.9±3.87 points) and identified (8.9±2.92 points) motivation are the main behavioural regulation in exercise contexts for students. Respondents have low a motivation (2.35±2.08 points), external (1.45±2.35 points) and introjected (3.18±2.85 points) regulation score. The obtained data shows correlation between leisure time domain of PA and intrinsic regulation (Pearson Correlation r=0.*284*; *p<0.05).*

Keywords: *behaviour regulation, motivation, physical activity, students*

Introduction

The habits and the way of life obtained in period of youth may substantially affect human health, development and quality of life in the future. Young people are often considered to be healthiest population, but, as shows studies, this generation's health is at risk. Changes in the dynamic society also change the values and daily habits. Modern technologies more

and more facilitate human lives, but it also reduces the physical activity. Sufficient physical activity (PA) is an essential prerequisite for health maintenance and improvement. Physical activities strengthens musculoskeletal system, reduce risk of the heart and vascular diseases, arthritis and multiple cancer risks, and also have a positive impact on human mental health.

Physical activity is „any bodily movement produced by skeletal muscles that result in energy expenditure" (Caspersen, Powell, Christtenson, 1985). Physical activity is closely linked to physical fitness. Physical fitness is „a set of morphological and functional characteristics of the individual, which provides the ability to carry out physical activity" (Caspersen, Powell, Christtenson, 1985). According to studies minimum required health enhancing PA is not less than 150 minutes of moderate intensity or 75 minutes of high-intensity activity per week (Physical Activity Guidelines for Americans, 2008). All activities of daily living, which are made with at least medium intensity and continue at least for 10 minutes without interruption, are suitable in order to maintain health. However, despite the obvious physical and mental health benefits, 49% of Latvia population does not engage in any sport or physical activities and as the main reason they mentioned "lack of time" and "lack of necessity to be physical active" (Sporting habits of the inhabitants of the Republic of Latvia, 2007). Also cognitive factors affect one's perceptions that there are no benefits from moderate activity, physical activity is not enjoyable, and lack of confidence in one's ability to be active.

Starting studies at university, young people significantly change their learning process organization and everyday activity habits changes too. The approaches of organizing sport activities at the Latvian universities are different from primary education. Physical activities at the universities are mainly organized as participation in team sport trainings or attending optional sport courses. Only in some particular universities study course „Sport" is in compulsory section. Therefore clarification of students' motivation has essential role in their involvement in physical activities.

There are many studies that have investigated the mechanisms of motivation to be physical active (Rodgers et al., 2010). G.Sage motivation simply defined as the direction and intensity of one's effort (Sage, 1977). Scientific literature describes different motivation theories, which the main conclusion is that a person's internal processes have the determinative role on the personality action.

Behavioral change theories and models try to explain the reasons of individuals' behavioral patterns. Theories and models of physical activity behavior change have both empirical and theoretical background (Tab. 1).

Table 1

Theories of Physical Activity Behaviour

Belief-Attitude Theories	Competence-Based Theories	Control-Based Theories	Stage-Based Theories	Hybrid Models
Theory of Planned Behaviour Ajzen, I. 1985 *Health belief model* Irwin M. & Rosenstock I.M. 1966;	*Social Cognitive Theory* Bandura, A 1986 *Relaps prevention model* Marlatt, Gordon 1985	*Self-Determination Theory* Deci, E. L., & Ryan, R. M 1985	*Trans-theoretical Model* Prochaska & DiClemente, 1983	*Social Ecology Model of Health Promotion* Stokols 1992 *Ecological Systems Theory* Bronfenbrenner 1979 *The Health Action Process Approach* Schwarzer 2008

Self-determination theory (SDT) is widely applied for examination of human motivation to different types of behavior including physical activity. Theory of self-determination is differentiating the types of motivation. The main distinction is between autonomous motivation and controlled motivation. SDT, like other behavior explanation theories, was developed in the mid-1980s of last century. The core components of theory were defined by E. Deci and R. Ryan in 1985 (Deci, Ryan, 1985). This theory is based on recognition that individual has three innate psychological need – autonomy of ego, expertise and belonging. Autonomy of personality is described as inner locus of control – it is a person who explains life events with one's peculiarities of personality and possesses perception that action is carried out at one's own choice. Competence is confidence of the ability of an individual and readiness to make effective action. As social beings, each person feels the need of belonging to one of the social groups. It means that person takes certain actions to meet the psychological needs and it can be referable to physical activity too.

Self-determination theory explains that the extents to these needs are affected by the level of person's motivation. Continuum is peculiar to expressions of action motivation and it can be described from amotivation (lack of motivation) to true inner motivation. Levels of motivation and its representative actions are presented in the Table 2.

Nowadays topical research studies, applying components of SDT, are based on an assessment of the internal and external motivation components and its interaction with physical activity determinants. In the research of N.Cacisarantis and co-authors was founded that intrinsic and introjection motivation affects the perceived competence on physical activity, but it is not sufficient condition for developing strong intentions for behavior (Chatzisarantis et al., 2003).

Table 2

Continuum of Motivation Factor of the Self-determination Theory

Locus of inner control	Locus of external control			
True inner motivation	**Weak external regulation**	**Strong external regulation**	**External regulation**	**Lack of motivation**
„I exercise because it is fun"	„I exercise because I want to look good"	„I exercise because I don't want to feel guilt for leaving my team"	„I exercise because my parents want it"	„I think exercising is a waste of time"
Action to feel joy and comfort, incentives are not required	Action is run by internally defined values	Action is taken as an internal need, but the cause is an external effects	Action is ruled by system of penalty and an incentive	Action is not happening because there is no need to
High autonomy of activity ◄——————————————► Low autonomy of activity				

Based on SDT statements, it can be concluded that promoted inner motivation can encourage the participation in physical activities. This can be achieved by:

- reducing the need for external encouragement and controlling monitoring;
- promoting the self decision making;
- focusing attention to the own tasks and purposes;
- ensuring rational reasoning to the action;
- recording results of operations, which reflects the increase of competence.

The aim of the study was to define physical activity of first year students in Rezekne Augstskola (Rezekne Higher Education Institution) using the International Physical Activity Questionnaire (IPAQ) and compare results with The Behavioural Regulation in Exercise Questionnaire (BREQ-2) results.

It will provide the internationally comparable data and will allow evaluating students' physical habits and motivation changes during the study period.

Material and methods

Physical activity

To assess the level of physical activity long version of the International Physical Activity Questionnaire (IPAQ) was used. The given instrument has been validated with a criteria method in several researches and has been adapted in 12 countries (Craig et al., 2003). Questionnaire can be used with a wide range of respondents (aged from 15 to 69). The obtained results are objectively comparable between persons and other researches, including international ones. The items in IPAQ are structured to provide separate domain-specific scores for walking, moderate intensity and vigorous intensity activity within each of the leisure time PA, domestic and gardening (yard) activities, work-related PA and transport-related PA. 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). To calculate physical activity scores, only the activities lasting at least 10 minutes at the time were taken into account. Both categorical and continuous indicators of physical activity are possible to obtain from IPAQ. The following values continue to be used for the analysis of IPAQ data:

- vigorous PA - 8.0 METs;
- moderate PA - 4.0 METs;
- walking - 3.3 METs.

There are three levels of physical activity to classify results of the respondents: low, moderate and high. The algorithms for classification of the data are defined in scoring protocol (Guidelines for Data Processing and Analysis of the IPAQ 2005). The gained data can be reported as a continuous measure too. The MET-minute is computed by multiplying the MET score of an activity by the minutes performed during the week. The sitting time is an additional indicator variable of time spent in sedentary activity.

Behavioural regulation in exercise

The parameters of exercising motivation were determined using The Behavioural Regulation in Exercise Questionnaire - BREQ-2 (Markland & Tobin, 2004), which questions are based on Self-determination Theory (Deci &Ryan 2000). This questionnaire was developed and supplemented by group of scientists. It was done with a goal to establish the reasons why

people decide to participate or not in physical activity. The BREQ-2 has been adapted to Latvian by the translation-back translation method. The questionnaire item pool includes 19 assertions which are divided into 5 subscales of motivation:

- amotivation - „I can't see why I should bother exercising";
- external regulation- „ I exercise because other people say I should";
- introjected regulation – „I feel guilty when I don't exercise";
- identified regulation - „I value the benefits of exercise";
- intrinsic regulation - „I exercise because it's fun".

Each item is measured on a five-point Likert-scale. Answering the assertion, a respondent has to evaluate how much he or she agrees to it (0 – not true for me; 1-2-3 – sometimes true for me; 4 – very true for me). The mean of the all subscales was calculated on a five point scale to set off the extent of each motivation type separately. The Relative Autonomy Index (RAI) was used to get information about the level of relative autonomy of person as motivation types are located on the self-determination continuum. The RAI was calculated by weighting each motivation subscale by their specific weights and summing up the weighted scores: (amotivation multiplied by -3; external regulation multiplied by -2; introjected regulation multiplied by -1; identified regulation multiplied by 2; intrinsic regulation multiplied by 3). The maximum score for the RAI is +20 and the minimum score is -24. Higher positive scores for the RAI shows the degree to which an individual is more self-determined in the regulation of his/her behaviour. Lower negative scores indicate less autonomous motivation.

Participants

The first year students of Rezekne Augstskola (RHEI) took part in research. The time for filling up the questionnaire wasn't limited. It was organized for respondents in their first sport lesson in order to find out about students physical activity before they began studying in RHEI. Totally 110 students took part in survey. Valid questionnaires for further data processing were 98 (72 women and 26 men). Average age of respondents was 19.4±2.2 years. The survey was carried out in second week of September in 2012.

Data Analysis

Statistical 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. 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 analyzed for the whole group throughout the article.

Results

According guidelines for the data processing and analysis of the IPAQ - high physical activity level is achieved at 3000 MET- minutes per week, moderate – at least 600 MET- minutes per week and low activity – less than 600 MET- minutes per week (www.ipaq.ki.se). In some studies it was found that self-estimated questionnaires shows the tendency to overrate the level of physical activity than it really is (Janevic, McLaughlin, Connell, 2012). The similar situation was ascertained in this research too. Twelve respondents declare the result which exceeds the 30000 MET- minutes per week. It can be compared to 12 hours of very hard physical work without interruption 5 days per week; therefore, these questionnaires ware recognized as invalid and was not included in further processing of results. The distribution of physical activity based on IPAQ survey data is presented in Figure 1.

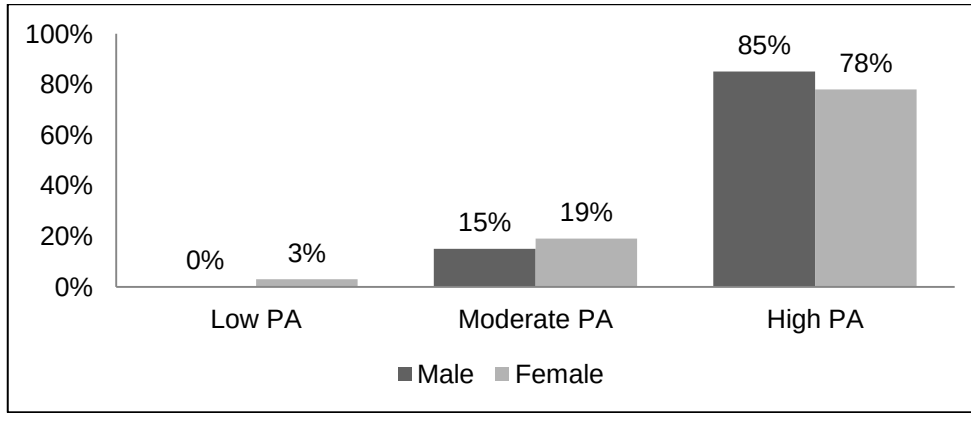

Figure 1. The results of the International Physical Activity Questionnaire (IPAQ)

The data show that most of respondents are quite active. 78% of women and 85% of men represented a high level of physical activity. These results exceed 3000 MET-minutes per week which is equivalent to 1 hour of walking and 1 hour of moderate intensity activity every day. Although the risk of overestimating of physical intensity has to be taken into account, however the total data indicates a trend that in this age group the physical activity level is sufficient.

The statistical analysis of data shows that there are not significant differences of the total amount and level of physical activity between men and women ($p>0.05$). The data were compared with research which was carried out in Croatia in 2009, which included the study of PA using IPAQ survey for different age range (Jurakić et al., 2009). The age group of Croatians' that is presented in Table 3 is from 25 to 34 years. Comparing the results of total PA no statistically significant differences were found between groups ($p>0.05$).

Table 3

The comparison of common physical activities between genders and researches

MET-minutes per week	RHEI students men	RHEI students women	Croatians men	Croatians women
Average	6454.5	5518.5	8186	4656
Median	5833	5824.5	4770	2712
Standard Deviation	±3078.1	±2656.4	-	-

The structure of the long format of the IPAQ provides more detailed analysis of PA of the respondents, and the possibility of omitting some kind of PA is reduced. Nevertheless, the higher number of questions potentially overestimates the prevalence of PA. The amount of total PA from the IPAQ long format was calculated separately in 4 domains (job related PA, transportation PA, housework PA, leisure time PA). It enables to assess how much respondents participate in leisure time physical activities which are mainly carried out with a medium or high intensity. The distribution of physical activity by domains based on IPAQ survey data is presented in Figure 2.

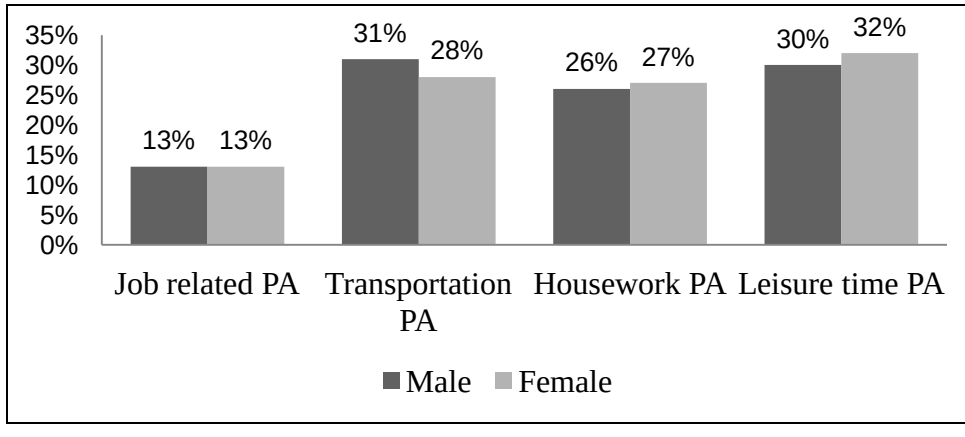

Figure 2. The distribution of physical activity by domains

It can be concluded that only 13% of respondents carry out the job related physical activity. Only approximately one third of respondents (30% men and 32% women) are active in their leisure time. Physical activities in spare time, time spending walking, working at home, for both groups of genders are distributed proportionally. There are no statistically significant difference between genders in physical activity domains ($p>0.05$). The gained results indicate that it is important to take into consideration the interests of young women too and it is necessary to offer the attractive physical activities for them in university curriculum.

IPAQ questionnaire includes question about time spent sitting. This indicator variable allows assessing parameters of person's sedentary life. The research data show that before studies in university they spent sitting in average 294±130 minutes a day. The statistically significant difference between genders was not found ($p>0.05$).

Discussion

Analyzing the data about exercising motivation it was founded that the self-realization and expected benefits of personality (identified and intrinsic regulation) are most essential for students. External and introjected regulations are not so important meaning for students for participation in physical activities. Only small part of students indicates that they are not motivated to participate in physical activities. The Relative Autonomy Index was 9.08±4.4 that shows positive tendency for autonomous motives for exercising. Also in this questionnaire no statistically significant differences between genders were found ($p>0.05$). Although in research done by Egli and colleagues with the student population, gained results shows that male students are more motivated by intrinsic factors (power, competition and challenges), but female students are more motivated by extrinsic motives, such as body weight control and appearance (Egli et al., 2011). The gained results were compared with data from Wilson and colleagues (Wilson et al., 2012) research that has been done in Canada with young population (161 males with mean age 18.91years and 220 females with mean age 18.52 years). The research was provided by paper-and-pencil surveys in classes at vocational and general colleges located in central Canada. The comparisons of the main figures of the researches are presented in Table 4. There are the tendencies that Canadian you people have more autonomous motivation for exercising, but also they have more pressure from the persons who have important influence in an individual's behavior. It could be explained with bigger social, media and marketing enforcement for Canadian inhabitants to be fit and physically active than it is in Latvia. For Latvian people every day

physical activity is more common than exercising in leisure time as it shows the data from IPAQ questionnaire.

Table 4

The parameters of exercising motivation (BREQ-2)

Type of motivation	Maximum possible value	Average sum of subscale - RHEI (SD)	Mean of subscale-RHEI (SD)	Mean of subscale-Canada (SD)
Amotivation	16	2.35 (2.08)	0.59 (0.52)	0.21 (0.38)
External regulation	16	1.45 (2.35)	0.36 (0.58)	1.43 (0.55)
Introjected regulation	12	3.18 (2.85)	1.06 (0.95)	2.22 (0.85)
Identified regulation	16	8.9 (2.92)	2.23 (0.73)	3.02 (0.68)
Intrinsic regulation	16	10.9 (3.87)	2.73 (0.96)	3.04 (0.81)

The Pearson's correlations between the five motivation types are presented in Table 5. Internal perceived locus motivation types (identified and intrinsic regulation: $r = 0.300$, $p \leq 0.05$; introjected and identified regulation: $r = 0.512$, $p < 0.01$) were significantly related to each other. As it was expected, for respondents with low level of motivation to participate in physical activities (amotivated) intrinsic regulation is not meaningful. The negative correlations among the subscales that are more distant on the self-determination continuum (amotivation and intrinsic regulation: $r = - 0.284$, $p \leq 0.05$) and stronger positive correlations between adjacent subscales approved the gained results as conformable to Self-determination theory statements (Tab. 5).

Table 5

Pearson correlations between the motivation types

Type of motivation	Amotivation	External regulation	Introjected regulation	Identified regulation
External regulation	0.271	_	_	_
Introjected regulation	-0.219	0.237	_	_
Identified regulation	-0.187	0.132	0.512**	_
Intrinsic regulation	-0.284*	-0.102	0.233	0.300*

* $p \leq 0.05$; ** $p < 0.01$;

Although most of the studies indicate that higher levels of autonomous motivation are related to higher amounts of PA (Verloigne et al., 2011, Daley & Duda 2006) in our research the obvious data were not founded. The Relative Autonomy Index does not correlate with physical activities results of IPAQ. The positive correlation was founded only during comparing results of IPAQ domains and exercising motivation types (leisure time activities and intrinsic regulations $r=0.284$, $p \leq 0.05$). The correlation between total amount of the daily physical activities and exercising motivation parameters of was not found.

Conclusions

The most of the student's physical activity results refer to "moderate" or "high" PA level, but there is a risk of overestimating of the total activity at this age group. Nevertheless the obtained results let conclude that most of the first year student have sufficient total physical activities level, but only one third of respondents took part in leisure time activities before studies. Respondents spent sitting at an average five hours a day before they have started the studies in university. The differences between women and men in results of physical activity survey are not statistically significant. Our findings approve the theoretical relationships between motivation types on the self-determination continuum. The main motives for students to participate in physical activities are self-realization and expected benefits for personality. The obtained results show that leisure time activities have mostly close correlation with parameters of motivation.

It is important to acknowledge potential limitations that must be considered in the interpretation of the research data. Firstly, as in other self-reported measures, the physical activity level was obtained by the questionnaire. The usage of this method might potentially overestimate the results of total physical activity. As in any questionnaire approach, the responses were dependent on respondent's recollection and how attentive the subjects may have been in their responses. Secondly, the sample was limited to first year students, thereby restricting the ability to generalize the findings to other age groups. Finally, the proportion between genders was not equal because of study peculiarities in RHEI. In future research should be investigated the physical activity with objective methods and ascertain whether the more physically active people are more autonomously motivated.

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ORIGINAL RESEARCH PAPER

EMOTIONAL EXPERIENCES OF ADOLESCENTS IN SPORT

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Abstract

The aim of the research is to reveal, on the basis of the diagnostic study, the emotional experiences of adolescents (11-13 year-old) in sports in relation to oneself and others. Research methods: analysis of relevant scientific research, used by the author of emotions, a questionnaire, and statistical analysis. For the establishment of the emotional level, the author's questionnaire of emotions was used which allowed to determine the expression of emotional experiences of the participants of the research and the stability of emotional experiences in relationship with oneself as well as in relationships with other people (a friend, a teacher, a team, a competitor). The most significant positive emotions (trust, joy, hope, admiration, compassion) and the most significant negative (anger, shame, fear, sadness, guilt) emotions were researched. Adolescents' (11-13 years old) were selected randomly from 8 schools of general education from different parts of Lithuania. They were selected according to incidental convenient selection method. There was a diagnostic research carried out. The representative group consisted of 708 adolescents (11-13 years old). The results of the research revealed that emotions are closely linked to the moral values of fairness, generosity, responsibility, sensitivity, and revealed the stability of positive emotions in adolescents' relations with themselves and other (friend, physical education teacher, teammates) people. A more detailed analysis revealed that the negative emotions (shame, anger) are even more linked than the positive (joy, admiration, trust).

Keywords: *adolescents, situation in relation (to oneself and others), emotional experiences in sport.*

Introduction

Currently, the educational function of sport and its influence on a shift of value system of a learner seems to receive an exclusive attention (Šukys,

2001; Tilindienė, 2000). Thus, broader possibilities of sport activities are ensured to influence not only physical development of a person, but also health, value orientation by building knowledge, skills and competencies related to such activity (Šukys, 2001). However, a significant role is played by moral and material incentives for aroused behavior during competitive sports. If during competition first of all such values as health, physical development, moral culture, human communication are promoted, there is a chance that athletes will pursue them (Malinauskas, 2008). On the other hand, behavior sometimes demonstrated by current sport stars to the public is not a behavior model of an honest and reputable person, who would comply with ethic norms. Therefore, the beauty and essence of sports competition is devalued (Stonkus, 2000).

Authors of Lithuania and other countries (Žukovska, Žukovski, 1998; Stonkus, 2000; Puišienė, Smalinskaitė, 2000; Smalinskaitė, 2003; Willimczik, 2002; Vidoni, 2005; Naul, 2010 and etc.) emphasize that olympic development has a significant influence on development of adolescents‘ human values, formation of moral values, perception of positive honorable and respectable behavior. Therefore, it is not a coincidence that researchers focus on such matter as an integral researching of such phenomena gained a meaningful importance.

The research aim – to reveal, on the basis of the diagnostic study, adolescents' (11-13 years old) emotional experiences in sports in relation to oneself and others.

Research procedure. For determination of emotional level the author's questionnaire of emotions was used, which allowed to determine the expression of emotional experiences of the participants of the research and the stability of emotional experiences in relationship with oneself as well as in relationships with other people (a friend, a teacher, a team, a competitor). The most significant positive emotions (trust, joy, hope, admiration, compassion) and the most significant negative (anger, shame, fear, sadness, guilt) emotions were researched. Adolescents (11-13 years old) were selected randomly from 8 schools of general education from different parts of Lithuania and from different towns in size: Vilnius, Klaipeda, Plunge, Telsiai, Raseiniai, Sakiai, and Vidukle. They were selected according to incidental convenient selection method. There was a diagnostic research carried out. The representative group consisted of 708 adolescents. (11-13 years old): 11 years old – 49.6% (n=351), 12-13 years old – 50.4% (n=357).

Material and methods

Research methods: analysis of relevant scientific research, used by the author of emotions, a questionnaire, statistical analysis. For determination of emotional level the author's questionnaire of emotions was used, which allowed to determine the expression of emotional experiences of the participants of the research and the stability of emotional experiences in relationship with oneself as well as in relationships with other people (a friend, a teacher, a team, a competitor). Emotional level the author's account of emotions has been used, that allowed to determine the expression of emotional experiences of the participants of the research and the stability of emotional experiences in relationship with oneself as well as in relationships with other people (a friend, a teacher, a team, a competitor). The most significant positive emotions (trust, joy, hope, admiration, compassion) and the most significant negative emotions (anger, shame, fear, sadness, guilt) have been chosen according to V. Aramavičiūtė (2005) and D. Verbylaitė (2006).

A total number of known ten factors influence expression and frequency of adolescents' emotional experience, which explain a data dispersion of 69.0 %. The calculated value of the KMO measure 0.656, Bartlett's test of sphericity χ^2=2558.739, when $p < 0.000$ attests suitability of data. Factorial analysis revealed that all of the emotional experiences carry a sufficient factorial weight and are significant. Excluded ten factors categorize ten different emotions into ten groups. Such factors disclose expression of different emotions in relation to oneself and others (friend, teacher of physical education, teammates, and competitor).

Data analysis. The data of the research was processed with SPSS (*Statistical Package for the Social Science)* software, version 19.0. *Pearson's linear correlation coefficient* (*r*) between separate variables applied in determination of statistically significant connections between the variables and the strength of the connections. *Student's t–criterion* applied in verifying the hypothesis in case of more than two separate variables. The method of single–factor dispersion analysis of interferential statistics *(ANOVA)*. Which reveal the view of the participants of the research on moral decisions in sporting activities (*Cronbach's Alpha* coefficient = 0.853) and the sections of questions related to demography.

Results

When studying the emotional level, attention was focused on stability of occurrence of the emotional experiences and it was attempted to analyze what emotions are dominant in relationship to oneself and to other people

(friend, teacher, team, competitor). Following positive and negative emotions emphasized by V. Aramavičiūtė (2005) and D. Verbylaitė (2006), the following most significant positive emotions (trust, joy, hope, admiration, compassion) and the most significant negative emotions (anger, shame, fear, sadness, guilt) have been chosen as a measure.

Analysis of the research results allows concluding that adolescents express positive emotions more often than negative in relation to one. It has been disclosed that more than half developed a self-trust when engaged in sports, less than half hope to become a good athlete, a slightly more than a third feel joy because of their active life. It has been noted that it is a rare case that respondents experience sadness – 52.3 %, if they fail to succeed in sports, a sense of shame – 44.4 %, when they are late for physical education classes, anger – 39.2 % if other pupils disturb them during the class. However, 42.9 % of the respondents admit their fault during a competition as they often feel a sense of guilt, while others – 34.9 % feel compassion in relation to oneself in cases of improper behavior. Based on A. Adler (1969) and E. Erikson (1968), pursuit to experience positive emotions and avoid negative (guilt, fear) is the leading motive stimulating a person to behave positively.

It has been identified that positive emotions more often than negative are dominant in adolescents‘relationships with a friend. It is significant to note that joy is experienced more often in relation to a friend (60.3 %) than in a relation towards oneself – 38.1 %. It is worth mentioning that a majority of respondents (70.6 %) rarely feel a sense of fear in relation towards a friend, other 69.0 % of pupils do not feel shame when communicating with a friend who does not make any effort and lacks activeness in sports and more than half of respondents do not accuse a friend even though he played improperly and less than half of pupils do not feel anger. It is also important to emphasize that 40.6 % of adolescents express sadness in relation towards a friend more often than towards oneself (22.3 %) when fail to succeed in sports. It was revealed that the respondents tend to express joy, admiration, and trust in relation to a friend more often rather than feel anger, fear, shame or guilt towards him.

The research took an interest in analyzing emotions dominant in relation to a physical education teacher (Tab. 1).

