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ORIGINAL RESEARCH PAPER

RETENTION OF NONVISUAL SENSORY SKILL IN FOOTBALL

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Abstract

The purpose was to study retention of nonvisual sensory skill and skill during visual feedback in the control of the football after a time period of one year. In total 12 young players from an elite boy football team participated in the retention study. Their mean (±SD) age was 13.3 (±0.3) years. The participants were available players from an intervention group (n=8) and a control group (n=4) in a previous study (study 1) that examined development of nonvisual sensory skill in football (Nilsson et al. 2018). The pre- and posttest in study 1 consisted of two sub-tests; 1) a stationary ball control test and 2) slalom course ball drive test. The posttest in study 1 was repeated one year later with the available players in the intervention and control group to investigate retention of nonvisual sensory skill. The results showed no significant difference between the post- test in study 1 and the retention test one year later in the intervention and control group in the stationary ball control test (p=0.667 and 0.689, respectively) or in the slalom ball drive test (p=0.582 and p=0.372, respectively). Corresponding results were seen between the post- and retention test when no visual restrictions were present. Conclusions. A significantly improved nonvisual and visual sensory skill in stationary ball control and driving the ball in a slalom course can remain over at least a 12-month period.

Keywords: *nonvisual sensory skill, football, ball control, performance, retention*

Introduction

In a previous study (study 1) published in the LASE Journal (Nilsson, Gürsoy & Hermansson 2018) significant improvement effects of nonvisual sensory skill in football was obtained among young elite male football players after a period of training. No significant training effect was seen in the control group. The aim of the present investigation was to study the retention of the nonvisual sensory skill and skill during visual control in football after one year without nonvisual sensory skill training.

The hypothesis in study 1 was that the visual system is dominant in football and therefore it is plausible that other sensory systems get less stimulation in conventional football training. Due to the visual dominance in conventional football we assumed that the nonvisual system may not have developed enough in this context. Therefore, it was important to evaluate the potential of the nonvisual sensory system to adapt and cope with greater involvement in the control of the ball in football.

It is obvious that the nonvisual sensory skill can supply information about whole body and segmental positions as well as orientation in space by means of the vestibular system, muscle spindles and joint receptors. In addition, the sensation of contact with external objects is supplied by means of receptors located in the skin projected to distinct areas on the sensory cortex (Latash 2008). Thus, the nonvisual system can handle balance, position of body segments, and contact with external objects such as a football. The nonvisual system functions in collaboration with the visual system but can, to a certain extent, also function alone in the control of the body.

Learning was expressed as a significant improvement in nonvisual skill in the post-test, which indicates that the learning process of nonvisual sensory skill in football have occurred and formed permanent changes in the brain expressed as memory. Memory permits organisms to benefit from past experiences. Thus, the nonvisual sensory skill training among the players in the intervention group resulted in memory changes expressed in the post-test performance improvements. However, it was not known how persistent over time these new formed memory structures were.

The learning process in nonvisual skill indicates a substantial neuro-cortical plasticity associated with changed peripheral afferent input (Merzenich et al. 1983, Bach-y-Rita 1986, Jenkins et al. 1990). This was also obvious in a study by Kapreli and co-workers (2009) where patients with unilateral anterior crucial ligament (ACL) deficiency from previous injuries affecting different tissues such as ACL can cause reorganization in the central nervous system including higher brain areas.

The intention of the present investigation was to gain further indirect knowledge about the neural plasticity, learning and memory time limits by studying the retention of nonvisual sensory skill in football.

Materials and Methods

In total 12 young players from an elite boy football team participated in the retention study. Their mean (±SD) age was 13.3 (±0.2) years. The participants were available from the intervention group (n= 8) and a control group (n= 4). The available players in the intervention group and the control group participated in a retention test one year after the post-test in study 1. In this test, the post-test and procedures from study 1 were repeated, and the results from the participating players in the post test and retention test were compared.

The test procedures and training were approved by the players and their care takers. The design and procedures in the study were approved by the regional ethics committee of Uppsala, Sweden.

Below, a shorter description of the test design and procedures are presented. For a more detailed description see Nilsson and co-workers (2018).

Test design and procedures. Study 1 followed a pre- and posttest design in which the intervention group trained 30min specific nonvisual sensory skill training within the normal training three times a week during four weeks. Simultaneously, the control group got the same amount of training but conventional football training with full vision.

The participants performed conventional warming up exercises before the pre- and posttest test and in addition they "warmed up" five minutes with test exercises. Each test exercises were first performed with full vision and subsequently with visual restrictions. All tests were filmed with a video camera at 50Hz time resolution and the video recordings were stored for subsequent analysis.

A pre- and posttest design including two exercises was performed:

1. *Stationary ball control*. The participants tried to perform a sole and ball backward draw followed by a forward inside foot diagonal kick to the contralateral foot, repeating the same procedure completing one cycle
2. *Slalom course ball drive.* The participants were instructed to drive the ball through a 16.5m long slalom course as fast as possible.

Training design for the intervention and control group. All players in the intervention group wore specially designed glasses that restricted the vision of the ball during the whole training session of 30min. The control group exercised conventional football with full vision during the same

amount of time as the intervention group exercised non-visual ball handling. Subsequently all players in the team (intervention and control group) continued with conventional team training.

Retention test. After the post-test neither the players in the intervention group nor the players in the control group performed any nonvisual ball control training for 12 months. After this period nine players in the intervention group and four players in the control group took part in a retention test in which the same test procedures as in the pre- and posttest for stationary ball control and slalom ball drive were performed. The retention test was performed on the same type of artificial turf as the pre- and post-test.

Statistics. Conventional descriptive statistics were used to calculate mean and standard deviation (SD). The statistical calculations were performed with an Excel software package. The statistical significance between the pre- and posttest results were calculated by means of Student´s t-test and the alpha level for assumed statistical significance was set to 0.01.

Results

In *the stationary ball control test* with visual restrictions, the results showed an eight percent but not significant improvement for the intervention group ($p=0.197$) between post- and retention test. Corresponding change for the control group was a thirteen percent but not significant ($p=0.417$) increase in performance compared to the posttest. The average number of ball drops for the intervention group in the posttest and retention test was 0.6 and 0.1, respectively. Corresponding number of ball drops for the control group was 1.0 and 0.3 respectively. In the test situation with no visual restriction the performance decreased with one percent in both the intervention and control group but the decrease was not significant ($p=0.667$ and $p=0.689$, respectively). In *the ball drive test* with visual restriction the results showed a nonsignificant reduction in performance of seven percent for the intervention group ($p=0.275$) between post- and retention test. Corresponding change for the control group was an eight percent non-significant decrease ($p=0.587$) in performance in the retention test. The average number of ball drops for the intervention group in the posttest and retention test was 1.0 and 0.4, respectively. Corresponding number of ball drops for the control group was 0.8 and 0.3 respectively.

