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ORIGINAL RESEARCH PAPER

SPEED ADAPTATION IN CYCLE DURATION AND EMG DURING RUNNING AT DIFFERENT TERRAIN AND GROUND CONDITIONS

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Abstract

The purpose was to study how important stride parameters such as the cycle duration, electromoygraphical (EMG) burst duration and activation level change with running speed and with change in terrain and ground conditions. In total six male regional to national level elite orienteers participated in the study. Mean (range), height and weight were 25 (19-32) years, 180 (1.74-1.88)m and 71 (67-75)kg. Hip joint angular displacement was determined by means of an electrogoniometer. The electrical activity in m. vastus lateralis (VL) of the right leg was recorded with bipolar surface electrodes taped over the belly of the muscles. Electrogoniometric and EMG data were recorded by means of a portable data logger at a rate of 1000 Hz. The time between markers in test intervals was recorded by means of an ultra sound based timing system (Time-it, Eleiko AB, Sweden). The participating orienteers performed, after a warming up period, runs on four different horizontal ground surfaces; gravel road, forest terrain (low density undergrowth), timber felling and wet moss. The recordings were done during running in four different constant self determined speeds: slow, medium, fast (competition speed) and maximum speed. The cycle duration decreased in a similar manner with speed during running in all the tested terrain conditions and gravel road. The burst duration of the knee extensor m. vastus lateralis showed the same trend as the change in cycle duration with speed. The same increasing trend in mean EMG activation level with speed is seen in all terrain conditions and gravel road. However, specific differences between terrain and surface conditions in cycle duration, burst duration and EMG amplitude were present.

Key words: *speed adaptation, terrain, ground surface, orienteering.*

Introduction

Orienteering is a sport that is extremely demanding, not only with respect to work load, but also with respect to running techniques that has to be performed in different terrain and on different surfaces at different speeds. The change in surface from hard to soft and from even to extremely uneven etcetera will impose a challenge to the neuro-motor system in the execution of an optimal movement for the specific demands. From a motor control point of view it would be beneficial to use a similar basic movement pattern over the whole velocity range and on different surfaces. Very few studies have been performed in orienteering in general and biomechanical aspects in particular (Creagh & Reilly 1997). However, one exception from this is a study by Havas and Kärkkäinen (1995) that investigate the effect of running speed and surface on muscle activity during running on a path and in terrain. This study showed an increased activation of m. gastrocnemius, m. biceps femoris, m. vastus lateralis and m. rectus femoris with speed. Differences in the integrated EMG signal between running in the terrain and on a path were seen in m. gastrocnemius and m. biceps femoris but not in m. vastus lateralis and m. rectus femoris at increased relative speed. These data suggest a generic speed adaptation but specific EMG activation output related to ground surface. With reference to this the present study aimed at further investigates the cycle duration and EMG response during running in four different ground surface conditions: gravel road, forest terrain, wet moss and timber felling. Further, our aim was to investigate how a typical relevant muscle for running and cycle duration adapt to increased speed within the different terrain conditions. Thus, this investigation will add important detail information how the system solve the motor control as a response to increased speed and change in terrain and ground conditions. More specifically, the purpose was to study how important stride parameters such as the cycle duration, electromoygraphical (EMG) burst duration and activation level change with speed and with change in running terrain and ground conditions.

Material and methods

Participants. In total six male regional to national level elite orienteers participated in the study. Mean (range), height and weight were 25 (19-32) years, 180 (1.74-1.88) m and 71 (67-75) kg. The study was approved by the Regional Ethic Committee. The participants wore conventional orienteering shoes and light clothing during the tests.

Electrogoniometry. Hip joint angular displacement was determined by means of an electrogoniometer that was attached by elastic tape and straps

over the hip joint (trochanter major) (Fig. 1A). Angular displacement of the hip joint of the right leg was used to determine the cycle duration (Fig. 1B). Left and right leg symmetry was assumed. Angular displacement in the sagittal plane was recorded. The electrogoniometric data was sampled at 1000 Hz. Cycle duration and stride rate was calculated from consecutive cycles of the hip angular displacement (Fig. 1B).

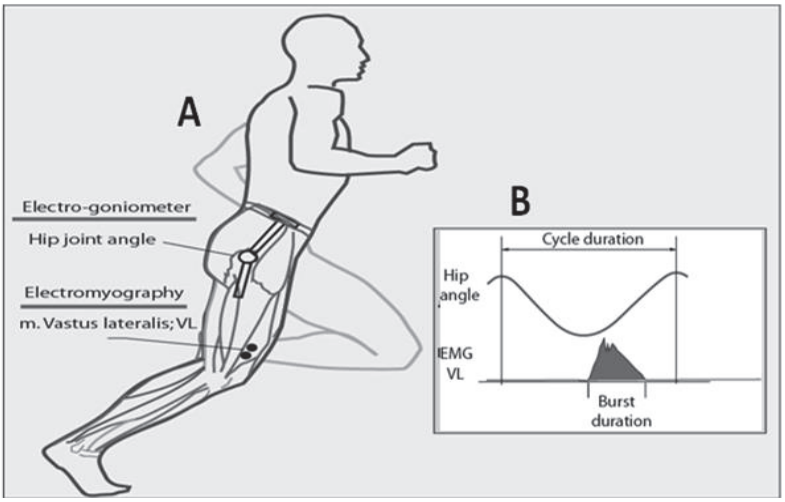

Figure 1. Electromyography (EMG)

Electromyography (EMG). The electrical activity in m. vastus lateralis (VL) of the right leg was recorded with bipolar surface electrodes taped over the belly of the muscle (see Figure 1A for placement of the electrodes). The site of the electrode placement was gently shaved and cleaned with alcohol before application of the surface electrodes. The EMG data was recorded at 1000 Hz.

Data logging. Electrogoniometric and EMG data were recorded by means of a portable data logger (ME3000P, Mega Electronics, Finland).

Test settings and test speeds. The participating orienteers performed, after a warming up period, runs at four different horizontal ground surfaces; gravel road, forest terrain (low density undergrowth), timber felling and wet moss. The recordings were done during running in four different constant self determined speeds: slow, medium, fast (competition speed) and maximum speed. The test intervals were marked in the terrain settings and on a gravel road. The time between markers in the test intervals was recorded by means of a ultra sound based timing system (Time-it, Eleiko AB, Sweden). The mean velocity was calculated by dividing the length between time markers by the time spent between the markers. The participants were allowed repeated runs (shorter than 15s) in the test intervals if the preferred speed was not reached and rest periods (about 90s)

were allowed between runs to avoid that fatigue affected the performance by the participants.

Analysis. The stored data was analyzed by means of a custom made program script in the Matlab® software (Matlab Inc. USA). The hip angular displacement (onset flexion in one cycle to onset flexion in the following cycle) was used to determine the stride cycle duration in repeated cycles (see Figure 1 B). Each EMG burst was rectified and filtered and the mean EMG amplitude was calculated by dividing the area under the EMG curve by time.

Statistics. Standard descriptive statistics including means, standard deviations (sd) and ranges were employed in the data analysis. Differences between mean data were tested using repeated measures ANOVA and the alpha level was set to 0.05 to assume statistical significance. Post hoc comparisons were made using the Tukey procedure.

Results

The cycle duration decreased in a similar manner with speed during running in all the tested terrain conditions and gravel road (Fig. 2A). The burst duration of the knee extensor m. vastus lateralis showed the same trend as the change in cycle duration with speed (Fig. 2B). The same increasing trend in mean EMG activation level with speed was seen in all terrain conditions and gravel road (Fig. 2B-C). Specific differences in cycle duration, burst duration and EMG amplitude are present in Figure 2.

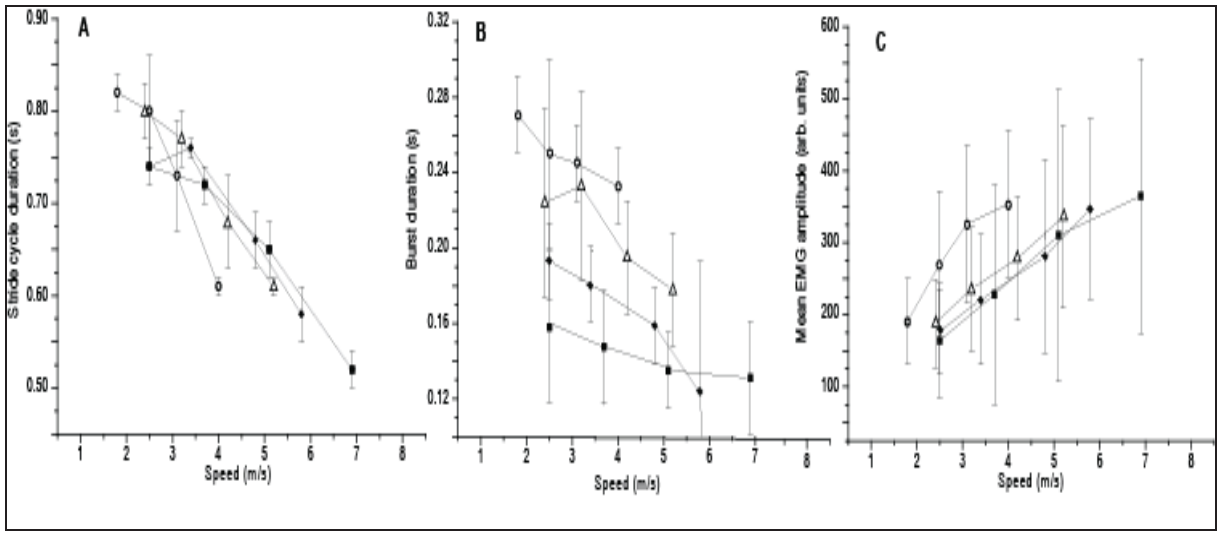

Figure 2. EMG amplitude

Discussion

The clear trends in stride cycle duration and EMG during running in different terrain and on different surfaces with speed indicate that the neuro-

motor system tends to adapt the control of locomotion with a similar basic pattern in the studied parameters (cf. Nilsson et al. 1985, Nilsson & Thorstensson 1987). Despite the similar generic trends in stride cycle duration and EMG in different terrain settings and on gravel road as well as different speeds there are specific differences that will be discussed in the following section.

The speed range from perceived slow to maximum (i.e. peak speed) for this group of male elite orienteers was about 5 $m \cdot s^{-1}$ (approximately 2-7 $m \cdot s^{-1}$) (Fig. 2A-C). It is obvious that terrain setting and surface conditions influenced the speed range in the order; wet moss, timber felling, forest and gravel road. The maximum average speed running in the wet moss was almost 4 $m \cdot s^{-1}$ but the maximum speed was much higher, approximately 7 $m \cdot s^{-1}$ when the elite orienteers ran on a gravel road. Therefore, surface conditions such as undergrowth, type of surface (such as wet moss and gravel road) and the impact response i.e. stiffness of running surface seem to have clear effect on the speed. Running on the extremely compliant surface wet moss only allowed a maximum speed of about 60 percents of the speed obtained on a gravel road.

The average stride cycle duration ranged from about 0.8s to about 0.5s from slow to maximum speed. This corresponds to about 1.2Hz at slow speeds to about 1.5-2.0Hz at maximum speed. The shortest stride cycle duration i.e. the highest stride frequency at maximum speed was in the order; running on gravel road, forest terrain, timber felling and wet moss, respectively. The differences in stride cycle duration and stride frequency between the different terrain settings were significant at maximum speed. It is worth noting that the stride cycle duration during wet moss running at maximum speed is significantly shorter than other terrain settings tested at compatible speeds. It is assumed that the compliant base of support of the wet moss does not allow a leg thrust that cause a long flight phase, which reduces the stride cycle duration. The burst duration of m. vastus lateralis follows the order; wet moss, timber felling, forest terrain and gravel road at almost all speed levels from low to maximum (Fig. 2B). It is obvious from Figure 2B that the burst duration is longer in wet moss running at all speeds compared to all other test settings. This is also seen in the relative support phase duration (represented by the knee angular displacement) in wet moss running at competition speed, which is longer than in other terrain conditions (Nilsson et al. 2013a). Also the burst duration during running in timber felling is longer than running in forest terrain and on a gravel road. It is assumed that the elongation of burst duration may be caused by the compliance as well as density and complexity running in wet moss and timber felling, respectively. The elongation of the burst duration i.e. a longer activation of the muscle is one prerequisite for longer contraction and thereby a larger metabolism at given speeds and muscle activation levels. The mean EMG level during wet moss running showed larger values than in the

other tested terrain settings and gravel road running at comparable speeds. This indicates that the orienteer has to activate m. vastus lateralis to a larger extent at comparable speeds. The larger muscle metabolism related to the higher mean activation level causes larger energy consumption for a given speed. In addition, the longer burst duration may occlude the blood flow to a larger extent restricting the oxygen to reach the musculature which in turn may cause a larger local anaerobic metabolism in vastus lateralis with an increased risk of local fatigue.

The specific differences between the various terrain test settings calls for a more specific view on training. The results in this study point at the importance of specific adaptation to speed and terrain condition. This is important information in endurance and strength training design and for the acute route choices in an orienteering race.

Conclusions

The cycle duration and burst duration of the knee extensor m. vastus lateralis decreased in a similar manner with speed during running in all the tested terrain conditions. The same increasing trend in mean EMG activation level with speed is seen in all terrain conditions and gravel road. However, specific differences in cycle duration, burst duration and EMG amplitude were present.

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ORIGINAL RESEARCH PAPER

MUSCLE BLOOD SUPPLY DURING PROLONGED STATIC VOLUNTARY CONTRACTIONS

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Abstract

It is known that metabolic activity of muscle cells even in one separate muscle differs. If VO_2 rate differs between muscle`s motor units, then blood flow through capillaries supplying muscle cells must be regulated according to their metabolic activity. The aim of this study was to evaluate muscle blood flow and compare it with active muscle cell metabolic activity during muscle prolonged static voluntary contraction with different contraction forces. In this study participated 37 healthy untrained people in age 24 – 36. Investigations were performed on the forearm muscles using hand grip exercises with 10% and 15% of maximal voluntary contraction (MVC) Volume blood flow in the forearm segment (I) and capillary filtration coefficient (CFC) were measured using venous occlusion plethysmographic device "KPOBOTOK- 4". VO_2 and lactate delivery (La) were calculated from pO_2 and lactate concentration arterio-venous differences and I in every controlled moment. pH and pO_2 was measured using bioanaliser ABC-1"RADIOMETER". Lactate concentration was measured using BIOSEN C-line "EKF diagnostic" device. During 10% MVC it was shown that I, VO_2, La and CFC till the cessation of exercise caused by exhaustion which takes 42±1,1min stabilize on appropriate level not reaching maximal possible values. Increasing contraction force only for 5% it is to 15% MVC all examined parameters during exercise till exhaustion which takes 12±0,8 min, increases and at moment of cessation of exercise reaches their maximal values. Increasing of blood supply and VO_2 during 15% MVC did not provide prolonged forearm contraction and exhaustion occurs more than 3 times quicker neither during 10% MVC .

Key words: Muscle energetic; prolonged static contraction; exhaustion.

Introduction

The important role for muscle energetic supply plays oxygen transport to muscle cells. For whole organism it is well known as oxygen consumption – VO_2 – a main parameter characterising activity of aerobic metabolism of the body. For characterising muscle metabolism are used parameters indicating activity of oxidative phosphorilation in muscle cells. In literature it is known that different muscle cells have different activity of oxidative phosphorilatin and it is known that during light till sub maximal muscle contractions there are active only definite part of all muscle motor units. Simultaneous activity of all motor units is described in literature during maximal voluntary contractions. In addition, it is known that during muscle contraction increases intramuscular pressure which reduce muscle`s blood supply. It means that metabolic activity of muscle cells even in one separate muscle differs. If $VO_2$ rate differs between muscle`s motor units, then blood flow through capillaries supplying muscle cells must be regulated according to their metabolic activity.

The aim of this study was to evaluate muscle blood flow and compare it with active muscle cell metabolic activity during muscle`s prolonged static voluntary contraction with different contraction forces.

Material and methods

In this study participated 37 healthy untrained people in age 24 – 36. Investigations were performed on the forearm muscles using hand grip exercises. We evaluate forearm muscle maximal voluntary contraction tacking in account the best of three attempts and investigate forearm muscle energetic supply during prolonged exercises till exhaustion with 10% and 15% of maximal voluntary contraction (MVC)

Volume blood flow in the forearm segment (I) and capillary filtration coefficient (CFC) were measured using venous occlusion plethysmographic device “KPOBOTOK- 4” constructed in Latvian cardiology institute. VO_2 and lactate delivery (La) were calculated from arterio-venous differences of pO_2 and lactate concentration and I in every controlled moment pH and pO_2 was measured using bioanaliser ABC-1 “RADIOMETER”. Lactate concentration was measured using BIOSEN C-line “EKF diagnostic” device. The MVC was measured every time before starting exercise.

Results

At first was organised an experiment where was measured actual MVC after selected time of maintaining 10% of MVC and 15% MVC. It shows decrease of MVC during increase of fatigue. In second part of this

investigation I, VO_2, La and CFC during prolonged static contraction of forearm muscles with 10% MVC till exhaustion was calculated in every second minute, but with 15%MVC – every minute. The values of measured and calculated parameters were analysed as group means with standard mathematic statistics. Dispersion of the results around the mean in every case not exceeded 8% and on the figures these dispersions where not presented.