Table 1

Frequency of adolescents' emotional experiences developed in relation to a physical education teacher

In relation to physical education teacher Developed emotions (%)	Often	Seldom	Rarely
1. Trust in physical education teacher	59.5	25.4	15.1
2. Joy towards physical education teacher when his/her coached team wins the game	61.9	23.0	15.1
3. Hope for a friendliness of a physical education teacher	67.5	18.3	14.2
4. Admire physical education teacher's competencies, achievements in sports, devotion to work	76.2	13.5	10.3
5. Compassion for physical education teacher if he (she) is in distress	71.4	16.7	11.9
6. Anger towards physical education teacher after losing a game	19.8	19.8	60.4
7. A sense of shame towards physical education teacher if his team loses the weaker competitors	30.2	32.5	37.3
8. Sense of fear regarding strictness of a physical education teacher	16.7	13.5	69.8
9. Sadness in cases the physical education teacher promises to supply special sportswear, but fails to comply with his promise	28.6	34.1	37.3
10. Accusation towards physical education teacher if he is late for a class	17.5	24.6	57.9

Summarized results of the study reveal that positive emotions more often than negative ones are dominant in relation to a physical education teacher and such is shown significantly more often compared to relations with a friend or oneself. Hence, often the majority (76.2 %) of respondents admire a teacher's competencies and devotion to work, 71.4 % of respondents feel compassion for their physical education teacher, as a person, in case of misfortune, 67.5 % of respondents hope for his friendliness, 61.9 % respondents feel joy for the victory of his team and 59.5 % of pupils feel trust towards physical education teacher. Moreover, such emotions as fear – 69.8 % and anger – 60.4 % are rarely dominant in such relationships.

Positive emotions often expressed by pupils reveal a positive influence towards relationships with a physical education teacher.

Positive and negative emotional experiences, shown in relationships with team members are analyzed (Tab. 2).

Table 2

Frequency of adolescents' emotional experiences developed in relation to team members

In relation to team members Developed emotions (%)	Often	Seldom	Rarely
1. Trust in team members when playing basketball, dodge ball and other games	61.1	21.4	17.5
2. Joy when winning the game together with the team members	77.8	16.7	5.5
3. Hope for a victory during a game	72.2	22.2	5.6
4. Admiration of personal characteristics of team members	57.1	35.7	7.2
5. Compassion due to a chosen team to play with	9.5	14.3	76.2
6. Anger towards team members after losing the game	12.8	31.7	55.5
7. Sense of shame after a weaker team won against your team	18.3	29.4	52.3
8. Sense of fear when competing with a strong team	35.4	29.2	35.4
9. Sadness when having no special and exclusive sportswear for the entire team	20.6	27.8	51.6
10. Sense of guilt after a lost game	59.5	25.4	15.1

Obtained results reveal that very often emotional experiences dominant in a relation to team members for the majority of adolescents are very positive. This shows that a majority (77.8 %) of research participants feel joy pertaining to a victory together with the rest of team members, have a sense of hope – 72.2% and trust – 61.1% in playing and success of team members during a game. Very rarely the respondents experience anger, expressed towards team members because of a lost game – 55.5%, shame having lost to a weaker team – 52.3%, sadness if a team was not supplied with special outfits – 51.6 % of the respondents. Based on the facts specified above, adolescents' relation to team members is positive and optimistic more often – such is witnessed by the adolescents' choice of emotions.

Having analyzed the adolescents' emotional experiences evoked in relation to a competitor, their frequency is presented as follows (Tab. 3).

Table 3

Frequency of adolescents' emotional experiences developed in relation to a competitor

In relation to a competitor Developed emotions (%)	Often	Seldom	Rarely
1. Trust in competitor's fair and honest game	59.5	25.4	15.1
2. Joy after a lost game by the competitors' team	25.4	37.3	37.3
3. Hope for a lost game by the competitors' team	32.0	30.7	37.3
4. Admiration of a competitor demonstrating sport related excellence, following the rules and easily achieving victories.	50.8	26.2	23.0
5. Compassion for a competitor in case of injury during a game	61.1	27.0	11.9
6. Anger towards the competitor playing unfair, not following the rules and acting aggressively	64.3	19.8	15.9
7. Sense of shame against the competitors having lost the game	19.0	29.4	51.6
8. Sense of fear against a strong competitor	19.0	39.3	41.7
9. Sadness when the competitors' team wins the game	19.0	21.5	59.5
10. Accusations towards the competitors winning the game unfairly	49.2	34.9	15.9

Having summarized the study results it is possible to conclude that more than half (64.3 %) of the respondents often feel anger and accuse (49.2 %) competitors, who do not follow the rules, behave aggressively and win the game by playing unfair. On the other hand, 59.5 % of adolescents often trust the competitor's honesty and fair game and, in cases the competitor is able to show his sport related excellence plays fairly and is able to achieve a victory, then such is admired even by 50.8% of respondents. Other emotions: sadness (59.5%), shame (51.6%), fear (41.7%) in relation to a competitor are expressed rarely. Moreover, the results show that 61.1% of research participants feel sympathy towards a competitor in case of an injury and only 25.4% would feel joy in case the competitor's team loses the game. It was observed that emotional experiences of teenagers, dominant in relation to a competitor, are often positive and conform to the selection of moral values.

Analysis of adolescents' emotional experiences based on gender and physical activeness (engaged or not engaged in sports) revealed even though slight, but still statistically significant differences. Only the factor of age (of fifth; sixth class) did not have a significant influence on stability of emotional experiences.

It was revealed that boys in relationship to oneself more often than girls feel self-trust ($t=2.077$, $p<0.041$) when engaged in sports and have hope ($t=2.106$, $p<0.037$) to become good athletes. Adolescents often feel joy in respect to their active life ($t=3.035$, $p<0.003$) and admiration ($t=3.182$, $p<0.002$) for sport related achievements.

According to E. Martišauskienė (2004), peers comprise a meaningful part of a social environment and are of a significant relevance during the adolescence. It is likely that during the period of adolescence friends and well maintained relationships to them are of a great significance, therefore positive emotions were dominant more often in relation to a friend. Relationships with a friend reveal that boys being engaged in sports often trust a friend ($t=3.402$, $p<0.001$) during a game. Girls rarely feel ashamed to communicate with a friend who does not make any effort and is not very physically active in sports ($t=2.125$, $p<0.033$), but they often feel sad when a friend fails to succeed in sports ($t=2.321$, $p=0.022$) and compassion ($t=2.121$, $p<0.036$) when being shouted at by the coach. Results obtained from analysis of relationships with the physical education teacher revealed that adolescents engaged in sports often together with the physical education teacher feel joy ($t=2.765$, $p<0.007$), when a team coached by him wins the game and admire his competencies and achievements in sports ($t=4.298$, $p<0.000$). Even though it is a rare case, however, boys express anger ($t=2.241$, $p <0.027$) towards physical education teacher if they lose a game. Results of relationships with team members represent that adolescents engaged in sports often feel joy ($t=2.354$, $p<0.020$) together with other team members, when they win the match and hope ($t=2.694$, $p<0.007$), if this game was not successful to succeed in others. It was revealed that girls express a sense of guilt more often ($t=2.578$, $p<0.009$) compared to boys, when their team loses the game. Relationships to a competitor revealed that adolescents engaged in sports often admire a competitor who demonstrates excellence in sports, does not violate rules of the game and succeeds in it ($t=2.054$, $p<0.042$), but quite often express anger towards the competitor who does not play fair or is aggressive. Boys more often than girls blame ($t=2.127$, $p<0.035$) the competitors who win the game by playing unfair.

Statistical analysis of the study results allows distinguishing links between emotional experiences, expressed in relation to oneself and other people. Data analysis reveals which emotions correlate with positive and negative emotions.

Quite a number of correlations were established being dominant in relation to oneself and other (friend, physical education teacher, team

member, competitor) people, however, presents only the strongest and statistically significant correlations.

Correlation with positive emotions: joy, admiration, trust and negative: sadness, anger, shame, blame and often a fear. Considering the positive emotions, a strong correlations were identified between admiration of a friend's achievements in sports and joy because of friend's won game ($r=0.564$, $p<0.000$), between admiration of personal features of the team and trust in competitor's fair fame ($r=0.545$, $p<0.000$). A correlation was also noticed between the adolescents' joy, admiration, and trust, expressed in relation towards a friend, team members and a competitor. Such allows presuming that adolescents tend to be open to emotional experiences. Therefore, positive emotions in relation to a friend as well as other have influence on one another thus creating emotional stability of a person.

Data of the study results reveal several observed correlations between a sense of shame when a team loses the game and fear for the teacher's strict behavior ($r=0.596$, $p<0.000$), between shame, when a weaker team wins the game and anger, expressed towards team members after losing the game ($r=0.583$, $p<0.000$), between sadness, being fairly unsuccessful in sports and a fear to lose the game ($r=0.568$, $p<0.000$). The strongest correlation was observed between a fear against a strong competitor and fear to compete with a strong team ($r=0.671$, $p<0.000$). As the data reveals there are more correlations between negative emotions compared to positive ones, being dominant more often in relation to a team and a competitor. Fairly strong correlations are dominant between adolescents' fear, shame, anger shown in relation to oneself and other people. Fear and anger in relation to oneself and others also influence each other.

According to theories of psychologists (Freud, 1962, Erikson, 1968, Adler, 1969), fear is the greatest obstacle for positive experience as it can have influence on development of values. Therefore, experiences of fear, shame and anger should be considered as factors often accompanying life of the research participants.

Discussion

Different emotions make a different impact on an individual. The impact of emotions primarily depend on the things and phenomena of the surrounding world that cause them, on their significance for an individual, and on his needs they meet. Moreover, not all the experienced emotions are equally atractive to an individual and important or pleasant for him (Aramavičiūtė, 2005, p. 192).

Scientific research which at least partly deals with emotional experiences can be divided into several trends: first, those are studies that analyze emotional experiences of adolescents (Martišauskienė, 2004), senior scholchildren (Aramavičiūtė, 2005), and students (Verbylaitė, 2006) in general, unrelated to sport. They discuss the trends and stability of emotional experiences. Second, those are studies in Lithuania and abroad that analyze the emotional states of athlets and their stability (Jasiūnas, Bagočiūnas, 1994; Malinauskas, 2001; Smalinskaitė, 2003; Jones, 2003; Malinauskas, Skučas, 2004; Ručinskaitė, 2008, Chow et al., 2009; Maxwell, Visek, 2009; Özakatar, Sanal, 2011; Šniras, 2012). However, there is a shortage of scientific studies on the emotional experiences of adolescents who go or do not go in for sports in the relationships with oneselves and others. Therefore, an original methodology of empirical research was applied. It was based on the theory of existential philosophy which treats a human being as individual, constantly developing, and rich in emotional experiences, able to perceive their existence, to make decisions, and to be responsible for their actions. The significance of emotional experiences was especially emphasized (Heidegger, 1975; Sartre, 1996; Jaspers, 1998; Kierkegaard, 2002). In the development of a theoretical-empirical model of the expression of moral values, the said theory became integral part of the perception of the meaning of moral values which implied emotional experiences of schoolchildren and their stability.

Given all that, the research sought to analyze emotional experiences of adolescents in sport, i.e. to determine which positive or negative emotions were experienced most frequently. The principal assessment criterion was the frequency of emotional experiences in sport in relationships with oneself and other people.

In our diagnostic research, the *expression of emotional experiences* revealed that boys going in for sports frequently *trusted* their friend in a game, *enjoyed* their sport life, and *admired* their sport achievements. Similar results were obtained in V. Aramavičiūte‘s (2005) research in senior schoolchildren. As determined, the sources of postive emotions manifested themselves in relationships with other people: *admiration* (60.0%) and oneself: *hope* (61.4%). In that way, senior schoolchildren expressed *trust* in themeselves and others and *belief* in their own and other people‘s achievements . As disclosed by I. Smalinskaite (2003) research outcomes, most of the 14-15-year-old boys (74.0% ($p<0.007$) and girls (60%) mostly admired emotions in sport competitions. However, the author did not analyze in detail whether the positive (joy, admiration, trust) or the negative (anger, fear, shame, or sadness) emotions predominated in sports.

In our research, the adolescents experienced positive emotions (*joy, admiration, trust)* more frequently, however, the correlations of the research outcomes revealed the abundance of negative emotions (*fear, shame, anger*, and s*adness*), e.g. *fear* of a strong competitor or *fear* of competing with a strong team (r=0.671), the feeling of *shame* after the loss of the team and *fear* of teacher‘s strictness (r=0.596), *shame* after the victory of a weaker team and *anger* with the members of the team after the loss (r=0.583). The *relations with a rival* especially revealed that the boys that went in for sports more frequently expressed their *anger with a rival* (t=2.127, p<0,035) than girls. Š. Šniras‘ (2012) research outcomes from the viewpoint of gender proved that the boys who played football were more frequently characterized by anger, revenge, and dissatisfaction with themselves and others, even though the outcomes of the feeling of guilt did not differ in statistical reliability (p>0.05). After the analysis of the indices of agressiveness of football players at different ages, the said author determined that 17-18 year-old young men more frequently expressed anger, shouting, and threats during the game than younger (15-16–year-old) football players (t=2.32, p<0.05).

The obtained research data do not refute the necessity of paying greater attention to the emotional experiences of schoolchildren in sports not only in *relationships with themselves*, but also in *relationships with other people* (peers, teacher of physical education, members of the team, or competitors) in the process of education. Moreover, the continuation of research in the subject would be useful, by focussing not only on the emotional experiences in sports, but also on the adolescents‘ justification of their positive and negative emotions. The answer to the question can only be found by means of new research.

Conclusions

The obtained research data revealed the stability of adolescents‘emotional experiences in sport that manifested themselves in the relationship with themselves and other people. As determined in the case of 11 to 13-year-old adolescents, *in relationships with themselves*, more than 50% *trusted themselves* in sport; often experienced *joy in relationships with a friend* when doing sports (60,3%); *in relationships with teacher of physical education,* 76,2% of the respondents *admired* his abilities and devotion to work; in *relationships with the team members*, 77,8% were able to *enjoy* their common victory in sport competitions; and 61,1% *trusted* the game of their team members and their success in the competition. The outcomes proved that emotions were closely related to such moral values in

sport as fair play, sport chivalry, and responsibility, as demonstrated by the recognition of the said values at the age of adolescence

A strong relation has been established between positive and negative emotional experiences, being dominant in relation to oneself and others (friend, physical education teacher, team members, competitor). Upon conducting a more detailed analysis it was revealed that negative emotions (fear, shame, anger, sadness) are more linked compared to positive (joy, admiration, confidence). Such results confirmed that sometimes *anger* is felt towards team members due to the loss of the game– 55.5 per cent, *shame* – due to the loss to a weaker team – 52.3 per cent. Such frequent experiences of fear, shame and anger by the adolescents might have negative influence on their emotional instability.

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ORIGINAL RESEARCH PAPER

FORMATION OF THE CITY IMAGE UNDER BUSINESS APPROACH

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Abstract

Major foreign countries and cities create their image through cultural, economical, political or geographical values. The formation of the city image requires thorough and consistent work, actions based on the real situation and possibilities, and all societal members' citizen-initiatives. Consistency is one of the key criteria of success in the implementation of the city image strategy. The level of direct foreign and material investments is dissatisfying in Marijampole. The number of investments is reducing and it is 14 times lower than the Lithuanian average. It involves the fact that Marijampole has relatively few international economical relationships and distinguishes for economical structure, mostly completed from small and medium business companies. Besides, in the meantime the image of municipality is unattractive for investors. Due to the insufficiently effective formation of the city image there is noticed slender attractiveness to private national and foreign investments – business facilities, service, leisure, sports and entertainment service sector are not developed. It should be noted that image of Marijampole is very significant for ones setting up and developing business. One of the key components of the successful business is place, attractiveness and quality, where business is developed, and identity. Under businessmen's approach, the most significant factors, which form the city image, are support for business, business conditions, investment policy safe environment, infrastructure, notoriety of the city in the international space, active proclamation policy of the city, cooperation of the city municipal administration with business representatives. During the formation of the city image of today in the national level there is necessary marketing strategy of the city, city trademark, qualitatively operating local

business policy, contribution of the city authorities into the formation of the environment attractive for business. In the international level there are not enough business events, international WEb advertising, city trademark, attractive local business policy and publications introducing businesss.

Keywords: *city image, leisure and sports service, investments and business.*

Introduction

Marijampole is the center of the region located not far away from the boarders of Poland and Russia. The city is crossed by the highways and railways which are of international significance. It should be noted that the city image is very significant for the ones, who create and develop business facilities, service, leisure, sports and entertainment sectors. Who creates the city image? Firstly, factors impacting the image of the location have to be analysed. The most significant characteristics of the location image are reasoning, reliability (persuasion), integrity, distinction and attractiveness. However, it is obvious that the city image is concurrent from the concept of the location identity that can be disclosed through the qualities characteristic for the location, culture and individuality, business peculiarities, etc. The key factors impacting the success for the cities in a competitive struggle are leadership and the partnership of a public and private sector. Partnership projects can certainly aid the city at the creation of added value, solution of some economical and social problems. Every city should have a clear vision of positioning based on the real analysis and assessment of the situation. Competitive struggle in all levels encourages the assessment of cities as a trademark – and create it following all fundamental principals or marketing, and apply the same marketing strategy for a city, which is applied for a product or service. It is significant to pay attention that the formation strategy of the city image has to be adjusted to the distinction of the certain location situation maximally. It is also very important that different organization, the youth and other residents have taken part in the formation of the city image. The following significant aspects enabled penetration of the *scientific problem* and fortified the importance and topicality of the article under both theoretical and practical significance. *The aim* – to define the elements, those have influence on the attractiveness and competitiveness of the city and carry out the assessment research in the factors forming the city image under the members' approach of the very city business community. *Research object* – the formation of the city image. *Research methods* – analysis of scientific literature and other information sources, and questionnaire survey. *In order to achieve the aim the following objectives were set:*

1. To present he factors reasoning the image under theoretical aspect.
2. To carry out a research in the image of Marijampole City under the business participators' approach and form the recommendation for the city image formation.

Investigatory questions and solved problems:

1. What is systematic approach towards the image formation in Marijampole City?
2. How does business assess the city image?
3. What are partnership trends of public and private sector in the formation of the city image?

The researched – 102 executives and specialists form business companies in Marijampole Municipal Region.

Research method – survey (questionnaire).

Material and methods

Location image is a multidimensional phenomenon that involves cognition and emotions. The cognitive part of the image is a whole of beliefs and knowledge concerning qualities of physical location or object, emotional grounds on the emotional assessments of the location or object characteristics and surrounding environment. That causes the fact that different people form different image of the same object. According to P. Kotler, Ch. Asplund, I. Rein, D. H. Haider (1999), Ulaga, Sharma and Krishnan (2002), Beerli and Martin (2004), Lin and Huang (2009), Gallarza, Saura and Garcia (2002), the location image can be defined as a whole of impressions, expectations and thoughts, related to the location. World international tourism organization (WTO) proposes the perception of the country image as a whole of emotional and rational impressions, those form having compared different characteristics of the country, own experience and rumor. I.e. image – created purposefully or formed spontaneously in human consciousness – the image of the certain object, picture or impression. The image of location (country, region, area or city) is present in several levels of perception: domestic, social-economical, business, financial, etc. The image is affected by psychological, political and economical factors and is the outcome of their interaction.

Summarizing scientific work by Bagdonienė L, Hopenienė R. (2006), Baubinas R, Krupickaitė D. (2005), Butkus T.S. (2008) Juškevičius P. (2003) Piliutytė J. (2005, 2007), Sinkienė J. (2008) it can be stated that local marketing or in other words is the formation of the city image. In the global practice there are identified four changes, which force cities to pay attention to the meaningfulness and necessity of the image formation strategy:

1) increasing the significance of the life and residential environment quality as a criterion of economical growth; 2) a change characteristic to the following period – fast intensifying spacious interaction among European cities (product transit, mobility of business, recreation and people, etc.); 3) global change – increasing competition among European cities and regions. More comfortable accessibility of regions encourages the competition of private companies. During the movement of the certain activities, some cities defeat, and other win; 4) influence decrease of the national authorities and the impact increase of the regional authorities. Integration into the common Europe means the strengthening of the European administrative institutions' role (including the European Parliament). It is obvious the economical competition among European cities will increase in future, thus accordingly effective city management will turn to be more and more underlying. In the city management there will be applied more and more methods characteristic to business fields in order to secure continuation of 'urban company' business. International competition creates such existence environment in the city in which it is not possible to manage without the implementation of actions characteristic to the concept of marketing. City leaders should be encouraged to analyze the principals of the marketing theory and implement urban marketing measures. That would enable the strengthening of the competitive position of the city under national or international levels and aid the local communities at the better exploitation of their potential in national and international markets and seek for higher living quality more effectively. The strategy of the city image formation is an inseparable part of the city strategic planning that involves a systematic process of the image formation. Consequently, it is significant to emphasize that the policy of local image has to be oriented taking into consideration the aims of the location and coordinated in tandem with local actions. It is possible to form image purposefully having got familiar with and researched its factors through the analysis and observation of their impact.

Every city has its clear positioning vision grounded on the analysis and assessment of a real situation. Competitive struggle in all levels encourages the assessment of cities as a trademark and create it actively following all fundamental marketing principals and applying the same marketing strategy that is applied for a product or service. It is significant to draw attention only to that factor that the formation strategies of the city image have to be adjusted to the distinction of the certain location situation. It is also very important that different organizations the youth and other residents took part in the formation of the city image. The policy of the city formation is not

only a kind of science, but of art too. In order to form local image that is favorable to the target groups, it is a must to comprehend it as an overall concept under psychological, social, cultural and economical approach. Image is purposefully formed or unexpectedly arisen whole of beliefs and impressions about the location in humans' consciousness that has been formed under environmental, design, historical, cultural, economical and social factors by service and trade organizations, their employees and city residents.

Results

Characteristics of the researched: 69% – service, 34% – trade, 17% – production; 76% – companies – develop one business field and 12% – carry out two or three activities; 31% - executives of small or medium companies, 15% – executives of medium and big companies and 8% - managers, who defined another form of business. 63% of the executives, who participated in the research, have more than 10 year experience in management work. 17% – from 5 to 10 years, 14% – from 1 to 5 years and 6% up to 1 year experience in management work.

One of the key research questions: *have they ever considered the strategy of the city image and its impact on business?* Research results: 76% of the respondents said that they have thought about it, and only 24% mentioned that they have never considered it. It is obvious that the initiated research concerning the formation of the city image is purposeful and topical for business community as one of the factors for the increase of business competitiveness in both national and international space.

Under the research it was sought to find out the meaning of the factors forming the city image. There were provided 24 factors (Fig. 1), forming the strategy of the city marketing. 43% of respondents indicated that the application possibilities of multidimensional complex are neither significant nor not important for formation of the city image. It is difficult to comment what caused the flowing respondents' choice; however under the presence of a need it is possible to initiate the research in the application possibilities of a multidimensional complex and in its impact on the formation of the city image.

Majority of respondents think that the activity of cultural sector is very important (20%) and important (50%) forming the city image. 30% of respondents have noticed that the activity and expression are neither important nor unimportant factor of cultural sector while forming city image. Discussing the formation of the city marketing, one of the image formation tools is the city trademark. During the following research even

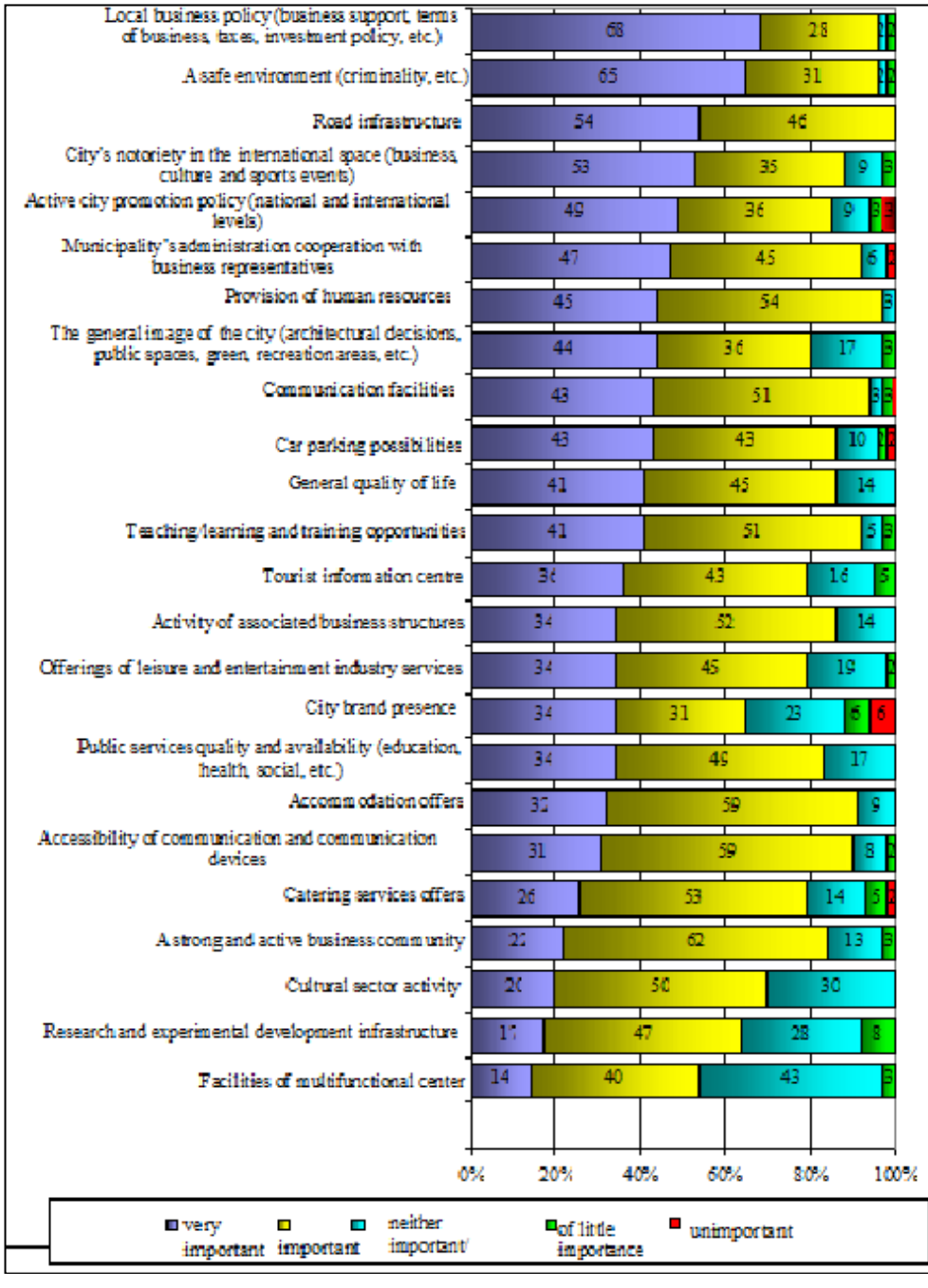

Figure 1. Assessment in the significance of the factors forming the city image (%)

23% of the respondents indicated that the presence of the city trademark is neither significant nor not very important for the formation of the city image and communicative strategy. It is likely that the deeper impact of the following factor on the positioning of the image strategy is necessary. In summary it can be stated that less or more, however, all factors are important in the formation of the city image strategy.