In the test situation with no visual restriction the performance in *the slalom ball drive test* improved with three percent in the intervention group but decreased with eight percent in the control group. These changes were not significant ($p=0.582$ and $p=0.878$, respectively). To summarize, there

were no significant differences between post-test and retention test results in the intervention group or in the control group.

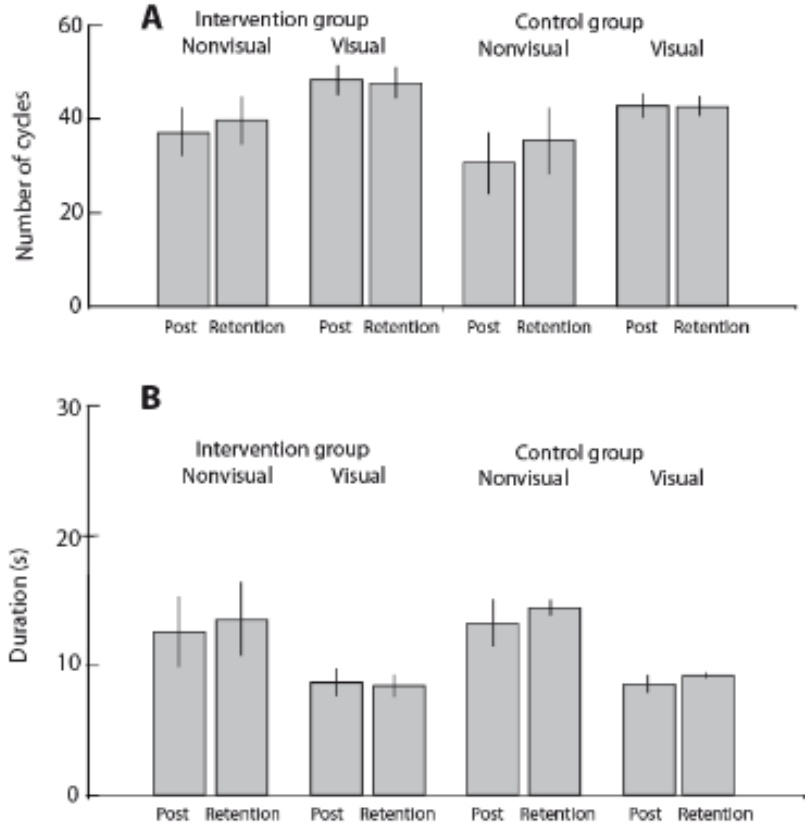

Figure 1. Mean values (±SD) in the post- and retention test of (A) stationary ball control test numbers of cycles in the wooden frame during 60 seconds. Duration of slalom course ball drive (B) for the intervention group (n=8) and control group (n=4).

This was the case for both the stationary test and the slalom ball drive test with and without visual restriction.

Discussion

The players in the intervention group and control group performed conventional football training during the retention interval of one year. During this period nonvisual sensory skill training was not performed in either group. The performance during post-test stationary ball control and slalom ball drive test were not significantly different from the results in the retention test. This was true for both the intervention group and the control

group in the test of both nonvisual skill and skill with no visual restriction. Thus, it appears from the results in the retention test that the improved ability gained in the intervention group remained in the retention test after one year. It was also obvious that the control group remained on the same level as in the post-test.

According to Baddeley (2012) memory can be viewed as two functional systems: working memory and long-term memory. The long-term memory, which is the memory system most applicable to the present situation are divided into three sub-systems (semantic, procedural and episodic) in which procedural memory is most likely to play a role in the development of nonvisual sensory skill in football. It is also argued that the long-term memory capacity is relatively unlimited (e.g. Chase & Ericsson 1982). The long-term memory can be regarded as a relatively permanent storage repository of information and in this case nonvisual sensory information connected to specific football motor performance structures. The organization of how e.g. sensory information of different modalities is stored and the degree of resistance to time related memory loss is vital in this respect. It seems to be a common opinion that the memory structure can include different memory storage components and obviously also nonvisual sensory information (see e.g. Nee & Jonides 2011). The procedural long-term memory enables us to respond to motoric demands that occur and perform learned and memory stored procedures to achieve given action goals. For example in football a stored and memory encoded nonvisual sensory based "motor program" may be retrieved and executed when a football player needs to drive the ball and simultaneously seek relevant visual information about the ongoing play. Thus, procedural long-term memory may inform us how to perform i.e. how to do it.

Retroactive interference may cause memory reduction in the long-term memory due to learning activities during the retention interval. In this study eventual retroactive interference from learned football actions other than nonvisual sensory skill during the retention period did not seems to be the case.

There may be so that certain types of motor skills are remembered better over long period of times than other types. Continuous motor skills are typically more resistant to long-term memory reduction than are discrete skills. Driving a ball and stationary ball handling are both continuous serial motor skills and the high degree of retention may be related to this form of motor skill. However, visually remembered locations for limb movements will be different from those remembered kinesthetically (for review see Simmering, Peterson, Darling & Spencer 2008).

In the present study the practice contexts were in several ways similar to the test contexts. The encoding specificity principle, introduced by Tulving & Thomson (1973), state that the more the test context resembles the practice context the better the retention performance will be.

In addition, it is reasonable to assume that the participant perceived meaningfulness in the training situation with the intention to remember (Crocker & Dickinson 1984). It may also be the case that the participants in the intervention group adopted effective cognition and ways to organize the memory storage (Starkes et al. 1987). Such factors may have had positive influence on the retention.

These results indicate changes in the neuromotor system in the intervention group that are stable over time. At this stage it is not possible to pinpoint exactly where the changes and what changes in the neuromotor system that may have occurred. This information that the nonvisual sensory skill can be improved and sustained over time is important for practitioners in the design of this type of training and in the periodization of it. Future studies where the intervention period is longer and also repeated and varied will possible reveal new interesting features in the nonvisual sensory skill adaptation to training in football.

Conclusion

A significantly improved nonvisual and visual sensory skill in stationary ball control and driving the ball in a slalom course can remain over at least a 12-month period.

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ORIGINAL RESEARCH PAPER

THE USE OF ADDITIONAL TRAINING TOOLS IN THE PREPARATION OF SHOOTING ATHLETES

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Abstract

This study presents the material concerning the issue of effective training of shooting athletes. In studying the aspects of technical training of professional shooting athletes using additional training tools, data were obtained that are of interest to both the athletes themselves and specialists in the field of shooting. The research was conducted at the premises of the Belarusian State University of Physical Culture shooting range and involved shooting athletes - members of the national shooting team of the Republic of Belarus. The data obtained showed the effectiveness of using various kinds of adapters (AA) and modern shooting simulators in the education and training process of professional shooters. High density of results in the international sporting arena at the current stage of development of shooting sport requires that trainers and specialists search for accessible and reliable means, the use of which will allow athletes to increase stability and ensure growth of sports results.