The results of the first part of experiment are shown in Fig. 1.

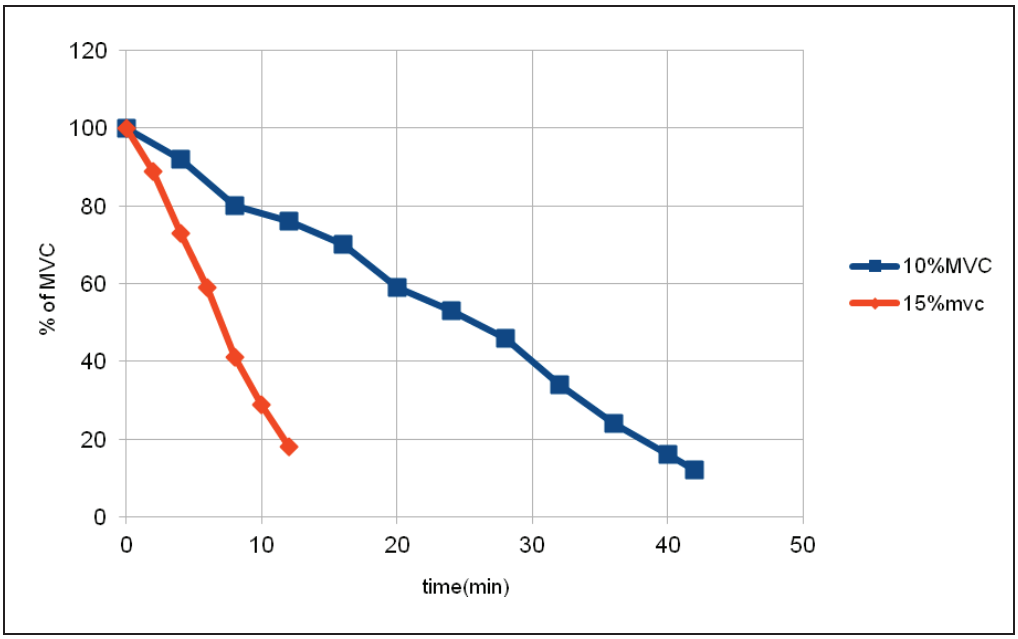

Figure 1. Decrease of MVC during prolonged static contraction of forearm muscles maintaining 10% MVC and 15%MVC till exhaustion

From these results it is evident that MVC decreases with increasing fatigue and reaching full exhaustion it is not possible voluntary increase contraction force above maintined ctatic contraction. It is known that during MVC there are activated all motor units and from the results of this experiment it can be stated that maintaining 10% MVC or 15% MVC till exhaustion there are fatigued all motor units of the forearm. In the same time it is knwn that during muscle contraction with low forces there are activated only appropriate part of all motor units. It could be concluded that during prolonged static contraction till exhaustion there are fatiguet sequensly all motor units and once fatiqued part of motor units till ceasetion of contraction are not again activated. From obtained results it is evident that only 5% MVC increase – from 10% MVC to 15% MVC more than 3 times decreases contraction time till exhaustion. It could be speculated that there exist two different mechanisms of development of fatigue.

For clarifying this question was done next part of experiment. In this part of experiment it was evaluated dynamics of I, VO_2, La and CFC during forearm handgrip with 10% MVC and 15% MVC till exhaustion These results are shown in Fig. 2.

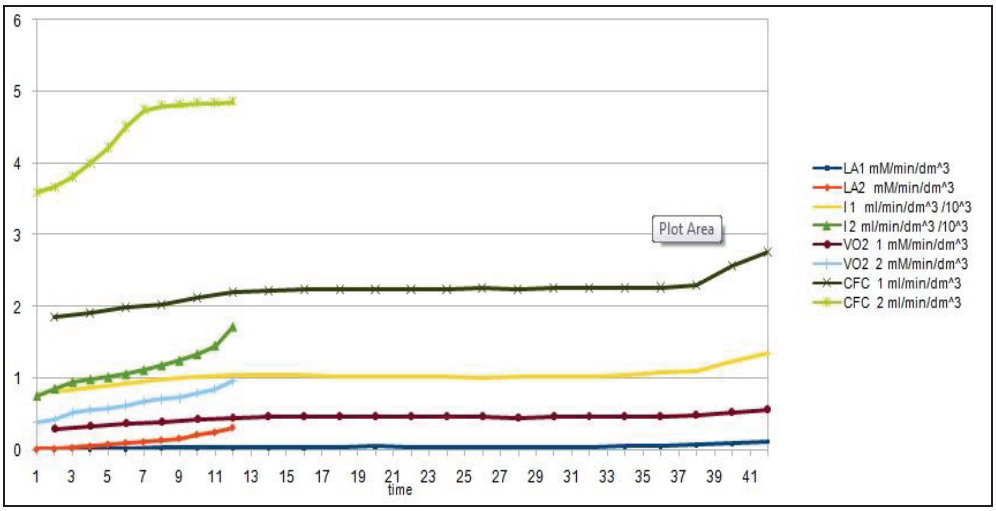

Figure 2. Blood flow, oxygen consumption, lactate delivery and capillary filtration coefficient during forearm muscle static voluntary contraction till exhaustion with contraction forces 10% MVC and 15% MVC

Discusions

During 10% MVC it was shown that I, VO_2, La and CFC till the cessation of exercise caused by exhaustion which takes 42±1,1min stabilize on appropriate level not reaching maximal possible values. Tacking in account results of the first part of experiment it could be stated that during prolonged contraction with 10% MVC where contraction force was maintained by appropriate amount of motor units which during contraction changes recruiting new not fatigued motor units blood flow also was distributed not through all the muscle, but through capillaries feeding active muscle fibres. It is obvious also from dynamics of CFC which characterises the number of opened capillaries and which level during prolonged contraction stays on steady state level not reaching maximal values. Increasing contraction force only for 5% it is to 15% MVC all examined parameters during exercise till exhaustion which takes 12±0,8min, increases and at moment of cessation of exercise reaches their maximal values. It means that during fatiguing one portion of motor units and switching them off and recruiting next portion of motor units the blood flow feeding this part of motor unit's remains and are opened new capillaries feeding newly recruited motor units. In the end of contraction there are opened all capillaries and blood flow through the muscle reaches its maximal values. In

spite of increasing VO_2 there is activated anaerobic glycolisis which characterises with increasing delivery of La. Increasing of blood supply and VO_2 during 15% MVC did not provide prolonged forearm contraction and exhaustion occurs more than 3 times quicker neither during 10% MVC.

Conclusion

During fatiguing one portion of motor units and switching them off and recruiting next portion of motor units the blood flow feeding this part of motor units remains and are opened new capillaries feeding newly recruited motor units. In the end of contraction there are opened all capillaries and blood flow through the muscle reaches its maximal values.

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ORIGINAL RESEARCH PAPER

ASSESSMENT OF SERVICE SKILLS IN THE COMPANIES PROVIDING WITH LEISURE FACILITIES: RESEARCH IN CUSTOMER APPROACH

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Abstract

On the plane of human capital theories –staff is considered being the most significant resource in a company. The implication is that a company has to take care of employees' competence, their approach towards work, perception and assumption of responsibility, liabilities to a company, etc. Such an approach towards staff is particularly meaningful for service companies, the employees of which are indentified not only with the very company, but also with the service by customers. Consequently, the employees, oriented towards a customer, can become a meaningful condition of competitive advantage (L.Bagdonienė, 2008). Service is more and more influencing companies' business. The process of service skills is a significant and complex element of customer service culture development. According to L. Žalys (2002) it can be described as endless and constantly going on in the certain stages process, which possesses distinctive operation technologies. Good relationship with customers and their loyalty is built exactly under the development process of customer service, as it is one of the sales service staff functions. Development process of customer service: to satisfy customers' needs and requirements. Significant organizational culture is directed towards customer service based on corresponding organizational rules and procedures, practical skills and abilities. The level of the service process depends on the professionalism of the service staff taking care of a customer, communication, responsibility, responsibility and competences. For the assessment of service there are additionally applied two criteria: solution of service problems, and company's policy in solution of service problems. In the research related to the formation and management of service skills, there are researched assessment criteria for service skills: external image/outlook of the companies, which provide with

leisure service, locations and working hours, information about service and their prices, delivery of service, service staff's appearance, staff's qualification and attention to constant customers.

Key words: leisure, skills

Introduction

In the companies which provide with leisure service and where service sales are based on the contact between a service supplier and customer, service skills have a great significance. Staff facilitating customers, on whose behavioral culture, professionalism and flexibility are dependent customer satisfaction with the very service. During the following after-crisis period, great attention is paid to the satisfaction of customers' expectations. Companies, in order to achieve better results, have to better and develop customer service skills constantly. Consequently, in the current market there will be able to survive only those service companies, those will be able to respond to customers' expectations flexibly. In order to satisfy customers' needs comprehensively, the staff of leisure service companies, has to possess sufficient knowledge concerning the development of customer service skills, service culture and cognize the very customers. Customers' expectations encourage the interest in the development of customers' service skills. During the growth of needs, customer service staff is expected mo professional and qualitative service. Concurrently, leisure service companies have to be interested in the process of customer service skills due to more and more intensifying competition. Being aware of the company's condition and having determined the service areas to be developed, it is necessary to plan which customer service skills problems it is necessary to solve first. *Problematic issue*: How do customers assess service skills in leisure service companies? How have to be solved service skills problems? What service skills problems do customers notice? *Research object* – customer service skills. Article aim – is to assess service skills in leisure service companies under the very customer approach. In order to achieve the aim there have been set the following objectives:

To present the concept, management and criteria of customer service skills and characterize the customer that is self-determined to use the service.

To research customer service skills in the companies, those provide with leisure service in Kaunas City.

Material and methods

Methods: Analysis of literature, questionnaire survey

The essence of customer service skills. The location of companies influences the company's relationship with customers, and impacts the extent and frequency of service consumption. Excluding the following factor the growth of service consumption can be described by great changes in human life and activities those directly reflect during the consumption of service. Consumption costs, recorded researching the budget, reflect how there are satisfied basic and secondary needs, which are satisfied by majority of versatile service. There can be drawn a presumption that the quality of service companies' relationship with customers indirectly is reflected in consumption costs too (Bagdonienė L.2008). Sales delivery function can not be dissociated from a service function, thus it is obvious that in order to sell more, the aim of companies is to serve better, i.e. that it is necessary to develop good customer service skills. According to A. Pajuodis (2005), customer *(consumer) service*- is completely defined, although sometimes 'untouchable' (intangible) activity, that is executed by the service suppliers in tandem with sales. According to L. Žalys (2002), *customer service skills* – is organizational structure directed to customers' service, based on the corresponding rules and procedures, practical skills and abilities. Service culture derives from organizational policy and its philosophy. A. Pajuodis (2005) states that *the essence of customer service* – is to satisfy customers' needs and that has to be reflected in the activities of the whole company. All actions – communication, competence and politeness contribute to the development of service skills. According to J. Adomaitytė (2006, p.27) customer service is a company business field that has to operate unconsciously.

Management of customer service skills. Customer service skills, according to A. Šalčius (1998), are conditioned under the organizational structure in a company. One of the most significant company's objectives is to research the organizational management system in a company, company's income and expenditure widely, and to provide with some proposals for their development. Due to the bad organizational management system in a company there are irrationally exploited human resources, tangible and financial resources, there are made mistakes, and made inequitable managerial decisions. As the author states, the key elements of organizational management structure in a company influencing its functioning, are a group of people, general aim, general work and responsibility. Z. Gineitienė, D. Korsakaitė et al. (2003) indicate that is very important for companies to exploit resources. Good management practice in

a company – is not only an instantaneous action, but constant process, continuous efforts seeking for good results in service skills. According to the authors, a good company's business strategy has to respond to the following questions: what is the external environment for company's activities under macro-level (to assess economical, social geographical, regulatory and other factors, and competition), what external environment is in its business field, and what internal company's policy is (current business strategy and possibilities to implement it organizational structure, staff and the organization of business process). I.e. that every company seeking for successful business in the competitive market, has to research personal company's external and internal business policy and its influencing factors well, to study managerial methods applied by business partners and competitors.

According to L. Žalys (2002) the key service rule is that service staff has to be polite, attentive and tactful to all customers with no exception. The service staff has to be ware of morality and moral requirements set for their profession. *Customer service skills* – first of involve service culture, relevant staff management, and spread of information concerning high service culture among employees. In order to achieve this it is necessary to encourage employees to work well. In the following case a good contributor for company's executives is strengthening of motivation. According to A. Pajuodis (2005) good service has to provide with some satisfaction and tie him/her to a company (object). Satisfaction or dissatisfaction can be expressed *actively* (when not only company's employees get aware of this, but all or majority customer's acquaintances. If expectations grow, and service level remains the same, customer satisfaction decreases. It can be stated concerning formation and management of customer service skills that in the company formed approaches and relationship, business atmosphere, organizational structure and culture, and external factors or social, economical, legal-political and technological conditions of society and its economical functioning can significantly impact the development and pattern of customer and company's contact. Customer's participation in the process of companies' activities, orientation of the organization towards a customer, his/her needs, depend on the successful organization and management of service skills process in a company, and the analysis of external and internal environmental factors. The essence of service quality is qualitative customer service that has to satisfy customer's needs and requirements and the requests set for the very service culture in a company. It is significant to discuss the experienced quality aspects, technical and functional quality.

Experienced quality aspects, technical and functional service quality. Technical quality is that what is provided to the customer during delivery of the service – evident phenomena of external service (B. Vengrienė, 2006, p.75). According to N. Langvinienės et al. (2005) quality can often, but not always be measured by a customer, their pattern depends on the selected technical solution. *Technical quality* is usually related to the physical means and technologies of service delivery. Their presence can be demonstrated to a customer before providing with service. *Functional quality,* according to L. Žalys (2002) – is a service delivery process during which a customer passes through a lot of stages and communicates with the staff serving him/her. It involves relationship with customers, service staff's behavior and dressing. Technical and functional quality, passing through the customer's formed possibility image of service and its delivery, causes the customer's experienced service quality and its assessment. Customers can assess service differently; besides, the same customer at different time can assess the service of the same level differently. Consequently, customers' requirements for service can be described in summary as following: diversity, quickness, preciseness, convenience, quality, fair prices and employees' helpfulness.

Customer – is not only a participant of a company providing with leisure organization service, but a required process participant in marketing macro-environmental research (service) – what for him/her there would not be any customer service. It is important to discuss customer's characteristics, and the factors causing customer's decisiveness to purchase.

Results

Research in service skills of leisure service companies. For the research there was selected a survey method. The questionnaire was completed following the most significant criteria, highlighted in the theory, those form customer service skills: responsibility, communication, attractiveness of promotional means.

Table 1

Research questionnaire structure of service skills assessment

Block of questions	Pattern of questions	Question type	Number of questions
Demographic/ tangible	Geographical convenience of location, is car park/company's exterior and interior attractiveness installed conveniently	Close	1/5
Company's attendance	Attendance frequency of leisure companies, time when it is gone in for sport most and entertained. Service planning	Close	3

Table 1 (continued)

Research questionnaire structure of service skills assessment

Tangibility of the service staff	Tidiness of the service staff dressing, personal hygiene, and posture if there is worn pinned identification card, service staff's workplace.	Close	8
Responsibility	Do staff communicate with customers quickly, precisely, fast, purposefully, with no hesitation and respectively and do staff offer to a customer some extra service satisfying his/her needs.	Close	7
Communication	Does staff communicate with a customer politely, provide with correct information or find out customers' needs, listen to and encourage customers to speak.	Close	4
Solution of problems	Do service staff quickly explains, responds, provides with possible solutions of problems, find out the problem causes, apologize and thank for remarks and inconveniences.	Close	6
Promotional means	Which promotional means are most attractive to a company	Close	8
Demographic	Age	Close	1
	Sex, place of residence, education, social status, income.	Close	18

Research date: 01-24 March, 2012. Number of respondents: at random customers of Kaunas City sports centers, clubs, leisure and entertainment center 'Mega', which provide with leisure service, totally 103 respondents. Data processed applying Microsoft Excel software.

Research outcomes and summary. At the beginning of the questionnaire there were provided questions which are oriented towards the assessment of companies' image (Table 2).

Table 2

Distribution of image assessment (N=103)

Statement	Totally agree	Agree	Don't have opinion	Don't agree	Totally disagree
Service company is in a geographically convenient place	16	76	0	8	0
It is convenient to approach the company	16	51	4	26	
Car park is conveniently installed	12	44	15	28	1
Company's exterior is attractive	10	51	26	13	0
Interior is attractive	50	29	16	5	1
Working time is relevant	17	54	11	18	0

The convenience of the companies' geographical location was assessed best (76), and working time (54). Premises of the companies providing with service are spacious and that aids the company at the creation of positive company's, which provides with leisure service, image. Managers have to take care of illumination, temperature of premises, musical background and also wafting scent. High assessment criteria of interior attractiveness were caused by the creation of interior design that provides the company with information concerning new service and actions. During the survey it was sought to find out, how often the companies, which provide with leisure service are attended. It proved that 32 respondents (N=103) visit companies several times a week, 25 respondents – daily, 20 respondents even several times a day.