It was sought to find out the significance of the respondents' approach towards the factors, forming the local image and proposed to assess the present image under the provided factors. The performed assessment under points from 0 to 5, where 0 means that the following factor does not exist and relevantly 5 – this factor is assessed as perfect. The respondents assess from 30 to 34% such factors as active policy of the city proclamation policy, absence of the city trademark, possibilities of car parking and the notoriety of the city in the international space. The respondents assess weakly, in the boundaries from 20 to 29%, the following factors: the infrastructure of scientific research and experimental activities, activity and strength of the business community, the infrastructure of leisure and entertainment sector, and provision with human resources, possibilities of education/training and qualification refreshment and safe environment. It also feels like emphasizing that even 39% of the respondents highlighted that the service of the tourism information center is not provided. 35% of the respondents assess general city image satisfactorily. The respondents assessed well over 46% – the supply of accommodation service, and application possibilities of a multidimensional complex. Summarizing the research data it can be stated that the factors forming the image of Marijampole City today have to be developed.

It was sought to find out those factors are lacking that the city image was attractive in Lithuania. The respondents were provided with seventeen factors and the number of choices was not limited. Even 59% of respondents indicate that consistent marketing strategy of the city is lacking most. 47% – solved problems of the central city part infrastructure and city trademark. The respondents also refer to the lacking factors, those, which form the city image in the national space: contribution of the city authorities, qualitative functioning of local business policy factors, sociality of business companies and leisure service – that makes 42% of all respondents, who participated in the research. The respondents indicate least that there is a lack of catering and accommodation service and educational establishments – relevantly 11 and 10%. Only 15% of the respondents think that there is a lack for scientific research and infrastructure of experimental development in the formation of the city marketing strategy (Fig.2).

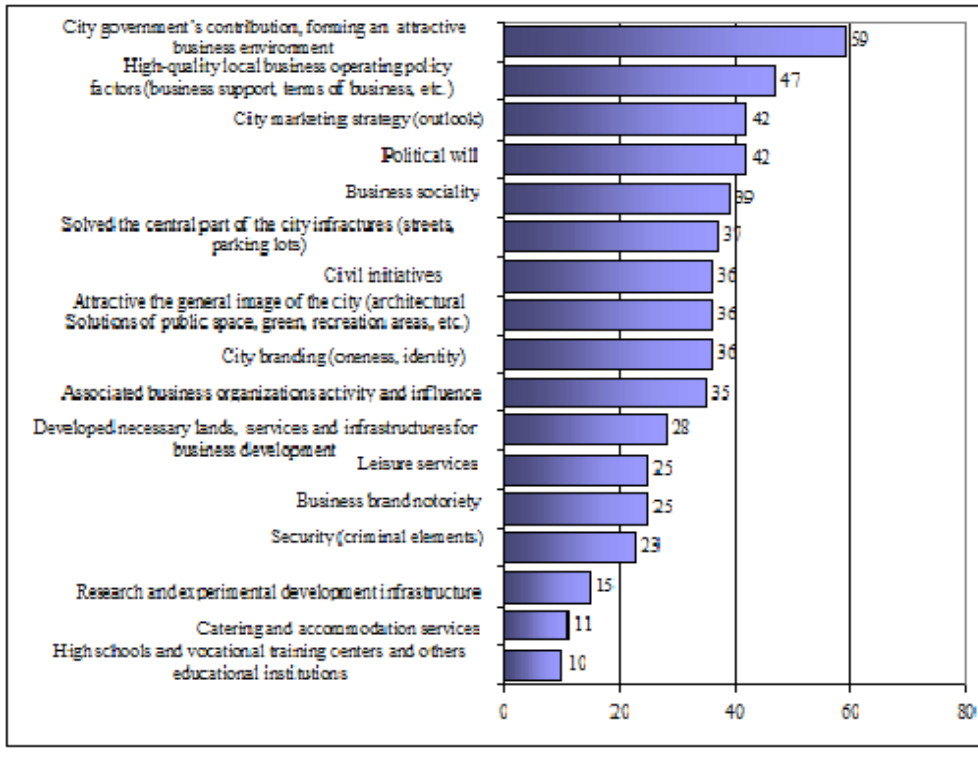

Figure 2. Assessment of lacking factors in the formation of the image in Marijampole City (%)

It is obvious that a consistent strategy of the city marketing is one of the most significant factors, talking about the formation of attractive and competitive city image .45% of the respondents, who participated in the research; develop their company business in international markets too. As a matter of fact, markets are globalizing and it is likely that more and more companies from different business field will develop their activities under international level. Even 66% of respondents indicated that one of the most significant forming the city image under international level is the organization of international business events. In the summary it can be stated that the organization of international events and international WEb advertising, and the city trademark are the very key factors which form the local image in the international space.

In both national and international pace there are significant: trademark and identity (symbol). It is precisely defined what could be the following exclusiveness – building, monument, geographical exclusiveness etc.

How do respondents assess the city image? 49% of respondents think that it is necessary to assess the city image satisfactorily, 32% – on average and only 7% assessed the city image negatively.

The respondents were provided with questions what they think: *does Marijampole City have a communication strategy today*? The respondents' approach distributed as following: 6% responded that there is a communication strategy, 48% – which the city does not have any strategy and 45% – does not know. It is obvious that the question of the communication strategy is burning and remains open and requires deeper analysis.

It was intended to find out the respondents' approach, what communication means should be to proclaim the name of Marijampole under national and international levels.

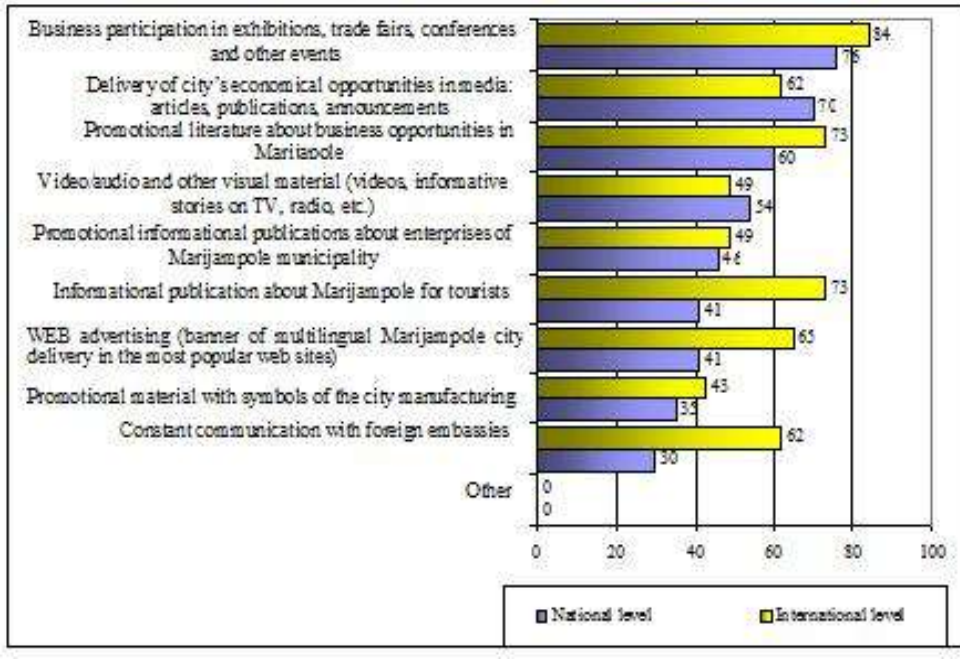

Figure 3. Distribution of the communication means application in proclamation of the name of Marijampole City (%)

Even 76% of respondents indicate as the most attractive means of proclamation the participation of business companies in exhibitions, fairs and other business events. 70% of respondents indicate that the presentation of the economical city possibilities in the media also can also be one of the

proclamation means, and 60% of the respondents think that could be advertising publications about business possibilities in Marijampole. In summary it can be stated that the respondents indicate as the key proclamation means being the participation of business companies in exhibitions and fairs and advertising publications about economical possibilities in Marijampole under both national and international levels. Undoubtedly, for the business companies, which work in international markets there is significant communication with the embassies of foreign countries.

It is considerably widely discussed about the strategies of the city marketing, means and instruments, and discussed who/what should participate in the formation of the city image. The respondents were provided with a question, which directly related to their decision to participate or not to participate in the image formation (Fig. 4).

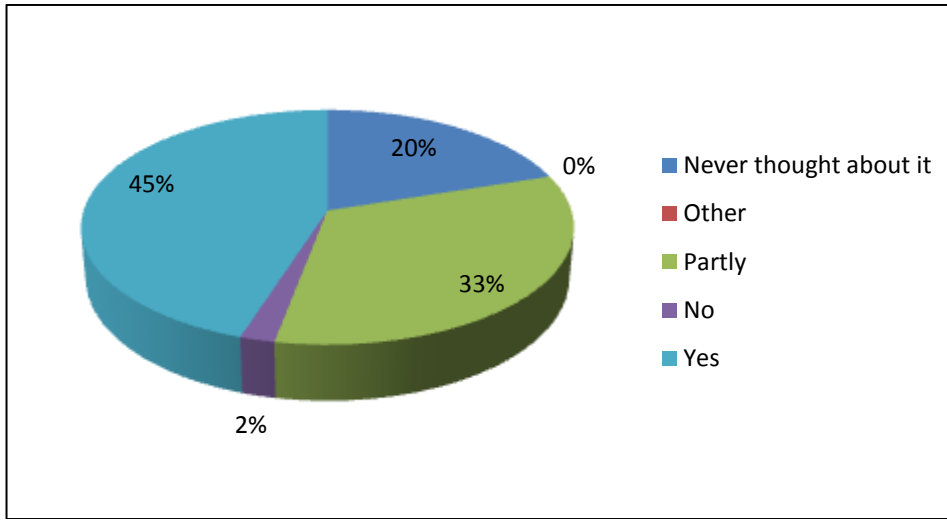

Figure 4. Distribution of the participation of the formation of Marijampole City image (%)

45% stated that they would like to participate in the formation process of the strategy, 33% - would contribute partially. All the rest respondents have never thought about that or do not intend to contribute to the formation of the city image. It is obvious that business companies would intent to contribute in one or another form to the creation and implementation of the city marketing strategy.

Discussion

During the research there were represented nine possible means of the image formation. They are: ideas, influence strengthening of the business community, social initiatives, strengthening of merchant sign of the enterprise in local and international markets, publicizing at the national exhibitions and other events, publicizing at international exhibitions and other events, public spaces formation in the territory of enterprise, attraction foreign partners, financial investments and other means that are important for respondents. 43% of respondents would like to contribute with their ideas, 42% – with the strengthening of the business community, 31% – with social initiatives. The least only 11% of the respondents indicated that they could contribute to the city image with financial investments. In summary it can be stated that the business community intends to participate in the formation of the city image in different forms.

Conclusions

1. Under the businessmen's approach the most significant factors forming the city image are: local business policy (support to business, business conditions, taxes and investment policy), safe environment, road infrastructure, notoriety of the city in international space, active policy of the city proclamation, and cooperation of the city municipal administration with business representatives.
2. The research results highlighted the weakest factors of the image formation – the proclamation policy of the city, the possibilities of car parking, the city trademark, local business policy that encourages direct foreign investments (DFI), absence of the tourism information center, and infrastructure of scientific research and experimental development.
3. Respondents assessed the accommodation service, the exploitation of the multifunctional sports center, commuting possibilities and catering service well. During the formation of the city image of today under national level, there is necessary a city marketing strategy, city trademark, qualitatively operating local business policy, and the contribution of the city authorities into the formation of attractive environment for business. Under the international level there are not enough international business events, international WEb advertising, city trademark, attractive local business policy and publications introducing business.
4. During the formation of the city image under national and international levels it is proposed to apply the following communication means: the participation of business companies in exhibitions, fairs, business events

proclamation of economical city possibilities in the media, advertising publications about business possibilities in Marijampole, constant communication with the embassies of foreign countries, proclamation adverting of the city on the online space and information publications for tourists

5. The research proves that it is necessary to form a long-term formation strategy of the city image that attracts investments to the entertainment business, organization of exhibitions, business and cultural events, encourage the partnership of business, science and authorities in the process of image formation.

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ORIGINAL RESEARCH PAPER

BIOINFORMATION TECHNOLOGIES IN THE COMPLEX ASSESSMENT AND CORRECTION OF CEREBRAL HEMODYNAMIC IMPAIRMENTS IN JUDO-FIGHTERS WITH CERVICAL DORSOPATHY

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Abstract

Objective. To give the characteristics of the dynamics and to carry out cerebral hemodynamic impairment correction in judo athlets with cervical dorsopathy(CD) in the process of bioresonance therapy(BRT) and electro-pharmaceutical oscillation spectrum(EPHOS). Materials and methods. The study of cerebral hemodynamics in judo-fighters with CD was performed on the basis of transcranial dopplerographic (TCDG) data, before and after bioresonance therapy course and electro-pharmaceutical oscillation spectrum (Sharova L. V., patent RF # 2204374 dated 05.20.2003). We used the apparatus "BRT IMEDIS-FOLL". 37 individuals were studied. The mean age of the patients was 20.10 ± 0.36. There were 17 males and 10 females. All the athlets were divided into three groups. The first group included 15 athlets with CD and chronic pain syndrome (CPS). They were treated with BRT+EPHOS, physical therapy (PT), massage. The second group consisted of 12 athlets who did not undergo BRT+EPHOS. They received only PT and massage. The third group (the control group) included 10 individuals who did not reveal CD, they were given placebo treatment. We note the tendency to cerebral hemodynamics improvement on the basis BRT+EPHOS use. BRT+EPHOS are supposed to possess resonant analgetic and prolonged prolonged properties to prevent CD exarcebations and to strengthen the treatment effect as a result of adaptive compensatory mechanisms involvement. Taken together with the bioinformation methods cerebral hemodynamic research gives the possibility to individualize the physical exertion during working out an individual sortsman training cours

and to consider these findings for the sport selection to judo sections. BRT+EPHOS possessing the resonant properties, analgetic and prolonged effect, promote cervical osteochondrosis exarcebation prevention and a more rapid therapeutic effect due to the adaptive-compensatory body systems. The treatment effectiveness is up to 87%.

Key words: *dopplerography, bioresonant, cervical osteochondrosis, judo-athlets.*

Introduction

Purposeful athlets usually don't pay attention to episodic pains accompanying the initial anatomic-functional defects (Pääsuke et al., 2008). Not only participation in the competitions but sport achievements are of great importance for them (Boutcher, 2008; Zakirov, Sharov et al., 2010) the practical significance of our work indicates to the coaching teaching … (Kuznetsova et al., 2012). Scoliosis deformities or the so-called "pr-scoliosis" are often the main cause of cervicalgia, its starting mechanism being formed in the early-school age (Belokrylov & Sharova et al., 2012). New approaches to the athlets general health new correction and treatment issues, e.g. in CD became possible after bioinformational technologies rehabilitation methods (Voll, 1980; Gotovckiy, 2001; Sharova, 2002; Goabout, 2002; Humble, 2008; Denisenko et al., 2008). By Mugerman (2011), "...Considering a person as a comprehensive whole consisting of structural, functional and psychic components, rehabilitation process is directed to disbalance elimination in every component". Among new diagnostic and therapeutic technologies based on the electromagnetic principles, electropharmaceutical oscillation spectrum worked out by L. Sharova (2002) gives the possibility of the individual's general condition objective assessment through biologically active points (BAP). The method also helps to influence directly the adaptive-compensatory body processes of the sportsman. This method basis is supposed to ensure an individual approach to each sportsman to provide reliability, informativeness, efficiency (Sharova, 2002; Razumov, Sharova, & Kravtsov, 2011). CD is associated with slowly progressing cartilage dystrophic changes of intravertebrae disks (chondrosis) and lying beside body vertebrae bone tissue (osteo). CD exarcebation in athlets occurs more often during ligament and synchronic muscular contraction impairments, especially at the points of their connections with bones, dystrophic processes being very common (Zharkov, 2005). Cerebral circulation changes are the key components of all the existing CD pathogenesis theories. However, cerebral hemocirculation

status in CPS i.e. a widespread disease has not yet been studied well enough (Schmidt, 2001). There are quite few publications concerning BRT effectiveness in CD (Gotovckiy, Sharova & Kravtsov, 2004). Objective. To characterize the dynamics and to carry out the correction of cerebral hemodynamic impairments in judo-athlets with cervical dorsopathy during BRT+ EPHOS method appliance.

Material and methods

Subjects. We examined 37 individuals. The mean age of group members was 20,10 ± 0,36. There were 17 males and 10 females. All the study participants were divided into 3 groups. The first group consisted of 15 judo-athlets with CD and CPS (we diagnosed CD with the help of MKB-10). They received BRT+EPHOS, physical therapy (PT), massage. 12 athlets constituted the 2 group; they did not undergo BRT+EPHOS. They were given physical therapy and massage. The 3rd group – the control group (10 individuals) did not contain any athlets with CD, they received placebo. The athlets were divided according to their professional skills in the following way: 17 Masters of Sports, 10 Candidate Masters of Sports, and 10 athlets had the first adult grade. The duration of the disease at the examination time varied from some weeks to 5 years. Exacerbation rate was from one to three exacerbations a year.

Procedures. Transcranial dopplerography was performed with VASOFLO apparatus – 4 and 2 MHz in the pulsating oscillation regime. The patients were lying on their back before and after BRT+EPHOS (5-7 procedures). Brachiocephalic and intracranial arteries were examined. The blood flow in the common carotic and inner carotic arteries, middle cerebral and arterial cerebral arteries was studied. We also determined speed and spectral characteristics of the flow.

Blood flow linear velocity flow in view of average rate which contributes to an accurate estimate of BFLV in the proximal and also in the distal artery was described. The reaction of cerebral hemodynamic on hypercapnia and hypocapnia in case of a variant – breathing into a closed space for 1-2 minutes was determined. The average blood flow linear velocity (ABFLV) in middle cerebral circulation (MCC) and in the main artery (MA) was also investigated. Reactivity of cerebral hemodynamic was determined by pulsation index (PI), by coefficient of reactivity on hypercapnic (HE +) and hypocapnic exertion (HE-), by index of vasomotor reactivity (IVR), counted according to ABFLV MCC. The level of ABFLV insufficiency in posterior circulation system was estimated on the basis of positional exertion on the cervical part of the spinal column (SPS).

Researches and correction were made on the hardware and software complex (HSC) "IMEDIS Foll" (reg.№ 95/311-120); on the apparatus "Mini-Expert- DT" (reg.№ 95/311- 121), which were approved for medical use (MU) and for medical industry in RF dated 15 September 1995, order № 311 for instant diagnosis of organism functional condition on physiological data of reflex areas and on biologically active points (BAP). BRT was done with the help of electromagnetic waves withing the range from 10 to 500 000 Hz, pertained to the patient, which were taken from the patient skin. They were analyzed in a special way and returned into the organism. As signals (waves) common to a man have electromagnetic origin, then it is possible to take them with the help of electrodes and transfer them through the cable at the input of "IMEDIS-BRT" apparatus (Fig. 1). Having passed the decontamination (linear and nonlinear filtering), waves from the input of the apparatus through the second cable and electrodes are returned to the patient. Electromagnetic field of a patient response to these therapeutic signals and corrected waves are sent to the apparatus once again. Closed-circle system of adaptative monitoring, inside which there is a patient, is formed.

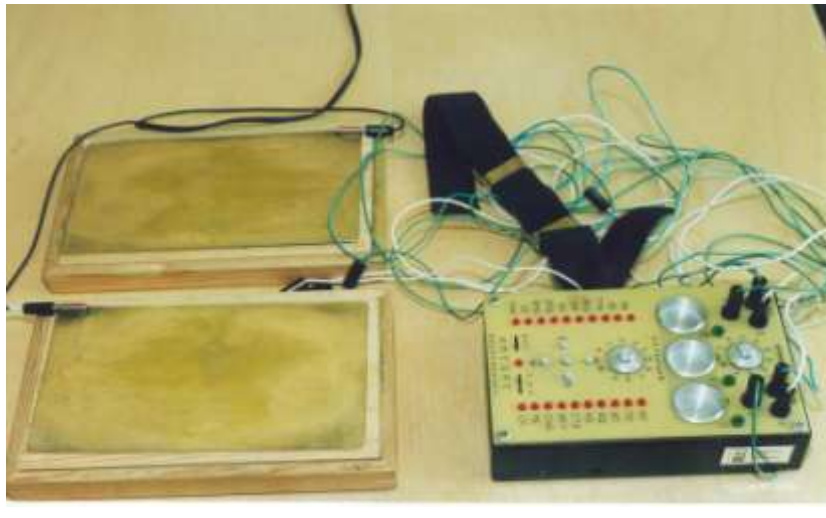

Figure 1. Apparatus for adaptative bioresonance therapy "IMEDIS – BT"

Influence by BRT is based on inhibition of pathological – (D), restoring and increase of physiological frequency content of waves – (H) (Fig. 2). Gradual resolution of membranous bioelectrical features and maintenance of relative gating of different wave processes, composing the physiological

homeostasis (dynamic balancing state) of the organism occur (Gotovckiy et.al., 2001).

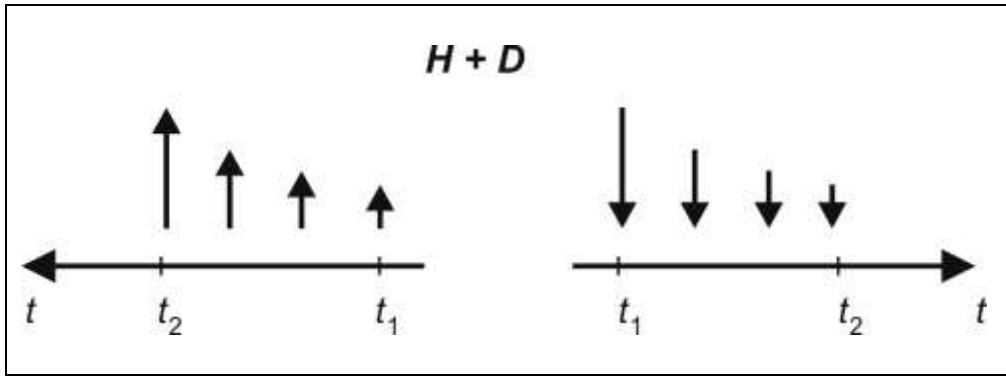

Figure 2. H – Physiological (a) and D- pathological (b) waves

We made the preliminary clinical studies to prove the development of the above mentioned physiological responses in general and local influences BRT + EPHOS on BAP. The essence of EPHOS is in the formula of invention: V=Di+1.9+4.2 Hz, where Di – inversion of pathological waves, recorded from the maximal algetic biologically active points (BAP) of the patient. The frequency of 1.9 Hz has a prophylactic influence on muscle hypertonia. The frequency of 4.2 – on connective tissue and autonomic plexuses. The results were reached by influence of five BAP (Fig. 3), (Fig. 4).

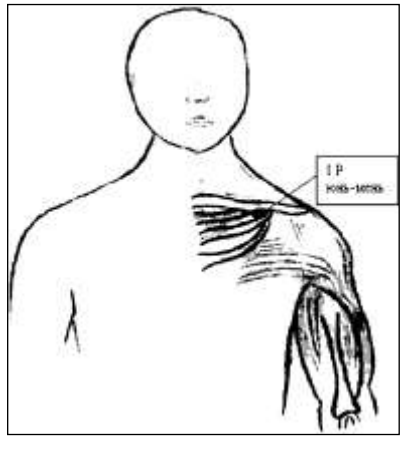

Figure 3. The way of influence on BAP (front view)

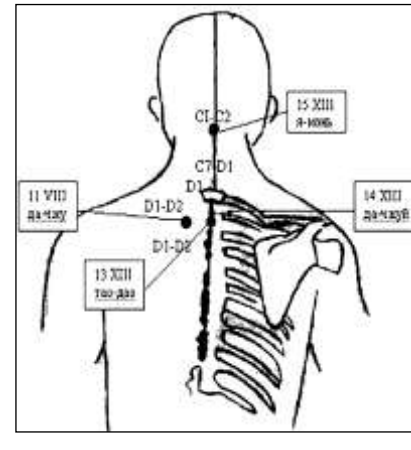

Figure 4. The way of influence on BAP (back view)

Homeopathic grit was processed by electromagnetic waves withing the range, determined according to a created formula V=Di+1.9+4.2 Hz (Sharova L. invention patent № 2204374 RF. The method of treatment and prophylaxis of cervical vertebral osteochondrosis/ priority on 20.02.2001; declared 20.02.2001). Eigen frequency of oscillations in a sportsman was determined with the help of BAP on BRT during 30 seconds. Then it was inverted into relative physiological frequency (50-60 c.u.). After that it was transferred on homeopathic grit, complemented by wave medical frequencies 1.9+4.2 Hz with the help of BRT apparatus "IMEDIS-Foll". Each record was made with the frequency of 15 seconds. Then EPHOS was fixated with the medical patch to BAP for 1-3 days with the following change of EPHOS: 14 XIII dazhui; 13 XIII – tao-dao; 15 XIII – ja-men (XIII posteromedian meridian); 11 VII da-zhu (bladder canal); 2 I yun-men (lungs canal, to the outside of the I rib on the 3rd lateral chest line).The course of treatment and prophylaxis is from 7 to 10 sessions, and if it is necessary the course can be repeated after a 3 month break. Physical therapy and massage were also performed in order to enhance the medical outcome. EPHOS was administered to take orally 3 grits 2 times a day during 2-3 weeks (Sharova L. – Certificate of intellectual product 73200500142 RF. Algorithms of energoinformational diagnosis and treatment of cervical osteochondrosis/ L.V. Sharova. – FSUE 'ASTIC' June, 23).

Statistical analysis. Materials of research are subjected to mathematical processing by means of statistical packages of Excel 5.0, Statistica for Windows 5.0 and "Biostatistika" programs. The significance value of differences index (p) between values of surveyed indicators "before and after the treatment" was calculated with the use of Vilkokson's non-parametric tests (Wilcoxon Matched Pairs Test) and Sign-test. Wald-Wolfowitz Runs Test, Mann-Whitney U Test and Kolmogorov-Smirnov Test were applied to make the comparison of quantitative indices (dopplerography) in different groups. Value differences of these criteria, smaller than 0.05 were considered to be statistically significant.

Results

The common complaints in examined patients were headaches (28 persons), as a rule, in cervico-occipital area with irradiation to the forehead, temple, usually unilateral. The pains were tender and of pulsating type. 4 athlets noted dizziness while movements in cervical vertebrae. Myofascial pains with a specific areal pain disposed sufficiently from a spasmatic muscle, not connected with spine pathology were formed in 7 athlets. Vegeto-emotional disturbances with a specific instability of arterial

pressure, with an increase and decrease tendency, feeling of fear, anxiety, irritancy, sleep disturbances were revealed in 5 athlets (10). So ABFLV in MCC was 60.54 ± 4.22 cm/sec (p>0.05). ABFLV in MCC in 1st group athlets, was 63, 93 + 8, 30 before treatment, and it increased to 68.90 ± 11.89 (p>0.05) after a complex of therapy.

In comparison with a control group the APServed increase of results was not of statistical importance. The level of flow resistance in pial capillary bed, estimated by the Gosling pulsation index (PI), was 0.78 – 0.03 before treatment, and it decreased to 0.76±0.03 after BRT. Significant differences were not noted between these findings.