Keywords: *shooting athletes, adapters, shooting simulator, sports results, education and training process.*

Introduction

Information about the functional capacity of shooting athletes, the specific nature of the capacity of their bodies to adapt to extreme physical and psychological stress is limited and insufficient in comparison with what we have yet to find out about the training and competitive processes techniques (Korkh, Komova, 1987; Chan Thi Minh Ngoc, 1992; Polyakova, Penigin, Yurchik, 2010; Polyakova, Zubovskiy, Pankova et al., 2011)

In the Republic of Belarus, shooting takes one of the leading positions among the wide variety of sports included in the program of the Olympic Games.

The today's level of shooting requires that advanced techniques and the latest shooting simulators with immediate information be used in training professional shooting athletes (Polyakova, Yurchik, 2010; Polyakova, Zubovskiy, Pankova et al., 2011).

Currently, training of highly skilled athletes is characterized by large volumes, stresses and high load intensity accompanied by the danger of overtraining, which threatens health of an athlete removing him/her from the training mode for a certain time (Polyakova, Yurchik, 2014). That gives grounds to assume that the organization of the training process requires of the coach pedagogical excellence, up-to-date scientific knowledge, careful study of experience, constant search for new means and methods to improve the efficiency of training, which is essential at the current stage of shooting sport development (Yurchik, 2010).

The aim of our study is to identify specific patterns for controlling the shooters' sensory systems based on the use of additional training tools. We believe that determining the relationship between the psychodiagnostics, psychophysiological testing (with the use of adapters) and the level of technical readiness of shooting athletes, could help achieve high goals in the light of the modern development of shooting sport in the Republic of Belarus.

Material and Methods

In the course of our research, generally accepted pedagogical research methods were used.

Our research on the quality of shooting by the shooting athletes was conducted at the premises of the Belarusian State University of Physical Culture shooting range and involved participants specializing in rifle and pistol shooting – members of the national shooting team of the Republic of Belarus, athletes having a sports degree of Master of Sports (MS), as well as athletes with sports qualification from the first adult degree to the degree of Candidate Master of Sports (CMS). The number of participants was 15 (male and female, the age of the participants ranged from 17 to 23 years) (figure 1). The shooting athletes performed the following work – technical readiness test: shooting with the use of a shooting simulator "SCATT" at a distance of 10 m from small-caliber weapons (rifle, pistol), record shots – 40, where: series 1 – 10 shots – result-oriented shooting; series 2 – 10 shots – shooting using adapters; series 3 – 10 shots – result-oriented

shooting using the SCATT simulator; series 4 – 10 shots – shooting with an adapter concentrating the attention on heartbeats (Tables 1, 2).

Research objectives:

1. To study the specific nature of the "shooter-weapon" system stability, taking into account the technological background in the motor activity of the shooting athletes, depending on the type of weapon.

2. To analyze the results of the study. The following methods were used in solving theoretical tasks: analysis and synthesis, induction and deduction, generalization, classification and other methods of theoretical knowledge.

To obtain empirical data, the following groups of research methods were used: pedagogical: analysis of specialist scientific and methodical literature, pedagogical observation of training activities; expert assessment methods, pedagogical control tests;

Athlete's technical readiness test: shooting with the use of a shooting simulator "SCATT" at a distance of 10m from small-caliber weapons (rifle, pistol), record shots – 40, where: series 1 – 10 shots – result-oriented shooting; series 2 – 10 shots – shooting using adapters; series 3 – 10 shots – result-oriented shooting using the SCATT simulator; series 4 – 10 shots – shooting with an adapter concentrating the attention on heartbeats (Tables 1, 2).

In the study it was intended to use a systematic and multifactorial approach to evaluating the management of shooters' sensor systems based on the use of additional training tools. In practice, the shooting athlete performing a high-performance shot, often faces a problem – psychological preparation. In the practice of top sports the tasks of psychological preparation are often regarded only when solving tasks related to the performance of an athlete in competitions. However, mental processes and psychological preparation are present in all aspects of the shooter's training, being an integral part of both the training and competitive activities of an athlete.

Working on the shot, the shooter is confronted mainly with visual and muscular-articular sensations. Visual sensations are central. The whole work on the shot is being done under the control and organizing influence of vision. In the course of mastering the shooting technique, the role of muscular-articular sensations is increasing. The muscular-articular sensations give information on the habit of shooting stance, condition stability, muscle tone, ligament fixation, and development of triggering efforts. These sensations do not replace the function of vision, but significantly facilitate and complement its work (Polyakova, 2011; Yurchik, 2014)

Results

Using the device for audio and visual indication of the pulse in the shooters' training process gives the shooter additional possibilities for quick entry into the state of stable stance with a sufficiently high concentration level. It results in a "starting condition" stimulating the shooter's physical and mental activity. This implies the emergence of a "starting condition" that stimulates the physical and mental activity of an athlete; activating coordination and increasing in the activity of organs and systems; "work-in" as the achievement of optimal and maximum working capacity based on the improvement of cortical and motor-visceral regulation.

Figure 1. Conducting research

Therefore, this research was conducted with participation of shooting athletes. The main task of this research was to study the specific nature of the "shooter-weapon" system stability, taking into account the technological background in the motor activity of the shooting athletes, depending on the type of weapon and to determine the effectiveness of audio adapter (AA) when shooting using a shooting simulator "SCATT".

The existence of a large number of elements making up the work of the shooter on the shot does not mean that all of them are simultaneously and fully controlled by the mind. The shooter concentrates on the central task (heartbeats), while other tasks are pushed aside, the clarity of attention

to them decreases, according to their importance. Lack of confidence, fear of failure, and overconfidence, unjustified determination can disrupt the shooter's focus on the performed actions. Distraction by extraneous thoughts can lead to errors in the work on the shot, which remain unnoticed.