During the analysis of customer behavior and trying to distinguish the certain customer groups, there was provided a question concerning the most attractive hours. Major part of respondent are employed persons, most 36 respondents (N=103) make visits from 15 to 18 o'clock, 28 respondents come after 18 o'clock and later.

Under the next question it was sought to find out if they plan visits to leisure service companies. Result: 75 respondents (N=103) claimed that they plan when they will make visits, 8 respondents make visits on their way or drive passing them, 20 respondents accurately plan a visit. Following the research data it was indicated that major part of customers complies with the customers of a practical type; i.e. these customers who are economically rational. Due to the fact that most respondents come after work, there is taken care of sufficient service supply in a hall and there work more staff serving customers.

How do companies take care of staff image? Customers are inseparable from service process suppliers during service. One of the image elements is service staff's dressing. In the questionnaire there were provided a block of questions under which it was sought to assess service staff's dressing, hairstyle, makeup, personal hygiene and posture.

Table 3

Image distribution of service staff (N=103)

Statement	Totally agree	Agree	Don't have opinion	Don't agree	Totally disagree
Clean and tidy clothes	24	53	13	1	0
Employees' hairstyle and make-up are tidy and not provocative	13	57	16	13	1
Secured personal hygiene	13	54	24	9	0
Straight and open posture	10	49	26	11	1
Worn pinned identification card	33	55	4	8	0

Following Table 3 it can be seen that 63 respondents assess the tidiness of the staff's dressing positively 24-very good, 1-negatively. 57 respondents assessed the employees' hairstyle and make-up positively, 13 respondents assessed very well, 13 respondents did not agree that employees' hairstyle and make-up are tidy and not provocative, 1-negatively. Personal hygiene of the service staff was assessed well, 67 respondents assessed positively. Service staff wears pinned identification card. The best assessment was given (57 respondents) to staff make-up, and to hairstyle and service staff's hygiene (54 respondents). In summary it can be stated that customers assess the dressing, appearance, personal hygiene and posture of the service staff favorably, and that creates presumptions for the provision with a successful service process in the companies providing leisure service.

During the analysis of the service process, the respondents were asked to assess how service staff greets a customer and strike up a contact. Respondents could choose at least 2 variants. 36 respondents related the striking up a contact with a verbal greeting, 21 respondents indicated as a variant of greeting and striking up a contact: a smile and an eye contact, 18 respondents indicated – guest and movements, 4 respondents indicated that service staff strikes up a friendly contact.

During the survey respondents were asked to describe the service staff's workplace. Workplace is tidy: agree 51 respondents (N=103), 23 respondents assessed very well, 6 respondents did not express any point of view, and 20 respondents did not agree that workplace is tidy. Such a distribution of opinion could have been influenced by the fact that the service staff keeps personal items and leaflets in a workplace. The respondents were assessed the workplace of the service staff, 47 respondents assessed positively, 40 – assessed negatively, 13 respondents did not have any opinion. As it can be seen under the research results, managers have to pay more attention for the installment of the service staff's workplace. As relevantly prepared the service staff's workplace will aid at the obtainment customers' trust in service staff, and herewith in the image of the company, which provides with leisure service.

In the questionnaire there was provided a question block under which it was sought to assess the very service process. Respondents were asked to assess the accuracy, quickness and speed.

Table 4

Service staff's responsibility (N=103)

Statement	Totally agree	Agree	Don't have opinion	Don't agree	Totally disagree
Service staff serves customers quickly, accurately and fast	27	32	39	9	0
Service staff responds to the customer's provided questions quickly	19	34	37	10	-
Service staff works purposefully and with no hesitation	16	34	32	18	-
Service staff provides with the right information concerning service and their prices	21	41	27	10	1
Service staff communicates with customers respectfully	22	32	36	10	-
Service staff offers a customer some extra service complying with his/her needs	9	32	49	8	2
Service staff offers a customer some extra service	14	41	35	18	2

Under Table 4 it is seen that 37 respondents (N=103) did not possess any opinion concerning customer service quickness, speed and accuracy; 34 respondents agreed that the staff serving customers woks purposefully and with no hesitations; 30 respondents indicated that the staff serving customers works accurately, quickly and fast, 26 – assessed very well, 18- assessed negatively, 7 respondents do not agree that the staff serving customers works quickly, fast and accurately. Such a distribution of opinions could have been influenced by service staff's personal qualities. Customer service depends on the staff's, serving customers, dutifulness and responsibility.

The respondents were asked to assess if the staff serving customers offers some service complying with a customer's needs: 32 – assessed positively, 49 respondents assessed neutrally, 8 – assessed staff work negatively.

During the assessment of the staff's, serving customers, responsibility, respondents were asked to assess if staff communicates with customers respectfully. 32 respondents- assessed positively, 22 respondents assessed very well, 10 – respondents assessed negatively. Such assessments could have been influences by the service staff's personal qualities, its ability to listen to a customer. The staff serving customers, in order to serve professionally, has to obtain some professional knowledge and develop it.

Next there was provided a question under which it was sought to assess the staff's, serving customers, communicativeness (see Table 5).

Table 5

Service staff's distribution of communicativeness (N=103)

Statement	Totally agree	Agree	Don't have opinion	Don't agree	Totally disagree
Service staff provides customer with the right information	26	43	21	9	1
Service staff communicates with customers politely and pleasantly	22	37	33	6	2
Service staff finds out customer's needs and asks open specifying questions	16	31	37	15	1
Service staff listens to a customer and encourages him/her to speak	15	31	32	20	2

Assessment of communicativeness aids at the disclosure of the staff's knowledge and staff's behavior during service. As it is seen from Table 5, 43 respondents assess the correctness of the service staff's provided information positively, 26 respondents – very well, 21 respondents did not have any opinion about the staff's provided information, 9 respondents assessed negatively, 1 respondent assessed very badly. In summary it can be stated that the staff, serving customers, has to inform customers about service and provide a customer only with the right information.

In the questionnaire there was provided a question under which there was sought to assess the solution of the arisen situation (see Table 6)

Table 6

Assessment distribution of problem solution (N=103)

Statement	Totally agree	Agree	Don't have opinion	Don't agree	Totally disagree
Service staff responds to customer's complaints and arisen problems fast	17	39	35	7	2
Staff relevantly explains and provides with possible solution variants of problems	19	33	38	9	1
Service staff listens to a customer accurately, with no interruption, and finds out the cause of the problem	18	33	29	13	7
Apologizes a customer for inconveniences	22	33	35	5	5
Thanks a customer for remarks	20	39	29	8	4
During complex situations does not use words 'no' and 'don't know'.	13	34	34	14	5

Under Table 6 it can be seen that 39 respondents (N=103) assessed the service staff's response to customer's complaints well, 17 respondents assessed very well, 35 – respondents did not possess any opinion, and 7 respondents assessed very badly, 2 respondents assessed very badly. 33 respondents assessed the service staff's efforts to listen to a customer accurately, with no interruption and finding out the problem cause. Under the research it was defined that major part of respondents (38) assesses efforts to explain and covey possible solution ways of problems relevantly. Consequently, the staff's serving customers, efforts were assessed well; however authorities have to pay more attention to the solution of problems. It is necessary to control the service staff's work and to make the right decisions in order solve a problem.

According to A. Pajuodis (2005), in case of more saturated market, and more versatile customers' needs, and strengthening of competition, the significance of competition is increasing constantly. In the questionnaire there were provided questions, following which it was sought to assess the means of sales encouragement in leisure companies. Due to the fact that different discounts, actions and other means of sales encouragement enable the purchase of the desirable service cheaper, customers assess the sales encouragement positively. The respondents' opinion concerning the attractiveness distribution of promotional means for the sales encouragement is provided in Table 7.

Table 7

Attractiveness distribution of promotional means (N=103)

Statement	Totally agree	Agree	Don't have opinion	Don't agree	Totally disagree
Printed advertising (advertising announcements, periodical publications, leaflets)	31	39	27	3	-
Advertising in the place of service provision (and indoor advertising)	37	41	21	1	-
Broadcasted advertising	38	29	26	4	3
Discount cards	47	28	21	4	-
Advertising souvenirs	21	44	25	5	5
Competitions, lotteries, games	35	27	32	4	2
Actions	49	28	19	3	1

Through the analysis of the attractiveness distribution of promotional means, it can be seen that 62 respondents assessed the attractiveness of the printed advertising means positively, 31 – very well, 27 respondents did not have any opinion concerning the attractiveness of the

printed advertising, 3 – assessed badly. It can be stated that respondents excluded as an effective means of sales encouragement being the programme of loyalty. This was provided by 47 respondents, those indicated that discount cards are an effective means of encouragement. In summary it can be stated that carrying out programmes encouraging service sales, that the most effective means of encouragement excluded by respondents were discounts and held actions.

Customer is the key element of every company. In order to develop the service process every company has to collect information concerning customers' sex, age, education, earned income and social status. In the research there were participated 62 women and 41 men. During the analysis of customers' point of view, there more reflected the women's approach towards the service process. According to the education the greatest part of respondents consists of ones with higher and college education; according to the social status, major part of respondents are employed, whose average of salaries is from 1000 to 1500 Lt. Respondents were asked to indicate service problems which they had happened to face in the companies, which provide with leisure service. The customers indicated as a frequently faced service problem – the service staffs' impoliteness.

Conclusions

The essence of service skills is the satisfaction of customer's and served service supplier's needs and requirements. Customers' service skills process is a relevant staff management, and information spread concerning service skills culture among employees.

Customer service is an organizational culture directed towards customer service based on relevant rules and procedures of the service skills process, practical skills and abilities. Good results are achieved in companies providing leisure service through the effective organization of customer service skills process. Customer service skills are conditioned by organizational structure in a company, management of human, tangible and financial resources.

During the analysis of service process it is necessary to research customers' behavior. Distribution of customers into separate segments aids the company at the orientation towards those customers, whose actions are the most beneficial to the company seeking for the development of customer service skills and surviving in the competitive market. To perform the market segmentation means to solve the customers' typology or classification under the characteristics.

It was defined that customers in the companies providing with leisure service in Kaunas, assess service skills process passively; however the elements of particular criteria were assessed positively. The customers assessed the convenience of location positively, and the worst assessment fell on the convenience of car parking. There were indicated customers' types which can be divided into groups: mostly constant customers, those visit the companies, those provide with leisure service several times a week, and active customers, who choose service actively. The customers assess the service staff's dressing and personal hygiene positively and that allows favorable presumptions for successful provision process delivered by service staff. It was defined that during service, the service staff's politeness is the most significant for customers. During the conflict situations, the shown respect, staff's response to complaints and arisen problems, excuse to a customer for inconveniences and thanks for remarks are the most significant to a customer.

Customers are the most significant group of market participators, thus the development of relationship is an underlying aim in a service company. Loyalty programmes aid at the achievement of the following aims, the diversity of which is determined by the spectrum of the solved objectives. Service companies can create and implement the programmes of assessment, rewards, discounts, cooperation or coalition loyalty. Independently which one a service company chooses loyalty programmes are created following the certain logical sequence – from the identification of a target group to the foreseeing of the conception in the programme success. The programme participant's comprehended value is seen as the key criterion of success in the encouragement of a customer to refuse to look for alternative service providers.

The further service research, assessing topical for science service areas highlighted by global scholars could be related to the following fields: management of service customers' experience, acceptability of service innovations for a customer, service suppliers and customers' relationship quality and dynamics. Kregždė V. (2012) claims that the year 2012 was called the year of possibilities, thus we would encourage all employees to work well further, strive for the achievement of changes in personal career and discover new possibilities in this company.

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ORIGINAL RESEARCH PAPER

SOMATOTYPE, BODY COMPOSITION AND EXPLOSIVE POWER OF ATHLETE AND NON-ATHLETE

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Abstract

The aim of this study was to identify the effect of somatotype and body composition variables on leg explosive power of college level men students. The sample consisted of 500 young college students, divided into two groups: athletes (N= 250) undergoing Bachelor of Physical Education course whose mean age 23.86 ± 0.36 years; and non-athletes (N= 250) college students who do not take part regular physical activities and mean age 22.16 ± 0.88 years. The somatotype was assessed using the Heath & Carter method. Assessing body composition of the subject various anthropometric measurements were taken. Sargent vertical jump test was used to measure leg explosive power. The measures were compared between the two groups using the Student t-test for independent samples. The two groups differed significantly (p≤0.01) in terms of body weight, % body fat, lean body mass, % skeletal muscle mass and somatotype. The findings of the present study showing that athlete have higher mean values in leg explosive power (p≤0.01) than non-athlete. The leg explosive power was positively significantly (p≤0.01) correlated with % skeletal muscle mass, lean body mass, mesomorphy and ectomorphy components of somatotype; on the other hand body weight, height, % body fat, body surface area and endomorphy component of somatotype significantly (p≤0.01) negatively correlated. In conclusion, somatotype and body composition variables are important factors in determining leg explosive power.

Key words: Vertical jump; % body fat; Lean body mass.

Introduction

Somatotyping has a relatively long tradition in human biology. Since the early development of Sheldon's somatotyping system, researchers have studied the relation of somatotype and body composition to physical

performance (1). About 25% to 65% of the variance in physical fitness tests could be explained by somatotype in adult sportsmen (2,3). Power is the product of force applied on the athlete and the velocity of the athlete (4,5). The best way to test the explosive power is to find how much of C.G can be raised in standing jump. This can be determined by measuring the difference between a people's jumping reach and his standing reach, with his arm fully extended upward. Vertical jump is commonly used as an index for the power of the lower limb or explosive leg power (6-9). Vertical jumping ability is an important fundamental skill for many athletic activities. Vertical jump height is a measurement that coaches, health care professionals, and strength and conditioning professionals frequently use (10) as an objective functional measurement. Many coaches consider vertical jump as an essential skill contributing to higher performance in numerous sports, including football, basketball, diving, and volleyball (11,12). Some authors consider vertical jump performance a measurement of muscular power of the lower extremity (13-15), whereas others see the vertical jump as a measurable coordinated activity (16-20). Vertical jump is a frequently assessed athletic skill used to measure improvement of an athlete's capabilities throughout a specific training program (21).

The performance of the athlete in the vertical jump is closely related to biomechanics. Velocity, force, acceleration and momentum are the biomechanical principles involved in any type of vertical jump (22,23). Apart from the biomechanical and physiological factors, anthropometric and body composition characteristics also play significant roles in vertical jump performance. Studies on anthropometric and body composition characteristics have been carried out by a number of researchers (5,16,21,24-28). However, only a few studies on the performance of college level students in leg explosive power have ever been published. Therefore, the objective of this article was to determine the influence of somatotype and body composition characteristics on leg explosive power. The other aim was to compare leg explosive power in young athlete and non-athlete of college level men students.

Material and methods

The present study was conducted on 250 athletes and 250 non-athletes (total 500) young college levels male students (age range 18-25 years). Athletes were completed one year Bachelor of Physical Education (B.P.Ed) course and took part in obligatory physical activities under their course of study and non-athlete students were not participated regular physical activity. The subjects were selected from nineteen colleges located in nine

different districts of West-Bengal in India irrespective of their caste, religion, dietary habits and socio-economic status. The age of the subjects were calculated from the date of birth as recorded in their institution. The investigation received ethical approval from the Visva Bharati University Research Degrees Ethics Committee.

The anthropometric measurements were carried out using standard instruments and in accordance with the methodology recommended by the International Society for the Advancement of Kinanthropometry (Ross & Marfell-Jones, 1991). All the anthropometrics measurements of the subjects were taken right side of the body as per the direction of the Leon and The Koerner Foundation Study Group in 1973. Researcher was used the technical error of measurement (TEM) for evaluating the consistency, or precision, of the measure on a given variable. The TEM is the square root of the sum of the differences between measures one and two squared, divided by twice the number of subjects. The TEM provides an estimate of the measurement error that is in the units of measurement of the variable. The TEM was lower than 2% for skinfolds and 0.5% for the other measurements.

The response variable was leg explosive power; the explanatory variables were height, weight, corrected thigh girth (thigh skinfold subtract from thigh girth), corrected calf girth (arm skinfold subtract from arm girth), % body fat, lean body mass, % skeletal muscle mass, % skeletal mass, body surface area and somatotype components (endomorphy, mesomorphy, ectomorphy). The height was measured to the nearest 0.1 cm using a stadiometer. The subjects wore light clothing and were weighted to the nearest 0.1 kg using a calibrated digital scale. Researcher also examine five muscle girths (upper arm, fore arm, chest, thigh and calf) in cm, four bone diameters (humerus, bistyloid, femur and bimalleolus) in cm, and eight skinfolds thickness (triceps, sub-scapular, suprailiac, pectoral, axilla, abdominal, thigh and calf) in mm. For calculating body density of the subjects Jackson and Pollock (29) equation was adopted. The Siri equation (30) was used to convert body density to percent body fat of each participant. Poortman's (31) and Drinkwater et al. (32) formula was taken up for assessing skeletal muscle mass and skeletal mass respectively. Measurement of body surface area (BSA) of the subjects Mosteller's formula (33) was used. Somatotype components (endomorphy, mesomorphy and ectomorphy) of the subjects were calculated according to Carter and Heath anthropometric method (34). Lastly, for explosive power Sargent vertical jump test was conducted. First, confidence of appropriate physical condition were achieved, correct process of measurement were described for

them and then subjects warmed up completely to perform the test. Subject stands side on to a wall and reaches up with the hand closest to the wall. Keeping the feet flat on the ground, the point of the fingertips was recorded. This is called the standing reach height. The subject then stands away from the wall, and jumps vertically as high as possible using both arms and legs to assist in projecting the body upwards. Attempt to touch the wall at the highest point of the jump. The difference in distance between the standing reach height and the jump height was the score. The best of three attempts was recorded in cm. There was a one minute resting period between each jump in order to overcome fatigue.