Coefficient of reactivity on hypercapnic exertion (HE +) was 1.33±0.03 before treatment, and it has been increasing to 1.44±0.03 (p>0.05) after BRT + EPHOS complex. The APServed increase of HE + in athlets of the 1st group in comparison with a control group is of statistical importance. Coefficient of reactivity on hypocapnic exertion (HE-) has been increasing from 0.29±to 0.02 after treatments. In comparison with a control group the HE- increase is of statistical importance. The index of vasomotor reactivity (IVR) in the circulation of MCC, was 0.61±0.05 before BRT +EPHOS, and it has been increasing to 0.75±0.04 (p>0.05) after treatment. In comparison with a control group this index has a statistically important increase (Tab.1).

Table 1

Dynamics of IVR in the circulation of MCC in judo athlets at the process of BRT +EPHOS.

	1 groupn=15	2 groupn=12	3 group n=10
	Mean ± Standard error	Mean ± Standard error	Mean ± Standard error
IVR_1	0.61± 0.05 W-W 1-3 p= 0.039 M-W 1-3 p=0.034	0.63 ± 0.06 M-W 2-3 p< 0.05	0.90 ± 0.01
IVR_2	0.75 ± 0.04 W-W 1-3 p= 0.039 M-W 1-3 p= 0.034	0.76 ± 0.06 M-W 2-3 p< 0.05	0.95 ± 0.02

W-W – Wald-Wolfowitz runs test;
M-W – Mann-Whitney U test;

		Pairs	
1 group	APS+BRT	:	
2 group	APSwithoutBRT	1-3	$mean_1$- BFLV before treatment
3 group	control	1-3	$mean_2$- BFLV after treatment
			IVR_1- index of vasomotor reactivity before treatment
			IVR_2-index of vasomotor reactivity after treatment etc.

So, the reactivity of ABFLV after BRT + EPHOS has been increasing both on hypercapnic and hypocapnic exertions, indicating on introduction of compensatory mechanisms of cerebral hemodynamic. This is also confirmed by the IVR increase. ABFLV of basilar artery before BRT + EPHOS was 34.49±3.27 in all the examined athlets, and it significantly increased to 3.76±3.96 after treatment, S-T (p=0.000874), W-M (p=0.001475), W-M (p=0.001475) (Tab.2).

Table 2

Compensation abilities of vertebral-basilar hemodynamic according to ABFLV indexes in the circulation of basilar artery in positional tests with a flexion in CV

	A. basilaris	Flexion to the right	Flexion to the left
	Mean± standard error		
1st group (*n* = 15) before BRT+EPHOS after BRT+EPHOS	34.49 ± 3.27 43.76 ± 3.96	11.92 ± 2.27 4.00 ± 1.40	12.33 ± 1.82 5.09 ± 1.33
2nd group (*n* = 12) before BRT+EPHOS after BRT+EPHOS	40.33 ± 10.54 45.87 ± 9.40	10.67 ± 5.46 5.33 ± 3.53	9.33 ± 1.76 3.67 ± 2.33
3rd group (*n* = 10)	42.36 ± 7.36	9.38 ± 3.28	7.02 ± 2.35
p-level	0.000874	0.004427	0.002569
Vilkoxon's test	p=n.s.	p=n.s.	p=n.s

Revealed by position tests in athletes with a head rotation and a forward flexion to the right(duck of the head) deficiency of average blood flow linear velocity (BFLV) in VA statistically significantly decreased after treatment from 11.92±2.27% to 4.00±1.40% (S-T (p=0.004427), W-M (p=0.005065). At a flexion to the left deficiency of BFLV APServed before treatment also authentically decreased after BRT+EPHOS influence from 12.33±1.82% to 5.09±1.33%, (S-T (p=0.002569), W-M (p=0.002569).

BFLV in a basilar artery in the 1st group before BRT+EPHOS was 40.3±10.54, increasing after BRT+EPHOS to 45.87±9.40, (p>0.05). In comparison with the control group BFLV in VA increased, but statistically it was not significant. During the position tests in athletes with a head rotation and a forward flexion to the right (duck of the head) APServed before the treatment deficiency of BFLV in VA decreased from 10.67±5.46% to 5.33±3.53%, (p>0.05) after the course of BRT+EPHOS. At a flexion to the left it decreased from 9.33±1.76% to 3.67±2.33%, (p>0.05)

as well as in the control group. After the carried-out BRT+EPHOS complex the reduction of APServed insufficiency of BFLV in the course of position tests indicates, to some extent, the increase of cerebral haemodynamics compensatory abilities.

In the 2nd group, BFLV in MCA was 73.03±7.69 before the treatment, after the course of carried out rehabilitation it increased to 79.17±6.35 ($p>0.05$).

Judging by the increase of BFLV at APS CD the effect of BRT+EPHOS was significant and apparent. The index of the peripheral resistance (PRI) before "BRT+EPHOS placebo" influence, in the 3rd group made 0.79±0.02, decreasing after the procedure to 0.77±0.06 ($p>0.05$). In comparison with the first group 0.72±0.03, APServed differences were also not statistically significant.

PRI in MCA made (0.73±0.03) cm/sec in females and 0.72+0.03 cm/in males and it practically didn't have gender differences (Tab. 3). The assessment of a vasomotor reserve (AVMR) in the surveyed athlets with CD was significantly lower in males (0.30±0.02), than in females (0.36±0.01), but only HE (M-W) = 0.02475 (Tab. 2).

Table 3

Blood flow linear velocity in the middle cerebral artery (MCA) and AVMR (an assessment of vasomotor reserve) in athlets with CD depending on the gender (cm / sec)

Patients	MCA		AVMR		
	Mean	PI	HE^+	HE^-	IVR
	M±*m*	M±*m*	M±*m*	M±*m*	M±*m*
Females(n=10)	64,54±3,88	0,75±0,03	1,34±0,06	0,36±0,01	0,68±0,06
Males (n=27)	55,64±4,93	0,72±0,03	1,38±0,05	0,30±0,02	0,67±0,04
p (M-W)				0,024751	

mean – mean blood flow linear velocity;
PI – Gosling pulsation index;
HE^+ – coefficient of reactivity on hypercapnic exertion;
HE^- – coefficient of reactivity on hypocapnic exertion;
IVR – index of vasomotor reactivity;
p (M-W) – Mann-Whitney U test.

In the 1st group of athletes PRI in MCA raised to 0.78±0.02. In the second group and in the control group the indicators were 0.71±0.04, and 0.75±0.01. However the APServed differences were not significant. Reflex syndromes aggravations rate in cases of CD practically had no impact on

PRI in MCA or in the basilar artery. However, studying the indicators in MCA a peripheral resistance increase was revealed in relation to higher frequency of headaches in cases of cervicalgia.

Index of a vasomotor reserve (IVMR) in MCA circulation at APS before BRT+EPHOS was 48%, increasing after the treatment to 69%. Noted reactivity index increase on hypercapnic and hypocapnic exercise testifies the inclusion of regulation compensatory mechanisms of cerebral haemodynamics in reply to BRT+EPHOS influence that was confirmed by the results of IVMR.

BFLV of a. basilaris being 24.7% before BRT+EPHOS increased to 32.8% after these procedures. It was due to the improvement of blood inflow through the vertebral artery. In the third group before the course of placebo treatment IVMR was 0.63±0.06. It increased after BRT+EPHOS appliance to 0.76±0.06 (M-W (2-3), $p<0.05$). The cerebral haemodynamics changes revealed in the course of TCDG, predominantly in the vertebrobasilar circulation, are characterized by reduction of BFLV and vasomotor reactivity. The adequate brain blood filling in the course of BRT+EPHOS was carried out at the expense of adaptive-compensatory an mechanism that was confirmed by the BFLV and vasomotor reserve increase at the expense of the improvement of elastic characteristics of the basilar and MC arteries. These positive changes led to an adequate arterial filling in of the brain ($p<0.05$). Associated with BRT+EPHOS, the tendency to the cerebral haemodynamics improvement, which was confirmed by BFLV increase, reduction of vascular resistance in pial-capillary bed, brain perfusion improvement was revealed.

HE+ and HE- demonstrated MCA reactivity increase after BRT+EPHOS, testifying compensatory mechanisms inclusion. Furthermore the reaction of cerebral haemodynamics to a hypercapnia was noted by BFLV increase and the peripheral pial-capillary bloodstream resistance decrease. Certain manifestations of a cerebral haemodynamics disregulation remained mainly in the vertebrobasilar system as BFLV insufficiency and also reactivity of the vascular circulation of MCA. Therefore, BRT+EPHOS give biological effect necessary for the organism for the vascular system adequate reaction, in particular in the pial-capillary bed.

Discussion

Similar changes of a cerebral hemodynamic were noted in professional swimmers, weightlifters and other athlets, subjected to exercise stresses (Titova, 2008). The obtained data of the experiment concerning cerebral hemodynamic changes in CD coincide with the results of researches

(Volchenko, 1995; Nebozhin, 2002; Shmidt, 2001). Informativeness of TCDG, predominantly for an assessment of a collateral blood flow in the vertebrobasilar system initial condition and opportunities is confirmed. Functional exertion of CV athletes lead to a more significant BFLV decrease in VA ($p<0.05$). That testifies compensatory reserve oppression of a vertebrobazilar hemodynamic. BFLV decrease is not estimated by the pain syndrome intensity.

In the control group the index of the peripheral resistance (PRI) in MCA was 0.75±0.03 of cm/sec and was not associated with age and gender. Certain BFLV increase in MCA in the athletes of the 1st group are associated with adaptive mechanisms overstrain. The combination of prolonged low-intensive painful syndrome with frequent and long exacerbations in the remission periods results in adaptive-compensatory abilities decrease of an athlete's organism that reflects the vertebrobasilar hemodynamics state. With the help of BRT+ EPHOS certain methods of the referred preventive and corrective influence on the main health indicators of athletes through BAP are developed. The effectiveness of BRT+EPHOS in prophylaxis of CD exacerbation in judo-athlets of the first group is high (87 %). The obtained data help to widen the scope of energoinformational technologies appliance as a method of physio- and reflexotherapy both during APS treatment and in complex influence of a wide range of diseases with different homeostasis disturbances in athlets. The influence of a training load on a cerebral hemodynamic in judo athletes was characterized by a tendency to changes of the main hemodynamic indices both in males and females but it was not significant. Having an individual approach to the investigation of cerebral blood flow condition it is possible to estimate peripheric circulation adaptation to a training load, to reveal the condition of a recovery period or fatigue with a sufficient degree of probability.

Conclusions

Chronic pains in the CV with temporal exacerbations due to the applied methods of training and performance are characteristic for judo-athlets. Changes of cerebral hemodynamics, predominantly in the vertebro-basilar circulation compose the important part of pathogenetic processes of an organism disadaptation. In the course of BRT+EPHOS at the expense of normalization of membranous bioelectric processes, maintenance of relative synchronization of wave processes is achieved due to analgesic end-point, cerebral hemodunamics improvement and the rise of adaptive opportunities of an athlete organism. The given complex based on bioiformation technologies includes: BRT+EPHOS method, massage of a collar zone

physical therapy. This complex can be applied for an individualization of exercise stresses, treatment of CD and prevention of its exacerbation, for a stress resistance increase of an athlete during work-outs and preparations for competitions.

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ORIGINAL RESEARCH PAPER

RELATIONSHIP BETWEEN ISOKINETIC MUSCLE STRENGTH AND FINSWIMMING TIME

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Abstract

Finswimming is a sport, where athlete swims different distances similar to swimming. Divergence comes form that athlete uses one big monofin to produce propulsion. One of the important elements for speed is dependent on the increase of the angular velocity of thigh extension (Rejman 2007). However, there is lack of studies describing role of isokinetic strength on finswimming outcome. Aim of the study was to describe lower limb muscle strength among finswimmers and examine the relationship between isokinetic muscle strength and finswimming time. Methods: eleven top level junior male finswimmers (age 15.7±1.9 yrs., height 177.8±7.8 cm., weight 72.2±9.0 kg) performed 50 m apnea and 200 m finswimming during a high level competition. At the same week isokinetic muscle strength of knee extensors and flexors were measured at angular speeds 60°/s, 180°/s and 240°/s for peak torque, power and total work of 15 repetitions. Results: There was a noticeable correlation between strength of knee extensors on all angular speeds (60°/s, 180°/s, 240°/s) and finswimming time. The data showed strongest correlation r=-0,92 between knee extensors absolute power and 200 m finswimming time at 240°/s. At angular speed of 60°/s there was a strong correlation between peak torque and time r=-0,88. At angular speeds of 60°/s and 180°/s finswimming time was strongly associated (r=-0,85) with power. For 50 m apnea finswimming time a correlation (r=-0,81) was found between power of knee extensors at 180°/s and between peak torque at 60°/s (r=-0.79). All correlations were statistically significant (p<0.05). Correlation between knee flexors and finswimming time was not established. Conclusion: This study suggests that knee extensors strength is related to finswimming time but knee flexors strength does not demonstrate significant impact on finswimming time.

Key words: *Finswimming, peak torque, isokinetic, dynamometry, knee strength*

Introduction

Finswimming is a sport, where athletes swim distances of different lengths like in swimming. Swimmers use one big monofin to produce propulsion. Overall technique is similar to underwater dolphin kicking in swimming. Finnswimming comprises of two main disciplines. Surface swimming (SF) is when athlete swims on the surface of the water his hands are stretched in front and he uses snorkel (in front of face) for breathing. Swimming underwater without breathing for 50 meters is called apnea (AP). Fins used in finswimming have different rigidity. Choice of rigidity depends on the strength of the athlete. Knee bending must be minimal in order to limit frontal surface area Vogel (1994). Studying of finswimming techniques Gautier found that knee bending is smaller for experts than for novice (Gautier et al. 2003). Rejman et al. (2007) found that there is need to increase the angular velocity of thigh extension. As far as we know there is no study about finswimmers isokinetic force.

In classical swimming there are several studies describing relationship between knee extensors and flexors strength values and swimming time. Secchi et al. (2011) found that there was no significant difference in knee extension-flexion isokinetic strength and endurance between swimmers of symmetric swimming styles (butterfly/breaststroke) and asymmetric swimming styles (front crawl/backstroke). Mookerjee et al.(1995) found that peak torque in the lower limb muscles plays a significant role in swimming 22,86 m flutter kicking using kickboard. He also suggested that velocity-specific isokinetic testing of the knees should be done in excess of 6.00 $rad \cdot s^{-1}$.

The aim of this study was to describe lower limb muscle strength among finswimmers and examine the relationship between isokinetic muscle force and finswimming time.

Material and methods

Subjects

During high level open finswimming championship 11 members of national junior team finswimmers were engaged in the study. All finswimmers had at least 4 years focused finswimming training and competition experience. 7 of them (age 16±2.1 yrs., height 173.7±4.4 cm, and body weight 72±6.1 kg) swam 200 meters surface (SF) and 9 swam 50 meters apnea (AP) (16.1±1.8 yrs, 180.1±6.5 cm, and 70.7±9.3 kg).

Procedures

Two day experimental protocol had 2 separate phases: finswimming competition in 25 meter pool followed on the next day with isokinetic force test measurements. Isokinetic dynamometer (HUMAC NORM, Computer Sports Medicine, Inc. Stroughton MA, USA) was used. The knee extensors and flexors on both legs were tested. All test procedures, dynamometer settings and securing of subjects to seat were carried out in accordance with the dynamometer's user manual. To avoid gravity effect on limb weight the "gravity correction" procedure was used.

Tests used concentric test at velocities 60°/sec, 180°/sec and 240°/sec. At each velocity, the subject performed 4 warm-up trials followed by 5 (60°/sec and 180°/sec) and 15 (240°/sec) maximal test trials after 20 seconds recovery. Between tests a period of 60 seconds was used for recovery.

The highest peak torque values of best repetition (PT) in Newton-Meters and average power per repetition (PW) in watts were registered. Additionally at velocity 240°/sec total work done (TW) was also recorded.

Analysis

Descriptive statistics expressed as mean ± standard deviation (SD) were used in addition to Pearson correlation test to indicate relationship between isokinetic muscle force and finswimming time. Comparisons were done using student-t test. Significance level was set at $p<0.05$.

Results

The time results of 50 m apnea and 200 m surface swimming is given in Table 1.

Table 1

Swimming results 50 m AP and 200 m SF

	50 m AP	200 SF
Average time (sec)	20,14	104,99
SD	±2,68	±11,64

The absolute isokinetic muscle force of knee extensors is given in Table 2. Knee extensors have always higher force compared to flexors (see also Tab. 5). Generally accepted norm of knee flexors versus extensors deficit is in the range of 40-50%. Compared to higher angular speeds at 60°/sec peak torque of both extensors and flexors is significantly ($p<0.05$) higher while power is smallest. But when speed increases the power is drastically more

pronounced and the peak torque is reduced. At higher angular speeds (180°/sec and 240°/sec) knee extensors generated power stayed the same.

Table 2

Absolute isokinetic force data for knee extensors and flexors at different velocities for 200 surface finswimmers (n=7, mean ± SD)

Angular velocity	60°/sec		180°/sec		240°/sec		
	Peak torque (Nm)	Power (W)	Peak torque (Nm)	Power (W)	Peak torque (Nm)	Power (W)	Total work (Nm)
Knee extensors	229.6 ±43.2	142.9 ±19.1	145.1 ±27.7	239.7 ±45.2	127.1 ±22.0	239.1 ±40.8	1488.1 ±258.5
Knee flexors	104.6 ±21.7	72.1 ±18.0	64.4 ±16.9	108.2 ±36.2	53.8 ±14.7	99.9 ±36.5	520.2 ±240.7

Table 3 describes isokinetic force of 50 m apnea finswimmers. Overall picture is similar to 200 m surface finswimmers, that at angular velocity of 60°/sec peak torque is higher with low power but in higher angular velocities the relationship is reversed.

Table 3

Absolute isokinetic force data for knee extensors and flexors at different velocities for 50m apnea finswimmers (n=9, mean ± SD)

Angular velocity	60°/sec		180°/sec		240°/sec		
	Peak torque (Nm)	Power (W)	Peak torque (Nm)	Power (W)	Peak torque (Nm)	Power (W)	Total work (Nm)
Knee extensors	240.9 ±37.3	147.7 ±21.9	150 ±24	249.1 ±39.4	132.9 ±19.4	255.2 ±39.5	1508.9 ±257.2
Knee flexors	111 ±23.5	75.8 ±21.4	69.1 ±22.4	116.7 ±44.0	59.5 ±21.1	114.1 ±49.6	590.8 ±272.6

Table 4 describes correlation between isokinetic force parameters and finswimming times at the competitions. Relative force values (per kg of body weight) demonstrate somewhat weaker correlation with time than absolute values. In both distances 200m SF and 50m AP knee extensors force has strong negative correlation with finswimming time (e.g. time is faster) practically at all angular velocities.

Table 4

Correlation between isokinetic knee extensors muscle force and finswimming time

	Correlation of absolute values of torque and power with swimming time		Relative values of torque and power	
	50 m apnea (n=9)	200 m surface (n=7)	50 m apnea (n=9)	200 m surface (n=7)
Peak torque 60°/sec	-0.79*	-0.88**	-0.71*	-0.84*
Power 60°/sec	-0.7*	-0.85*	-0.51	-0.73
Peak torque 180°/sec	-0.76*	-0.75	-0.7*	-0.75
Power 180°/sec	-0.81**	-0.85*	-0.69*	-0.78*
Peak torque 240°/sec	-0.72*	-0.84*	-0.59	-0.84*
Power 240°/sec	-0.68*	-0.92**	-0.52	-0.81*
Total work 240°/sec	-0.83**	-0.88**	-0.67*	-0.78*

*p<0.05, **p<0.01

For finswimmers the ratio of flexors versus extensor force deficit is relatively high at all and angular speeds.

Table 5

Flexors and extensors ratios of knee muscles during isokinetic strength test (at the angular velocities of 60°/sec, 180°/sec and 240°/sec) in 200m surface (n=7) and 50m apnea (n=9) finswimmers (mean± SD)

	Flexors/Extensors ratios	
	200 m surface (n=7)	50 m apnea (n=9)
60°/sec peak torque	0.46±0.10	0.46±0.15
60/sec power	0.51±0.11	0.51±0.19
180/sec peak torque	0.45±0.12	0.44±0.15
180/sec power	0.45±0.13	0.45±0.19
240°/sec peak torque	0.44±0.14	0.42±0.14
240/sec power	0.43±0.17	0.43±0.20
240°/sec total work	0.36±0.16	0.38±0.21

Discussion

Knee extensors force at angular speed 60°/sec in this study for finswimmers was between 220-250 Nm. In symmetric swimming styles knee extension peak torque at same angular speed has been registered between 220-230 Nm (Secchi et al. 2011). In general we can conclude that finswimmers and swimmers have similar force of knee extensors. Knee flexion force is in the range of 100-120 Nm that is also at same ballpark with earlier study of Secchi (2011), where the range was 110-120 Nm.

At angular speed 60°/sec the peak torque of knee extensors and flexors are both higher than respective power when compared to higher angular speeds. When we increase the angular speed to 180°/sec then power goes up and peak torque is reduced. Same results have been shown by Mameletzi and Siatras (2003). They found also that for flexors the above alteration was less than for the extensors. Current study found the decrease to be equal for both muscle groups.

The aim of present study was to characterize leg muscles strength among finswimmers and to examine potential relationships between isokinetic muscle force and swimming time. We found that knee extensors have a significant impact on reduction of finswimming time. Strong negative correlation was established between 200 SF time and strength in all angular velocities, especially at 240°/sec.

Significant negative correlation with time of 50 m AP was also found for total isokinetic work done and also for power at 180°/sec. This is in accordance with Mookerjee et al. (1995) who found a significant correlation between flutter kicking times for 22.86 m and 45.72 m and peak torque during knee extension at 6.28 $rad.sec^{-1}$(respectively r=0.82 and r=0.71). He also suggested that velocity-specific isokinetic testing of the knee muscles should be done in excess of 6.00 $rad.sec^{-1}$(over ~348°/sec).

Present study shows that knee extension test have high correlation with finswimming time in smaller and higher angular velocities. So testing of knee muscles force must be also conducted at smaller angular velocities.

Correlation between knee flexors force and finswimming time was not established. This can be explained with their function. Knee flexors must bend lower leg (shin), but in finswimming after knee extension (or down movement) leg must come up in straight position, therefore loading less the flexors. However, this phenomenon needs further study as the pronounced force deficit of flexors compared to extensors may carry risks, if compare to general recommendations of 40% - 50% higher force for extensors among healthy population. However it may be a specific propensity for finswimming mode of generating propulsion in water that must be take

into consideration. Also Secchi et al. (2011) found in swimmers that the same ratios at angular velocity 60°/sec were in the range of 45%-55%.

On the other hand Mameletzi & Siatras (2003) found that knee flexors/extensors ratio in boy and girl swimmers at different velocities was in the range of 60%-70%. This finding may be due to undeveloped strength among young swimmers. Finswimmers should concentrate in mid-season on developing knee flexors to avoid injuries, but during the season they should develop knee extesnors.

Conclusions

Knee extensors forces have a significant negative correlation with finswimming times.

Knee flexors force did not show meaningful correlation with finswimming times.

Isokinetic force of finswimmers knee muscle groups should be tested in all angular velocities (60°/sec, 180°/sec, 240°/sec).

Finswimmers ratios of knee flexors and extensors are low 38%-51%. Finswimmers should concentrate in mid-season on developing knee flexors.

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ORIGINAL RESEARCH PAPER

COACHES' LOYALTY IMPORTANCE ON THE ORGANIZATIONS PROVIDING WITH RECREATIONAL SPORT SERVICE

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Abstract

Human resource quality turns to be the crucial factor of organizational success in modern sport organizations. In other words the mission and aims of such organizations will be implemented only in case there work competitive and dedicated employees. In the following article there is discussed employees' loyalty as a significant activity part in sport organizations that determines the awareness, service quality and customer satisfaction of the organizations providing with recreational sport service. Due to the fact that one of the employee's disloyalty expressions towards the organization is his/her job turnover intention; there are also reviewed the reasons for changing a job and the links of such a wish to the demonstrated loyalty towards the organization. There is presented empiric research, the aim of which is to indicate the expression of coaches' loyalty to an organization and connection to the job turnover intention in martial arts clubs. Research sample – 79 coaches, employed in different martial arts clubs in the largest cities of Lithuania. The anonymous questionnaire was used to determinate the employees' continuance, affective and normative expression of loyalty, to disclose job turnover intention and determine their links towards socially demographic variables. The result has been calculated and analyzed by SPSS. The research disclosed that the investigated coaches are not tied by sport clubs which they work in as they do not have any moral commitment to the organization based on a strong sense of duty, and their link to the organization is not based on financial, career or professionalism ladder interests. During the analysis of the coaches' preparation to change an organization there was disclosed weak intention to change a job. Also there was noticed a trend that those employees distinguish by a lower wish to change a job, whose affective and normative loyalty is higher.

Key words: *loyalty, turnover intentions, sport organization, employee.*

Introduction

In recent years it is more and more broadly comprehended that physical activity turns to be one of the key conditions of an individual's physical, social and emotional wellbeing. Consequently, there increases a need for recreational service that impacts the development of the organizations, those provide with such service. However, thereby there arises quite a serious coaches' and instructors' issue that is most frequently related to the poor quality of the provided service (Jankauskienė, 2008). In the following context there arises an objective for sports organizations, which provide with recreational service and focus on the high quality standards - to find and maintain competitive specialists, able to meet customers' needs and provide with qualitative service maximally. Nevertheless, even though an organization possesses such human resources, it will not be efficient, if the employed do not become loyal to it.

There is predominant approach that the greatest asset of every modern organization is its loyal employees (Vveinhardt, Kotovskienė, 2008). There exists no possibility to achieve the aims of an organization without such persons effectively. High employees' loyalty or in other words – commitment to an organization means their willing to work for the benefit of an organization, through the identification of personal and organizational aims, commitment to them, loyalty, and work not only for a salary during the period critical for an organization. However, the continuity of the following willing depends on the responsive commitment of an organization to its members – employees commit their skills as they are provided with the conditions those meet their needs best. As a result human being performing some meaningful work experiences some satisfaction, and due to his/her competence and energy, an organization can compete successfully. In case this balance is violated, the employee's loyalty level decreases and most often that is related to his/her intention to change a job.

High turnover of employees in an organization reveals the management inadequacy of human resources. The following inadequacy is deepened by fast and dynamic change of external environment, due to which people are becoming more and more mobile, and have more possibilities in labor market. It is more and more difficult to keep competitive employees and tie them to an organization. Organizations are absolutely aware that having lost employees they are very likely to face a set of problems – not only will there be experienced financial expenses; however, there might be worsened atmosphere in a collective and it might be more difficult to provide with

services for some time as well as to secure their quality. As a result that could lead to the loss of customers' loyalty. It turns to be clear that good outcomes might be achieved only by organizations which set themselves an aim for their employees' development and security of the loyalty sense (Šajeva, 2007).