Table 1

The results of shooting with the use of an audio adapter and without its use (rifle)

No.	Surname	Degree	Series 1	Series 2	Series 3	Series 4	Full ring scoring points	Decimal scoring, points
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
1	K-a	MS	98	98	95	94	385	402.8
2	Sh-a	MS	86	93	88	93	360	374.5
3	H-k	CMS	87	96	89	88	360	371.9
4	L-k	MS	88	81	91	91	351	363.9
5	Ya-k	CMS	85	87	86	86	344	358.1
6	S-o	MS	94	90	93	92	369	385.6
7	S-a	1	86	80	90	70	326	368.5
8	V-ch	MS	98	99	97	97	397	408.4
	$\bar{x}$		90.25	90.5	91.125	88.875	361.5	416.7125
	σ		5.52	7.35	3.68	8.36	22.52	118.67
	S		1.95	2.60	1.30	2.95	7.96	41.96

Table 2

Shooting results with and without an audio adapter (pistol)

No.	Surname, name	Degree	Series 1	Series 2	Series 3	Series 4	Full ring scoring points	Decimal scoring, points
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
1	D-a	MS	94	97	94	96	381	399.4
2	Ts –'	MS	92	93	92	94	371	392.4
3	N-a	CMS	96	94	98	97	385	406.1
4	P-a	MS	88	83	86	84	341	364.2
5	T-k	CMS	83	74	86	82	325	340.7
6	M-r	CMS	89	91	89	92	361	374.1
7	S-v	MS	86	86	91	92	355	370.1
	$\bar{x}$		89.71	88.29	90.86	91.00	359.86	378.14
	σ		4.57	7.91	4.34	5.80	21.60	22.78
	S $\bar{x}$		1.73	2.99	1.64	2.19	8.16	8.61

The results of our research showed that the use of adapters by shooting athletes has a distinctive dynamics. So, for shooting athletes it is important to take into account what a degree he/she has and from which

kind of weapon he/she performs shooting (rifle, pistol).

As the research has shown, for rifle shooters with a MS degree the use of adapters did not significantly affect the shooting efficiency. Some athletes improved their scores. For shooting athletes with a CMS degree, the dynamics of shooting efficiency increased by 2.33 points on average ($\overline{X}$). This dynamics of shooting indicators allows us to state the obviousness and faster adaptation of athletes to the conditions of the "distracting factor" – audio adapter.

The results of research conducted with pistol shooters allow us to state that shooting performance of test persons with a MS degree deteriorated by 5 points on average ($\overline{X}$). We explain this fact by the difficulty of performing tasks for pistol shooters and a longer rearrangement of actions direction of the "shooter-weapon" system under the conditions of a "distracting factor". Shooting athletes with a CMS degree had stable shooting scores $\overline{X}$ = 89 points under conditions of "distracting factor" both before and after the use of the adapter.

Discussion

In shooting it is very important to search for effective ways of correcting and regulating the athlete's motor sensory activity in order to create a dynamic motor-visceral stereotype. In this regard, the development of technologies that adapt sensory, motor and autonomic components to ensure high-precision shooting in conditions of training sessions and competitions is topical.

For an athlete at the level of higher skills, when the technical action is performed largely automatically, sensations of sensory nature begin to play a leading role, reflecting the focus of attention, emotional state, and a sense of readiness for shooting. The content of perceptions is related to the task being solved by the athlete. This is an active process that can be controlled, however, the influence of an attitude on what we want to perceive is important. Thus, in pulling the trigger a novice sees only the effort necessary to overcome it, whereas the master of sports from testing a trigger of a new weapon also obtains additional information about the nature of the required pull.

Under normal conditions, the muscular processes that make up the work of taking the shot are not reflected in the athlete's mind. For their perception, a focus of attention is needed, "highlighting" them from the entire complex of undirected work. So, the pistol shooter needs to develop a sense of fixing the wrist joint, the autonomy of the index finger, the smoothness of the efforts he/she makes. Periodically focusing his/her attention on them, the athlete relatively easy develops the ability to control

these actions. In the process of training, specific sensitivity is developing and, consequently, the shooter is required to develop the ability and adaptation to specific "distracting factors", sensations affecting him/her in the shooting sport. The use of an audio adapter (AA) is a kind of distracting factor, to which the shooter has to adapt under any (competitive or training) conditions. It is clear that the unusual sensations that arise will distract the athlete's attention, however, adaptation to them takes up time and rather deep analysis.

Thus, a highly skilled shooter controls his/her readiness for a shot, not only by pointing the weapon, but also by sensing the reliability of this condition. He/she perceives the subtlest disruptions of his/her body's immobility before it affects the state of the weapon. This allows him/her to promptly slow down the development of the triggering effort or postpone a shot. While a lower-level athlete needs a lot of time and practical experience for that.

Conclusions

Thus, solving a number of tasks faced by the shooter during education and training sessions, competitions, requires certain knowledge. Many coaches and athletes have a good theoretical background, but in practice they need not only general expertise, a body of knowledge, but also the ability to select those directions that work towards the main task – a consistently high result in shooting.

1. The obtained results suggest that education and training sessions for shooting athletes using additional training tools provide an accelerated formation of conditioned reflex sensory-motor and motor-visceral connections.

2. The combined use of special devices – adapters – helps the shooter to develop an optimal control of the process of autonomic regulation of stable high-precision shooting skills and to simulate loads in order to create conditions for achieving the desired training effect.

The conducted research on the management of shooters' sensory systems based on the use of additional training tools by shooting athletes seem very interesting and promising to us, and require a more detailed follow-up research in order to train highly skilled athletes in shooting sport.

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ORIGINAL RESEARCH PAPER

CAUSES OF ATHLETIC AND NON-ATHLETIC STUDENTS' AGGRESSIVE BEHAVIOUR AT SCHOOL AND ITS PREVENTION

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Abstract

The article analyses the causes of aggressive behaviour of senior high school students and the prevention of such conduct. The aim of the research is to analyse aggressive behaviour of athletic and non-athletic senior high school students and to discuss the possibilities of prevention of such students' conduct. Material and methods: theoretical (analysis of scientific literature), empirical (a written interview using the ASEBA questionnaire) and statistical data analysis. The selection of respondents was based on a non-probability, convenience, purposive sampling. The sample consisted of N=68 senior students of Zemyna Gymnasium in Klaipeda City. Results. The research has showed that senior high school students are often nervous, tense and rejoice little in their lives; they also demand a lot of attention for themselves, often argue with the others, communicate with other students and teachers in an unpleasant manner, and frequently behave aggressively. Conclusions. Senior high school students considered themselves as being teased and annoyed by others, so they treated them in an unpleasant manner, thus, constantly argued and used to get involved in conflicts with each other. During conflicts, senior male students used physical aggression more often than female ones, the latter used verbal aggression most often. Athletic male pupils were more likely to engage in fights than their non-athletic peers end non-athletic male, female pupils were more likely to threaten other people.

Keywords: *aggressive behaviour of athletic and non-athletic senior high school students, prevention.*

Introduction

Aggressive behaviour among secondary students has been identified as a serious problem in European and American countries (Smith, 2016; Vega-Gea, Ortega-Ruiz, & Sánchez, 2016). Aggressive behaviour among teenagers is considered to be a public health problem associated with severe physical and psychosocial consequences.