Statistical Analysis Descriptive statistics (mean, ± standard deviation) and Student t-test for independent samples were used for compared between the athletes and non-athletes. Pearson's correlation of coefficients was used to establish the correlations of vertical jump with other variables in athletes and non-athletes of college level students. Data were analyzed using SPSS (Statistical Package for Social Science) version 17.0. A 1% level of probability was used to indicate statistical significance.

Results

Table 1 depicts the mean and standard deviation of the variables of athlete and non-athlete.

Table 1

Descriptive statistics and t-value of body composition, somatotype and leg explosive power of athlete and non-athlete

Variables		Athlete		Non-Athlete		
		Mean	S.D.	Mean	S.D.	t-Value
Anthropometric Measurements	Height (cm)	168.82	5.63	168.33	5.59	0.97
	Weight (kg)	60.44	5.53	58.43	6.48	3.71**
	Corrected Thigh Girth (cm)	49.32	2.97	47.22	3.91	9.54**
	Corrected Calf Girth (cm)	32.52	1.84	30.02	2.31	18.89**
Body Composition	% Body Fat	12.37	3.01	14.36	3.69	6.58**
	% Skeletal Mass	13.57	1.34	13.38	0.98	1.80
	% Skeletal Muscle Mass	49.79	3.22	40.35	3.32	4.90**
	Lean Body Mass	52.90	4.55	49.95	5.23	6.70**
	Body Surface Area (m^2)	1.68	0.09	1.65	0.10	3.51**
Somatotype	Endomorphy	2.86	0.86	4.87	1.01	6.17**
	Mesomorphy	4.67	0.88	3.44	1.23	5.51**
	Ectomorphy	3.85	0.74	3.34	1.18	5.42**
Explosive Power	Vertical Jump (cm)	49.13	6.87	42.41	6.43	11.24**

(**) indicates $p < 0.01$.

The mean height of the college aged athlete and non-athlete is parallel, which are 168.82 ± 5.63 cm and 168.33 ± 5.59 cm respectively. Although athletes have higher mean body weight (60.44 ± 5.53 kg) than non-athletes do (58.43 ± 6.48 kg), but they have lower mean % body fat (12.37 ± 3.01 %) than non-athletes (14.36 ± 3.69 %). Athletes have higher mean corrected thigh girth (49.32 ± 2.97 cm) and mean corrected calf girth (32.52 ± 1.84 cm), as well as greater mean % skeletal muscle mass (49.79 ± 3.22 %), % skeletal mass (13.57 ± 1.34 %), lean body mass (52.90 ± 4.55 kg), body surface area (1.68 ± 0.09 m^2), mesomorphy component (4.67 ± 0.88) and mean vertical jumping ability (49.13 ± 6.87 cm). In contrast, the mean value for corrected thigh girth, corrected calf girth, % skeletal muscle mass, % skeletal mass, lean body mass, body surface area, mesomorphy component, and mean vertical jumping ability of non-athletes are 47.22 ± 3.91cm, 30.02 ± 2.31cm, 40.35 ± 3.32%, 13.38 ± 0.98%, 49.95 ± 5.23kg, 1.65 ± 0.10m^2, 3.44 ± 1.23 and 42.41 ± 6.43cm respectively.

Pearson coefficient of correlation of body composition variables and somatotype components with leg explosive power was presented in Table 2. All the variables were statistically either positively or negatively significant correlation at 0.01 level with leg explosive power irrespective of athlete or non-athlete.

Discussion

The purpose of this study was to determine the effects of somatotype and body composition factors on leg explosive power among college level athletes and non-athletes. The finding of the present study is similar to the work done by Ostojic et al (35), demonstrated the height and weight of a player had significantly negative correlation with vertical jump height. This result is disagreed by Aslan et al. (25) and Davis et al. (26) where they reported that there is no significant relationship between vertical jump and body height and weight. Greater thigh and calf girth has significant positive correlation with vertical jump in athletes and non-athletes. Muscle size effects force producing and jump performance. Perhaps, greater physiological cross section of muscles, contains more sarcomers contributing in muscular contractile which leads to more cross bridges foundation and finally greater force production.

% Body fat is the amount of body fat stored in the body and does not take into account the lean body mass and muscle mass. Table 2 shows that % body fat and leg explosive power have a negative association. An individual with lower % body fat definitely has a higher leg explosive power (16,24). This is because the athletes with lower % body fat and

greater power are more likely to generate greater velocity of kicking (5). The study done by Davis et al. (26) has reported that % body fat is the best predictor of vertical jump for recreational male athletes aged between 20 to 37 years old. This result corresponds to that of Roschel et al. (5), who stated that the sum of skinfold thickness has significant negative association with vertical jump height. % Body fat is related to the work performed during vertical jump. Since work is the product of average force acting on the subject and the displacement of the jump, heavier athletes need more work to move the body to the same displacement achieved by lighter athletes (5,11). So, in order to perform better, the coaches and dieticians should have guided the athletes to burn the body fat with proper training and dietary planning. Food consumption should be monitored so that the body fat will be flushed away without losing the nutrition.

In present study the mean somatotype of the college level athletes is ectomorphic mesomorph (2.86-4.67-3.85) on the other hand mean somatotype of non-athlete students is balanced endomorph (4.87-3.44-3.34). A higher mesomorphic rating in athletes than the non-athlete college level students suggests that the former are more muscular than the later (Table 1). High mesomorphic ratings in athletes can be attributed to take part in obligatory physical activities under their course of study, as there is positive association between mesomorphic component and physical activity (36,37). Mesomorphy and ectomorphy components of somatotype are significantly ($p \leq 0.01$) positive correlated with leg explosive power (38), where as endomorphy component found significantly ($p \leq 0.01$) negative correlation with leg explosive power irrespective of athlete and non-athlete.

Conclusions

The leg explosive power for Indian college level male athletes is significantly higher than that of their non-athlete counterparts. Body weight, corrected thigh girth, corrected calf girth, % skeletal muscle mass, lean body mass and mesomorphy component of somatotype is significantly positive association to the leg explosive power of Indian college level male athletes and non-athletes. In contrast, endomorphy component of somatotype and % body fat is an important body composition factor that has a significant negative relationship with leg explosive power of both athlete and non-athlete. Reducing the amount of body fat with proper physical training and dietary planning will be helpful to improve the leg explosive power. As the present study is examine relationships between leg explosive power with somatotype and various body composition variables in men athlete and non-

athlete college aged students of few districts in India, so more research on larger area and other sex is needed to confirm or refute this finding.

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ORIGINAL RESEARCH PAPER

DEPENDENCE BETWEEN THE LEVEL OF MOTIVATION AND THE ASSESSMENT OF REHABILITATION EFFICIENCY AND SPORTS-ACTIVITY AFTER THE INJURY AT BASKETBALL AND HANDBALL PLAYERS

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Abstract

The aim of the study was the assessment of the dependence between the type and level of motivation, and the assessment of rehabilitation efficiency and sports-activity after the injury. 207 male and female competitors training basketball and handball participated in the study. There were 111 women (46 basketball and 65 handball players) and 96 men (48 basketball and 51 handball players) studied. The investigative tools were: the Carver and White's questionnaire (measuring the activity level of the BAS and BIS system in three measurements), the author's survey taking into account the information concerning training-methods, number, types and circumstance of experienced injuries, methods of their treatment and the visual analogue pain intensity scale (VAS). Those surveyed evaluated also the efficiency of physiotherapeutic treatments in the 1-10 scale. The statistical tools were as follow: the arithmetical mean together with the standard deviation and the simple correlation. At training men there was some negative dependence between the time of break in trainings after sustained injury and one of the measurements according to the questionnaire: BAS Drive ($p<0.05$). In the above-group there also appeared some positive dependence ($p<0.05$) between the declared level of felt pain and the results on the BAS Fun Seeking scale. The studied women attained noticeably higher ($p<0.05$) results of the BAS Reward Responsiveness and BIS scale than men. At women there also appeared some positive dependence between the time of break in trainings after sustained injury and

the intensification of the BIS activation ($p<0.05$). 1. Some strong relationship between the levels of different forms of motivation in chosen aspects of rehabilitation of sportsmen was shown. 2. At men, high level of goal oriented motivation was connected with the negative assessment of rehabilitation efficiency, what could evidence the frustration resulting from inability to train. Strong goal orientation may therefore shorten the period of convalescence.

Key words: *motivation, injury, rehabilitation, team sports*

Introduction

Sports injuries influence not only the competitor's organism but also his or her psychical condition (Garrick and Requa 2003). Sustained injury can be accompanied by more intense feeling of such emotions as anger, fear, decrease of mood or tension, and also decrease of self-esteem (Schwab Reese, Pittsinger, and Yang 2012). Unprofitable changes were observed just after the accident and during the treatment (Ardennes Forest, Taylor, Feller and Webster 2012). The competitor's emotional reaction on injury and curative treatments connected with it is variable – negative feelings dominate directly after the accident; they diminish in progress of rehabilitation, and then increase, when the return to sport training becomes more and more real (Morrey, Stuart and Smith 1999).

Factors of the psychical nature also influence the efficiency of rehabilitation and possibility of the return to sports-activity. Besides, many physiotherapeutic applications influence also the psychical sphere (Zeitlin and co. 2000, Kuriyama and co. 2005, Boguszewski and co. 2010, 2012, Field and co. 2012). Research also showed the importance of stress coping abilities during recovering and rehabilitation (Crossman 1997). Podlog and Eklund (2007) account motivation as the key factor influencing the process of returning to sport, crediting the special role to needs of autonomy, competence and belonging, which according to the theory of the auto determination are the source of internal motivation (Ryan and Deci 2000).

Increased interest in psychological aspects of the return to sports-activity after sustained injury led to the essential observation: full physical and psychical preparation of the competitor for the continuation of suspended trainings does not always pair up. In spite the fact that the purpose of undertaken treatment and rehabilitation is the recovery and full participation in the sports competition, competitors often struggle with the uncertainty regarding their own readiness for the return to former training-loads (the Podlog and co. 2011).

The aim of the study was to gain information about the influence of the type and level of motivation defined by Gray (Carver and White 1994) as the intensification of activation of the behavioural activation (BAS) and inhibition (BIS) system on the assessment of sports-rehabilitation efficiency and the consequences of sustained injury for further sports-activity.

Material and Methods

Participants. There were 207 male and female competitors training basketball and handball who participated in the study. Among them there were 111 women (46 basketball and 65 handball players) and 96 men (48 basketball and 51 handball players), training in Warsaw athletic clubs (Tab. 1). Average age of competitors was 22.23 years (SD=2.79), and the training advancement of 7.67 years (SD=2.79).

Table 1

Characteristics of examined groups

gender	*sport*	*age [years]*	*body mass [kg]*	*body height [cm]*	*training experience [years]*
women	basketball	21.72 ±3.09	64.64 ±9.24	173.09 ±7.61	7.53 ±3.55
	handball	22 ±1.94	63.62 ±9.08	169.12 ±6.21	5.86 ±4.13
men	basketball	22.64 ±3.57	88.8 ±11.45	189.36 ±7.13	9.54 ±3.71
	handball	22.63 ±2.55	84.39 ±8.42	184.81 ±5.9	8.49 ±4.56

Measures. Carver and White's (1994) BIS/BAS scale was used in the research to assess the level of motivation of the studied people. The scale was adapted by Muller and Wytykowska (2005). Each of twenty four sentences of the questionnaire was a statement that a person could either agree with or disagree with. Answers possible to choose from were as follows: 1 – very true for me, 2 – true in some way, 3 – false in some way, 4 – very false for me.

The questionnaire measures the intensification of behavioural inhibition system (BIS), that is the inclination to avoid situations perceived as difficult and unpleasant, and behavioural activation system (BAS) – its result expresses itself by means of three scales. The BAS Drive scale (BAS D) qualifies the power of motivation in goal fulfilment, BAS Fun Seeking (BAS FS) expresses the inclination to looking for positive experiences, last from scales – BAS Reward Responsiveness (BAS RR) shows the level of stimulation sensitivity to the modification with rewards (Carver and White 1994; Muller and Wytykowska 2005).

The visual analogue pain intensity scale (VAS) was also used in the research. There was author′s survey done too and it was about sports injuries, methods of their treatment, further sports-activity after sustained injury and the range of use of physiotherapeutic applications and assessment of their efficiency. The efficiency of rehabilitative applications was rated in the scale from 1 to 10 points (where one means the lack of efficiency and 10 the maximum efficiency) in four categories: acute pain relieving (mark 1), moderate pain relieving (mark 2), restitution of strength of damaged muscles (mark 3) and restitution of the range of movement of the damaged joint (mark 4).

Statistical analyses. To the elaboration of statistical data there were used some statistical tools: arithmetical mean, standard deviation, rho correlation by Spearman and the T-student test for independent groups. The level $p \leq 0.05$ was fixed as of minimum significance.

Results

Women and men did not significantly differ in the level of any motivation categories. The important difference ($p<0.05$) was noted only at basketball players in the BAS Drive category. Moreover, women declared considerably higher ($p<0.05$) level of pain complaints. The efficiency of rehabilitative applications in three from four categories (acute pain relieving, moderate pain relieving and restitution of strength of damaged muscles) was higher rated at men, differences however were not characteristic (Tab. 2).

Table 2

Results of BIS/BAS scale and pain, pause in training, pause in competition and assessment of rehabilitation (mark 1-4) – the mean values ± SD

	women	men	women		men	
			basketball	handball	basketball	handball
BAS D	9.94 ±2.69	10.57 ±2.65	9.57 ±2.71	10.2 ±2.67	10.77* ±2.48	10.38 ±2.62
BAS FS	10.26 ±2.81	10.02 ±2.91	9.61 ±3	10.72 ±2.59	9.92 ±3.01	10.13 ±2.75
BAS RR	13.5 ±5.02	13.51 ±2.69	11.89 ±5.18	14.63 ±4.6	12.44 ±4.82	14.58 ±3.84
BIS	18.19 ±3.85	18.03 ±4.47	17.04 ±3.61	19 ±3.83	17.81 ±3.66	18.25 ±2.94
pain [VAS]	4.6 ±1.94	3.94* ±3.31	4.88 ±2.04	4.42 ±1.86	3.77* ±2.32	4.1 ±2.36
no training [month]	12.62 ±18	14.72 ±16.18	11.57 ±17.21	13.54 ±18.79	17.65 ±19.53	12.51 ±12.92
no competition [month]	`	16.28 ±17.71	14.05 ±20.36	14.4 ±21.47	18.91 ±20.73	14.1 ±14.65
mark 1	6.67 ±1.97	6.98 ±2.12	6.73 ±1.86	6.62 ±2.1	6.57 ±2.13	7.39 ±2.06
mark 2	6.99 ±2	7.16 ±2.16	7.12 ±1.93	6.85 ±2.08	6.73 ±2.05	7.58 ±2.22
mark 3	6.61 ±2.17	7.08 ±2.15	6.09 ±2.21	7.12 ±2.04	6.87 ±2.19	7.29 ±2.12
mark 4	7 ±2.14	6.83 ±2.16	6.84 ±2	7.15 ±2.28	6.4 ±2.08	7.27 ±2.18

* $p<0.05$ difference between women and men

Some important positive correlation between the pain intensity (measured with the VAS) and the level of BAS RR and BIS motivation was shown among female basketball and handball players. Additionally the assessment of rehabilitation in relieving of acute pain negatively correlated with the result of the BIS scale that is with the inclination to resign from the activity due to fear of negative results (Tab. 3).

At men practicing basketball and handball there was some strong negative correlation between the degree of goal oriented focus (BAS Drive) and the assessment of physiotherapy efficiency (in all its aspects). The positive correlation was noted instead between the time after injury, time of break in trainings and competitions and the susceptibility to looking for positive new strengthening (BAS FS) and between the training-advancement and the level of three measurements of motivation – BAS D, BAS FS and BAS RR (Tab. 4).