Even though in the scientific literature the employees' loyalty and commitment (Meyer et al, 2002), job turnover (Cunningham, 2006, Steel, 2002) and its connection to the loyalty and commitment to organization (Matzler & Renzl, 2006) have been analyzed quite for a long time and quite widely, there is not a lot of research of such a kind in the science of sports management (Kim & Chang, 2007, Komskienė et al., 2009, Lee et al., 2010). Although, it is known that employee attachment to the workplace index in Lithuania is one of the lowest in the Baltic States and in Europe (Savareikiene, Daugirdas, 2009), there is a gap in a deeper analysis of the commitment of the employed to an organization in different sectors. It would allow only disclosing the present situation and foreseeing measures those enabled effective implementation of loyalty sense for employees. Sports sector is not en exception as for it there are needed loyal employees, able to work efficiently and secure the quality of the provided service (Todd, Kent, 2009).

The expression of thought sets a question: what the employees' loyalty level is in sports organizations, providing recreational service and how the intentions to change a job are related to the employees' demonstrated loyalty?

The aim of study was to indicate the expression of coaches' loyalty to an organization and connection to the job turnover intention in martial arts clubs.

Material and methods

The study was carried out in Lithuanian martial arts clubs. In the study there participated 79 trainers, in average of 39.12±12.52 years old. The categories of surveyed were divided into gender (83.5%, n=66 of participants were men and 16.5%, n=13 were women), education levels (high school graduate – 81.0%, n=64 and secondary education 19.0%, n=15), total duration of work in organization (less then 1 year: 10,1%, n=8, 1 years till 5 years – 45.6%, n=36, from 5 years till 10 years 21.5%, n=17, from 10 years and more 22.8%, n=18 of the surveyed), received salary (1000–1500 Lt. a month 55.7%, n=44, 1501–2000 Lt a month 26.6%, n=21, 2001 up to 3000 Lt a month 17.7%, n=4).

Instrument. There was used an anonymous questionnaire. The questionnaire was composed of three parts. The first part of questionnaire was designed to measure organizational loyalty. It was adapted from J. P. Meyer and N. J. Allen's 3-component model of organizational commitment (Savareikiene, Daugirdas, 2009). Loyalty to the organization was rated on an 18 question scale, i.e. 6 questions for each form of loyalty: affective, continuous and normative. The respondents were asked to indicate their level of agreement with each of items on a Likert scale, ranging from 1 – strongly disagree to 5 – strongly agree.

The second part of the questionnaire was designed to measure one‘s intent to change job. It was designed in accordance with the work of Pilkauskaitė-Valickienė et al. (2007). The scale considered of 5 items, each item was rated on a 5-point scale, ranging from 1 – strongly disagree to 5 – strongly agree. The third part included socio – demographic questions.

Analysis. The data were processed using SPSS 16 for Windows. For the research data estimation of the employees' loyalty expression there was applied arithmetic average (V) and standard deviation (SN). Work experience, salary and age group average differences were indicated under the Student t test. There was applied Pearsons correlative analysis to indicate the relationship between the strength of employees' loyalty and their willing to change a job. The research outcomes of employees' intention to change a job were reviewed after having carried out a percentage analysis and differences were indicated applying the criteria of χ^2. The difference was statistically significant at $p<0.05$.

Results

Expression research of martial arts club coaches' loyalty disclosed that the loyalty forms to the organization spread as following - continuous loyalty, the average of which is 3.2±0.4 points, normative loyalty (average 3.0±1.1 points) and affective loyalty (average 2.9±0.7 points).

Having analyzed separate loyalty forms it was disclosed that affective loyalty is mostly influenced by the fact that a club there coaches work means a lot for them (average, 3.8 points), besides, the researched in the following organization would be eager to seek for career (average 3.7 points) too. However, coaches do not feel being tied to the club very often emotionally (average 2.2 points) or being a 'part of the family' in an organization (average 2.3 points).

The analyzed normative coaches' loyalty to the club revealed that the researched agree that the following organization is worth their loyalty (average 3.5 points) and think that they felt guilty if they had to resign

(average 3.2 points). However, they feel in debt to the organization least (average 2.6 points) or committed to coworkers (average 2.7 points).

Continuous loyalty analysis revealed that the researched think that they would lose too much if left the club now (average 3.5 points), thus at the moment they would like to stay (average 3.6 points), and they also have too few options those enabled thinking of resigning from the club (average 3.0 points).

Having analyzed the expression of loyalty forms under the aspects of age, work experience and salary (Fig. 1) it was defined that affective, continuous and normative loyalty essentially do not differ dependently on coaches' age, work experience or salary ($p<0,05$).

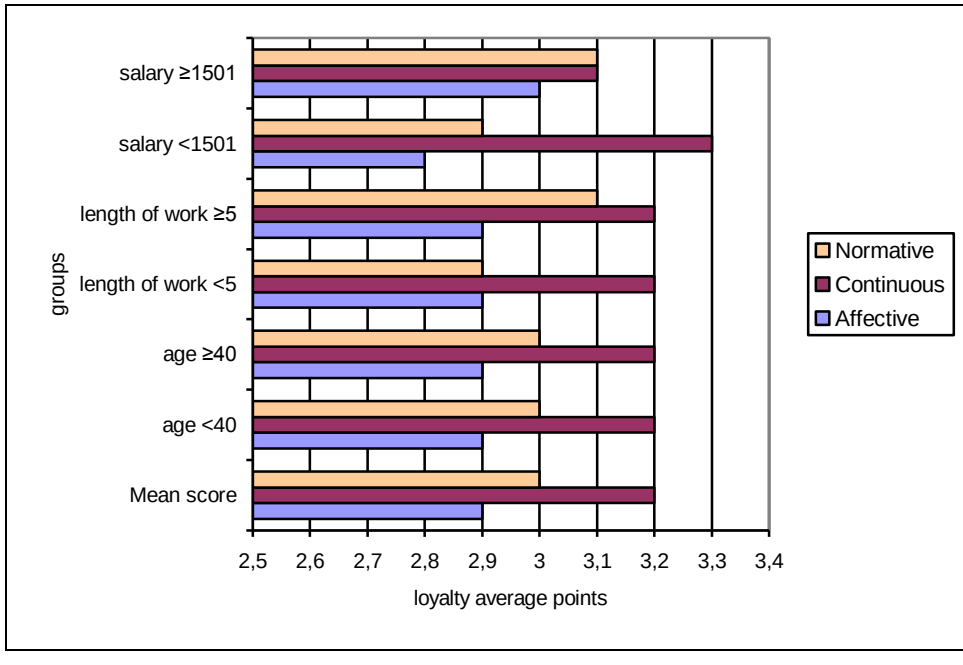

Figure 1. Expression of loyalty forms in the aspects of age, length of work and salary

However, it was indicated that the researched, whose work experience exceeds 5 years, demonstrate higher normative loyalty (average 3.1 points) in comparison to those, whose work experience is less than 5 years (average 2.9 points). Those, whose salary is higher than 1500 Lt., demonstrate a bit stronger affective (3 points) and normative (3.1 points) loyalty. However, ones, who receive a salary that in less distinguish for continuous loyalty (3.3 points).

Having analyzed coaches' preparation in martial arts clubs to change a job, it was indicated that the researched do not distinguish for very strong or strong willing to change a job. There is predominant very weak (40.5%) and weak (43.0%) employees' wiling to change a job and only for 16.5% of employees there is appropriate average strength willing to change a job (Fig. 2).

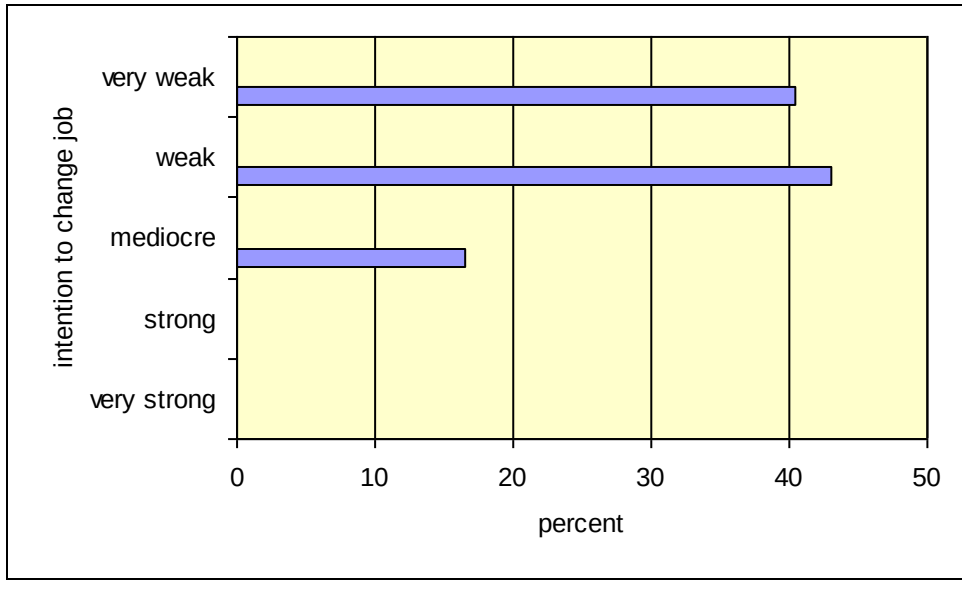

Figure 2. Coachers' willing strength so change a job

In order to define the relationship between employees' loyalty form expression and intention to change a job there was carried out correlative analysis, during which there was estimated Pearson's correlation coefficient. During the analysis of the statements reflecting the strength of affective loyalty and willing to change a job there was disclosed weak relationship between the strength of a willing to change a job and statements: 'I do not feel 'emotionally attached' to this organization, 'I do not feel a strong sense of 'belonging' to my organization' and 'I really feel as if this organization's problems are my own' (Tab. 1).

Table 1

Relationship between coaches' loyalty and willing to change a job

Loyalty	Strength of willing to change a job r
Affective loyalty	**-0.249***
This organization has a great deal of personal meaning for me	-0.077
I do not feel like "part of the family" at my organization	0.182
I do not feel "emotionally attached" to this organization	0.318**
I do not feel a strong sense of "belonging" to my organization	0.323**
I really feel as if this organization's problems are my own	-0.306**
I would be very happy to spend the rest of my career with this organization	0.236*
Continuous loyalty	**0.024**
One of the few negative consequences of leaving this organization would be the scarcity of available alternatives	-0.167
If I had not already put so much of myself into this organization, I might consider working elsewhere.	-0.002
I feel that I have too few options to consider leaving this organization	-0.325**
Too much of my life would be disrupted if I decided I wanted to leave organization now	0.084
It would be very hard for me to leave my organization right now, even if I wanted to	0.056
Right now, staying with my organization is a matter of necessity as much as desire	-0.386**
Normative loyalty	**-0.292****
I owe a great deal to my organization	0.074
I would not leave my organization right now because I have a sense of obligation to the people in it.	-0.283*
This organization deserves my loyalty	-0.020
I would feel guilty if I left my organization now.	-0.246*
Even if it were to my advantage, I do not feel it would be right to leave my organization now.	-0.368**
I do not feel any obligation to remain with my current employer.	0.068

Clarification: *level of statistical meaningfulness in correlative connection $p<0.05$
**level of statistical meaningfulness in correlative connection $p<0.01$

During the research of continuous loyalty in the relationship of employees' loyalty and a willing to change a job there were indicated statistically reliable weak reverse relationship only between: a statement *'I feel that I have too few options to consider leaving this organization'* and the strength of a willing to change a job, and a statement *'Right now, staying*

with my organization is a matter of necessity as much as desire' and the strength of a willing to change a job.

During the relationship research of employees' normative loyalty and a willing to change a job it was indicated that normative loyalty and a willing to change a job are related via statistically reliable weak reverse relationship.

Discussion

During the analysis of employees' loyalty there might be distinguishes its different forms; however, most frequently analyzed ones are affective, continuous and normative loyalty (Meyer et al, 2002, Savareikiene, Daugirdas, 2009). Loyalty research of coaches, employed in Lithuanian martial arts clubs disclosed that among the researched continuous loyalty distinguishes most. Such loyalty is connected to the price of leaving the club. Employees, who demonstrate continuous loyalty most frequently, stay in the same organizations as it is financially beneficial for them. In the presence of such a form of loyalty the employee feels that he or she has invested some valuable things into the organization and they will be lost if he/she leaves it. In the following case the coaches are convinced that if staying in the present work place they will lose less than having decided to leave it. Such a form of loyalty is caused by a little number of other job suggestions which could enable the consideration of possibilities for resigning. This was also disclosed by the executed research which revealed that coaches currently would wish to stay in clubs (average 3.6 points), as they are convinced that they would lose too much if they left the club now (average 3.5 points). It is also thought that there are too few options which could enable the consideration concerning leaving the club - resigning (average 3.0 points).

Normative loyalty form is demonstrated weaker in the group of the researched (average 3.0 points). The following form disclosed the person's duty to stay in the organization. That is related to different established social norms most often, which oblige the employee to stay in the organization. It is frequently a result of cultural and organizational socialization. It is likely that coaches demonstrating normative loyalty will perform all working assignments thus they have to do them. These coaches also know that others depend on them and are looking forward to the certain result what is of great significance in sports sector (Todd, Kent, 2009). The following research disclosed that coaches partially feel in debt to the organization (average 2.6 points) or they are liable to the colleagues (average 2.78 points).

The least highlighted among the researched is affective loyalty. Even though such a form of loyalty is significant to the organization, affective loyalty is connected to the person's identification with an organization. Thus the researched coaches are not completely identified with a club, and they very often are not proud of belonging to it and only partially accept and recognize organizational aims and values. That is proved under the statements revealing that the researched do not feel emotionally tied to the club or being its family members.

Such a combination of loyalty forms when there is predominant continuous loyalty can not secure that at a critical moment the employee will take responsibility for actions or results of a decision made. The employees tend to opt; they care about their own interests, but not common ones. They will not do more than are paid for, and having received a financially more rewarding offer the employee will be willing to accept it (Savareikiene and Daugirdas, 2009). The following is confirmed under the research, those reveal that only affective and normative loyalties are very closely related to staying with the organization (Pakalkaite, 2006).

Employee loyalty can be treated as a specific pattern of behavior. Most frequently the employees, who are loyal, behavior differs from those, whose loyalty and commitment to an organization are lower. It was disclosed that the employees possessing stronger loyalty not only are more efficient, but leave the organization much more rarely (Vveinhardt, Kotovskienė, 2008). The following research revealed that the researched coaches' willing to change a sports club is quite weak – any researched did not reveal a very strong or strong willing to change the workplace. This could be explained under different reasons. The employees very often stay in the workplace as there are satisfied their different needs in it. The present work conditions and workload, career opportunities, organizational climate, good relationship with colleagues and managers, fair salary and stability satisfy them. However, unwillingness to change a job might be influenced by the very employee to be mobile or present little supply in labor market (van Dam, 2005, Petkevičiūtė, Kalinina, 2004)

There has been noticed a trend that those employees distinguish by less willing to change a job, whose affective loyalty is higher and who are emotionally more tidied to the organization and feel strongly belonging to an organization. The less willing to change an organization is characteristic to those coaches, who think that they have fewer opportunities to compete in modern labor market. Those employees who are sure that they have currently to stay in the organization and have a wish for that, also distinguish by less willing to change a job. It is indicated that the employees

distinguishing for higher normative loyalty are likely not to change a job. Those employees who in case of a better offer would feel that it s not right to leave the organization would be also less likely to change a job.

Conclusions

Expression research in employees' loyalty revealed that the researched employees do not distinguish by the wish to tie to an organization, do not have strong duty feeling based on the moral commitment to an organization, and their relationship to an organization is not based on financial, career or professional refreshment interests. Affective, continuous and normative employees' loyalty under the aspect of work experience, age and salary did not differ reliably. It was indicated that there varied very weak and weak willing of the researched to change a job. There was noticed a trend that those employees distinguish by less willing to change a job, whose affective and normative loyalty is higher.

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ORIGINAL RESEARCH PAPER

PHYSICAL ACTIVITY AS A DETERMINANT OF PHYSICAL AND PSYCHO EMOTIONAL WELLBEING IN LATE ADOLESCENCE

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Abstract

The aim of the study was to identify the impact of physical activity (PA) of 16-19 year Lithuanian adolescences on their physical health and emotional wellbeing. The study sample represents Lithuanian schoolchildren of secondary schools. Study population consisted of 1035 persons. Anonymous questionnaire was used. Evaluating physical health prevalence of chronic diseases, scoliosis, impaired sight, incidence of acute diseases, and frequent somatic symptoms were measured. Psycho emotional wellbeing was defined as the feelings of happiness, school anxiety and feelings of angriness or aggressiveness. To establish the impact of insufficient PA on health χ^2-test and the Odds Ratio (OR) were used. In the study population one fifth part of respondents were found to have different chronic diseases; 28,8% were diagnosed scoliosis or asymmetric posture, 36,1% - farsightedness or other sight disorder, but significant difference by PA level was not established. Frequent acute morbidly was characteristic for 16,1% of the study population, frequent somatic ailments - for 73,3%. Relative risk of these health disorders for students whom PA level is low was 1, 7 times higher compared to those who exercises at least 2-3 times a week. 29,4% reported feeling not completely happy or totally unhappy in their life, and these psycho emotional state was significantly associated with low PA. School anxiety was characteristic for 9,3% of students, feeling of angriness, aggressiveness for 11,2%, no difference by PA was found. Conclusion: insufficient PA has the essential impact on student's incidence of acute morbidity, somatic symptoms and feeling unhappy in their life.

Key words: *Adolescences, physical activity, self evaluated health.*

Introduction

The health of children and adolescents is a resource for future economic and social development in all countries (Barnekow, Muijen, 2009). Early investment in the health of children and adolescents is important to ensure children's right to enjoy the highest attainable standard of health. Many diseases can be prevented and health promoting measures implemented with optimal effectiveness from the early stages of life.

Health potential of the students aged 16-19 years graduating from secondary schools may be of valid importance taking a public health approach. In early age prevalence of chronic diseases is low compared to the adults but repeated somatic symptoms or psycho emotional complains may be the predictor of chronic conditions in their adulthood. Subjective health complaints include somatic symptoms like headaches and psychological symptoms such as nervousness or irritability. In adolescence, which is characterized as a period of relative good health and low mortality, poor health may have particular significance. Poor health may affect the fulfilment of the developmental tasks of adolescence, and there may also be long-term negative effects (Health behaviour in School-aged children, 2008). Complaints in late adolescence could be not only indicators of how they are responding to stressful situations, but also reflect the lifestyle's habits they acquired during their life. Unhealthy lifestyle may course poor health potential for their future life and performance.

Physical activity is considered as important health-promotion or risk factor. In the World Health Report (2002) it is indicated, that overall physical inactivity was estimated to cause 1.9 million deaths globally. Physical inactivity is estimated to cause, about 10 – 16% of cases each of breast cancer, colon and rectal cancers and diabetes mellitus, and about 22% of ischemic heart disease. Also, this report estimates the prevalence of physical inactivity among people aged 15 years and over. It is 17%, ranging from 11% to 24% across sub regions. Estimates for prevalence of some but insufficient activity (<2.5 hours per week of moderate activity) ranged from 31% to 51%, with a global average of 41% across the 14 sub regions.

Young people spend big part of their time in school, as formal education takes place there and for most adolescents it is a centre of their social lives. School policy framework (2008) stimulates schools to promote healthy eating and physical activity and recognizes their efforts to develop appropriate school curriculum. School health education aims to help students develop the knowledge and skills which are needed to make informed decisions, practice healthy behaviours and create conditions that are conducive to health.

The aim of this paper was to identify the impact of physical activity (PA) of 16-19 year Lithuanian adolescences on their physical health and emotional wellbeing.

Material and methods

The study sample represents Lithuanian schoolchildren aged 16-19 years of secondary schools. In total the study population consisted of 1035 persons from all Lithuanian districts: 48.4% 11-formers, and 51.6% 12-formers; 650 (62.8%) girls and 385 (37.2%) boys; 52.7% lived in the city, 47.3% - in the country.

The study was based on anonymous questionnaire. Student's physical activity (PA) and health were evaluated using Health Behavior in School-aged Children (HBSC) questionnaire. Also original questions related to the students health and wellbeing were included. HBSC PA evaluation was used to ensure comparability of the results of 16-19 agers with younger adolescences, i.e. 11-13-15 year age results. The questionnaires were filled in the classrooms. They were selected by the teachers in sealed envelopes.

Leisure time physical activity was measured using the item: "Omitting PA classes in school how often do you usually exercise so much that you get out of breath or sweat"? Students selected the answer from given alternatives: 'every day', '4–6 times a week', '2–3 times a week', 'once a week', 'once a month' 'less than once a month' and 'never'. In the analysis all responses were divided into two categories: „at least 2-3 times a week" and "sometimes, almost never".

Descriptive statistics methods were used. Prevalence of reported PA, health and well being indicators are given by gender and residence place. To assess contingency tables, χ^2-test was used. A 99% significance level was employed in the analysis. To establish the impact of insufficient physical activity on health the Odds Ratio (OR) with Confidence intervals (CI) was estimated Rothman (1990). The OR reflect the relative risk of health disorder given in certain exposure level (low physical activity, defined as „PA sometimes, almost never") in comparison with reference category of exposure („at least 2-3 times a week").

Results

Table 1 presents the portion of physically active/inactive adolescents by sex and residence place. Low physical activity (PA) was more characteristic to girls than boys (73.4 vs 36.6%, p=0.0001). In total 40.3% students reported they exercise at least 2-3 times a week to sweat out and to increase breathing rate omitting physical culture lessons in the school. The

rest of the study population (59.7%) reported lower leisure PA, and they said they exercise sometimes or never (Juškelienė, Ustilaitė, 2009). Statistically significant PA differences by residence place were not found.

Table 1

Distribution of adolescents with different PA level by sex and residence place

Reported exercising level per week		At least 2-3 times a week	Sometimes, almost never	Total	Chi-square test
Sex	Boys	244 (63.4%)	141 (36.6%)	385 (37.2%)	χ^2=135.82 p=0.0001
	Girls	173 (26.6%)	477 (73.4%)	650 (62.8%)	
Residence place	City	267 (39.3%)	413 (60.7%)	680 (59.7%)	χ^2=0.86 p=0.19
	Small town, village	150 (36.0%)	205 (33.2%)	417 (40.3%)	

Young people were asked to describe their physical health answering questions by picking up the ready alternative or writing their own answer. Table 2 estimates relative risk of different health disorders by PA level. Insufficient physical activity has the essential impact on physical health. Risk of frequent morbidity and frequent psychosomatic ailments was 1.7 times higher to those who exercise sometimes or never compared to those who exercise 2-3 and more times per week.

In the questionnaire students pointed out if some chronic diseases were diagnosed to them, and also indicated particular chronic condition. Among chronic diseases that students wrote were asthma, bronchitis, chronic pneumonia, diabetes, heart diseases, and also other diagnosis reflecting disorders in endocrine, nervous, blood, muscle bone, and urogenital systems. Altogether in the study population 21.7% respondents were found to have different chronic diseases. Chronic conditions were more prevalent among girls than boys (24.6 vs 16.9%, $p<0.005$), but no demographic differences were found. There was no statistically significant difference in the groups of presence/absence of chronic diseases by PA level (Tab. 2).

Prevalence of the posture disorders was also extracted from the study data. Students wrote if scoliosis, trunk asymmetry or other posture disorders were diagnosed to them by orthopedist. In all group 28.8% (28.8% girls and 28.6% boys) pointed out that doctor has diagnosed scoliosis or asymmetric posture. Demographic differences were estimated. The prevalence of posture disorders were higher among city residences compared to the

students who live in small cities and villages (31.2 vs 24.1%, p<0.05.1). Relative risk of posture disorders in the group of students whom PA level is low, is 1.3 times higher compared to those who exercises at least 2-3 times a week (OR=1.3), but difference is not significant (Tab. 2).

Table 2

Relative risk of health disorders by PA level

Reported exercising level per week		At least 2-3 times a week	Sometimes, almost never	Total	OR (CI)
Presence of chronic diseases	No	334 (80.1%)	476 (77.0%)	810 (78.3%)	1
	Yes	83 (19.9%)	142 (23.0%)	225 (21.7%)	0.83 (0.61-1.13)
Posture disorders	No	265 (74.2%)	362 (69.2%)	627 (71.3%)	1
	Yes	92 (25.8%)	161 (30.8%)	253 (28.8%)	1.28 (0.95-1.73)
Impaired sight	No	279 (66.9%)	382 (61.8%)	661 (63.9%)	1
	Yes	138 (33.1%)	236 (38.2%)	374 (36.1%)	1.25 (0.96-1.62)
Incidence of acute diseases	0-3	366 (87.8%)	502 (81.2%)	868 (83.9%)	1
	4>	51 (12.2%)	116 (18.8%)	167 (16.1%)	1.66* (1.16 -2.37)
Frequent psychosomatic ailments (at least one ailment two times per week or more frequently)	No	137 (32.9%)	139 (22.5%)	276 (26.7%)	1
	Yes	280 (67.1%)	479 (77.5%)	759 (73.3%)	1.69* (1.28 -2.23)

* Significant differences

Estimated prevalence of impaired sight including nearsightedness, farsightedness or other sight disorder was 36.1%. They were more prevalent among girls than boys (40.5 vs 28.8%, p<0.001), among city residences than those living in the small cities and villages (40.7 vs 31.1%, p<0.01). Relative risk of impaired sight in the group of students whom PA level is low is 1.3 times higher compared to those who exercises at least 2-3 times a week (RR=1.25), but difference is not significant (Tab. 2).

Incidence of acute diseases was estimated calculating all the episodes of diseases that the students pointed out in the questionnaire. All acute diseases (respiratory, gastrointestinal, urinary and general infectious diseases) were included. Two levels were made calculating number of times the adolescent had been ill during last year (0-3 times, and 4 and more times). This calculation principle usually is used in pediatric practice. Study results showed that 16.1% of the study population were taken ill 4 and more times

per year. Prevalence of frequent acute morbidly is 20.5% among girls and 8.8% among boys, p<0.001; 14,0% among city students and 18.5% among country residents, p<0.05. Significant difference by PA level was estimated. Relative risk of frequent acute morbidity of students whose PA level is low is 1.7 times higher compared to those who exercise at least 2-3 times a week (OR=1.66, CI>1), (Tab. 2).

In the questionnaire respondents pointed out some symptoms and ailments, and also their frequency during last half year. Considering psychosomatic ailments (irritability, nervousness, headaches, quickly tiredness, weakness, vertigo, sleeplessness, stomach ache, bad appetite, and tiredness in the morning) and their frequency, groups of the students who felt almost well and felt at least one ailment two times per week or more frequently were formed. Estimated prevalence of frequent psychosomatic ailments was 73.3%; among girls – 81.5%, and among boys – 59.5%, p<0.001. Difference between city and country residences is insignificant. Relative risk of frequent psychosomatic ailments among students whom PA level is low is 1.7 times higher compared to those who exercises at least 2-3 times a week (OR=1.69, CI>1).

Psycho emotional wellbeing was defined by respondents in the questionnaire as the feelings of happiness, school anxiety and feeling angry or aggressive. Insufficient physical activity has the essential impact on student's psycho emotional wellbeing (Tab. 3).