Aggression is the most significant psychopathological risk factor among children and adolescents. Aggression has a multifaceted construct and can affect the social, psychological and physical health of students and teachers (Salimi et al., 2019). In social psychology, aggression refers to behaviors emerged to harm another person. The definition of aggression falls into two categories as instrumental aggression and hostile aggression. While instrumental aggression is used to achieve an external goal, hostile aggression intends to harm others and includes two forms of explicit aggression (physical and verbal aggression) and social aggression (Connor, 2012). Physical aggression refers to purposefully harming someone to cause pain such as beating, pushing, throwing objects, etc. (Shachar et al., 2016). Application of the aggressive language such as yelling and screaming that causes hurting emotions and credit of a person and lowers a person's value is called verbal aggression (Reen, Sharma, 2013). Social aggression refers to actions to harm others' social statuses and friendships. Heavy silence and negligence are some examples of social aggression (Allen, Anderson, 2017). Due to physical, psychological and social complications of aggression, attention of researchers to this important subject has been increased (Salimi et al., 2019).

Aggression causes devastating effects on social competence, efficiency, and interpersonal relationships (Jenkins, Demaray, 2017) and can develop a negative image among peers and teachers. It is believed that aggressive behaviors in childhood are associated with an increased risk of psychological problems in adolescence and adulthood (Musci et al., 2014). In addition to the individual dimensions of aggression and its consequences in the school, it can have extensive social and economic costs. Research indicates that school violence is associated with less employment and a further use of mental health services in adulthood (Baams, Talmage, Russell, 2017; Brimblecombe et al., 2018).

School aggression based on the ecological model of human development, particularly highlighting the role of contextual (family and school) and individual (empathy, social reputation, and attitude towards authority) variables in its explanation for boys and girls separately (Jiméneza, Estévezb, 2017). Regarding the school environment, students who perceive a positive classroom climate (perceiving peers in the

classroom as friends or colleagues, and feeling respect and support from teachers) will not normally exhibit behavioral problems. In addition, classroom environment and victimization is indirectly related to overt and relational violence through its relationship with loneliness, nonconformist ideal reputation and transgression of social norms (Povedano, 2015).

The onset of violence and aggression often begins with bullying, which is increasingly becoming a relevant problem among school children, which has a significant impact on their further development and social well-being. Bullying is most commonly defined as repeated, intentional aggression, perpetrated by a more powerful individual or group against a less powerful victim (Shetgiri, 2013). A repetitive bullying merely establishes a power relationship between an aggressor and a victim. Bullying is intentional aggressive behaviour, which is understood as a conflict, which may manifest itself as intentional or unintentional and as direct or indirect. Aggressive behaviour can take various forms, including physical, verbal and social, and can be experienced in a variety of ways, such as physical, mental, emotional and psychological harm (Pepler, Craig, 2014). Verbal aggression is among the most prevalent forms of problem behavior in schools with detrimental effects for both perpetrators and victims (Gregory, Stephen, 2017).

The problem of an aggressive society is also encountered in the neighbouring state of Latvia, where verbal aggression of students is most distinct in adolescence, and the highest level of verbal aggression, both among boys and girls, is reached at the age of 14-15. Kronberga (2015) emphasizes the need for the prevention measures of antisocial behaviour to be introduced at the earliest age of a child, since a timely detection and termination of ill-treatment would significantly reduce the likelihood of aggressive or antisocial behaviour in the future (Kronberga, Judins, Rinkevics et al., 2014). However in order to fundamentally change the situation, it is necessary to act on a wider scale, i.e. to develop the country's legal framework, to arrange training of competent specialists in the field, to effectively organize preventive work at the national and state levels.

New information dissemination tools are open and accessible all day, thus it is necessary to prevent not only traditional but also online bullying by creating effective and modern prevention strategies. Gedutienė et al. (2012) indicate that nearly one-third of 11 – 15 year-old students have been offended in cyberspace, while one-fifth has bullied the others. 38.6% of 11 – 14 year old students have experienced online bullying at least once or twice in the last few months, while both boys and girls have been involved equally often in traditional bullying as victims and as offenders (Sadauskaitė, 2014).

In response to the increased number of cases of students' bullying and aggression, it is relevant to analyse the causes of aggressive behaviour of senior high school students and to discuss the possibilities for preventing such conduct.

The aim of the research is to analyse aggressive behaviour of athletic and non-athletic senior high school students and to discuss the possibilities for prevention of aggressive behaviour. The objectives of the research are as follows: 1. to reveal the causes of students' aggressive behaviour at school. 2. to compare and analyze the aggression among athletic and non-athletic senior pupils. 3. to discuss the possibilities for prevention of students' aggressive behaviour.

Material and Methods

Quantitative sampling. The selection of respondents was based on a non-probability, convenience, purposive sampling. The sample consisted of N=68 senior students of Zemyna Gymnasium in Klaipeda, i.e. boys (N=43) (M=3.12; SD=1.03) and girls (N=25) in grades 1 – 4 of the gymnasium (M=2.92; SD=1.23). To interview the gymnasium students who were under adulthood at that time, their parents' consent to carry out the research regarding aggression at school was obtained. Adult students were involved in the research voluntarily. The consent of the administration of the Zemyna Gymnasium was also received. During the survey, the respondents were divided into the groups of students-athletes and non-athletes. The athletes group included students who both attended physical education classes and additionally took part in their favourite sports activities or attended sports clubs. The group of non-athletes included students who attended only physical education classes and were not involved in any physical activities in their spare time. 37 (72.5%) male students and 14 (27.5%) female students (M=1.27; SD=0.451) out of all senior class students who participated in the study (N=68), attended sports activities in their spare time, and 7 male students and 10 female students did not do any sports in their leisure time (M=1.59; SD=0.507).

Research process. The research was conducted on April 10 – 14, 2017. All students who took part in the research were informed about its aim, anonymity and the right of choice to participate or not.

Research methods: theoretical (analysis of scientific literature), *empirical* (written interview using the ASEBA questionnaire), and *statistical data analysis*. In order to analyse aggression at school among senior high school students of Zemyna Gymnasium in Klaipeda, relevant scientific articles and other scientific literature have been analyzed and a research has been conducted to determine the aggression of the students of

the senior classes of Zemyna Gymnasium in Klaipeda. During the research, we have used the scale of aggressive behaviour and its statements: frequent disputes with others, cruel treatment of others, request for lots of attention to themselves, damage of one's own and other people's property, disobedience at home and at school, frequent involvement in fights using physical violence against other people, frequent shouting, being stubborn, having sudden changes in mood and feelings, being suspicious, repeated annoyance of others, being easily frustrated, threatening other people, being noisier than the peers.