Table 3

Correlation (Spearman) between the BIS/BAS results and time after the injury, pause in training, pause in competition and assessment of rehabilitation (mark 1-4) , pain and training experience in women practicing basketball and handball

	BAS D	BAS FS	BAS RR	BIS
time after the injury	-0.061	-0.152	-0.038	-0.078
pause in competition	0.015	-0.019	0.05	0.82
pause in training	0.003	-0.78	-0.002	0.045
mark 1	-0.128	-0.043	-0.2	-0.252*
mark 2	-0.059	-0.025	-0.176	-0.234
mark 3	0.068	-0.026	0.037	-0.035
mark 4	-0.01	-0.105	-0.097	-0.017
pain	0.052	0.113	0.219*	0.266**
training experience	0.042	-0.151	-0.082	-0.12

* p<0.05, ** p<0.001, *** p<0.001

Table 4

Correlation (Spearman) between the BIS/BAS results and time after the injury, pause in training, pause in competition and assessment of rehabilitation (mark 1-4) , pain and training experience in men practicing basketball and handball

	BAS D	BAS FS	BAS RR	BIS
time after the injury	0.274*	0.287*	0.354**	0.34
pause in competition	0.157	0.32*	0.124	0.048
pause in training	0.14	0.318*	0.11	0.037
mark 1	-0.437**	-0.163	0.048	0.165
mark 2	-0.39**	-0.167	0.082	0.126
mark 3	-0.423*	-0.048	0.089	0.111
mark 4	-0.394**	-0.09	0.074	0.207
pain	0.14	0.19	0.118	-0.006
training experience	0.22*	0.265*	0.251*	-0.095

* p<0.05, ** p<0.001, *** p<0.001

At female basketball players there was some positive correlation between the number of sustained injuries and the results on the BAS Reward Responsiveness scale ($p<0.01$) and BAS Fun Seeking ($p<0.05$). Higher results on both scales are accompanied in described group by the greater subjective feeling of pain complaints. In the group of women training basketball negative correlation between the results of the BAS Reward Responsiveness scale and the assessment of efficiency of physiotherapy in relieving of acute and moderate pain was noticed. In described group the higher activation of behavioural inhibition system (results on the BIS scale) led to lower assessment of rehabilitation efficiency in reduction of pain complaints aside from their intensification. Greater goal orientation (higher results on the BAS Drive Scale) also resulted in lower assessment of physiotherapeutic applications within the range of pain relieving and the restitution of agility of a damaged body part (Tab. 5).

Table 5

Correlation (Spearman) between the BIS/BAS results and pause in training, pause in competition and assessment of rehabilitation (mark 1-4) , pain and number of injuries in women and men practicing basketball

	women				men			
	BAS D	BAS FS	BAS RR	BIS	BAS D	BAS FS	BAS RR	BIS
pause in training	0.29	0.126	0.284	0.268	0.031	0.353*	0.316	0.179
pause in competition	0.223	0.108	0.232	0.241	0.019	0.327*	0.33*	0.188
pain	0.272	0.332*	0.433**	0.262	-0.137	0.183	0.197	0.06
number of injuries	0.159	0.292*	0.39**	0.266	0.117	0.052	0.312*	0.011
mark 1	-0.461**	-0.195	-0.369*	-0.433*	-0.229	-0.237	-0.106	-0.332
mark 2	-0.368*	-0.221	-0.365*	-0.533**	-0.224	-0.248	-0.094	-0.344
mark 3	-0.209	-0.058	0.065	-0.077	-0.332	0.027	-0.016	-0.366*
mark 4	-0.428*	-0.309	-0.177	-0.28	-0.239	0.3	-0.001	-0.28

* $p<0.05$, ** $p<0.001$, *** $p<0.001$

Different dependences were noted in the group of men – of basketball players. There was observed some dependence between the period of break in trainings and starts as a result of sustained injury and the result of the BAS Fun Seeking scale. Additionally, the period of resignation from the participation in sport positively correlated with the results on the BAS Reward Responsiveness scale. High results on the BAS scale, measuring the influence of rewards on the system of motivation, were connected in the above-group with the greater number of sustained injuries during the sports-

career. There was also noted negative correlation between the assessment of efficiency of physiotherapy in restitution of strength of the injured body part and the results on the BIS scale (Tab. 5).

At female handball players appeared some dependence between the higher results on the BIS scale and the declared higher level of pain complaints, what was not observed at women practicing basketball. Any important relationship between the results of the BAS scale and the undertaken activity after injury wasn't noticed. At women training handball none of above-dependences appeared (Tab. 6).

In the group of men practicing handball none of above-dependences weren't observed, too. The result of the BAS Reward Responsiveness scale correlated negatively ($p<0.01$) with the number of sustained injuries. Important negative correlation was observed between the assessment of efficiency of physiotherapy in all curative ranges (relieving of acute and moderate pain, restitution of strength and the agility of damaged body part) and the results of the BAS Drive scale. Equally significant dependence appeared between the intensification of tendency to avoid hazard and unpleasant experiences (higher results on the BIS scale) and the positive assessment of efficiency of rehabilitative applications (all of four aspects of their influence) (Tab. 6).

Table 6

Correlation (Spearman) between the BIS/BAS results and pause in training, pause in competition and assessment of rehabilitation (mark 1-4) , pain and number of injuries in women and men practicing handball

	women				men			
	BAS D	BAS FS	BAS RR	BIS	BAS D	BAS FS	BAS RR	BIS
pause in training	-0.103	-0.193	-0.23	-0.086	0.208	0.247	-0.104	-0.132
pause in competition	-0.1	-0.114	-0.133	-0.038	0.287	0.293	-0.13	-0.135
pain	-0.146	-0.139	0.02	0.27*	0.18	0.183	-0.036	-0.122
number of injuries	0.058	0.001	-0.015	-0.14	-0.182	-0.056	-0.421**	0.105
mark 1	0.258	0.158	-0.033	-0.11	-0.622**	-0.15	0.2	0.641**
mark 2	0.303	0.238	-0.003	0.037	-0.484**	-0.166	0.215	0.48**
mark 3	0.267	-0.114	-0.171	-0.104	-0.466**	-0.125	0.219	0.569**
mark 4	0.336	0.025	-0.138	0.129	-0.453**	-0.186	0.127	0.552**

* $p<0.05$, ** $p<0.001$, *** $p<0.001$

Discussion

There can be two forms of reacting on the new situation: willingness to learn and experience new types of stimulation or increase of precaution

and consequently even the escape from the unknown (Smolewska, McCabe and Woody 2006). The strategy accepted by the given individual most often is relative to the manner of transmission and processing the sensory information in the nervous system, which is the physiological base of temperament (Aron and Aron 1997). It is considered that behind the direction of motivation (the choice between looking for and avoiding reaction on the event), in the situation perceived as new or difficult, there is the inclination to react on the stimulation of two systems of connections between component parts of the nervous system: The Behavioural Activation System (BAS) and Behavioural Inhibition System (BIS) (Carver and White 1994). BAS is the system responsible for fixation of rewarded reactions and giving reasons to the active looking for positive experiences and undertaking of goal oriented behaviours (Becerra Garcia 2010). Activity of the hypothalamus and higher concentration of dopamine in synapses, which most likely characterize people with stronger inclination to looking for stimulation (Carver and White 1994), are responsible for positive feedback generated by the system. The source of BIS stimulation, responsible for the inclination to opting out of situation threatening with an unpleasant or inexplicable experience, comes from the hippocampal activity and enlarged production of norepinephrine (Becerra Garcia 2010). Nowadays the BIS/BAS Scale by Carver and White is considered as the most adequate tool used in the measurement of activation of both systems with the self-esteem of the examined person (Voight and co. 2009).

The level of activation of behavioural systems probably translates into willingness to participate in sports-activities. Research showed that higher BIS activation favourably correlated with the avoidance of the motor activity, BAS activation instead (in the aspect of goal orientation) correlates negatively with not taking up the physical activity (Voight and co. 2009). At teenagers, strong BIS activity correlated negatively with the efficiency of the circulatory system, with subjective satisfaction from performed physical exercises and resulted in worse mood during overcoming large and moderate workloads. Higher BAS activation correlated with the positive attitude towards undertaking physical effort and with greater acceptance of average training loads (Schneider and Graham 2009).

Negative impact of sustained injury on the psyche of the competitor is described enough, for a short time there have also been paid some attention to its possibly positive aspects (based on theory invoking of post stress development (increase) (Wadey, Clark, Podlog and McCullough 2013).

Obtained results are incoherent. In order to achieve more exact results of the study on relationship between motivational systems and the sports-

activity after sustained injury, it would be advisable to repeat the research on greater group of people.

Conclusions

1. Strong relationship between the levels of different forms of motivation with chosen aspects of rehabilitation of sportsmen was proved.
2. At men high level of goal oriented motivation was connected with negative assessment of rehabilitation efficiency, what itself could evidence the frustration due to inability to train. Strong goal orientation may therefore shorten the time of convalescence.
3. At women pain complaints caused the inclination to resignation from activities because of fear of negative experiences.
4. Obtained results can become a base of randomized prospective research with the participation of more numerous and diverse group of sportsmen.

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REVIEW PAPER

NORDIC WALKING – A VERSATILE PHYSICAL ACTIVITY FIT FOR EVERYONE (A LITERATURE REVIEW)

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Abstract

The topic of Nordic walking shows the main points of scientific interest concerning form of physical exercise. Existing research mainly focuses on presenting it as beneficial for the elderly. The authors of the topic are presenting the advantages of pole walking for distinctive age groups. There are a number of publications concerning elderly women specifically. Nordic walking is also an object of interest in biomechanical studies. There is an apparent shortage of publications on the utility of this kind of physical activity for children and the young. This seems to be a frequent shortcoming of the research methodology, as it is difficult to deduce whether the study is based on the correct Nordic walking technique or rather on walking with poles as a bracing device. At the same time there is no data concerning Nordic walking as a competitive sport which has been developing dynamically.

Key words: *Nordic walking, physical activity, biomechanical studies, sport for all.*

Introduction

In the past, men were forced to look for food, travel and exhibit stamina and other skills associated with movement in order to survive. The progress of civilization in most societies of the world has led to elimination of physical effort in most societies. Nowadays, there is no need to expend large amounts of energy to get nutrition. We minimize the amount of energy spent on a physical activity, which results in an energy imbalance. Health problems of industrialized countries stem from swaying from an energy regime set by our ancestors (Piech, Raczyńska 2010). Restoring energy balance is a challenge for modern societies and may be achieved by maintaining a satisfactory level of physical activity throughout life. Developing the habit of an active lifestyle during childhood, adolescence as well as among adults and senior citizens seems to be vital. Research shows that adults who have been more active in childhood demonstrate better parameters for the capacity of the cardiovascular, respiratory and skeletal systems. It is, therefore, important to develop a liking for motor activities from an early age. There are a number of people who can play a significant role in this process: family, physical education teachers, schools, physical culture individuals, self-governments, doctors. It is crucial that all of the people able to act in this area can cooperate to highlight the significance of the problem and undertake actions in order to neutralize negative phenomena. The growing absence of children and teenagers in physical education classes in recent years is worrying. It is necessary to find ways to engage various social groups in physical activities. One of the possibilities is to showcase a diverse choice of sport activities available for different age groups. The wider the choice, the greater the chance of finding a perfect sport activity for life. The dynamic development of various forms of sport activities engaging more and more people only supports the statement. The expansion of Nordic walking is a perfect example of this phenomenon.

Material and methods

Nordic walking – a sport for anyone and everyone

Nordic walking refers to a Scandinavian walking with poles, or in other words a physical activity based on walking and a special technique of pushing off with specifically matched poles. Its characteristic features are prolonged footstep as well as alternating movements of arms and legs. This kind of leisure activity strengthens the upper body and arms and enhances shoulders' mobility. Because of the poles we feel less tired and can, therefore, walk for a longer period of time. People suffering from osteoporosis strengthen their bones and muscles by walking with poles.

Among additional advantages we can list: enhancing the balance of the body, improving the work of respiratory and cardiovascular systems, increasing in the oxygen intake and lowering the resting heart rate. Nordic walking is an outdoor activity that can be practiced all year round. Regulating the frequency of physical exercise varies for each person and there are no counter-indications. Currently, Nordic walking is a relatively new activity; hence the ongoing research to find the optimal walking technique and teaching method, taking into consideration various age groups. So far, we can differentiate three levels of advancement: health, fitness and sport. The most frequently recommended technique to learn Nordic walking involves 10 "steps". Mastering properly all 10 steps is crucial for acquiring correct walking technique. Nordic walking on a sport level has been developed dynamically in order to form new groups for walking with poles. It is focused mainly on intensive physical exercises (strength training, athletic activities, running etc.) as well as on various competition systems. It is a chance to engage a larger group of young people and school-age students in the activity.

Benefits of practicing Nordic walking

Pole walking has been an object of scientific interest since the beginning of the 1990s. The first research was done in 1992 at the University of Wisconsin – La Crosse in the United States. It shown that after a 12 week training with poles the level of VO_2max increased by 8% on average and the muscle endurance increased by 37%, while in the group walking without poles saw an increase of only 14% (Stoughton. 1992), (Larkin, 1992) and (Karavan, 1992). Further research confirmed the beneficial influence of pole walking on the human body. Hendrickson (1993) examined 16 fit men and women on an athletic treadmill and found out that the oxygen intake; heart rate and energy expenditure have risen by around 20% while walking with poles, as opposed to without. Porcari et al. (1997) had similar outcomes after examining 32 healthy men and women, also on an athletic treadmill. He indicated that using poles leads to the increases in oxygen intake (23% on average), heart rate (16%) and energy expenditure (22%), in comparison to people walking without poles. Rogers et al. (1995) noticed that 24 year old healthy women walking with poles during a 30 minutes submaximal session exhibit higher level of VO_2max than during the same session without poles (21 to 18ml/kg/min). The heart rate raises as well, 133 to 122 heartbeats. Moreover, women walking with poles burnt more calories during a 30 minutes session (174 to 141 kcal during a session without poles). Gullstrand and Svedenhag (2001) and

Aigner et al. (2004) obtained similar results with regards to the same parameters. They also noticed the increase of lactic acid during pole walking, which indicates a more intense physical exercise.

Kamień (2007) got interesting results while working on a research programme "Nordic walking as a promoting healthy lifestyle new activity fit for everyone". The study was conducted in two groups, one of which was walking with poles and the other took part in March and run training. The positive impact of health training, visible in the overall improvement of physical function, was observed after just two months of systematic physical activity in both groups. More profitable results of research with regards to anatomic and physiological parameters were obtained by the participants practicing Nordic walking.

The study of the influence of Nordic Walking on the human body was also conducted on patients with various afflictions. Walter et al. (1996) researched a group of men after angioplasty, bypass surgery or a heart attack. The results show that during pole walking the average energy expenditure increased by 21%, heart rate by 14 ud/min and the highest systolic and diastolic blood pressure increased on average by 16 and 4 mm Hg accordingly, in comparison with a standard walking without poles. The authors claim that marching with poles is a safe form of rehabilitation for patients suffering from heart diseases. The results of a research into patients with peripheral vascular disease by Collins et al. (2003) indicate that 30 minute pole walking sessions led to lengthening the distance and increasing the speed of walking. Furthermore, the researchers emphasize higher physical effort tolerance and the improvement of the quality of life of these patients. A similar study involved women after mastectomy and the influence of pole walking on the functioning of their arms. Sprod et al. (2005) demonstrated an increase in the endurance of the upper body among women exercising with poles in comparison with a group of women walking regularly without poles. This type of rehabilitation may, therefore, facilitate everyday activities and contribute to a faster return to an independent lifestyle. Another research focuses on the influence of Nordic walking on the rate of glycaemic index among elderly patients with type 2 DM. A group of 19 patients (6 women and 13 men), whose average age was 67 years, were walking with poles once or twice a week for 90 minutes throughout a whole year. As Nischwitz et al. (2006) show, all biochemical parameters relevant to diabetes improved. Nordic walking training also allowed the patients to take a lower dose of hypoglycaemic agents. The influence of pole walking on the reduction of body weight among a group of middle aged people was also researched. The group practiced Nordic walking regularly

for 4 months. The participants lost 4kg of their body weight on average and 6.6 cm of their waistline. Their aerobic capacity improved as well (Heikkilä et al. 2004). The beneficial influence of Nordic walking was also presented by Baatile et al. (2000), who were studying men with Parkinson's disease. Patients took part in three 60 minutes sessions per week, for 8 weeks. Researchers stated in conclusion that Nordic walking exercises contributed to higher perceived functional independence and the quality of life of the patients suffering from Parkinson disease.

Ossowski et al. (2010) studied the changes of the limbs' strength levels among elderly women that result from Nordic walking training.

The purpose of this study was to determine the changes of the strength level of arms and legs under Nordic Walking training in women aged 60-69 years.

31 women aged 60-69 years, were subject to this examination. In the conducted tests for measuring strength level 2 trials were used: getting up from the chair trial and arm bend with dumb-bell trial (Physical fitness Test for older people – Fullerton Functional Fitness Test).Nordic Walking training was a part of pedagogical experiment – comparing this special type of training with overall body training some important results were obtain. Research showed that this new type of training is more efficient than overall body training as far as the strength level of arms and legs is regarded in women aged 60-69 years.

Wiech M. et al. (2010) studied the changes of positive health indicators in the elderly after Nordic Walking training sessions.