Table 3

Psycho emotional wellbeing by PA level

Reported exercising level per week		At least 2-3 times a week	Sometimes, almost never	Total	Chi-square test
Feeling happy	Yes	315 (75.5%)	416 (67.3%)	731 (70.6%)	χ^2=6.52 p=0.01
	No, not completely	102 (24.5%)	202 (32.7%)	304 (29.4%)	
Feeling school anxiety	No, sometimes	381 (91.4%)	558 (90.3%)	939 (90.7%)	χ^2=0.34 p=0.50
	Yes, always	36 (8.6%)	60 (9.7%)	96 (9.3%)	
Feeling angry, aggressive	No, rarely	362 (86.8%)	557 (90.1%)	919 (88.8%)	χ^2=2.76 p=0.09
	Very often, always	55 (13.2%)	61 (9.9%)	116 (11.2%)	

In the study population 29.4% of the respondents (24.7% of boys and 32.2% of girls, p<0.05; 27.9% of city residents and 31.6% country residents, p<0.05) said, they feel not completely happy or totally unhappy in their life. Statistically significant difference by the level of PA was

established: higher portion of the students with low physical activity reported being not completely happy, totally unhappy (Tab. 3).

In the questionnaire students pointed out, if in the school they experience fears, worries, related to exams, bad evaluations, sneer, bulling, and conflicts with teachers and parents, requirements, homework, difficulties with particular subjects, etc. School anxiety was characteristic for 9,3% of the respondents (6,8 % of boys and 10,8% of girls, $p<0,05$; 8,4% of city residents and 10,9% country residents, difference is not significant). The rest of the study population said they don't experience school anxiety, or this feeling in rare. Students, who exercise at least 2-3 times a week, were less likely to report school anxiety, but difference is not significant (Tab. 3).

It the questionnaire 11.2% of the students said in their everyday life they very often or always experience feeling of angriness, aggressiveness. Gender difference is not significant, but the country residents pointed this emotional complain more often (14.9%) than city respondents (9.3%), $p<0.05$. Students who reported never or almost never being active in leisure time experienced feelings of angriness or aggressiveness more often compared to their physically active coevals, but difference is not significant.

Discussion

Our study revealed that more than two thirds of 16-19 year girls and one third part of boys exercise sometimes or never and could be attributed to the level of insufficient PA. Since the year of 2000 part of students of the same age with insufficient PA increased about 10 percent (Juškelienė, Ustilaitė, 2009). World Health Organization (WHO) in order to improve cardio respiratory and muscular fitness, bone health, and cardiovascular and metabolic health biomarkers recommended for children and youth aged 5–17 should accumulate at least 60 minutes of moderate- to vigorous-intensity physical activity daily (Global recommendations on Physical activity for health, 2010).

Decreasing PA levels among children and youth are reported by many researches in Europe. The study of two thousand eight hundred and fifty-eight pupils aged 11-15 in four secondary schools in England revealed (Boyle et all, 2010) that only 25% of children engaged in 60 minutes of moderate to vigorous PA per day. Self reported PA in young people is lower than previously reported. Authors conclude that lack of students engaging in 60 minutes moderate to vigorous activity could have serious public health

consequences. If sustained, this could lead to more overweight adults, and more ill health.

The European wide study Health Behaviour in School-aged Children, carried out in 2005/2006 detected that among 11-13-15 year children in Lithuania only one fourth part of adolescences are engaged in at least one hour of PA: among 11 year olds 27% boys and 20% of girls, among 13 year olds - 22% boys and 13% of girls, among 15year olds - 19% boys and 13% of girls (Inequalities in young people‘s health, 2008). In other Baltic countries situation is similar. PA was found rather better in Latvia and slightly worse in Estonia. Part of adolescences engaged in at least one hour of PA in Latvia / Estonia respectively is: among 11 year olds 30/24% boys and 27/21% of girls, among 13 year olds - 27/22% boys and 17/13% of girls, among 15 year olds - 26/18% boys and 16/9% of girls.

In European countries physical activity varies according residence place and gender (Kolip, Schmidt, 1999). As early as 11 years of age, girls and boys show differing extents of PA, but these differences increase up to the age of 15 years. The proportion of adolescents who take part in sports outside school at least twice a week varies, in girls, between 28% (Spain) and 68% (Austria), and in boys between 62% (Slovakia) and 89% (Austria). Proportion of girls/boys who take part in sports outside school at least twice a week in Baltic countries are following: 47/72% (Estonia) and 46/78% (Latvia), and 42/74% (Lithuania). Adolescents are taught sport at school, but many give up the sports activities they pursued in childhood when they reach puberty. This withdrawal from sports activity is particularly marked in girls.

Monitoring health status of children and adolescent and evaluating of the risk factors is one of the main activities in public health research. Besides that health status is assessed through classical health indicators, health can also be viewed as a subjective representation of functional well-being (Ravens-Sieberer et all, 2001). The WHO definition of health, which is not only understood by somatic indicators, but also comprise show a person feels, psychologically and physically, and how she or he managers with other persons and copes everyday life. The measurement is increasingly important as a means of monitoring population health status over time, of detecting sub-groups within the general population who might be at risk, and of assessing the impact of public health interventions within a given population.

Our study showed rather pore health potential in late adolescence: more that one sixth part of respondents is characteristic low immune reactivity, as they were taken ill with acute diseases 4 and more times per year; two thirds

of the study population reported frequent somatic symptoms and complains; one fifth part the students pointed the presence of some chronic disease, about one third - posture disorder, and also more than one thirds - impaired sight. Self evaluated frequent somatic complains and frequent acute morbidity was associated with insufficient PA. Other studies also show the same tendency in PA and health relation and long time effect. The systematic review (Janssen, LeBlanc, 2010) based on the data that was abstracted from the 86 eligible papers and limited to 7 health indicators (high blood cholesterol, high blood pressure, the metabolic syndrome, obesity, low bone density, depression, and injuries) revealed that PA was associated with numerous health benefits in adulthood The dose-response relations observed in observational studies indicate that the more physical activity, the greater the health benefit. Results from experimental studies indicate that even modest amounts of physical activity can have health benefits in high-risk youngsters (e.g., obese). To achieve substantive health benefits, the physical activity should be of at least a moderate intensity. Vigorous intensity activities may provide even greater benefit. In our study presence of chronic diseases didn't show significant relation with insufficient PA. Cross sectional study design and comparatively young age may not allow assessing PA influence, and, likely, chronic conditions in late adolescence may be related mostly to biomedical courses than to lifestyle.

Examination of psycho emotional wellbeing in our study showed, that one third part of the study population feels not completely happy or totally unhappy in their life. School anxiety and feelings of angriness, aggressiveness was characteristic for about one tenth part of the respondents. Well-being has many aspects. Life satisfaction has been defined as a person's evaluation of various areas of his or her life, such as satisfaction with school or home experiences (Inequalities in young people's health (2008), Parfitt, Eston (2005). Absence of distress is of major importance, but equally relevant is the presence of positive affective states, such as happiness and excitement. The individual's overall evaluation of life, referred to as reported life satisfaction, is an important aspect of well-being. European study Health Behaviour in School-aged Children, carried out in 2005/2006 detected high life satisfaction in 11-year-olds from 76% (Turkey) to 95% (Greece); in 13-year-olds from 66% (Turkey) to 94% (Netherlands); in 15-year-olds from 62% (Turkey) to 90% (Netherlands). Lithuanian / Latvian / Estonian portion of the respondents with high life satisfaction were respectively in 11-year-olds 82/81/90%, in 13-year-olds 80/79/86%, in 15-year-olds 74/78/83%. A widening gender gap is observed as children grow older, with boys more likely to report high life satisfaction

by age 15 in most countries. Boys in northern and Western Europe are more likely to report high life satisfaction, while those in eastern and southern Europe are significantly less likely to do so.

Though in our study school anxiety and feelings of angriness, aggressiveness were not significantly associated with PA, higher portion of the students with low physical activity reported being not completely happy, totally unhappy. The similar results showed the study data drown from the 2005/06 Health Behaviour in School-aged children survey, aimed to examine the association between leisure time physical activity and psychological complaints among adolescents. It was found that the higher the frequency of leisure time physical activity, the lower the risk of physiological complaints (Petronyte, Zaborskis, 2009**)**. Regional differences in this association were not found. The findings also suggest that individual factors (e.g., gender, residence place) contribute in explaining the association between leisure time physical activity and psychological complaints among adolescents.

Low physical activity and related health problems in the European region courses wide scope of problems (Barnekow, Muijen, 2009). WHO has developed a European strategy for child and adolescent health and development. It is based on a broad concept and understanding of health which places it in a life-course perspective. The purpose of the strategy is not to provide universal solutions to all the challenges of child and adolescent health and development, but to create a platform and principles that all Member States can use to formulate better policies and programmes in this field. The Strategy is based on a wide range of data about children's and adolescents' health behaviours in Europe that reflect lifestyle, behavioural, cultural and socioeconomic factors. School health education can be delivered in a number of different ways, depending on a country's needs (School policy framework, 2008). Suggestions for the implementation of this policy are to develop, implement or strengthen a school curriculum that includes relevant information on healthy diets and physical activity, establish partnerships with teachers, parents, teachers' associations, publishers, etc. to encourage the development of criteria and materials that provide an appropriate curriculum related to diet and physical activity, and also consider, as appropriate, the development of a regulatory approach for compulsory health education during the school year.

Conclusions

Evaluating physical health it was found, that frequent acute morbidly was characteristic for 16.1% of the study population, frequent

psychosomatic ailments – for 73.3%. Relative risk of frequent acute morbidity and frequent psychosomatic ailments for students whom PA level is low is 1.7 times higher compared to those who exercises at least 2-3 times a week.

In the study population one fifth part of respondents were found to have different chronic diseases; 28.8% were diagnosed scoliosis or asymmetric posture, 36.1% – farsightedness or other sight disorder. There was no statistically significant difference in the groups of presence/absence of chronic diseases by PA level.

Examination of psycho emotional wellbeing showed, that one third part of the study population feeling not completely happy or totally unhappy in their life. Higher portion of the students with low physical activity reported being not completely happy, totally unhappy. School anxiety was characteristic for 9.3%, feeling of angriness, aggressiveness for 11.2%, but these indicators were not significantly associated with PA.

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ORIGINAL RESEARCH PAPER

CORRELATIONS BETWEEN STUDENTS' PHYSICAL ACTIVITY HABITS AND FACTORS INFLUENCING THEM FROM THE PERSPECTIVE OF THEORY OF PLANNED BEHAVIOUR

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Abstract

The World Health Organization (WHO) particularly highlights the actions that need to be taken in order to draw attention to preventive health-promoting effects, with particular emphasis on healthy eating and physical activity. Aim of the research is to identify and analyse students' physical activity (PA) habits and to determine the correlations between these habits and factors influencing them employing the theory of planned behaviour (TPB). Materials and methods. Students` physical activity is defined using survey method based on Godin and Shephard's Leisure -Time Physical Activity Questionnaire, (1985) questionnaire adjusting it to the goals of this research. The questions were added about daily physical activities and opportunities to participate in physical activities organized by the universities. Factors that influence physical activity are selected based on the theory of planned behaviour. For data analysis traditional programme SPSS 16.0 was employed. Participants of the research: 158 full-time and 52 part-time students of Liepaja University and Riga Stradins University Branch of Liepaja. The results. The research results indicate that on a daily basis full-time and part-time students exercise sufficiently, but only 50.0 % full-time and 55.8 % part-time students are involved in physical activities that provide additional health benefits (according to WHO recommendations).

Key words: *students, physical activity, habits, behaviour*

Introduction

According to the Sport Policy Guidelines for 2004-2009, approved in accordance with Cabinet of Ministers Order No. 632 of 15 September 2004, the National Sport Development Programme 2006-2012 has been

developed, reinforced by Order of Cabinet of Ministers Nr. 838, adopted on October 31, 2006. The main aim of National Sport Development Programme is to create conditions for the formation of a healthy, physically and mentally developed personality. In the section of this document "Children and youth sport", paragraph 3.7., it is stated that the minimum amount of sport lessons in the higher educational establishments is 2 – 3 hours per week for the first four semesters, which must be implemented by 2007 under supervision of Ministry of Education and Science. The planned result is to increase young people's fitness level, improve their health and ability to obtain a profession and work in it successfully, also to improve movement abilities, skills and knowledge needed for lifetime (IZM, 2004).

The Youth Policy State Programme for 2009-2013**,** paragraph 7.1., contains the programme of action, which aims to ensure that young people have enough possibilities to engage in physical activities and sports. Also it requires providing educational institutions with adequate and improved infrastructure, material-technical base and informative support, as well as creating a variety of cost-free opportunities for young people (including disadvantaged ones) to engage in physical activities ensuring the development of their physical and mental abilities and holistic development, and raising awareness about an active and healthy lifestyle (IZM, Riga, 2009).

The Latvia Law on Higher Educational Establishments (1995), paragraph 5, verse 1, states that higher educational establishments must provide their students with opportunities to engage in sports activities.

The World Health Organization (WHO, 2009), describing the top-ten health risk factors, rates obesity as the third, but lack of physical activities (hypodynamy) as the fourth health risk factor. Thus, WHO regularly follows and elaborates new activity programmes and suggestions, emphasizing the importance of physical activity for preserving and maintaining health.

Also the National Development plan of Latvia for 2014- 2020 presents a course of action called "Healthy and Fit for Work Person" highlighting the main health risks in European region, such as smoking, risky alcohol consumption, physical inactivity and poor diet that result in significant health care and social costs, and therefore, one of the priorities is to establish a healthy and active lifestyle habits in our society by strengthening the health promotion networks: (a) promotion of a healthy diet, active lifestyle and mental health, (b) development of children and young people's sports and popular sport activities, (c) inclusion of health education into the

school curricula, (d) prevention of substances and processes that can create dependency (NAP, 2012).

Based on above mentioned documents and facts, it is possible to estimate the need of promoting the habits of physical activity. This is also important for students, because the requirements to create favourable conditions for physical activities in the higher educational establishments are often not met, including the educational monitoring that promotes a healthy lifestyle, blaming the socio-economic conditions. The paragraph 3.7 of National Sport Development Programme for 2006-2012 is often ignored as well, and also the prolonged reforms of higher educational establishments are not helpful for finding a positive solution for this problem.

As the problem of hypodynamy is becoming more and more topical, and the physical activity habits (PA) are influenced by various factors, this research identified PA habits, reviewed and analysed the main elements that influence behaviour according to the theory of planned behaviour and how these elements can be applied for researching the habits of physical activity.
Aim of the research: is to identify and analyse students' physical activity (PA) habits and to determine the correlations between these habits and factors influencing them employing the theory of planned behaviour (TPB).

Material and methods

The physical activity habits of students were identified employing a survey method. The questionnaires were structured in three parts. The first part of questionnaire consisted of four questions from Godin and Shephard's Leisure-Time Physical Activity Questionnaire (1985): (1) During last 7days, how many times have you performed a high-intensity physical activity for more than 15 minutes?; (2) During last 7days, how many times have you performed a moderate-intensity physical activity for more than 15 minutes?; (3) During last 7days, how many times have you performed a low-intensity physical activity?; (4) During last **7**days, how often have you engaged in any regular activity long enough to work up a sweat (with considerable increase of heart beat and breathing rate)? Following the methodology of G. Godin (2011), the obtained results were equalized with metabolic equivalent (ME), subjecting 9 ME units to strenuous activities, 5 ME units to moderate activities, and 3ME units to mild activities, and summarizing the units obtained within 7 days. In 7 days, it is necessary to obtain 24 or more ME (about 14 kcal/kg/week or more) in order to provide additional health benefits, 14-23 ME units (between 7 and 13.9 kcal/kg/week) in order to influence several health aspects, but less than 14

ME units (less than 7 kcal/kg/week) have almost no influence on person's health (Cronbach's Alpha 0.562).

To obtain more detailed information about students' PA habits, the second part of questionnaire was developed containing questions about activities such as moving at home or at work place, shopping, walking in a slow pace, walking from work to public transport, and also accessibility of organized PA in higher educational establishments (6 questions, Cronbach's Alpha 0.502).

The third part of the questionnaire was based in Icek Ajzen's Theory of planned behaviour (2006), and 18 items were formulated emphasizing four main factors that influence human behaviour: (1) attitude (10 items); (2) subjective beliefs of an individual (5 items); (3) perceived behavioural control (behavioural control refers to people's perceptions of their ability and resources to perform a given behaviour) (2 items); (4) intention (the result of first three factors) (1 item). The responses were structured following the Likert scale. Before completing the questionnaire, the students were informed which PA can be considered as sufficient: 30 min or more moderate intensity activity accumulation at least 5 days a week or at least 20 min of very powerful activities per day 3 or more days a week (Cronbach's Alpha 0.864).

Correlations between PA, ME and factors influencing behaviour are calculated conducting a non-parametric data analysis Spearman correlation, SPSS 16.

Respondents: 158 full-time first year students (age19-26; 20, 4 ± 3.5, 17 men, 141 women) and 52 part-time first year students (age 20-34; 28.5 ±7.9, 2 men, 50 women).

Results

The research results showed that during last **7**days, 38.6% full-time and 30.8% part-time students have not engaged in high-intensity physical activities, 24.1 % full-time and 30.8% part-time students have engaged once, 13.3 % part-time and 11.5% full-time students – twice, but 17.7% full-time and 26.7 % part-time students have engaged in high-intensity physical activities three times or more.

During last 7 days, 20.9 % full-time and 28.8 % part-time students have not engaged in moderate-intensity physical activities, 21.5 % full-time and 13.5 % part-time students have engaged once, 17.4 % full-time and 15.4% part-time students - twice, but 30.4 % full-time and 30.7 % part-time students have engaged in moderate-intensity physical activities 3 times or more.

During last 7 days, 64.6 % full-time and 38.5 % part-time students have not engaged in mild-intensity physical activities, 12 % full-time and 44.2 % part-time students have done it once, 10.1 % full-time and 9.6 % part-time students – twice, 5.7 % full-time and 1.9 % part-time students – 3 times, but 7.5 % full-time and 5.7 % part-time students have engaged in mild-intensity physical activities 4 times or more (Tab. 1).

Table 1

Students' participation in PA of different intensity
(*a – full-time; b – part-time students*)

	none (%)		once (%)		twice (%)		3 times (%)		4 times (%)		5 times (%)		6 times (%)		7 times (%)	
	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b
1.*	38.6	30.8	24.1	30.8	13.3	11.5	8.2	11.5	6.3	3.8	4.4	3.8	1.3	3.8	3.8	3.8
2.**	20.9	28.8	21.5	13.5	17.1	15.4	10.1	11.5	7.6	5.8	12	9.6	3.2	3.8	7.6	11.5
3.***	64.6	38.5	12	42.2	10.1	9.6	5.7	1.9	2.5	1.9	0.6	0	1.9	1.9	2.5	1.9

* During last 7days, how many times have you performed a high-intensity physical activity for more than 15 minutes?
**During last 7days, how many times have you performed a moderate-intensity physical activity for more than 15 minutes?
***During last 7days, how many times have you performed a low-intensity physical activity for more than 15 minutes?

On question 4, 'During last **7**days, how often have you engaged in any regular activity long enough to work up a sweat?', there were 3 types of responses, and the results are the following: 8.9 % full-time and 17.3 % part-time students often engage in regular PA, 31 % full-time and 36.5% part-time students – sometimes, but the answer of 60.1 % full-time and 46.2 % part-time students was – never. Students are not engaging enough in high intensity PA, therefore the cardio-respiratory capacity is not trained sufficiently (Fig. 1).

Analysing Godin's and Shephard's questionnaire on PA and calculating ME units, it was observed that 50 % full-time and 55.8% part-time students have accumulated 24 ME and more within last 7 days, which corresponds to PA that provide additional health benefits. Calculated ME units correlate with high intensity PA Spearman's rho Sig. (2-tailed) 0.824 $p<0.01$; moderate intensity PA 0.804, $p<0.01$, low intensity PA 0.399 $p<0.01$. High and moderate intensity PA closely correlate with ME, and

there is a weak correlation between low-intensity PA and sufficient PA that would provide additional health benefits.

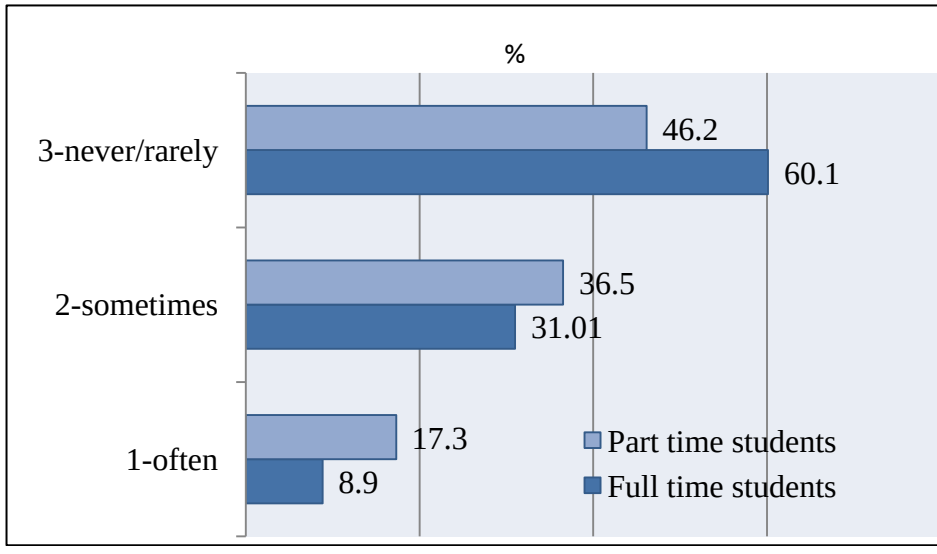

Figure 1. During last **7** days, how often have you engaged in any prolonged PA enough to work up a sweat (with considerable increase of heart beat and breathing rate)?

In the second part of the questionnaire, in addition to questions about PA in the spare time, some traditional questions were added: (1) about aditional PA ,which could be characterized as moderate intense; (2) if students are performing strength exercises at least twice a week as it is suggested by WHO; (3-4) about daily PA walking to/from the univesrity or work, and walking during the lunch break at university or work; (5) if students go for at least 10 minutes moderate of fast-pace walk just for the sake of exercising; (6) about taking part in PA offered by the university.

Summarizing the responses on the question: 'besides the above mentioned PA, how many times during last 7 days you performed any moderate-intensity activities for 30 min or more?' (this can include working in the yard or any activity not mentioned as PA in items1- 4), the following results were obtained: during last 7 days, 17.1 % full-time and 15.4 % part-time students do not engage in extra PA, 20.3 % full-time and 13.5 % part-time students performed extra PA once, 17.1 % full-time and 17.3 % part-time students – twice, 15.8 % full-time and 13.5 % part-time students – 3 times, 19.7 % full-time and 49.4 % part-time students – 4 times and more.

There is a correlation between PA and ME units Spearman's rho Sig. (2-tailed) 0.607; $p<0.01$. The given correlations show the frequency of this type of PA in this study, and the efficiency of this type of PA providing (additional) health benefits.

Strength development exercises (WHO recommendations) are not performed by 58.9 % full-time and 42.3 % part-time students. At least once a week strength exercises are done by 15.2 % full-time and 28.8 % part-time students, twice a week – by 11.4 % full-time and 9.6 % part-time students, but 3 times a week – by 5.7 % full-time and 5.8 % part-time students. There is a medium close correlation between the particular PhA and ME units Spearman's rho Sig. (2-tailed) 0.422; $p<0.01$. The medium close correlation can be explained with insufficient use of strength development exercises among the respondents.

During last 7 days, the average time that students have spent walking to/from university or work is 388.8±158.72 minutes for full-time students and 227.8±235.17 minutes for part-time students. Within the frame of this research, significant reliable correlations between this activity and calculated ME are not found, thus these activities do not provide for students additional health benefits.

During last 7 days, the average time that students have spent walking at lunch time at university or work is 112.5 ±117.2 minutes for full-time and 123.9±119.8 minutes for part-time students. But in order to complete their daily needs, full-time students have walked 383.3±790.9 minutes, but part-time students – 154.9 ±160.9 students. Within the frame of this research, significant reliable correlations between this activity and calculated ME are not found, thus walking at university or work do not provide for students additional health benefits.

54.3 % full-time and 55.8 % part-time students have performed moderate and fast-paced walking for the sake of exercising (at least 10 min a day). There is a weak correlation between this activity and ME units Spearman's rho Sig. (2-tailed) 0.326; $p<0.01$.

Only 12 % full-time and 5.8 % part-time students participated in sports activities organized by higher educational establishments, but 17.1 % full-time and 21.2 % part-time students took part in activities organized outside their universities. The higher educational establishments involved in this research do not provide a sufficient range of sport activities, and part-time students, when in university, mostly spend their time concentrating on their studies. These conditions create a weak negative correlation with ME units Spearman's rho Sig. (2-tailed) – 0.227; $p<0.01$, and do not influence significantly students' PA.

The additional PA, acquired from the second part of the questionnaire, were equalized according to the methodology of Godin G. used for calculating ME, and they were added to already existing ME. The results showed that sufficient PA, which provide additional health benefits, were performed by 67.7 % full-time and 71.1 % part-time students, that is, 17.7 % more for full-time and 15.4 % more for part-time students in comparison with the data obtained from the first part of the questionnaire.

Summarizing acquired data about students' PA habits, it can be concluded that:

1. Analysing the questionnaires on PA suggested by Godin G. and calculating ME units, it became clear that during last 7 days 50 % full-time and 55.8% part-time students have obtained 24 and more ME units, which corresponds with PA that provides essential health benefits.
2. 20.2 % full-time and 28.8% part-time students performed the strength exercises at least twice a week as it is suggested by WHO.
3. Assessing the responses to the question: "Besides the above mentioned PA, how many times during last 7 days you performed any moderate-intensity activities for 30 min or more?", only activities of 6.3% full-time and 15.4 % part-time students (that is, at least 30 min moderate-intensity PA every day) can be considered as sufficient.
4. 54.3 % full-time and 55.8 % part-time students had done moderate and fast-paced walking for the sake of exercising for at least 10 min.
5. During last 7 days, doing the daily chores, full-time students had walked in average 14.24 hours, which is 2 hours a day; but part-time students – in average 8.43 hours, which is 1,1 hour a day.

In the third part of survey, which was based on theory of planned behaviour (TPB), the main factors influencing human behaviour were analysed. They are: (1) attitude towards PA, (2) subjective understanding about PA, (3) perceived behavioural control (referring to human perceptions of their ability to conduct PA), and (4) intentions (planned PA in the future).

Attitude, according to TPB, characterizes the behavioural patterns of an individual; the values from which the individual derives his/her behavioural norms; and in addition, the individual's value orientation and his/her experience are closely related to each other (Ajzen I., 2006). In this survey 8 variables were used evaluating the attitudes of students, 2 control-questions, and Likert scale (from 1 – 7).

Table 2

Attitudes towards physical activity

Participation in regular physical activities for me is:		Mean	Std. Error
1.	Absolutely useless → very useful	6.3	0.08
2.	Absolutely boring → very interesting	5.5	0.09
3.	Extremely harmful → extremely beneficial	6.4	0.05
4.	Extremely unpleasant → extremely pleasant	5.5	0.09
5.	Extremely difficult → very easy	4.5	0.1
6.	Extremely stupid → very clever (activity)	6.1	0.07
7.	Extremely bad → extremely good	6.2	0.06
8.	Extremely stressful → extremely relaxing	4.7	0.1

1. There are no reliable correlations between the usefulness of PA and accumulated ME units.

2. There is a weak correlation between the interest in PA and accumulating sufficient ME; Spearman's rho Sig. (2-tailed) 0.269; $p<0.01$

3. There is a very weak correlation between the beneficial effect of PA and accumulating sufficient ME; Spearman's rho Sig. (2-tailed) 0.188; $p<0.01$

4. There is a weak correlation between the pleasantness of PA and accumulating sufficient ME; Spearman's rho Sig. (2-tailed) 0.291; $p<0.01$

5. There is a weak correlation between the difficultness or easiness of PA and accumulating sufficient ME; Spearman's rho Sig. (2-tailed) 0.280; $p<0.01$

6. There are no reliable correlations between PA as smart behaviour and accumulating sufficient ME.

7. There is a weak correlation between goodness of PA and accumulating sufficient ME; Spearman's rho Sig. (2-tailed) 0.226; $p<.01$

8. There are no reliable correlations between stressfulness of PA and accumulating sufficient ME.

In summary, students recognize the need for PA, highly rate the benefits of PA and its positive influence on health. Importance of PA is followed by attitude towards PA, liking and interest. PA is evaluated as rather pleasant and interesting activity, and for students is neither easy, nor difficult. In general, attitude is in weak correlation with sufficient PA.