Justification of the research instrument. A self-assessment questionnaire for the 11 – 18 year old youth (ASEBA – YSR 11/18, *Achenbach System of Empirically Based Assessment – Youth Self Report;* Achenbach, Rescorla, 2001) has been used to evaluate emotional and behavioural characteristics. YSR 11/18 questionnaire is designed to collect information about individuals' competencies as well as emotional and behavioural characteristics in a standardized form. The questionnaire consists of 20 statements intended to assess the adolescent's competencies and adaptive behaviour, and 112 statements that allow to assess the difficulties of their behaviour and emotions, each of which is assessed on a 3 point scale: 0 – if the statement is incorrect, 1 – partly or sometimes correct, 2 – if it has been often or very often correct over the last six month period. First, the sum of each of the eight syndrome scale scores is counted. Since the questionnaire consists of scales of internal (including results of the scales regarding depression/anxiety, withdrawn/anxiety and somatic complaints), and external difficulties (including results of the scales regarding aggressive and rule-breaking behaviour), the estimates of these scales are separately calculated. After calculating the sum of answers of each difficulty scale, the initial assessment is assigned a normalized standard T score. To assign the subjects to the "norm" group follow the initial limit of $T<65$ or >93 percentile. Score estimates that correspond to the standard T scores in the range of 65 and 69 (fall between 93 and 97 percentiles with the initial scores) are considered "marginal", i.e. already worrying, but not sufficient to make the rating as a "deviation" group. The "marginal" group falls into the interval between $T=65 – 69$, which corresponds to the 93 – 97 percentile with the initial scores. The "deviation" group consists of answers to the scale questions the sum of which corresponds to $T\geq70$ (98 percentile and more with initial scores). ASEBA methodologies are empirically based, i.e. data of large-scale surveys was used during the development of the questionnaire that was collected by providing specific questions to individuals. After carrying out statistical analysis, eight syndromes were established (anxiety, depression,

withdrawal/depression, somatic complaints, thought problems, attention problems, rule-breaking and aggressive behaviour), where a syndrome is perceived as a concept that defines a group of simultaneously occurring similar difficulties, but not necessarily identifying it with the disease. In our research a scale of aggressive behaviour difficulties has been used which measures the student's aggressive behaviour: frequent disputes with others, cruel treatment of others, request for lots of attention to themselves, damage of one's own and other people's property, disobedience at home and at school, frequent involvement in fights using physical violence against other people, frequent shouting, being stubborn, sudden changes in mood and feelings, being suspicious, repeated annoyance of others, being easily frustrated, threatening other people, being noisier than the peers.

The compatibility of the Lithuanian version of the questionnaire YSR 11/18 used in the research is rather high, i.e. Cronbach's alpha = 0.79 of YSR 11/18 aggressive behaviour scale. Currently, ASEBA methodology questionnaires are considered to be one of the most valid methodologies used in the world to assess children's behaviour and emotions. Therefore, it has been used in the implementation of our research regarding senior high school students' aggression.

Statistical analysis has been performed using an SPSS 20 software package. The mean (M) and standard deviation (SD) of the data were calculated. The reliability level of the difference in results and the significance of the different sample results were determined according to the Student's independent criterion t and p values of this criterion. If $p<0.05$, differences were considered as statistically significant. The Pearson's correlation coefficient r was used to estimate the quantitative data.

Results

We have been analyzing aggressive behaviour of the students of the senior classes of Zemyna Gymnasium in Klaipeda. The asymmetry coefficient (skewness) of aggressive behaviour difficulties scale (empirical) describing the asymmetry of the empirical distribution in relation to the mean as well as the kurtosis coefficient describing the peakedness of distribution in comparison with the normal one corresponded to the distribution of normal density, i.e. was in the range of 1 to 1 (respectively, 0.698; 0.370). Taking into consideration the Kolmogorov-Smirnov and Shapiro-Wilk criteria, the values obtained in our research were less than 0.05, and therefore the conditions for the distribution normality were partially met with one exception (31). However, the results of our research may have been determined by exceptions, so we have been able to apply parametric criteria in a further analysis of the research.

A normalized standard T score was assigned to the initial assessment after summarizing the statements of the senior students' YSR scale of aggressive behaviour difficulties. When analyzing the aggressive behaviour statements of male students, it was found out that T = 65, i.e. the results of scales of aggressive behaviour corresponded to the standard T scores in the range between 65 and 69 (between 93 and 97 percentiles with the initial scores), and therefore were considered as "marginal", i.e. worrying due to their aggressive behaviour, but not sufficient to make the rating as "deviation" group.

When analyzing female students' statements of aggressive behaviour and their YSR scale, it was determined that T = 42, i.e. the aggressive behaviour scores of girls met the standard T scores in the range T<65 or <93 percentile initial scores and therefore it corresponded to the "norm" group. When analyzing aggression of the senior students from a gender perspective, senior male students (63.2%) (M=7.30, SD=4.01) as compared to female ones (36.8%) (M=7.48, SD=4.08) were more aggressive, but statistically significant differences were not found t(66) = -0.175, p=0.086.

Taking into account aggression and the age groups, older male students, e.g. aged 17 (30.2%) (M=7.05, SD=4.78) and 18 (37.2%) (M=8.04, SD=3.75%) were more aggressive (t (28)=-2.06, p=0.048) as compared to 15-year-old students (7.0%) (M=6.12, SD=1.55). Analysing the aggression of female students in various age groups, similar results of the research were obtained i.e. 17 year old (28.0%) (M=7.05, SD=4.78) and 18 year old female students (36.0%) (M=8.04, SD=3.74) were more aggressive (t (28)=-2.06, p=0.048) in comparison with 15 year old ones (20.0 %) (M=6.12, SD=1.55). Analyzing the research data, it turned out that 30.2% of senior male students (M=0.23, SD=0.48), as well as 24.0% of female ones (M=0.28, SD=0.45), often tend to argue with the others. The research has determined that senior class students non-athletes exhibited more aggressive behavior (M = 9.47; SD = 4.42) than their peers athletes (M = 8.27; SD = 4.18), which was confirmed by statistically significant difference of the groups (t (50)=14.132, p=0.000).

A moderate and a weak linear relationship was determined between the senior students' disagreements with other members of the school community and their statements that they are often nervous or tense, they rejoice little in their life, they often tease other students, and they require a lot of attention (see Table 1).

The research has determined that female students never get involved in fights during conflicts (96.0%) (M = 0.04, SD = 0.20), unlike male ones who are more likely to be involved in fighting, thus they express their

aggression by teasing or otherwise provoking further conflicts with both classmates and teachers (8.0%) (M=0.44, SD=0.65).

Table 1

The senior students' disagreements correlate with:

The senior students scale of aggressive behaviour and its statements	r
they are often nervous or tense	0,499 * * *
they rejoice little in their life	0,299 * * *
they often tease other students	0,414 * * *
they require a lot of attention	0,274 *

Note: * - p<0,05; *** - p<0,001

The analysis of the research data has showed that female students-athletes (M=19.50, SD=0.70) were more likely to irritate others (t(12)=5.377, p=0.000) as compared with their non-athletic peers (M=10.40, SD=3,92). Meanwhile, male non-athletes (M=2.28, SD=0.49) were teasing others (t (15)=4.903, p=0.000) more often than female students non-athletes (M=1.20, SD=0.42).