The carried out examinations illustrate the effects of Nordic Walking physical activity on the elder women. The purpose of the examinations was to determine the changes of the body fat in women aged 60-75, who were subject to systematic health training. The carried out training program lasted 12 weeks, from 16 November 2009 to 5 February 2010. A group of 30 women was examined by selected measurements: skin folds thickness and body girths by means of standard tools. The conclusion indicates that Nordic Walking is an efficient way for weight loss, irrespective of age and season (the examinations lasted in winter, when amount of body fat increases and it concerned elder women whose muscle tissue is replaced by increased amount of body fat and connective tissue).

Ossowski and Kortas (2012) presented research results concerning the influence of recreational Nordic Walking training on the level of agility and balance in elderly women.

Science researches have proved that the main reason of postural instability is body balance disturbances. In the long term they often result in

falls. The aim of this article was to determine the changes in agility and body balance under Nordic Walking Training in older women. Subjects of this research were women aged 60-69 years. The women were divided in two age groups: 60-64 years and 65-69 years. Women took part in 6-month pedagogical experiment. This experiment had an aim to show the influence of overall training and Nordic Walking Training on the agility and body balance level. Agility trial and body balance trial from Fitness Trial for older people were applied (Fullerton Functional Fitness Test). The similar results on the agility and body balance level in older women after overall and Nordic Walking Training was stated. Women aged 60-64 years after Nordic Walking Training improved these abilities, moving in grade range from 75 to 85 centyl.

Piotrowska (2011) obtained interesting results while studying the assessment of physical capacity and body composition of boys leading a sedentary lifestyle. The author researched two groups of 17-18 years old boys. The first group of 46 boys regularly took part in physical education classes, while the second group (29 boys) avoided them. Boys from the second group were encouraged to engage in Nordic waking classes 3 times a week throughout the school year. The average differences observed in the Nordic walking group in comparison with the first group indicate a considerable advancement in their results. A significant improvement was observed in body weight, composition of the adipose tissue, 50m running ability, arm bending for pull-ups, crouching from a recumbent position and shuttle running 4x10m. No negative changes of somatic or functional parameters where observed.

Nordic Walking in biochemical research

The last few years brought a number of biomechanical studies of the subject, focusing mainly on the analysis of the lower extremities load as well as on the bioelectric work of muscles during pole walking. Many of the most recent studies dispute the statements of Nordic walking advocates who claim pole walking lightens the load on the legs.

One of the few studies that confirms the theory that pole walking lightens the load on the legs, is the study conducted by Willson et al. (2001). The outcomes suggest that Nordic walking slightly lowers the average vertical ground reaction force and the vertical (compressing) knee joint reaction force.

The lack of valid statistical data on the differences between Nordic walking and walking without poles with reference to the vertical ground reaction force rates was mentioned in several studies by Jöllenbeck et al.

(2006), Thorwesten et al. (2006), Hansen et al. (2008), and Stief et al. (2008).

A slight, yet statistically relevant, decrease of the vertical ground reaction force during the second, lower, peak (push off phase) was observed by Kleindienst et al. (2006) and Hagen et al. (2006). It could have been caused by the active use of poles in this phase of foot contact with the ground (Kleindienst et al., 2006).

The results of studies by Brunelle and Miller (1998), Kleindiensta et al. (2006), indicate, however, higher vertical ground reaction force during landing while pole walking, in comparison to standard walking without poles at the same speed.

The absence of differences in the average vertical ground reaction force between Nordic walking and walking without poles was observed in their studies Jöllenbeck et al. (2006). Nevertheless, in most cases during the contact of the foot with the ground, these forces were higher, although irrelevant. Only in the middle support phase the minimal forces significantly lower.

Besides the second peak of the vertical ground reaction force, Nordic walking results in higher load rates and horizontal forces, along with higher recurrence and recurrence speed rates, compared with walking without poles.

Hansen et al. (2008) show an absence of differences in compression or shear forces that affect the knee joint during Nordic walking and walking without poles.

The results presented by Kleindiensta et al. (2006) and Stief et al. (2006) show a lack of lightening the load on lower extremities, moreover, they point to a higher load on the knee joint while "landing", which is caused by the distinctive technique of Nordic walking: a higher sole angle, higher sole angle velocity and a straighter knee while standing the heel, when compared to walking without poles (Kleindienst et al. 2006).

Yet another researched problem is the influence of poles on the load on lower extremities during Nordic walking up and down hill. Bohne and Abendroth-Smith (2007) studied the effects of using trekking poles while walking down hill with an external load (a backpack). The authors observed a significant reduction of the ground reaction force moment affecting the ankle, knee and hip joints (in the sagittal plane) while walking with poles, compared to walking without them.

Significant differences between downhill walking with and without hiking poles were observed for peak and average magnitudes of ground

reaction force, knee joint moment, and tibiofemoral compressive and shear forces (12-25%)

Schwameder et al. (1999) have shown that walking downhill with trekking poles, in opposition to walking without them, leads a reduction in peak and average magnitudes of ground reaction force, knee joint moment, and tibiofemoral compressive and shear forces (12-25%).

Conclusions

The analysis of the literature concerning Nordic walking shows the main points of scientific interest regarding this form of physical exercise. It shows that the existing research mainly focuses on presenting it as beneficial for the elderly. The authors are presenting the advantages of pole walking for this distinctive age group: improved capacity, endurance, and mental health among others. There are a number of publications concerning elderly women specifically. The second group of studies involves the disabled, people with various psychological and physical problems. Nordic walking is also an object of interest in biomechanical studies. There is an apparent shortage of publications on the utility of this kind of physical activity for children and the young. The existing research focuses on the techniques applied by the subjects examined only to a small extent. This seems to be a frequent shortcoming of the research methodology, as it is difficult to deduce whether the study is based on the correct Nordic walking technique or rather on walking with poles as a bracing device. Furthermore, there is no data concerning Nordic walking as a competitive sport which has been developing dynamically. As an example we may mention Polish Cup of Nordic Walking and a growing number of other highly competitive championships. It seems that this will become the main focus for further research in the nearest future.

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REVIEW PAPER

FITNESS IN THE SPORT STRUCTURE OF LATVIA

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Abstract

Origination of physical activities in Latvia territory, the necessity for sports sector to be developed, as well as the change of people's understanding about physical loads and the essence of active lifestyle caused by rapid growth of the fitness sector where the main principle is load applied to strengthen and improve one's health condition. One of the most important problems is a uniform understanding of the term "fitness", and its place in the sports sector in Latvia. Therefore the aim of the article is to evaluate fitness as structure element inclusion possibilities in the Sports Structure in Latvia. The research is based on the investigation and analysis of the literature sources and sports policy planning documents, such as "Basic Positions of Sport Policy in Latvia", project 2013- 2020, "National Sport Development Program 2006 –2013" of Latvia, "National Development Plan of Latvia 2012 –2020". The place of fitness in the sports system in Latvia, the necessity and possibility to include fitness in the "National Sport Development Program" and in the "Basic Positions of Sport Policy" in perspective were studied. Commercial fitness clubs and the Latvian Fitness and Health Promotion Association (LFVVNA) are not included in the sports structure of Latvia; however, fitness is socially-cultural phenomenon which is necessary to be included in the development program of sport sector.

Introduction

It is known that innovative processes are an integral part of nowadays progress. In the framework of research more and more new terminology which characterizes the development process of society is being used. Socially-cultural environment requires also the development of the sports sector and spread of innovations within it. Today the analysis of the literature sources testifies that the aim of inhabitants' of several countries physical activities is not only to improve abilities to do definite physical

work, but, to spend one's free time actively, to improve lifestyle, whose main ingredient is health (Eichberg, 2004; Scanlan et al., 2011; Ford et al., 2012).

Today the decisive factor to improve and strengthen health is one's own position, his/her attitude towards social, mental and physical health. A new notion in society about a human's life abilities orientates a personality to the development processes of physical and mental health to improve one's feelings and harmonize mental and physical health (SKDS, 2007; Tuyckom et al., 2010).

Rapid changes in the sports sector regarding physical activities among society were caused by the origination of physical activities in Latvia territory and rapid spread of fitness sector with the main principle of load to strengthen and improve health condition.

Therefore *the aim* of the article is to evaluate fitness as structure element inclusion possibilities in the Sports Structure of Latvia.

Methods: the investigation and analysis of the literature sources and sports policy planning documents. The research is based on such information sources as *Basic Positions of Sport Policy in Latvia*, project 2013- 2020, *National Sport Development Program 2006 –2013* of Latvia, as on the national level Sport Policy in Latvia is regulated by exactly these two documents. *Basic Positions of Sport Policy 2013 – 2010* state the main principles, aims and tasks to implement the state sport policy, but the *National Sport Development Program 2006 – 2012* has been worked out as an implementation mechanism of basic positions of sport policy 2006 – 2020. As the third planning document which serves as the basis of this study is the *National Development Plan of Latvia 2012 –2020*, which is the highest national level medium term planning document, including the chapter *Priority – human's safety ability* and one of the priority directions is a healthy and workable individual. The place of fitness in the sports system of Latvia, the necessity and possibility to include fitness in the *National Sport Development Program* and in the *Basic Positions of Sport Policy* in perspective were studied.

Results and Discussion

Fitness gradually developed from simple physical condition to 20th century culture phenomenon, as another development way from a human's physical health, which reflects in its readiness to do physical work up to the desire to improve one's life quality, which includes social, mental and physical components (Howley & Frenks, 1998).

One of the most important problems in the fitness sector in Latvia is a uniform understanding of the term *fitness*, and its place in the sports sector. Fitness is not clearly defined in Latvia, what makes difficult to understand and adopt it in sport science. When analyzing the tendencies of the fitness sector in Latvia the authors conclude that up to now it has not been studied and described deeply enough. In Latvia there are data available from the Latvian Fitness and Health Promotion Association (LFVVNA), which are cited from the international fitness organization – International Health, Rasquet and Sportclub Association **(**IHRSA).

The American term "fitness", which appeared in the 20th century and has become popular today is widely used in such sectors as management, sociology, sports, medicine, and biology, however, the understanding of its essence is different. It can be explained by the fact that phenomena, which are described using the word *fitness* in Latvia and the USA are different. In the society of the USA *fitness* is understood in much broader meaning than in Latvia. In America fitness includes such terms as physical condition, physical activity, recreation, rehabilitation, proper diet, health, etc. In Latvia the word *fitness* does not have a uniform definition, but it is understood as both physical condition and the ability to do a definite action, as well as the desire of a human to be healthy. However, fitness in its broadest meaning is a lifestyle, which gives a possibility to maintain and strengthen one's health, to balance the emotional condition, to improve physical shape and promote active lifestyle (Лисицкая & Сиднева, 2002).

Having analyzed *Basic Positions of Sport Policy in Latvia*, project 2013- 2020, it can be concluded that commercial fitness clubs and the Latvian Fitness and Health Promotion Association (LFVVNA) are not included in the Sport Structure of Latvia (see fig. 2). The structure is an inner formation of a definite system, relations between sub-systems and system elements, composition of these sub-systems and elements, where each of them has a definite function (*Лопатников Л. И.,* 2003). Sports structure is formed in order to logically state mutual relations between the grades and functional parts of the system to effectively reach the aims of the system. So, it can be concluded if fitness clubs are not included in the system, they do not facilitate the process of reaching the aim. More definitely, as one of the aims the improvement of inhabitants health and promotion of active lifestyle should be mentioned.

However, in the *National Sport Development Program 2006 –2013* in the chapter *Sports for All* it is spoken about sports as healthy lifestyle and meaningful spending of leisure outside children and youth sports and outside top sports, for example, attending of sports and fitness centers,

development where competitions are used as an instrument and means, getting individuals interested and participating in various sports. LFVVNA was established in Latvia in 2007 with the aim to unite the representatives of the leading clubs as employers (legal persons), sector specialists – trainers, academic staff of the Latvian Academy of Sport Education to develop the fitness and health sector, as well as promote physical activities of society and improve its health condition, so it plays a great role in the health improvement process of society and promotion of active lifestyle.

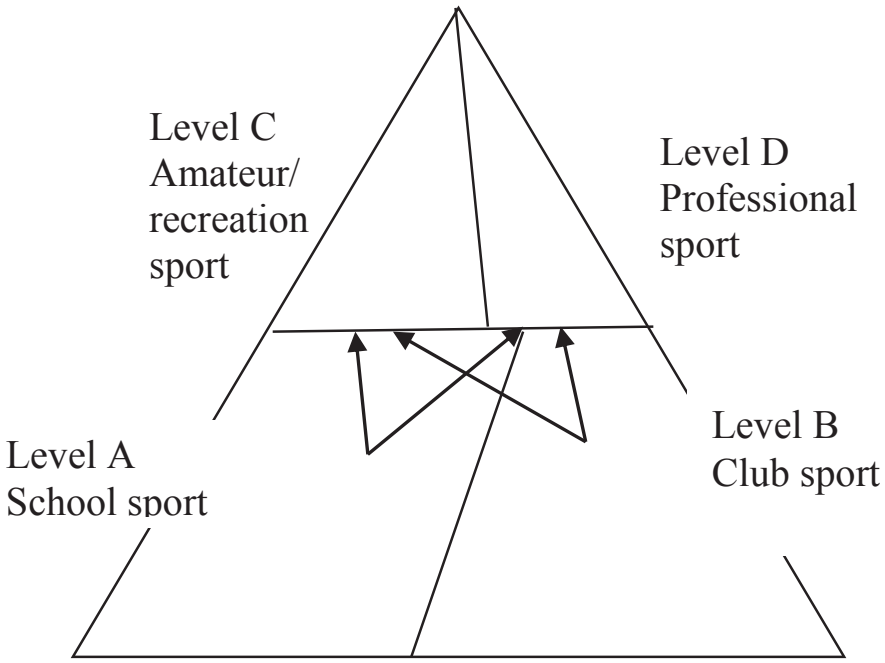

Figure 1. Scheme of sport level interaction (Laios, 1995)

All sport levels in the state should mutually interact (see Fig. 1). Such levels as school sport (children and youth sport), club sport (sport and fitness club), amateur/recreation sport and professional sport should be included in the sport system. School sport or children and youth sport, and club sport is potential forge of professional level athletes, and to great extent it provides also the health and life quality of the state inhabitants (Laios, 1995). There should be transparent, sustainable and towards future directed cooperation between the state, sports clubs, schools and federations on the one hand and sport patrons on the other hand to develop also professional sport in Latvia. To promote more active people's lifestyle it is necessary to get people interested in sport and other physical activities. It is necessary to create a positive attitude towards sport in society and family, emphasizing its role in health strengthening and maintaining of physical condition (Global Strategy for the Diagnosis, Management, and Prevention of Chronic

Obstructive Pulmonary Disease, 2006), what is also done by commercial fitness clubs holding active events for the clients and their families.

In 2007 Social Idea Research Center (SDPC) carried out research about sporting habits of Latvia inhabitants. According to the inquiry data almost a half or 49% of inhabitants have answered that they do not do any physical or sports activity at all. Riga inhabitants (57%) do physical activities more often than other inhabitants of cities (50%) and the countryside (45%) in Latvia. The respondents who had pointed out that they did not do any physical/sports activities, had mentioned the lack of time (44%) as the main reason, 27% of them pointed out that it was not necessary for them to do that, but 22% answered that they could not do that because of their present health condition. Only 2% of the respondents pointed out that they did not do physical or sports activities because it was too expensive (SDPC, 2007).

In 2010 a research was carried out on *Sex and Age Inequality Regular Participation in Sport: European state research* with 25 countries taking part, including Latvia. The results show that only 19.6% of respondents after the age of 18 participate actively and regularly in sports classes in Latvia. The research shows that men are more active than women, and they do sports more regularly (Tuyckom et al., 2010).

Fitness clubs and LFVVNA are not included in the Sport Structure of Latvia, therefore there are no data about them in the Latvia State Central Statistics Department, and so it is not possible to substantiate them scientifically. However, on LFVVNA homepage there is information about the campaign of active lifestyle popularization "Sweat off Your Tire!", which in 2012 involved 48 sports and fitness clubs, swimming pools and other institutions of active relaxation in Riga and other cities of Latvia. Comparing to 2011, when the campaign was supported by 37 sports clubs, we have experienced a significant increase of interest. The interest from the side of society has increased, too – in 2011 on the day of the campaign sports clubs were attended by about 4700 people, but in 2012 – about 5500. The oldest participant was 76 years old, the youngest – only 5 years old. 23% of all visitors attended a fitness club for the first time, 46% did fitness irregularly, and this event raised motivation to come to a sports club, and only 31% of the participants attend fitness clubs regularly.

The Sport Structure of Latvia (see Fig.2.) includes such sub-systems as Sport Medicine State Agency, the state capital companies, the Latvian Academy of Sport Education, subordinate institutions and non-governmental organizations. Every sub-system consists of definite elements, and their work is regulated by a definite ministry. Non-governmental

organizations are Sport Federation Council of Latvia, Latvian Olympic Committee, Latvian Paralympic Committee, School Sport Federation of Latvia, Latvian People Sport Association, Latvian University Sport Association, Latvian Sport Veteran Association and the Latvian Fitness and Health Promotion Association could be added as one more element in this Structure, as this association has a very important function in the Latvia state – the popularization of healthy lifestyle and regular physical activity among the inhabitants of Latvia. Commercial fitness clubs could be joined to the element sports clubs.