Subjective perception of students about PA, in accordance with TPB, is a result of social norms and different influences (Tab. 3).

Table 3

Subjective perception of students about physical activity

Items for determining subjective perception of students		Mean	Std. Error
1.	Most people who are important to me consider that I should participate in regular physical activities strongly disagree → strongly agree	3.9	0.1
2.	Most of the people who are important to me take part in regular physical activities strongly disagree → strongly agree	4.2	0.1
3.	Most of the people who are important for me support my participation in regular physical activities strongly disagree → strongly agree	5.4	0.1

1. There is a weak correlation between the opinion of important people and accumulating sufficient ME; Spearman's rho Sig. (2-tailed) 0.201; $p<0.05$

2. There is a weak correlation between the personal example of people the students respect and accumulating sufficient ME; Spearman's rho Sig. (2-tailed) 0.285; $p<0.01$

3. There is a weak correlation between the support of people the students respect and accumulating sufficient ME; Spearman's rho Sig. (2-tailed) 0.232; $p<0.01$

The opinion of people respected by the students is basically neutral, although the closest people rather support than do not support PA, but often they do not show the initiative and do not influence students' engagement in PA by their personal example.

Perceived behavioural control in accordance with TBP relates to people's perception and their ability to perform a specific action (Tab. 4).

Table 4

Perceived behavioural control of students.

Items of perceived behavioural control		Mean	Std. Error
1.	If only I wanted , I could participate in regular physical activities: strongly disagree → strongly agree	4.9	0.1
2.	How much control do you have when you participate in the regular physical activities? very little control → complete control	4.0	0.1
3.	I take part in regular physical activities ____days a week	2.3	0.1

1. There is a weak correlation between students who 'If only they wanted, they could participate in regular physical activities' and accumulating sufficient ME; Spearman's rho Sig. (2-tailed) 0.285; $p<0.01$.
2. There is a medium strong correlation between control over PA and accumulating sufficient ME; Spearman's rho Sig. (2- tailed) 0.448; $p<0.01$.
3. There is a strong correlation between already performed PA and accumulating sufficient ME; Spearman's rho Sig. (2-tailed) 0.716; $p<0.01$.

The ability to engage in PA students evaluate as if they wanted they could participate in PA, which suggests that there are no serious obstacles for them to engage in physical activities. Respondents sometimes control PA and sometimes do not, which suggests that the motivation for performing PA is not strong enough. Before participating in this survey, the students performed PA in average twice a week.

Intention is indication of person's readiness to engage in a particular activity, and that is considered as a priori behaviour. Intention is based on attitude towards behaviour, subjective norm and perceived behavioural control. Intention is connected with the action in the future and is included in the first item: I plan to engage in regular physical activities days per week (mean 2.7; St. Error 0.1) (Fig. 2).

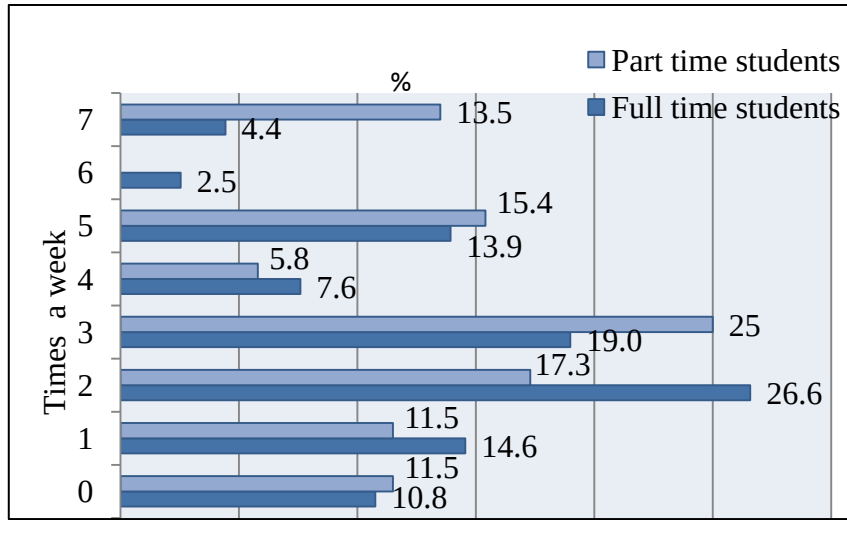

Figure 2. Intention of students to engage in PA

This intention to engage in sufficient PA correlates with gathering sufficient ME Spearman's rho Sig. (2-tailed) 0.618; $p<0.01$. 4.4 % full-time and 13.4 % part-time students have the intention to plan their PA in future 7

times a week (at least 20 min intense PA 3x a week or 30 min. moderate intense PA 5 x a week), 2.5 % full-time students – 6 times a week, 13.9 % full-time and 15,4 % part-time students – 5 times a week, 7.6 % full-time un 5.8 % part-time students – 4 times a week, 19 % full-time and 25 % part-time students – 3 times a week, 26.6 % full-time un 17,3 % part-time students – twice a week, but once a week – 14.6 % full-time and 11,5 % part-time students. 10.8 % full-time and 11.5 % part-time students do not plan to participate in PA.

The acquired correlations show the mutual connections and impact of attitude, subjective behavioural control and intention on formation of PA habits. The main behaviour influencing elements of TPB allow to understand deeper the correlations of formation of PA habits, but does not cover such PA influencing factors as environmental impact, although our study showed a weak correlation between PA offered by universities and PA in which the students get engaged. These correlations cannot be ignored. Similarly like intention is formed by the sum of three elements, therefore factors such as near and distant surrounding environment can bring a considerable influence.

Discussion

Godin`s and Shephard's Leisure -Time Physical Activity Questionnaire has been translated in several languages and quoted at least 1000 times; its validity is approved and recommended for using in medicine and sports science, and the amount of PA is appropriate for measuring the health benefits (Godin, 2011).

PA decreases starting from the late teens, and this trend is continuing until the end of one's life, leading to different health problems. The most commonly used excuses for not exercising are: lack of time, lack of social support, health condition, and lack of premises for PA in the close surroundings. Therefore, it is important to apply behavioural change theories in researching PA as they give additional information which later can be used for elaborating PA programs. Also the world praxis proves the relevance of standard exercise programs and special health-related PA programmes, which are organized and implemented in traditional or special health groups, as membership in such groups brings an effective long-term behaviour change with a positive impact on health (Biddle Stuart et al, 2011).

In recent years, statistical and research data show the following results: in Latvia 42% of higher education students do not attend sports activities as they are not mandatory, 34% attend sports activities if they are organized by

the universities, but 52% of young people do not engage in PA outside the university (Koroļova I., 2010, 41 - 45). The data of this research show a very small group of students (12%), who engage in sport activities in their universities. Because of the economic reasons, many universities are offering limited opportunities for PA, allocating the resources to sports teams but not supporting organized PA for maintenance and improvement of students' health.

Eurostat data for 2008 (sample – students and people who already have obtained higher education, age groups 15 -24 and 25 - 34) show that in Latvia the average PA indicator is 63.7% , which is the leading figure among the post-Soviet countries. FINBALT Latvia (2010) research (which says that in physical exercises at least 30 min, 2-3 times a week or more, engage only 39.9% respondents) contradicts with Eurostat data on PA. Also the data obtained by our research (50% and 55.8% of students actively engaging in PA) indicate a smaller range of physically active respondents, and this fact can be interpreted as a worrying sign – decrease of physical activity among the population and also the students.

Conclusions

50 % full-time and 55.8% part-time students engage sufficiently in some type of PA, which brings essential health benefits.

Additional PA generally increase the accumulated ME units, but they do not provide a balanced development of all physical characteristics.

The world praxis proves the effectiveness of traditionally complex approach, which includes such activities as informing, educating, creating of positive environment, elaboration of PA programmes and monitoring, therefore all correlations revealed by this research are considerable.

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ORIGINAL RESEARCH PAPER

DISTURBANCES OF MUSLES' NEURAL REGULATION IN CONNECTION WITH VEGETATIVE NERVOUS SYSTEM'S FUNCTIONAL STATE

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Abstract

In the practice of applied kinesiology (AK) it has been empirically stated that, having neural regulation disturbance, the muscle cannot use the routine of tonic contraction. Such muscles neural regulation state in AK is called a functionally weak muscle (FWM). It is known from the literature that the reasons for FWM can be: In muscles itself, in segmental, CNS subcortical and cortical levels. The aim: was to find out disturbances of muscles' neural regulations against mechanical irritation when the vegetative nervous system (NS) activity is changed. Subject: 29 LSPA students. Methods: AK, neurologic tests, mathematical statistics methods. Results: Too high activity of the sympathetic NS was noticed, about which we can conclude from results of the eye pupils test where 96% subjects' activity of the sympathetic NS is incompliant from the norm and after ortostatical test 55% subjects showed sympathetic NS increased activity. On the background of such neurological activity, the performed mechanical irritations mostly influenced the increase of the frequency of the body's left side FWM. The biggest increase can be seen in body's left side m. sternocleidomastoideus and the upper part of m. trapezius. Evaluating the influence of mechanical irritation, we can see that in all cases compression of neck's vertebrae causes significant increase of FWM. Conclusion: The results of neurological tests show that more than 76% subjects had incompliance to the norm of the sympathetic NS activity. Using compression in spine's neck – shoulder part, the development of FWM can be seen. The most sensible to this irritation are m. scalenus, m.sternocleidomastoideus and the upper part of m. trapezius on the body's left side.

Keys words: *AK tests, FWM, vegetative NS activity.*

Introduction

In the practice of physiotherapy we often come across with situations when sportsmen performing movements do not do it in optimal routine. Assisting musles are involved in the realisation of the movement, not forming an optimal stereotype of the movement. It is known from the literature that in these kind of situations it is mostly found out that musles agonists in the realisation process of the movement operate only in the routine of phasic contraction. In the practice of applied kinesiology (AK) it has been empirically stated that, having neural regulation disturbance, the muscle cannot use the routine of tonic contraction. Such muscles neural regulation state in AK is called a functionally weak muscle.

It is known from the literature that the reasons for muscle functional weakness can be: in muscles themselves, in segmental, CNS subcortical and cortical levels (Vasiljeva, 1998). In AK practice it has been stated, if the source of the problem is irritated for a short time, muscle neural regulation is normalized for a while, letting it contract in tonic routine.

One of the reasons of formation of functionally weak muscles can be functional changes in segmental level. We provoke these functional changes in segmental level in the back's neck – shoulder part, using mechanical irritation – compression and traction of neck vertebrae, irritation of inhalation and exhalation.

The aim of our research was to find out disturbances of muscle neural regulations against mechanical irritation when the vegetative nervous system activity is changed.

Material and methods

29 LSPA students took part in the research, aged 20 – 25 , from them 17 women and 12 men.

The following methods were used in the research: applied kinesiology (AK tests) tests. With the help of these tests we evaluated whether the investigational muscles (neck flexor muscles m. scalenus, m.sternocleidomastoideus, the upper part of m. trapezius) are or are not functionally weak.

We use AK tests for testing neck flexor muscles, m. scalenus, m.sternocleidomastoideus and upper part of m. trapezius.

Description of AK tests Neck fleksors sitting test: the patient maximally flexes the head and fixes this position (chin to chest). The stabilising hand is behind with the forearm resting over the thoracic spine and the flat hand behind the head. Light contact is made over the forehead. Test vector is in

an arc in the direction of extension. The patient pushes further into flexion (Ramšak & Gerz, 2001).

M. Scalenis test: these muscles can be tested sitting in flexion and about 10 degrees rotation away from the testing side. Ideally the examiner applies pressure with the ulnar edge of the hand on the middle of the patient's forehead in the direction of extension (Ramšak & Gerz, 2001).

M. Sternocleidomastoideus sitting test: the patient holds the head forward and maximal rotation. The stabilising hand supports the head with a flat contact and the forearm rests over the thoracic spine. The testing hand makes contact on the side of the head above the temporo – mandibular joint. Test vector is in an arc dorsally, in the direction of extension. The patient pushes anteriorly, further into flexion (Ramšak & Gerz, 2001).

M. Trapezius – upper division sitting test: the patient lifts the shoulder and drops the head towards the shoulder, with a small degree of rotation to the opposite side. From this position the patient is asked to bring the head and shoulder further together, whilst the examiner tries to pull the head and shoulder away from eachother.

For mechanical irritation of joints of cervico-thorocal region we use compression, decompression, inhalation and exhalation (Ramšak & Gerz, 2001).

Neurological tests were used to evaluate the influence of vegetative nervous system's state against neural regulation of back's neck – shoulder part. Klinoortostatical test was used, the change of body's position works as irritation of vegetative nervous system. Heartbeat frequency reflects the changes in the vegetative nervous system. In the beginning of the test, the frequency of pulss in a minute is detected, the subject being in a vertical position, then the pulss is counted the first 15 seconds after lying down and after standing up. Changing the positions from vertical to horizontal, the parasympathetic part of the vegetative nervous system is irritated, the irritability of this part is normal if the pulss slows down by 4 – 12 beats per minute. Changing the positions from horizontal to vertical, the sympathetic part of the vegetative nervous system is irritated, the irritability of this part is normal if the pulss fastens by 6- 18 beats per minute.

Also eye pupils' reaction test was used – the subject while sitting had light flashed into the eye, a normal reaction is when the pupil of the eye narrows, it shows that the activity of the parasympathetic part of the vegetative nervous system is normal, but, if after flashing the light into the eye the pupil starts to pulse – opens from the narrowed state, it shows that the activity of the sympathetic part of the vegetative nervous system is too high (Aberberga–Augškalne & Koroļova 2007).

Methods of mathematical statistics for finding out the relative frequency of nominal evaluation of stated parametres.

Results

In the beginning we checked muscle (neck flexor muscles, m. scalenus, m.sternocleidomastoideus, the upper part of m. trapezius) neural regulation disturbances. The obtained results are shown in Figure 1.

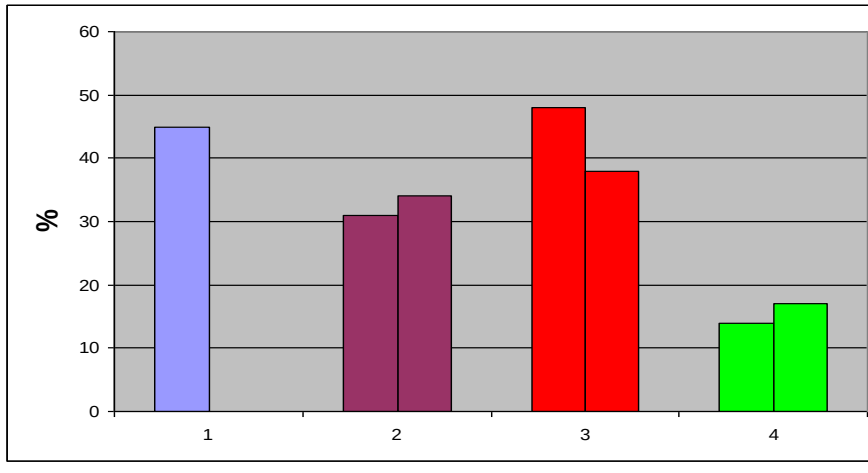

Figure 1. Functional weakness of muscles
(1- neck flexor muscles, 2- m. scalenis, 3- m.sternocleidomastoideus, 4 - m. trapezius upper part)

From the obtained results it can be seen that functional weakness in neck flexor muscles was 45% from the research group, m.scalenis functional weakness on the right side 31% and on the left side 34% from all the group. M. sternocleidomastoideus functional weakness on the right side 48%, on the left side 38% from the research group. M. trapezius upper part's functional weakness on the right side 14%, on the left side 17% from all the research group.

In the next part of the research we evaluated the frequency of neurological test posistive cases in the research group, the results are shown in Figure 2. In the test of eye pupils' reaction 96% of the research group subjects had vegetative nervous system's incompliance to norm. Having evaluated the results of klinoortostatical tests, we found out that incompliant activity of the parasympathetic nervous system had 76% of the subjects and incompliant activity of the sympathetic nervous system had 55% from the research group.

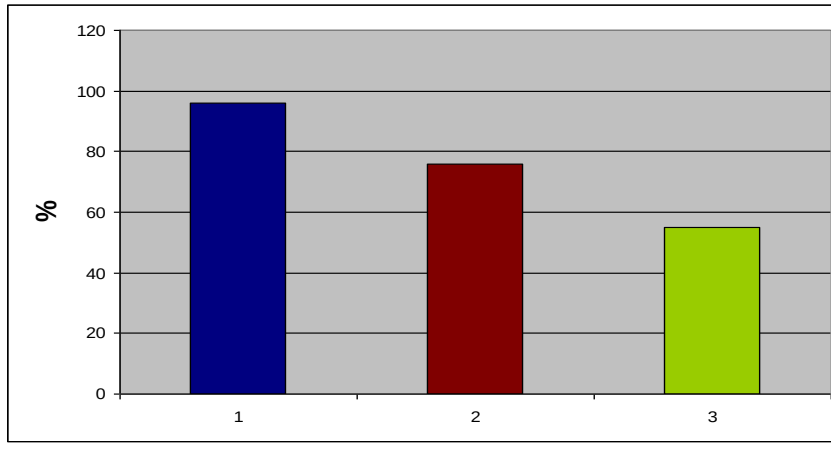

Figure 2. Neurological tests
(1 – reaction of eye pupils test; 2- 3 – klinoortostatical test)

In the further work we evaluated the influence of the mechanical irritation on quality of muscle neural regulation. At first we checked neck flexor muscles, the results can be seen in Figure 3.

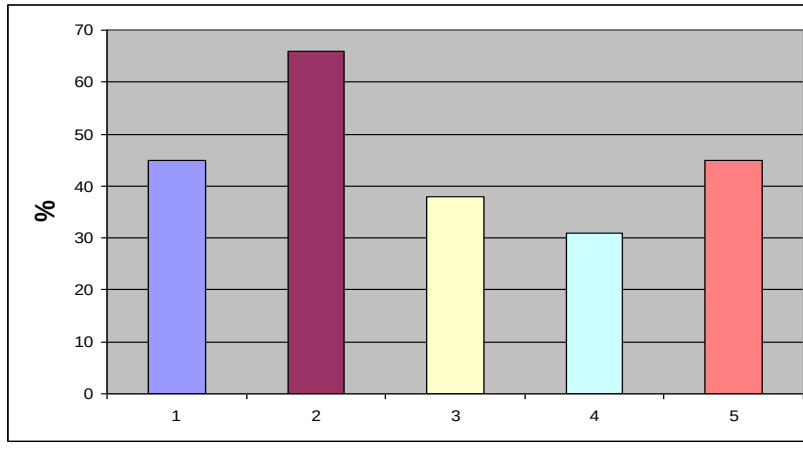

Figure 3. Frequency of neck flexor muscle functional weakness after irritation
(1 – basic test, 2 - irritation compression; 3 – irritation decompression ;
4- irritation inhalation; 5 - irritation exhalation)

From the obtained results we can see that neck flexor muscles' functional weakness at first can be seen 45% from the group, but after the irritation with compression functional weakness increases by 21% and reaches 66%

cases. Performing irritation with decompression functional weakness of muscles decreases by 7% cases and forms 38% from all the research group. Performing irritation by inhalation, muscle functional weakness cases decreased by 14% and fromed 31% from the group. Using exhalation as irritation, we did not notice changes in muscles functional weakness**.**

Further on we checked the influence of mechanical irritation on m. scalenis. The results are seen in Figures 4 and 5.

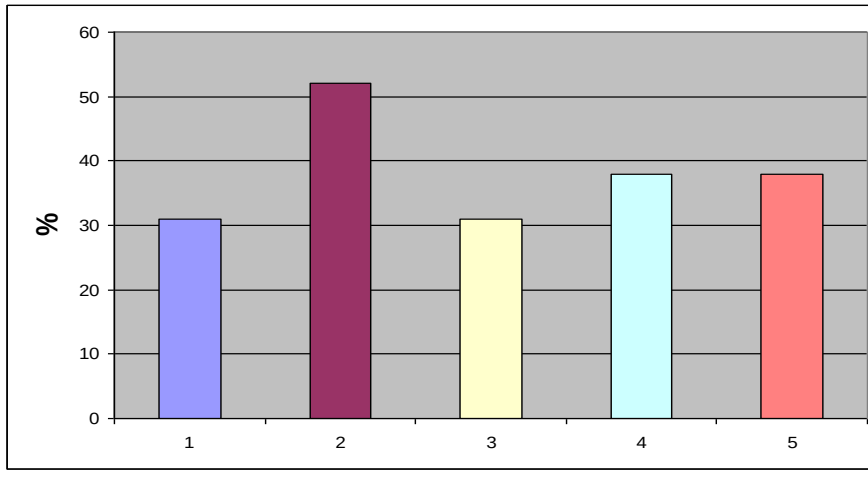

Figure 4. Frequency of functional weakness of body's right side m. scalenis after irritation
(1 – basic test, 2 - irritation compression; 3 – irritation decompression ; 4- irritation inhalation; 5 - irritation exhalation)

At first m. scalenis functional weakness on the right can be seen in 31%, but on the left side 34% from the group, looking at reasults of irritation on this muscle, from the obtained results can be seen that functional weakness after irritation with compression on the right side increases by 21% , reaching 52% cases, on the other hand, on the left side increases by 32%, reaching 66% cases from all the research group. After irritation with decompression, we did not notice changes in muscle functional weakness on the right side, but on the left side functional weakness of muscles increased by 7% , reaching 41% cases from all the research group.

Using inhalation and exhalation as irritation, the cases of muscle functional weakness on the right side increased by 7% and formed 38% from the group, but on the left side the cases of muscle functional

weakness increased by 21%, reaching 52% cases from all the research group.

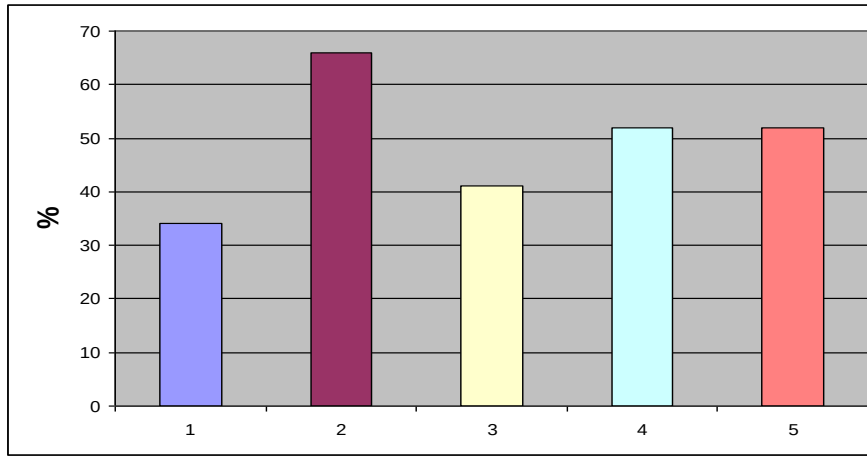

Figure 5. Frequency of functional weakness of body's left side m. scalenis after irritation
(1 – basic test, 2 - irritation compression; 3 – irritation decompression ;
4- irritation inhalation; 5 - irritation exhalation)

During the process of the research the infuence of the mechanical irritation on m. sternocleidomastoideus was evaluated. The obtained results can be seen in Figures 6 and 7.

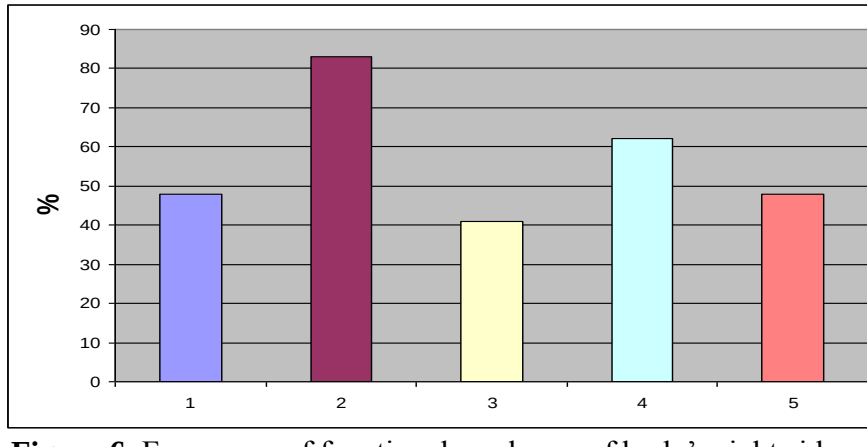

Figure 6. Frequency of functional weakness of body's right side m. sternocleidomastoideus after irritation
(1 – basic test, 2 - irritation compression; 3 – irritation decompression ;
4- irritation inhalation; 5 - irritation exhalation)

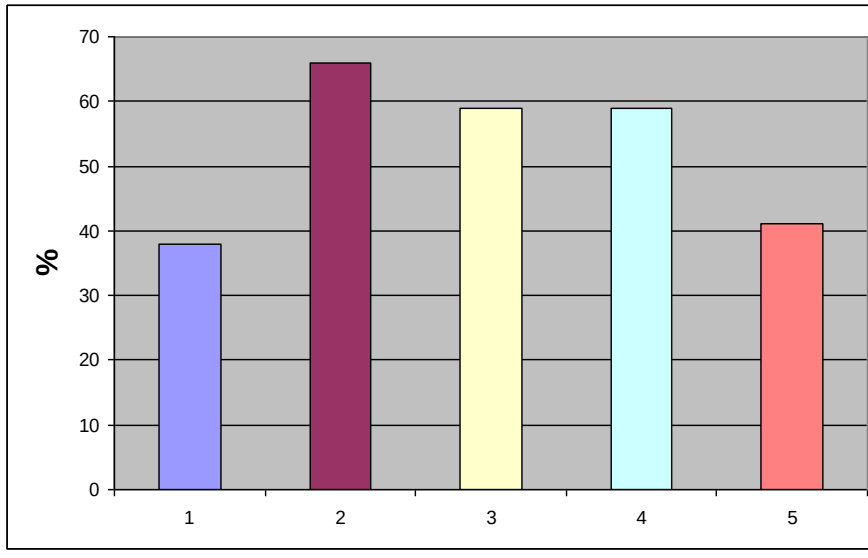

Figure 7. Frequency of functional weakness of body's left side m. sternocleidomastoideus after irritation
(1 – basic test, 2 - irritation compression; 3 – irritation decompression ; 4- irritation inhalation; 5 - irritation exhalation)

At first m. sternocleidomastoideus functional weakness on the right side can be seen 48%, but on the left side 38% from the group, looking at the influence of irritation on the muscle, from the obtained results we can see that functional weakness after irritation with compression on the right side increases by 35% , reaching 83% cases, but on the left side increases by 28%, reaching 66% cases from all the research group. After irritation with decompression muscle functional weakness decreased by 7%, reaching 41% cases, but on the left side muscle functional weakness increased by 21% , reaching 59% cases from all the research group.