A moderate and a weak linear relationship was determined between the senior students' unpleasant behaviour and their tendency to be alone, their refusal to communicate with others, their opinion that others are annoying, their feeling of being frustrated, their threats towards other people, their secrecy and keeping silent, and their feeling of being alone (Table 2).

Table 2

The senior students' unpleasant behaviour correlate with:

The senior students scale of aggressive behaviour and its statements	r
their tendency to be alone	0,487 * * *
their refusal to communicate with others	0,481 * * *
their opinion that others are annoying	0,463 * * *
their feeling of being frustrated	0,448 * * *
their threats towards other people	0,442 * * *
their secrecy and keeping silent	0,433 * * *
their feeling of being alone	0,416 * * *

Note: *** - p<0,001

The research shows that girls (16.0%) (M=0.64, SD=0.75), unlike boys (7.0%) (M=0.44, SD=0.62), require much more attention to themselves from the surrounding people. A weak and a moderate linear relationship was determined between a high level of required attention by senior students and their interest in testing innovations (r=0.344, p<0.01), their behaviour when teasing others (r=0.344, p<0.01), and their frequent disagreement with others (r=0.274, p<0.05). The research reveals that there is a weak and a moderate linear relationship between the respondents' tendency to damage

their own things as well as other people's belongings (r=0.393, p<0.001), their jealousy (r=0.378, p<0.001), their unpleasant behaviour with others (r=0.379, p<0.01), their lies or deceit (r=0.351, p<0.01), their inclination to be alone (r=0.264, p<0.05). Analyzing the level of aggression among male and female students-athletes, it has been observed that female students (M=8.7; SD=4.4) were more aggressive than male students (M=8.1; SD=4.1) and male students non-athletes (M=11.0; SD=4.9) were more aggressive than female students non-athletes (M=8.4; SD=3.9).

In the research, it was noted that there is a moderate and a weak linear relationship between senior students' disobedience at home and at school (r=0.670, p<0.001), their fear that they might think or do something wrong (r=0.359, p<0.01), their nervousness or tension (r=0,350, p<0,01), their feelings that others are annoying (r=0,299, p<0,05), their refusal to talk (r=0,279, p<0.05), their frequent disputes (r=0.257, p<0.05), their level of noisiness as compared with their peers (r=0.254, p<0.05), and their frequent teasing of others (r=0.245, p<0.05). The research shows that male students of senior classes (4.7%) (M=0.30, SD=0.55) frequently get involved in fights during conflicts. The research has revealed that male students (M=1.35, SD=0.59) who were doing sports were more likely (M=1.0, SD=0.0) to engage in fighting as compared with female students-athletes (t (36)=3.637, p=0.001). Similar results have been found in the group of male students non-athletes (M=1.14, SD=0.38) who were more likely to fight than female students (M=1.10, SD=0.32). However, comparing the results of male students athletes (M=12.36, SD=4.54) and non-athletes (M=10.50, SD=3.21), it has been identified that male students athletes were more likely to engage in fighting (t (35)=3.594, p=0.001).

A moderate and a weak linear relationship was determined between the senior students' involvement in fights and their running away from home, their attempts to injure themselves or commit suicide, their communication with those who often get into troubles, their feeling that others are annoying, their opinion that they fail to perform well at school, and their feeling of being lonely (see Table 3).

Table 3.

The senior students' involvement in fights correlate with:

The senior students scale of aggressive behaviour and its statements	r
their running away from home	0.421 * * *
their attempts to injure themselves or commit suicide	0.348 * *
their communication with those who often get into troubles	0.330 * *
their feeling that others are annoying	0.309 *
their opinion that they fail to perform well at school	0.292 *
their feeling of being lonely	0.254 *

Note: * - p<0.05; ** - p<0.01; *** - p<0.001

56.0% of senior female students (M=1.52, SD=0.58), unlike male students (30.2%) (M=1.16, SD=0.65), are more stubborn. A moderate and a weak linear relationship was determined between their stubbornness and their desire to try innovations (r=0.368, p<0.01), their rapid jealousy (r=0.273, p<0.05) and their hot-tempered behaviour (r=0.255, p<0.05). The research reveals that 23.3% of boys (M=0.79, SD=0.80), as well as 20.0% of girls, are constantly suspicious (M=0.92, SD=0.70). A strong, a moderate or a weak linear relationship was determined between the respondents' suspicion and their rapid jealousy (r=0.622, p<0.001), their secrecy and keeping silent (r=0.443, p<0.001), their feeling of being frustrated (r=0.354, p<0.001), their modesty (r=0.286, p<0.05), their excessive cowardice and anxiety (r=0.278, p<0.05), and high frequency of their agitation (r=0.249, p<0.05).

14.0% of boys (M=0.79, SD=0.67) and 28.0% of girls (M=0.80, SD=0.86) experience frequent changes of mood and feelings. A moderate and a weak linear relationship was determined between frequent teasing of peers and their frequent disagreements, their hot-tempered behaviour, their frequent agitation, their threats to other people, their nervousness tension and their feeling that others are annoying and irritating (see Table 4).

Table 4

The senior students' frequent changes of mood and feelings correlate with:

The senior students scale of aggressive behaviour and its statements	r
their frequent disagreements	0.414 * * *
their hot-tempered behaviour	0.389 * *
their frequent agitation	0.375 * *
their threats to other people	0.343 * *
their nervousness and tension	0.339 * *
their feeling that others are annoying and irritating	0.320 * *

Note: ** - p<0.01; *** - p<0.001

16.3% of boys (M = 0.63, SD = 0.75) and 12.0% of girls are hot-tempered (M=0.68, SD=0.69). A moderate and a weak linear relationship was established between hot-tempered behaviour of senior high school students and their statement that others are annoying and irritating, their frequent threats to other people and their teasing, their disobedience at home, school or elsewhere, their communication with those who get in trouble, their request for attention to them, and their nervousness and tension (see Table 5).

Table 5.

The senior students' hot-tempered behaviour correlate with:

The senior students scale of aggressive behaviour and its statements	r
their statement that others are annoying and irritating	0,431 * * *
their frequent threats to other people and their teasing	0,384 * * *
their disobedience at home, school or elsewhere	0,312 *
their communication with those who get in trouble	0,312 *
their request for attention to them	0,252 *
their nervousness and tension	0,243 *

Note: ** - p<0,01; *** - p<0,001

The research shows that there is a strong, a moderate or a weak linear relationship between high school students' threats to other people and stealing from home (r=0.601, p<0.001), their higher noise level as compared with their peers (r=0.477, p<0.001), their unpleasant communication with others (r=0.422, p<0.001), their feeling that others are annoying and irritating (r=0.440, p<0.001), their running away from home (r=0.407, p<0.001), their fear of thinking or doing something wrong (r=0.387, p<0.001), their hot-tempered behaviour (r=0.484, p<0.01), their frequent teasing of other people (r=0.343, p<0.01), their feeling of being frustrated (r=0.338, p<0.01), their nervousness or tension (r=0.340, p<0,01), their fear of going to school (r=0.276, p<0.05) and their frequent involvement in fights (r=0.258, p<0.05).