To understand better fitness position in EU we compare Sport Structure in Latvia with a Sport Structure in other European countries. According to information, we can conclude, that in Austria, Belgium, Bulgaria, Estonia, France, Germany, Greece, Hungary, Ireland, Lithuania, Malta, Poland, Portugal, Romania, Slovakia, Slovenia, Sweden and United Kingdom fitness clubs are not included in the Sport Structure as well as in Latvia. At the same time in Finland there are 2 fitness sport organizations in the Sport structure, which are regulated by the Finnish sport association (SLU), in Spain on the Local level organize and manage sport services for citizens (fitness, sport schools, technical centers). The reason for the high rate of sport practice in The Netherlands as one factor was mentioned the rapid growth in the number of fitness centers (from 400 in 1995 to more than 2,000 in 2007). The Czech Republic the Association of Sport for All is an association of sport clubs, institutions and civic associations which focuses on the organization of recreational and physical activities for people of all ages, including commercial activities – for example fitness clubs attendance. Cyprus Olympic Committee has a sport-for-all programm which supports the practice of sport for children, adults, senior citizens and the disabled, and organizes sport events at regional and district level in certain disciplines (Sport statistics data in EU,2013)

The number of sports clubs in Latvia is 84, capital companies whose work involves organization of sports classes and events are 19 and fitness clubs in Latvia are about 150, what is more than sports clubs. The number of sports organizations in Latvia from 2009 till 2011 has decreased from 1024 to 762 organizations (Sport statistics in Latvia, 2012), but the number of fitness clubs from 2009 till 2012 has increased from 118 to 150 commercial fitness clubs (IHRSA, 2012). It allows conclude once more that fitness clubs are popular among inhabitants of Latvia and help to reach the aim of strengthening and improvement of health condition, and healthy lifestyle popularization among inhabitants of Latvia.

Nowadays the development of society cannot be conceivable without sports. Therefore it is necessary to include fitness clubs and the Latvian Fitness and Health Promotion Association in the Sport Structure of Latvia, as:

1. The opening of various fitness clubs in Latvia affects the number of people, who do physical activities to improve and strengthen their health condition, so affects the health condition of inhabitants of Latvia and facilitates the development of sports sector in Latvia.

2. To develop the sports sector in Latvia it is necessary to make contacts with several international fitness organizations on the state level, such as International Health, Rasquet and Sportclub Association (IHRSA), European Committee of Development of Sport (CDDS) and International Dance Exercise Association (IDEA), etc.

3. There is a common international terminology, which includes several derived words: a fitness club, fitness sector, fitness technologies, fitness programs, fitness trainer, etc.

4. The effect of globalization on the sports sector decreases language barrier all over the world, using common terms, such as „fitness", which allows unite countries in one sports sector community.

5. Fitness gives positive impact on the economics environment. The fitness clubs segment of the global leisure facilities sector generated total revenues of $62.9 billion – over 45 per cent of the sector's overall value – representing a compound annual growth rate for the period 2006 to 2010 of almost 3.5 per cent (Datamonitor, 2011). A more encompassing analysis of the fitness industries conducted on behalf of the International Health, Racquet and Sportsclub Association (IHRSA, 2012) reported that, in 2009, the sector was worth $70 billion.

Fitness includes various physical activities, health improvement programs, innovative technologies, diet programs, whose main principle is health improvement. As it is mentioned in the action direction *Healthy and Workable Individual* of the *National Development Plan of Latvia 2012 – 2020*: 30% of all the dead in Latvia have lost their life at the age of being able to work. The main causes of death rate are different diseases (cardio-vascular, oncologic, mental, loco-motor, a.o.), as well as outer death causes (injuries, accidents, suicides, murders), which often cause the loss of work ability. Therefore it is necessary to implement purposeful and effective health promoting and risk limiting events, forwarding as one of the objectives – to strengthen healthy and active lifestyle habit in society by developing health promotion cooperation nets: of healthy diet, active lifestyle and the facilitation of mental health.

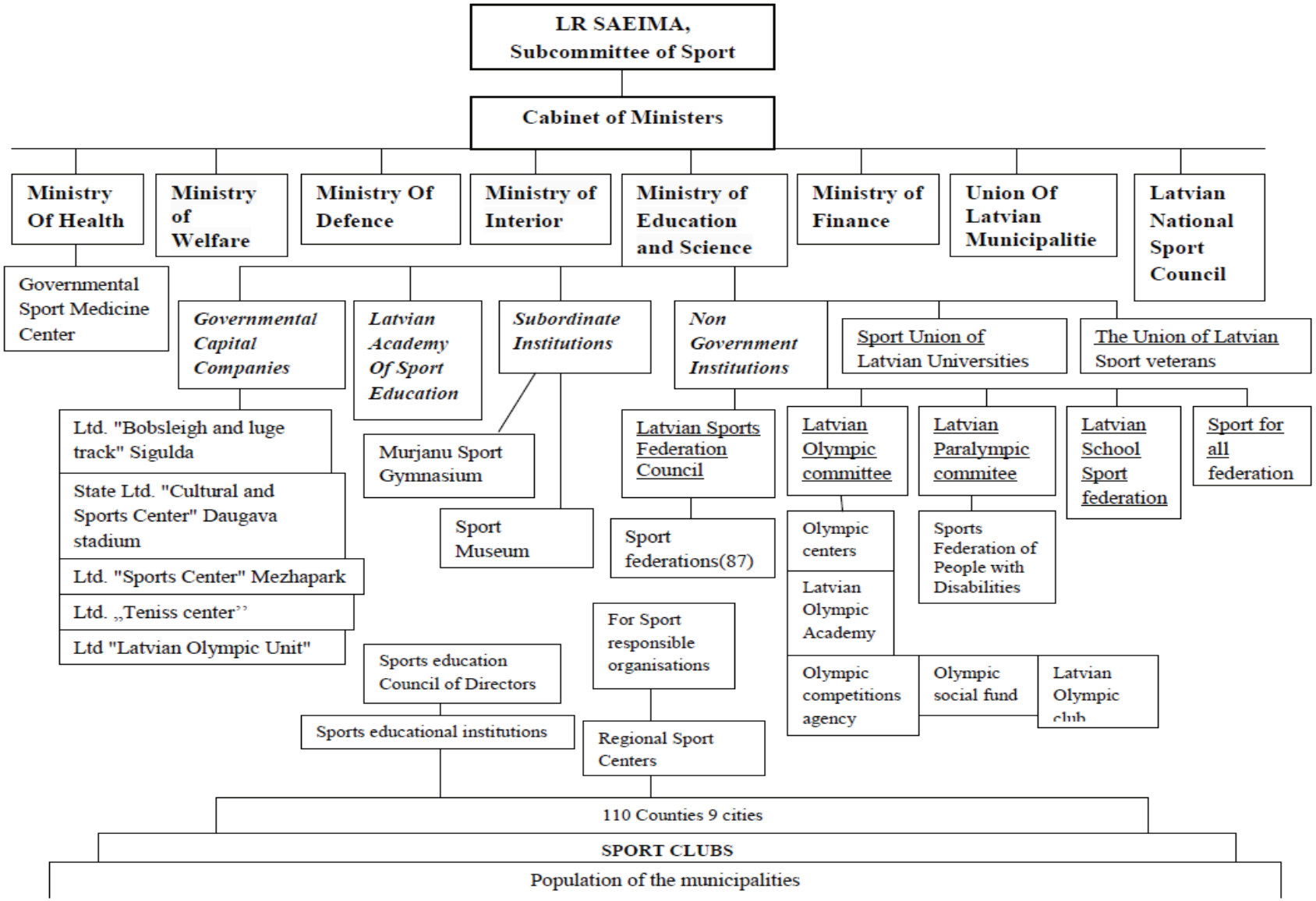

Fig. 2. Sport Structure in Latvia after the state sports institution reform on December 31, 2011 (Sport politics guidelines 2013 - 2020)

It can be mentioned that the development of the fitness sector is very rapid and continuous, characterizing any socially-cultural phenomenon. So, it can be concluded that fitness is socially-cultural phenomenon, necessary to be included in the development program of sports sector in Latvia. The fitness sector is very broad and involves such parts as physical activity, recreation, rehabilitation and education (see Fig.3). Fitness integrates in several sectors, also in the medicine sector. Fitness sector is related to the health field of the economic sector, and it shows that fitness has several functions and an essential place in the sports sector in Latvia.

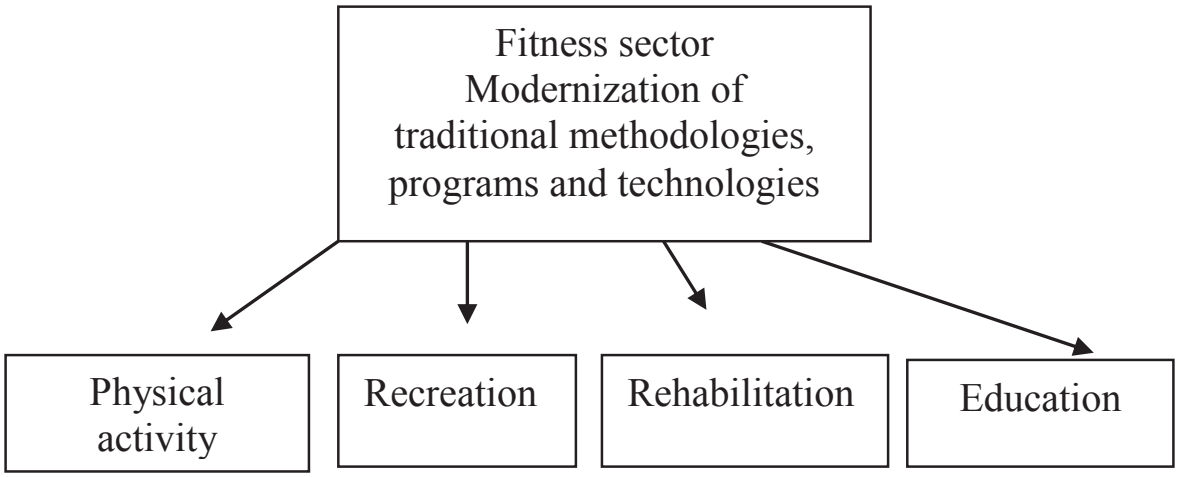

Figure 3. Parts of fitness sector (Сайкина, 2008)

Already for some years fitness is topical and popular among inhabitants of Latvia, and it affects their lifestyle and habits of spending their leisure. It is an innovative phenomenon in the sports sector, and by its essence it corresponds to innovative development logics.

Conclusions

1. One of the more important problems in the field of fitness in Latvia is the understanding of the term *fitness* and its place in the sports sector.

2. The number of sports clubs in Latvia is 84, the number of capital companies whose activities are related to organization of sports classes and sports events is 19 and the number of fitness clubs throughout the Latvia is approximately 150, that is more than sports clubs.

2. Commercial fitness clubs and Association of Fitness and Health Promotion of Latvia (LFVVNA) are not included in the overall Sport Structure in Latvia.

3. In the section *Sports for All* of the *National Sport Development Program of Latvia, 2006-2012*, it is spoken about sport as a form of healthy

lifestyle and meaningful leisure activity, for example, attendance of sports and fitness centers.

4. Association of Fitness and Health Promotion of Latvia can be included in the scheme of the Sport System of Latvia as one more element since it has one very important function – popularization of healthy lifestyle and regular physical activities among Latvian people.

5. Fitness is a socially-cultural phenomenon that needs to be included in the sport development program in Latvia. Fitness clubs need to be added to the element *Sport Clubs* in the Sport Structure of Latvia.

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Short communication

BRANCH OF SPORT SCIENCE IN HISTORICAL PERSPECTIVE IN LATVIAN ACADEMY OF SPORT EDUCATION (LASE)

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Branch of Sports Science

Currently, the Latvian Council of Science (LCS) database division in scientific and sub-sectors in Sports Science (No. 38) was merged with the Social Sciences. Sports Science is a branch of science which studies human physical health, development, physical fitness and the regularities of the formation of sports achievements. Sports science has two sub-sectors: 38.1 Sports Theory and History which is a Science subsector that explores methodological and theoretical correlation formation between human physical health, physical development and sporting achievements, as well as historical development of Sports theory, and 38.2: Sport Pedagogy: a scientific sub-sector exploring the regularities of sports and health education, teaching, mentoring and training. Sports Science involves sport-related integrated research on pedagogical, psychological, medical, biological, biomechanical, sociological and economical science issues. In several European countries science branch classifiers, Sports science as a separate branch already appeared in the last century (70s – 80s). In Latvia Sports Science as a separate branch of science was approved on February 17, 1998, with the LSC's decision, but it did not had corresponding name of Scientific degree, therefore it remained the same – Doctor of Pedagogy (Dr.paed).

LASE Sports Science Development

Sports specialists' path to the nomination of their own research sectors was not an easy task. The starting point was Latvian Cabinet of Ministers Decision (04.10.1991, No. 262) „Regulations for the Award of the Degrees", which approved Regulations for the award of degrees in Latvian Republic and commissioned to the research institutions and universities

consisting of Degree-granting Councils in accordance with the procedures laid down by the Soviet Union, to put an end to Soviet activities by December 31, 1991.

Initially Latvian Academy of Sport Education (LASE) made a bid for the promotion rights in Pedagogical Science sector, Physical Education and Sports Methodology sub-sector (25.10.1991), by applying seven expert candidates. Such rights Latvian Council of Science granted to Sports Academy with the Resolution No. 35-3-5 on March 19 1992. Later On March 23, 1992 Promotion Council in its meeting decided to rename the sub-sector Physical Education and Sports methodology to Sport Pedagogy by coordinating it with the Latvian Council of Science. In this meeting as a Promotion Council Chairman was appointed Professor I. Forands. With the Latvian Academy of Sports Education Rector's U.Grāvītis order (23.03.1992. No.68) were formally approved members of the Promotion Council in the field of Sport Pedagogy and its sub-sector which included seven members from the pedagogical and medical science industries. On the basis of the Latvian Science Council Decisions (19.03.1992, No.35–3-4 and 35–3-5), LASE Senate on May 7, 1992, approved its "Regulation on the Latvian Academy of Sport Education Promotion Council activities'', and according to these documents LASE Promotion Council was empowered to grant Scientific Doctoral Degree in Pedagogy, sub-sector of Sport Pedagogy, granting Doctoral Degree for both independently carrying out original research on relevant scientific issues in Pedagogy and Sport, and equating degrees acquired abroad to Latvian post-Soviet certification system in Pedagogy and its sub-sectors. Consequently, on June 29, 1992, the first Scientific Doctoral Degree in restored Latvia, and thus the first in Sport Pedagogy, acquired LASE Skiing Department lecturer J.Grants (Latvian History of Sports, 1994). The Promotion Council alignment meeting took place even faster – on May 13, 1992, by nostrificating first acquired abroad scientific candidate degrees, and they were LASE teachers J.Dravnieks, U.Švinks, H.Erdmanis and E.Popovs. In 1993, within the frameworks of the LR Science Council's decision (25.11.1993 No.12-3-1) LASE submitted an application on Habilitation rights, applying experts in following composition: prof. L.Žukovs (LASE), prof. M.Āboltiņa (LASE), prof. R.Garleja (Latvian University) prof. D. Meikšāne, prof. I.Plotnieks (Latvian University), prof. N. Jaružnijs (LASE).

LCS in 1994, (12.04.1994 Decision 19-2-3) repeatedly granted the rights for Latvian Academy of Sport Education to form a Promotion Council with a 3 year term of office in Sport Education sector and sub-sector of

Pedagogical Science. In 1997, the Examination Board's prof. R.Garleja was replaced with Latvian University expert prof. A.Špona.

On June 19, 1998, LCS on the basis of LR Parliament and LR President adopted and promulgated Amendments to the Law „On Scientific Activity", which envisaged powers to award degrees only in institutions of higher education and national research centers, stopped several Habilitation and Promotion Council activities in Latvia, but till October 31, 1998, extended all operational Habilitation and Promotion Council terms of office which are located nearly at all higher education institutions.

Following the previous Cabinet Regulation in 1997 and in 1998, LASE Doctoral Theses defended 10 people and nostrificated was 1 person. Overall from 1992 to 1999, 21 were defended and 41 nostrificated their works. During the period from July 1, 1999 to July 4, 2006, Latvian Academy of Sport Education Promotion Council was not established.

On July 4, 2006 with the decision of LSC Committee No. 4-3-8 with a 3 year terms of office (till July 4, 2009) as experts in scientific field "Sports Science" and sub-sectors "Sport Pedagogy" and "Sports Theory and History" were confirmed following scientists: L.Čupriks (Sport Pedagogy), J.Grants (Sport Pedagogy), U.Grāvītis (Sports Pedagogy, Sports Theory and History), R.Jansone (Sports Pedagogy), N.Jaružnijs (Sports Pedagogy), J.Lanka (Sports Pedagogy, Sports Theory and History), V.Lāriņš (Sports Theory and History). On August 31, 2006, LASE Senate approved regulations on Sport Science Promotion Council activities. Within the Council in addition to afore mentioned experts (without the LCS expert rights) were included: A.Konrads (Sports Theory and History), V.Krauksts (Sports Pedagogy), I.M.Rubana (Sports Pedagogy), U.Švinks (Sports Pedagogy, Sports Theory and History).