Using inhalation as irritation the cases of muscle functional weakness on the right side increased by 14% and formed 62%from the group, but on the left side the cases of muscle functional weakness increased by 11% , reaching 59% cases from all the research group. Using exhalation as irritation we did not notice changes in muscle functional weakness, but on the left side cases of muscle functional weakness increased by 3%, reachingt 41% cases from all the research group.

During the research process the influence of mechanical irritation on m.trapezius (the upper part). The obtained results can be seen in Figures 8 and 9.

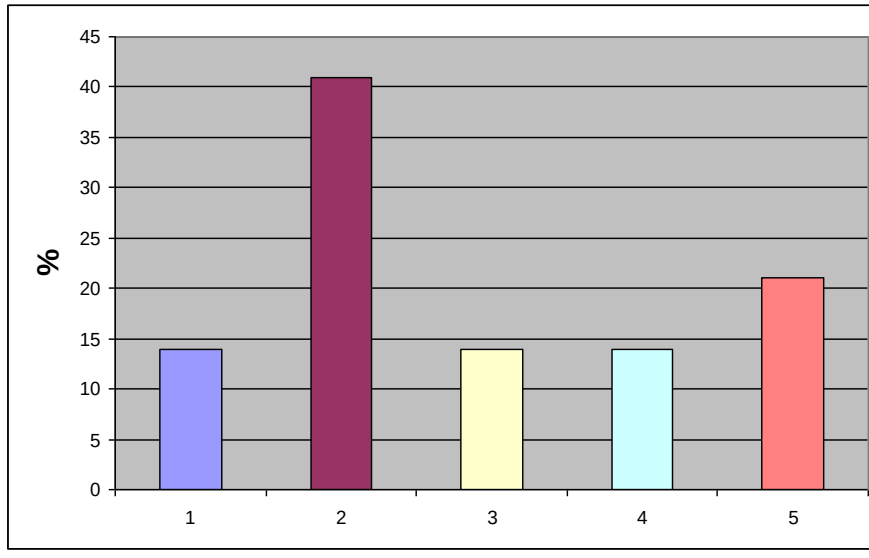

Figure 8. Frequency of functional weakness of body's right side upper part of trapezius after irritation
(1 – basic test, 2 - irritation compression; 3 – irritation decompression;
4- irritation inhalation; 5 - irritation exhalation)

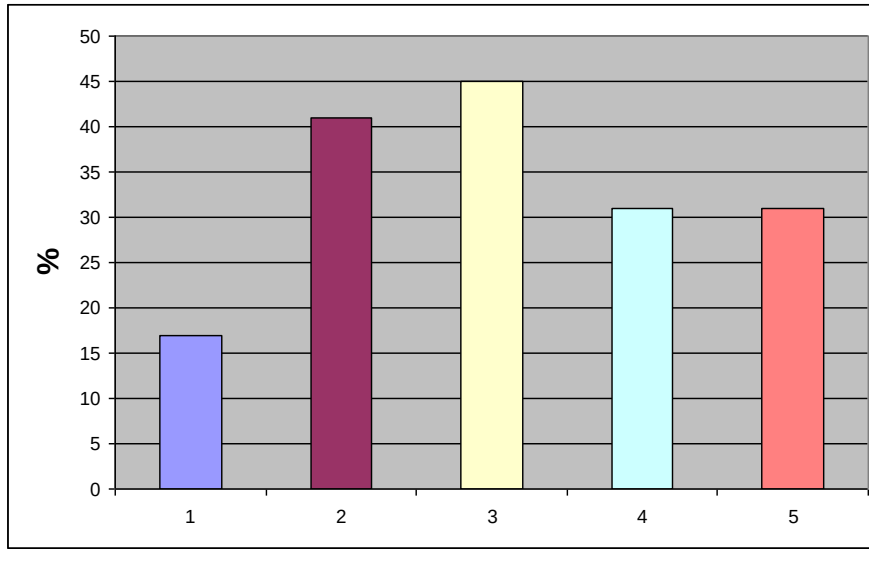

Figure 9. Frequency of functional weakness of body's left side upper part of trapezius after irritation
(1 – basic test, 2 - irritation compression; 3 – irritation decompression;
4- irritation inhalation; 5 - irritation exhalation)

At first m.trapezius functional weakness of the upper part on the right side can be seen 14%, but on the left side 17% from the group, looking at the result of the irritation on the muscle, from the obtained results we can see that functional weakness after irritation with compression on the right side inreases by 37% , reaching 41% cases, but on the left side increases by 24%, reaching 41% cases from all the research group. After irritation with decompression we did not notice changes in muscle functional weakness, but on the left side muscle functional weakness increased by 28%, reaching 45% cases from all the research group. Using inhalation as irritation the cases of muscle functional weakness on the right side increased by 3% and formed 17% from the group, but on the left side the cases of muscle functional weakness increased by 14%, reaching 31% cases from all the research group.

Using exhalation as irritation, the cases of muscle functional weakness on the right side increased by 7% and formed 21% from the group, but on the left side the cases of muscle functional weakness increased by 14%, reaching 31% cases from all the research group.

Discussion

From the obtained results we can conclude that the research group evidently has incompliance from the norm of the vegetative nervous system's activity. Mainly too high activity of the sympathetic nervous system was noticed, about which we can conclude from results of the eye pupils test where 96% subjects' activity of the sympathetic nervous system is incompliant from the norm and after ortostatical test 55% subjects had sympathetic nervous system's increased activity.

On the background of such neurological activity, the performed mechanical irritations mostly influenced the increase of the frequency of the body's left side functional weakness of muscles. The biggest increase can be seen in body's left side m. sternocleidomastoideus and the upper part of m. trapezius. Unfortunately it is not possible to compare our results of muscle functional weakness caused from mechanical irritation with other findings becaus such problems are not discussed in physiological research papers.

Evaluating the influence of mechanical irritation, we can see that in all cases compression of neck's vertebrae causes significant increase of muscle functional weakness. Here we could find connections with, increased cervical lordose and cervicothorocal part's kyfose influences the narrowing of the segments' lateral foramina, which is discussed by authors (Cailliet, 1981; Kapreli, Vourazanis & Strimpakos 2008), but nobody talks about narroving influence on muscle functional weakness.

Evidently, in this research group, as the cause of developing of functionally weak muscles could be disfunctions of neck vertebrae segments. Taking into account the fact that the membranes of nerve routes are powerfully innervated with vegetative nervous systems' nerve receptors, mechanical irritation of the routes with compression, narrowing lateral foramina, will directly influence the activity of the vegetative nervous system. Again such fenomena are not discussed in physiological literature.

This increased activity of the sympathetic nervous system, which was seen in the research group, is closely connected with muscle functional weakness, which is caused by the compression of neck vertebrae.

The decompression of neck vertebrae does not significantly influence muscle functional weakness, except the body's left side upper part of trapezius and strenocleidomastoideus muscles, of which the frequency of muscle functional weakness increases.

To a lesser extent inhalation and exhalation irritations cause the increase of the frequency of muscles' functional weakness also to the body's left side muscles, thus, the body's left side muscles are more liable to incompliance from the norm of neural regulations. Such asymmetric change of muscle functional state can not be explained only by mechanical irritations of neck vertebrae segments. This vertebrae segments asymmetric irritation can be provided by the movement restrictions in intervertebral right or left side joints. There are references in literature sources that there are connections between disturbances of breathing function and the functional state of neck vertebrae (Kapreli, Vourazanis & Strimpakos 2008; Kirpalani & Mitru 2008).

Therefore in the further research the influence of breathing function's symmetry or asymmetry on muscle funtional weakness of neck – shoulder part should be evaluated.

Conclusions

The results of neurological tests show that more than 76% subjects had incompliance to the norm of the sympathetic nervous system's activity. For such contingent irritation of back's neck – shoulder part's segments cause significant changes in muscle (neck flexor muscles, m. scalenus, m.sternocleidomastoideus, the upper part of m. trapezius) neural regulation. Using compression in spine's neck – shoulder part, the development of muscle funtional weakness can be seen. The most sensible to this irritation are m. scalenus, m.sternocleidomastoideus and the upper part of m. trapezius on the body's left side.

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REVIEW PAPER

THE ROLE OF MUSCLE DAMAGE IN THE ETIOLOGY OF OVERTRAINING SYNDROME

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Abstract

A complex of conditions leads to the development of overtraining syndrome. Overtraining syndrome is associated with peripheral-cellular and central-cerebral processes, hormonal-neural regulation and transmission mechanisms. The decrease in physical work capacity is substantially related to the muscle damage and a decrease in muscle oxidative potential. The review describe mainly the balance between training stimulus and recovery, skeletal muscle damage and defense systems, regeneration as well as the role of reactive oxygen species, heat shock proteins and insulin-like growth factors in overtrained skeletal muscles.

Key words*: overtraining syndrome, skeletal muscle damage, regeneration*

Introduction

High volume or intensity exercise disrupts body homeostasis and the body has to recover. Inappropriate volume or intensity of exercise may cause a maladaptive cellular or tissue response due to an imbalance between load and recovery (Foster, Synder and Welsh, 1999). Disruptions in cellular homeostasis appear to be key factors in the development of overtraining syndrome (Steinacker et al., 2004; Hohl et al., 2009). Tissue effects arise from these cellular disruptions. Overtraining has been defined as stress-recovery imbalance, i.e. too much stress combined with too little time for regeneration (Halson and Jeukendrup, 2004; Meeusen et al., 2007; Lehmann et al., 1999). Short-term overload, also called overreaching or supercompensation training, is a usual part of athletic training, which leads to a state of overreaching in affected athletes (Halson and Jeukendrup, 2004; Lehmann et al., 1999). Overreaching is characterized by a transient

performance incompetence, which is reversible within a short-term recovery period and can be rewarded by a state of supercompensation (Meeusen et al., 2007; Lehmann et al., 1999; Foster, Daniels and Seiler, 1999). The aim of the present review is to describe the role of skeletal muscle damages in the development of overtraining syndrome

The role of recovery

A significant decrease in physical work capacity during overtraining as compared to the enhanced training protocol suggests, that lack of recovery in the training protocol leads to overtraining. If the training stimulus lasts too long and training sessions are so frequent that they interrupt the recovery phase, the necessary adaptation does not occur (Seene et al., 2008; Foster, Synder and Welsh, 1999; Lehmann et al., 1999). The importance of recovery is evident from the fact that after symptoms of overtraining appear, a much longer recovery time is needed than before (Seene et al., 2004). The day after the volume was decreased by 60%, the participants were able to tolerate 150% of the prior exercise volume. After the appearance of overtraining symptoms on the day after the training volume was decreased by 60%, the participants could tolerate only 110% of the prior exercise volume (Kaasik and Seene, 2010). A further decrease in the volume did not have any effect since the contractile apparatus had been exhausted, damaged and physical work capacity (PWC) did not recover sufficiently (Seene et al., 2008).

The role of muscle fiber damage

Reactive oxygen species (ROS) are involved in tissue damage (Pansarasa et al., 2002; Kang et al., 2009). The reactive species include superoxide anion, hydrogen peroxide and hydroxyl radical. ROS may cause cell injuries, such as lipid peroxidation, enzyme inactivation, changes in intracellular redox state and DNA damage (Halliwell and Gutteridge, 2007; Urso and Clarkson, 2003). Cells possess enzymatic defense systems to reduce the risk of oxidative injury, i.e. superoxide dismutase, glutathione peroxidase and catalase with superoxide radicals and organic hydrogen peroxides, respectively (Duntas, 2005; Yaegaki et al., 2008). Increase in ROS production occurs during physical exercise and the resulting oxidative damage arises in muscle, liver, blood and other tissues (Venditti and Di Meo, 1997; Itoh et al., 1998; Magonis et al., 2007). Exhaustive training has been associated with enhancement of oxygen consumption in skeletal muscles (Packer, 1986; El-Sayed, Ali and El-Sayed Ali, 2005; Santalla, Naranjo and Terrados, 2009; Malek and Olfert, 2009), an increase in lipid peroxidation, and inhibition of key mitochondrial enzymes, such as citrate synthase and malate dehydrogenase (Urso and Clarkson, 2003; Margonis et

al., 2007; Ji, Stratman and Lardy, 1988). Enhanced endurance training does not lead to functional damage and promotes muscular adaptation (Seene et al., 2007; Carcia-Pallares et al., 2009).

Regeneration in damaged skeletal muscle

Muscle fibers regenerate via activation of quiescent precursor cells (satellite cells) and proceed with the formation of proliferating progenitors that fuse to generate differentiated myofibers (Wagers and Conboy, 2005). These cells activated by muscle injury give rise to intermediate progenitor cells expressing the myogenic transcription factor Pax-3, which divide asymmetrically and differentiate into Pax-3^{-}, Myf-5^{hi}, $desmin^{hi}$ myoblasts (Conboy and Rando, 2002). Regeneration in overtrained skeletal muscle is slow as lack of Insulin-like growth factor-I (IGF-I) and mechano growth factor (MGF) prevents the activation of satellite cells under the basal lamina of muscle fibers (Fig.1).

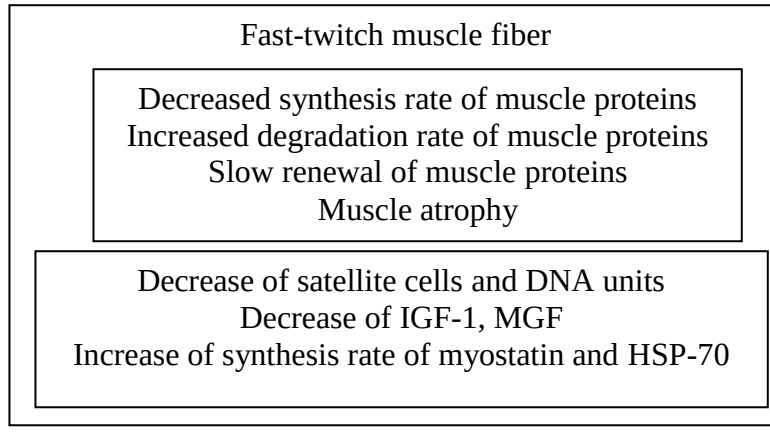

Figure 1. Reasons of slow regeneration in overtrained skeletal muscle
IGF-1 – insulin-like growth factor-1
MGF – mechano growth factor
HSP-70 – heat shock protein-70

If the number of satellite cells in skeletal muscle increased during endurance training (Seene and Umnova, 1992), overtraining led to a decrease in satellite cell number (Seene, Kaasik and Umnova, 1999). A decrease in the number of satellite cells is the reason why new fibers do not form and damaged fibers do not regenerate appropriately since satellite cells do not fuse with damaged fibers. Lack of satellite cells also leads to a decrease in the differentiation of fibers that form since levels of transcription factors, except for myostatin, decrease. Lack of MGF leads to

apoptosis. If muscle fibers do not regenerate, muscle atrophy develops. Only myostatin and heat shock protein (HSP-70) synthesis increases in atrophied muscle (Fig.1). A decrease of synthesis rates of muscle proteins, particularly myofibrillar proteins and increased protein degradation lead to the "wastage" of muscle. A decrease in myonucleus numbers and DNA damage lead to a decrease in DNA units in overtrained muscle (Fig.1). Lack of myonuclei, decreased synthesis and an increased degradation rate of muscle proteins, particularly myofibrillar proteins (Seene et al., 2004), lead to the development of overtraining caused myopathy (Seene, Kaasik and Umnova, 1999).

The activation of Sc is important for maintaining a muscle size, i.e. myonuclear domain size or DNA unit. The reason for decrease of muscle mass in overtrained skeletal muscle is the lack of addition of new nuclei (Seene et al., 2004). IGF-I is a factor that affect many steps in the control of gene expression, including cell proliferation, differentiation and degradation processes (Adams, 1998). It is widely accepted that many of the anabolic effects of the growth hormone may result from a growth hormone-stimulated increase in IGF-I production (Elloumi et al., 2005; de Graaf-Roelfsema et al., 2007; de Graaf-Roelfsema et al., 2009. IGF-I simulate amino acid transportation, which is essential to tissue growth. Autocrine/paracrine processes involving muscle-derived IGF-I may play a pivotal role in linking the mechanical stimulus to the muscle's morphological and biomechanical adaptations (Goldspink, 2000). It has been shown that in response to stretch or increased mechanical activity, the muscle locally produces a special isoform of IGF-I (autocrine) that is directly linked to the activation of gene expression necessary for muscle repair, maintenance and remodeling. The product of this isoform is called the MGF and differentiate it from the liver IGFs that have more systemic action (Goldspink, 1999). It has been shown that IGF-1 is associated with an impairment of blood fluidity, possibly due to a direct effect on red cell deformability and aggregability (Monnier et al., 2000).

Muscle atrophy develops further as myostatin expression in these muscles increases. Overtraining also leads to the decreased differentiation of muscle fibers since transcription factors are not expressed in overtrained muscle.

The role of immune reactions

Heat shock protein (HSP) play an important role as intracellular chaperones in the immune system and may protect cells from the harmful effects of environmental stress factors (Locke and Noble, 1995; Ferenbach and Niess,

1999). HSPs may also function as extracellular signals to activate the immune response (Moseley, 2000; Binder, Blachere and Srivastava, 2001).

Endurance exercise is a powerful stimulus of intracellular HSP expression in immune cells, in muscle and other tissues, such as myocardium, liver, spleen and brain (Locke and Noble, 1990; Liu et al., 1999; Ferenbach et al., 2000). An increased expression of heme oxygenase-1 in leucocytes, which appears only after long, intensive competitive endurance exercise, indicates that the duration of endurance exercise plays an important role in the activation of the anti-stress system. The release from intact muscle cells may be excluded because the increase of HSP-72 in the peripheral blood preceded any HSP-72 increase in exercising muscle (Walsh et al., 2001), and non-damaged muscle did not release HSP-72 into the circulation (Fabbraio et al., 2002). On the other hand, HSP-72 increased in muscle and early damage of skeletal muscle cells has been described after intense endurance exercise followed by secondary immunological changes (Tidball, 1995). Necrotic cells released HSP-72, delivered a maturation signal to dendritic cells and activated the NF-kappaB-pathway (Basu et al., 2000). Prolonged, competitive endurance exercise induces a more pronounced response of extracellular HSP-72 in the peripheral blood of endurance athletes compared with more intensive but shorter exercise (Ferenbach et al., 2002).

Cytokines have also role in the exercise-induced immune reaction and exercise-related metabolic and cellular signal transduction, and are capable of increasing HSPs synthesis (Liu and Steinacker, 2001). HSPs may act as a cytokine in reaction to exhaustive exercise, stimulate tumor necrosis factor-alpha (TNF-α), interleukin (IL)-β, and IL-8 in monocytes, and activate CD 14-dependent and Ca^{2+}-dependent pathways (Steinacker and Liu, 2002).
Exhaustive exercise increases athletes' energy and protein needs (Lowery and Forsythe, 2006). It has been shown that basal metabolic rate increases significantly after skeletal muscle trauma (Long et al., 1979). It is necessary to understand that the acquisition of new muscle mass of overtrained athletes in an energy-costly process as 2300-3500 kcal surplus is required to build each pound of new muscle tissue (Williams, 2005). Intensive fractional synthesis rate of myosin heavy chain (MyHC) in the muscle tissue protein intakes about two times (Brodsky et al., 2004).

Contracting muscle release cytokines, which in turn create many effects in other organs, including the brain. All these different mechanisms create sensations of fatigue and exhaustion in the mind of the exercising subject (Ament and Verkere, 2009). Exhaustive exercise induces an anti-inflammatory effect in skeletal muscle, especially in fast-twitch (FT) muscle

fibers and a pro-inflammatory effect in adipose tissue (Neto et al., 2009). This effect contributes to increased lipolysis to provide energy for the exercising muscle.

The DNA content in muscle, protein and DNA ratio in FT muscles decreases during overtraining showing signs of myopathy as a result of muscular overload (Seene et al., 2004). Overtraining caused myopathy is characterized by slow turnover of MyHC in FT muscle fibers, depressed neuromuscular and depressed alpha-motoneuron excitability (Seene et al., 2008).

The decreased synthesis and increased degradation rate of contractile proteins that was observed in overtrained muscles is in good agreement with the increased occurrence of destructive processes in FT fibers excitability (Fig.2).

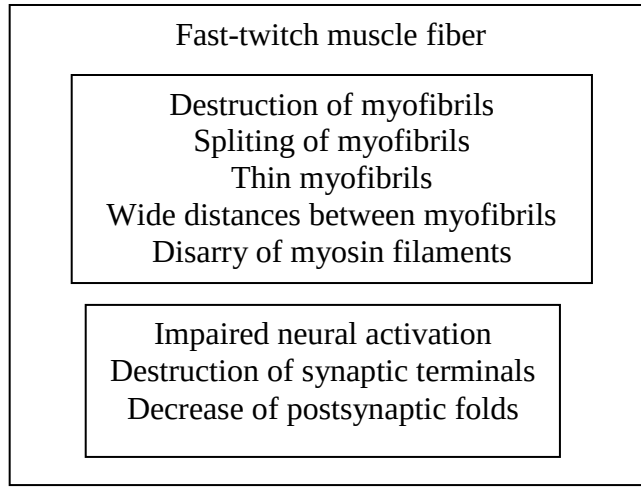

Figure 2. Destructive processes in nerve-muscle structures leading to the muscle weakness during overtraining

Contrary to the decreased turnover rate of contractile proteins, overtrained athletes show a persistent high synthesis rate or concentration of HSPs during exercise training, which might show the increased stress tolerance of affected cells and conduct cellular repair process (Salo, Donovan and Davies, 1991). Damaged muscle tissue releases cytokines, which act in the hypothalamus to re-set the regulatory mechanisms that, among other things, shut down functions that might promote further damage.

The molecular chaperones play a universal role in maintaining homeostasis of muscle fibers. HSPs in skeletal muscle are fiber-type specific (Liu and Steinacker, 2001) and may occur during overtraining in an effort to counteract the disruption of muscle function.

Muscle fiber phenotype maintenance and transition depends on motoneuron-specific impulse patterns, neuromuscular activity and mechanical load. Depending on the type, intensity, and duration of changes in any of these factors, muscle fibers adjust their phenotype to meet the altered functional demands (Pette, 2001).

Role of oxidative capacity of muscle

Skeletal muscle size is determined by a balance between protein accumulation and degradation. These two processes are tightly regulated and interrelated (Seene, Kaasik and Alev, 2011). Protein synthesis and protein degradation systems need ATP and muscle energy level is one of the cellular check points that decide either to promote growth or activate protein breakdown and atrophy (Sandri, 2008).

Overtraining is accompanied by a decreased synthesis rate of muscle proteins and an increased protein degradation rate in skeletal muscle (Seene et al., 2004; 2005; 2008).

The destruction of myofibrils is shown in volume-induced overtrained skeletal muscles, mainly in FT oxidative-glycolytic muscle fibers and in slow-twitch (ST) oxidative muscle fibers (Seene et al., 2008).

Changes in MyHC isoforms show that contractile properties of ST and FT muscles change in different ways in accordance with muscle oxidative capacity (Seene et al., 2007; 2008). Changes in myosin light chain (MyLC) isoforms during overtraining are much smaller in comparison with subsequent changes in MyHC isoforms (Kaasik and Seene, 2010). The most significant changes in MyLC isoforms during overtraining appeared in FT muscles (Seene et al., 2008). Regeneration of MyHC IIb and MyLC 3f isoforms, which have high affinity to each other in FT muscle fibers after tissue damage, proceeds at different speeds (Alev, 2009). MyLC 3f isoform regenerates about two times faster than that of MyHC IIb isoform in FT muscle fibers with low oxidative capacity (Alev et al., 2009). MyLC 1 isoform can negatively affect myoblast proliferation by facilitating myoblast withdrawal from cell cycle and differentiation (Zhang et al., 2009).

The changes in contractile protein isoforms pattern in overtrained skeletal muscle show the significance of changes in cellular and molecular level for diagnostics of overtraining syndrome. Molecular changes of contractile proteins may be the way how to prevent the development of overtraining syndrome among competitive endurance athletes.

Conclusions

Overtraining in the skeletal muscle is substantionally associated with muscle damage. Muscle damage is associated with calcium overload, free radical formation, a decrease in energy supply and a reduction in muscle defense system. Exhaustive exercise is associated with enhanced oxygen consumption in skeletal muscles, an increase in lipid peroxidation and inhibition of key mitochondrial enzymes. Cytokines play a role in the exercise-induced immune reaction, metabolic and cellular signal transduction as well as in increasing HSP synthesis. A decrease of IGF-1 and MGF results in the slow regeneration in overtrained muscles. Increased muscle protein degradation and a decreased synthesis rate in overtrained skeletal muscle as well as changes in MyHC isoform pattern are fiber type specific. Molecular changes of contractile proteins isoforms play the important role in changes in functional properties of overtrained skeletal muscle.

Acknowledgements

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CURRENT NEWS

Latvijas Sporta pedagoģijas akadēmija

Latvian Academy of Sport Education

LASE 6th PhD and Master Student Scientific Conference
"Theory and Practice in Sport Science"
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The information is placed on the website:
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CONGRATULATION

We congratulate ***Signe Luika***, the doctoral student of the Latvian Academy of Sport Education, with the defence of her Thesis "Innovative Model of Strategic Planning of Sport Sector in Latvia" (Sport Science) at the Latvian Academy of Sport Education on January 17, 2013. Supervisor Prof. U.Grāvītis.

PhD Signe Luika is a lecturer in the Department of Management and Communication Science.

We congratulate ***Kalvis Ciekurs***, doctoral student of the Latvian Academy of Sport Education, with the defence of his Thesis "Effect of Local Vibration on Rower Anaerobic Power and Anaerobic Power Capacity" (Sport Science) at the Latvian Academy of Sport Education on February 28, 2013. Supervisor Prof. V. Krauksts.

PhD Kalvis Ciekurs is a Lecturer in the Department of Skiing, Shooting, Orienteering, Tourism and Recreation.

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We congratulate ***Monta Jakovļeva***, the doctoral student of the Latvian Academy of Sport Education, with the defence of her Thesis "The Development of Coach Professional Didactic Competence in Further Education" (Sport Science) at the Latvian Academy of Sport Education on February 14, 2013. Supervisor Prof. J.Žīdens.

PhD Monta Jakovļeva is a researcher in the Department of Management and Communication Science.

We congratulate ***Andris Molotanovs***, doctoral student of the Latvian Academy of Sport Education, with the defence of his Thesis "Goalkeeper Competition Activity Optimization in Handball (taking HC LSPA team as example)" (Sport Science) at the Latvian Academy of Sport Education on February 28, 2013. Supervisor Prof. J.Žīdens.

PhD Andris Molotanovs is a lecturer in the Fire Safety and Civil Protection College.

Theses developed with ESF support under project *"Support for Sport Science"* No. 2009/0155/1DP/1.1.2.1.2/09/IPIA/VIAA/010 programme of work „Human resources and Employment" 1.1.2.1.2. sub activity *„Support for Doctoral Study Programme Realization"*

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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.

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