On May 15, 2009, LASE due to the fact that the Promotion Council's experts terms of office was coming to an end, asked the Latvian Council of Science to appoint new expert composition, submitting 14 candidate scientific documents (approved by the LASE Senate on May 7, 2009). LCS on July 3, 2009 with the Decision No. 6-2-1 as experts in Sports Science sphere appointed nine scientists: A.Ābele, J.Grants, U.Grāvītis, A.Kļaviņa, A.Konrads, J.Lanka, V.Lāriņš, I.Pontaga, A. Rudzītis with a term of office which lasts till July 3, 2012.

On July 21, 2011, LCS expert rights for 3 years acquired scientists: L.Čupriks, A.Fernāte, A.Emeljanovas (Lithuania) and A. Koka (Estonia). Consequently, the LASE Promotion Council became international. On October 20, 2011, for a time period of one year as experts were confirmed two more foreign university scientists – K.Piech (Poland) and R. Carlson

(Sweden). LASE Senate on August 30, 2012, on the basis of LCS Decision No. 26-4-1 on July 29, 2012, on granting expert rights to prof. A.Ābele, prof. J.Grants, asoc.prof. A.Kļaviņa, prof. A.Rudzītis, asoc.prof. Ž.Vazne, prof. J.Lanka, prof. I.Pontaga confirmed the new composition of the Promotion Board.

Doctoral Thesis

Starting from year 1992 to 2014, in Pedagogy and Sports Science field has been defended 42 Doctoral Thesis (Table 1).

Table 1

The authors of defended Doctoral Thesis in LASE Promotion Council

Year of defense	Name, Surname
1992	Juris Grants, Astra Vītola
1993	Ivans Kločkovs, Leopolds Kovals, Viktors Bonders, Ivans Klementjevs
1995	Ilze Avotiņa, Imants Liepiņš
1996	Tamāra Škoļņikova
1997	Jānis Žīdens, Leonīds Čupriks
1998	Baiba Smila, Andris Spunde, Jānis Melbārdis
1999	Jānis Želvis, Ludmila Beļikova, Ludmila Kurova, Juris Žuravļovs, Irēna Dravniece, Arvils Lielvārds, Jolanta Marija Garbacik
2009	Aldona Homiča, Una Veseta, Ivars Kravalis, Žermēna Vazne
2010	Antra Gulbe, Vita Mikitanova
2011	Inta Bula-Biteniece, Aivars Kaupužs, Inga Liepiņa
2012	Māris Lesčinskis, Uģis Ciematnieks, Ingrīda Smukā, Sergejs Saulīte, Luize Ventaskrasta
2013	Monta Jakovļeva, Kalvis Ciekurs, Andris Molotanovs, Signe Luika
2014	Alina Kļonova, Anna Zuša, Renārs Līcis

Many university faculty members has defended their thesis in various research centers and universities in the USSR (Moscow, Leningrad, Minsk, Kiev, Tartu, etc.), thus all defended thesis till 1992 were nostrificated in LASE Promotion Council, awarding Doctoral Degrees in the correspondent field of science (Dr.paed., Dr.biol., Dr.med.; Table 2).

Table 2

Authors of nostrificated dissertations in the LASE Promotion Council

Year of nostrification	Name, Surname
1992	Juris Dravnieks, Uldis Švinks, Helmūts Erdmanis, Eduards Popovs, Viesturs Krauksts, Daina Krauksta, Jānis Muižnieks, Raisa Tarnopoļska, Valentīns Vološins, Aina Pētersone, Rasma Jansone, Vladimirs Maksimovs, Genādijs Kobzevs, Genādijs Vanajevs, Alberts Bagojans, Gunārs Briņķis, Valerjans Kokorēvičs, Viktors Mūzis, Igors Ķīsis, Tālivaldis Jēkabsons
1993	Andris Rudzītis, Leonīds Žiļinskis, Laima Saiva, Oļģerts Altbergs, Silvija Skulme, Raisa Martuzāne, Mihails Amaļins, Valērijs Jaružnijs, Viveja Bulate, Sofija Laizāne, Vladimirs Demčeko, Isaks Jeļņiks, Jurijs Petrovs, Igors Kļosovs, Vladimirs Poļevojs, Jānis Kupčs, Aļģimantas Kubiļus
1994	Jeļena Solovjova
1995	Ārija Vasileva, Jevgenijs Petkevičs
1999	Vera Molčanova

From an interview with the professor V.Krauksts: "The first sport scientists who went to the Moscow Central Institute of Physical Education "*Target post-graduate school*" at the end of 1960s were: professor I.Auliks, professor E.Popovs (1968), professors V.Krauksts un A.Ņemčenko (1969), professor A.Lielvārds, professor A.Konrads, and assistant professor G.Kobzevs, whereas prof. U.Grāvītis studied in Postgraduate courses in Moscow and defended his dissertation in USSR Scientific Research of Physical Education and Sports Institute.

Baltic Sports Science Association

For further promotion of Sports Science on April 24, 2009, in the Second Baltic Sports Science Conference in Vilnius was established the Baltic Sports Science Society, with the aim to provide Sports Science development in the Baltic countries, to create a single international doctoral program in Sports Science and by joint efforts integrate into the European and Global Sports Science movement. University of Tartu Faculty of Sports, Lithuanian Academy of Physical Education, Vilnius Pedagogical University Faculty of Sports and Health Education and the Latvian Academy of Sports Education are all among the founders of the Society

LASE Honorary Doctors

Great support for LASE has given professors from Sweden and Poland, who according with the regulations (approved by LASE Senate on October 7, 2004, protocol No.3) received LASE Honorary Doctor title. LASE Honorary Doctorate diplomas were presented in the opening ceremony of the 3rd Baltic Sports Science Conference, thus celebrating contribution of foreign colleagues in LASE development.

Cooperation with Professor Rolf Carlson from the Swedish School of Sport and Health Sciences already lasts for fifteen years. It all started in 1995, with the project "Latvia-Sweden in Sports", when the Professor R. Carlson gave lectures to the LASE university lecturers and other professionals in Sport Sociology. For several years he has educated LASE doctoral students on Qualitative research in Sports sphere, and he has worked together with LASE lecturers on different sports research projects. Professor R. Carlson led coaching practice of several LASE students and organized co-operation with the Swedish sports clubs to ensure practice to LASE students.

Professor Johnny Nilsson is a scientist in Sports Physiology and Biomechanics fields from the Swedish School of Sport and Health Sciences. On several occasions he advised our specialists on scientific research for both skiers and orienteers functional fitness. During LASE student internship in Stockholm he led Sports Medicine and Testing Methodology Courses for LASE students. He is currently working together with Professor V. Kraukts and PhD student K. Ciekuru on the research Project ‘’Local Vibration Impact on Fitness of Cross-Country Skiers.’’

Together with Associate Professor Krzysztof Piech, who represents The Józef Piłsudski University of Physical Education in Warsaw, we have organized the International Summer School for doctoral students and graduate students. He is a curator of the Latvian students in Poland. For the sixth consecutive year, Professor K.Piech educates LASE students in both managing practical classes in subject "Nordic Walking" and giving lectures about ‘’Family Sports Development Trends in the World’’.

For a significant and lasting contribution to LASE physical education and science development the honorary title “LASE Honorary Doctor” was given to Professor Ausma Špona.

LASE Scientific and Methodological Publications

By 2009, collection of LASE scientific articles were issued regularly in three languages (English, Latvian and Russian), which brought together many sports deviations – Sports Biomechanics, Sports Physiology,

Psychology, Pedagogy. As of 2010, the previous scientific collection was replaced with two new editions – magazine in Latvian for sports professionals and practitioners ‘’Sport in Theory and Practice’’ in Latvian language and sports science magazine in English ‘’LASE Journal of Sport Science’’. The Journal website: http://journal.lspa.lv/

International Summer School of LASE

On August 2010, LASE along with two universities in Poland (The Józef Piłsudski University of Physical Education in Warsaw and Higher School of Computer Science and Business Administration in Lomza) organized the first International Summer School „Recreational Outdoor Games from the Historical Perspective in Latvia”, in which PhD and MA students had the opportunity to study qualitative research methods in practice interviewing local residents and collecting games characterizing Latvian traditions. International Summer Schools are held alternatively in both Latvian and Poland. This year it will take place in Latvian, in early September. Information about the events of the International Summer School can be obtained at website: http://osress.weebly.com/.

LASE Sport Science guidelines are based on our Alma Mater motto: education based on innovation, synergetics of study work and research, creative and open learning environment.

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Short communication

PERFECTIONISM IN ATHLETES- POSITIVE AND NEGATIVE ASPECTS

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Abstract

This article presents a review of recent studies about perfectionism in sport, its function and its positive and negative aspects. Perfectionism is a multidimensional characteristic of personality. Some studies suggests that perfectionism has two main dimensions- perfectionistic strivings and perfectionistic concerns (Stoeber, 2011) or positive and negative perfectionism (Łuszczyńska, 2012). Perfectionistic strivings correlate positively with approach goal orientations, self-confidence, hope of success and performance in training and competitions, where perfectionistic concerns show positive connections with avoidance goal orientation, fear of failure or competitive anxiety (Stoeber, 2011). Positive perfectionism may be associated with better performance in sport, refering to high personal standards and the pursuit of excellence. Negative perfectionism relates to concerns about your own performance, focusing on the mistakes, evaluation and implementation of a discrepancy between expectations and negative reactions for ones own mistakes (Łuszczyńska, 2012). Assuming that perfectionism is a part of personality which can change during the lifespan and is a multidimensional characteristic, we should ask the question whether in a given player the dimensions of perfectionism may change depending on the conditions in which he/she is located and his/her personal experience?

Keywords: *perfectionism in sport, perfectionistic strivings, perfectionistic concerns*

Introduction

As with general perfectionism, perfectionism in sport has for a long time been recognised as a one-dimentional, unhealthy, disfunctional and

maladaptive characteristic. Perfectionism has influence on all spheres of athlethes functioning- cognitive, emotional and behavioral. It can bring positive outcomes but it may also induce harsh self-evaluation or concern about mistakes and higher self-criticism. According to some authors perfectionism is an ambivalent characteristic which has positive and negative aspects. Perfectionistic strivings and concerns manifest mainly in an athlethes thoughts (Hall, Jowett & Hill, 2014).

Positive and negative dimensions of perfectionism

Some studies showed that there are two dimensions of perfectionism: perfectionistic strivings (positive perfectionism) and perfectionistic concerns (negative perfectionism).

Tabel 1 shows the comparison of Hall's and Stoeber's conceptions of perfectionism. Generally positive perfectionism is connected with more adaptive coping with stress, high personal standards, better performance in sport and having fun. Negative perfectionism- perfectionistic strivings correlates with fear of making mistakes, negative reactions for ones own mistakes, focusing on mistakes and frequent meditation on the negative consequences of a situation (Łuszczyńska, 2012).

Table 1

Factors connected with positive and neagtive dimensions of perfectionism

Hall, 2006	
involved perfectionionism	non-adaptive perfectionism
- beneficial to the individual - more adaptive coping with stress - high personal standards - a desire to have fun	- fear of making mistakes, - frequent meditation on the negative consequences of a situation - need for approval -pressure from important people during coping with stressful situatons
Stoeber et al. 2006	
positive perfectionism	negative perfectionism
- associated with better performance in sport - high personal standards - striving for perfection	- fear for their own performance - focusing on mistakes - evaluating the discrepancy between performance and expectations - negative reactions for own mistakes

Stoeber and Otto (2006) checked 15 studies about general perfectionism literature which reported bivariate correlations between healthy, adaptive and facilitative or unhealthy, maladaptive and debilitative

characteristics, processes and outcomes. Perfectionistic concerns were only negatively correlated with adaptive characteristic and positively correlated with non-adaptive charcteristic such as neuroticism. In 10 of the 15 studies perfectionistic strivings showed positive correlations with adaptive characteristics and neagtive with maladaptive characteristics. Other studies about perfectionistic strivings didn't showed any signifficant correlations or showed together positive and negative correlations between adaptive or maladaptive characteristics (Stoeber & Otto, 2006).

It is not clear if positive perfectionism can be change to negative perfectionism and negative perfectionism to positive perfectionism. However according to Hall (2006) athlethes who have a higher level of adaptive, perfectionistic strivings also tend to have a higher level of primarily, maldapatpive perfectionistic concerns. In this situation positive or negative aspects of perfectionism in an athlethe can depend on outside circumstances, his/her experiences and other factors which are not directly under our control. Moreover most perfectionistic athelthes reported a fear of failure, unremitting pressure to meet their own high standards, maladaptive forms of motivation anxiety over performance, fluctuating self-worth, anger and so on.

Some researchers suggest that perfectionism should have more precise meaning to help and enable sport psychologists to understand achievement behaviours in sport. It could be possible that when the term of perfectionism includes only compulsive strivings for perfection, which indicate harsh evaluative concerns and supports the thinking that self-worth is a result of productivity and sporting acomplishment (Hall, Jowett & Hill, 2014).

Conclusion

Taking all things into account it is difficult to conclude that perfectionism has only positive or negative aspects. Perfectionism seems to be a kind of paradox where some of its aspects are useful to build success of performance and at the same time some of its aspects make this success impossible. Perfectionistic strivings seems to be adaptive when not accompanied by perfectionistic concerns which clearly can lead to low self-esteem and be a risk factor for development of mental health disorders. But people having a positive perfectionism are still more likely to experince a negative perfectionism (Hall, Jowett & Hill, 2014). The future challenge for sport psychologists is to strengthen perfectionistic strivings and reduce perfectionistic concerns in athlethes so that they have reached their maximum capabilities.

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CURRENT NEWS

Latvian Academy of Sport Education

20th International Congress
Fair Play – Bridge Between Sports And Culture
and
European Fair Play Movement Executive Committee General Assembly
October 8-11, 2014 Riga, Latvia

OSRESS 2014

Outdoor Sports and Recreation Education Summer School 2014
Outdoor Games from the Historical Perspective in Latvia

September 4-11, 2014 Madona, Latvia

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

We congratulate Alīna Kļonova, the student of doctoral studies at the Latvian Academy of Sport Education, to have defended his thesis "Partners' Physiological Engagement and Body Contact Improvement in Standard Sport Dances" (Sport Science) at the Latvian Academy of Sport Education on January 16, 2014. Supervisors: Dr.paed., assoc.prof. Leonīds Žilinskis, Dr., prof. Antonio Cicchella. Advisor: Dr. Jolita Vveinhardt.

Thesis 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"

We congratulate Anna Zuša, the student of doctoral studies at the Latvian Academy of Sport Education, to have defended his thesis "The Forehand Stroke Biomechanics in Athletes of Different Qualifications and The Evaluation of The Locomotor System of Young Tennis Players" (Sport Science) at the Latvian Academy of Sport Education on January 28, 2014. Scientific supervisor Dr. habil. paed., prof. Jānis Lanka. PhD Anna Zuša is director and physical condition coach in Sia "Bērnu Tenisa Centrs".

Thesis 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"

We congratulate Renārs Līcis, the student of doctoral studies at the Latvian Academy of Sport Education, to have defended his thesis "Optimization of High Qualification Sport Game Referee Preparation Process" (Sport Science) at the Latvian Academy of Sport Education on February 4,, 2014 Scientific supervisor Dr.paed., Prof. Andris Rudzitis. Scientific adviser Dr.paed., Assoc. Prof. Zermena Vazne. PhD Renārs Līcis is LASE, Department of Sport Games, academic staff member, Since 2000 LASE, coach of women handball team. 2011 – today LASE, Master degree study programme, head of qualification: physical conditioning coach. 2011 – today Latvian Sport Games Scientifically Methodological Centre (LSGSMC), head. 2004 – today IHF category coach.

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A.Kļonova, A.Zuša and R.Līcis Doctoral Thesis have been developed by ESF support within the project "Support for Sport Science" Nr. 2009/0155/1DP/1.1.2.1.2/09/IPIA/VIAA/010 work programme „Human resources and Employment" 1.1.2.1.2. sub-activity „Support to Implementation of Doctoral Study Programme".

GUIDELINES FOR CONTRIBUTORS

Instruction to Authors

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

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

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

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

Manuscript specification

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

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

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

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

Format

Document format – Microsoft Word 97-2003 or 2007.

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

Style

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

Content

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

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

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

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

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

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

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

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

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

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

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

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

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

Citing in-text

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

Claessens (2010) found evidence that attention will be given to multi-compartment models, such as the 3-water, 3-mineral and 4-compartment models, to assess percentage of body fat. However, Raslanas, Petkus and Griškonis (2010) noted that Aerobic physical load of low intensity got 35.1 % of total trainings time. Research on physical loading also focused on

identifying the basis of many years' research of physical activity (Bytniewski et al. 2010). According to Ezerskis (2010), "… heavy physical loads had the undulating character depending on the dynamics of workloads…" (p. 71) yet girls are more ascertained that the Track & Field training helps to develop courage.

Instructions for Authors on References (APA style)

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

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

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

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

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

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

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

Submission of manuscripts

The articles should be sent to:

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