The research has determined that there is a moderate or a weak linear relationship between respondents' higher noise level as compared with their peers and their stealing from home (r=0.515, p<0.001), their threats to other people (r=0.477, p<0.001), their running away from home (r=0.326, p<0.01), their violation of rules at home, at school or elsewhere (r=0.302, p<0.05), their fear of going to school (r=0.263, p<0.05), their indecent and offensive language (r=0.299, p<0.05), their fear that they may think or do something wrong (r=0.276, p<0.05), their childish behaviour in respect to their age (r=0.265, p<0.05), their feeling that others are annoying and irritating (r=0.259, p<0.05), their disobedience at school (r=0.254, p<0.05), their frequent teasing of other people (r=0.244, p<0.05), their frequent disputes (r=0.239, p<0.05).

The research reveals that 4.7% of senior high school students often get involved into conflicts and fights with other classmates. Therefore, it can be stated that male students are often nervous and tense due to their lack of social skills and their hot –tempered manner, and sometimes being in a state of fear or anxiety they feel that others are annoying and irritating. Thus, they behave unpleasantly and constantly get involved into disputes and conflicts with others. In summary, it can be noted that students who threatened other

people, used to steal and run away from home were noisier than their peers, they felt that others were annoying and irritating, they feared to go to school, felt frustrated and were hot-tempered, nervous and tense, they communicated in an unpleasant way, often used to tease others and get involved in fights.

Discussion

Summarizing the results of the research on aggressive behaviour of senior high school students, it can be stated that senior male respondents were found as "marginal" based on the scores of aggressive behaviour i.e. they were causing concern due to their aggressive behaviour, however it was not sufficient to qualify the rating as a "deviation" group. The girls' rating scores of aggressive behaviour corresponded to the "norm" group.

Analyzing the individual components of the scale of aggressive behaviour used in our research, it was determined that the respondents were often nervous and tense and rejoiced little in their lives, they demanded a lot of attention for themselves, often involved in disputes with others and communicated in an unpleasant manner with both students and teachers, they were noisier than their peers and often behaved aggressively. Attawell (2017) confirms the results of our research and points out that of the students, 29% had a moderate level of aggression and 10% had a high level of aggression. Therefore, aggressive behaviour of teenagers acts as a means to raise their low self-esteem, and they feel superior if they behave aggressively. However, that not only the help of peers can be used to address a problem of aggression at school, but also aggressive adolescents themselves shall be involved in a conflict resolution process by assigning them a status of a tutor, encouraging them to communicate with other people and to help younger students manage and resolve conflicts in a positive way. Aggression in children and adolescents can be prevented and reduced through designing and implementing educational interventions (Salimi et al., 2019).

The research shows that senior students experienced negative emotions due to their inability to enjoy the success of others and their jealousy; also they deliberately annoyed and irritated others, often felt nervous and tense as well as damaged the belongings of their own and others. The results of various studies indicated that males were more exposed to physical and verbal violence than females. While in the females, social aggression was more common than males (Attawell, 2017). Therefore, it can be stated that senior high school students were often nervous and tense, sometimes experienced fear and anxiety, felt that others were annoying and irritating, behaved in an unpleasant way, constantly argued

and got involved in conflicts with each other due to their lack of social skills and their hot-tempered character.

Aggression is associated with social status (Molano, Jones, 2018). Our research results have coincided with the research data of other authors (Smith, 2016) that schoolchildren often behave aggressively in order to be popular among peers. Our research shows that senior students were often suspicious, communicated little with the people around and kept secrets, and having no proper social skills, they used to start interaction with the ones who got involved in fights and ended up in troubles.

Studies on bullying and aggressive behaviour of students in Lithuanian schools suggest that more accessible preventive measures must be taken. A lot of state and non-governmental organizations take care of the re-socialization of delinquent children, but they do not always combine their efforts to work together, and there is still a lack of coordination of activities and a coherent system of work. Cooperation with social institutions and organizations is still relatively sluggish. The school understands and appreciates the significance and meaning of preventive work and organizes various preventive activities, however, they do not always cooperate effectively with other institutions and organizations.

The students must be explained the causes and consequences of aggression with a help of various preventive measures. It is necessary to refer students with behavioral deviations to a counselling of a psychologist, to search for ways to attract and engage aggressive students into active non-formal education activities, and not just to punish for their inadequate school behaviour. Salimi et al. (2019) point out that aggressive behavior occurred less frequently among students who perceived their school as a safe environment. Therefore school administration, psychologists, social workers and teachers should be active participants themselves in preventive activities against bullying and aggression, should continuously monitor students' behaviour and involve aggressive students into socially meaningful and interesting activities that would help to shape their pro-social behaviour with the surrounding ones. The forms of social behaviour are characterized by complex conditionality, i.e. human behaviour depends not only on the person himself but also on the social structures around him (family, friends, institutions, etc.). Therefore, in order to influence the behaviour of a person, it is necessary to make an impact not only on the person but also on the surrounding environment. Le et al., (2017) point out that no significant relationship between social support of the family and bullying in students was found, that could be related to the inability of the family to help students solve the wide-ranging communicational problems and gaps between children and parents.

Social support for children and adolescents consists of any informational, instrumental, evaluative and emotional support provided by teachers, family and friends (Wood et al., 2017). Schools prevention programs on violence are applied to all students, while other schools limit themselves to the use of "secondary prevention programs" for aggressive children and the ones with behavioral problems. The use of "secondary prevention programs" designed to reduce aggressive behaviour of students has shown significant positive changes in different age groups and genders of both primary and secondary schools. Gavine et al. (2016) states that there has not been found enough evidence regarding universal and equally suitable prevention programs against violence and bullying in schools for the age group of 11-18. However in order to reduce students' aggression significantly, it is necessary to create social environment in schools that would promote friendly relationship between students and zero tolerance to bullying. The examples of Norwegian and English schools, where bullying has dropped from 30.0 to 50.0 percent, show that it is possible to achieve good results. In order to achieve significant changes in the reduction of violence and bullying at schools, intervention programs must be introduced to change the climate of each school and class, and to raise children's awareness about violence and bullying, and to encourage teachers and parents to actively participate in violence and bullying prevention activities. Wood et al. (2017) point out that defending behaviors by bystanders in bullying situations have been associated with decreases in the frequency and negative effects of bullying incidents. The number of cases of students' violence and bullying can be significantly reduced at schools if bullying and violence prevention programs are implemented through the involvement of the whole school community rather than separate social groups.

Conclusions

The research has shown that senior high school students were often nervous, tense, and rejoiced little in their lives; they communicated in an unpleasant manner with both their peers and teachers, and often behaved aggressively. The research has revealed that about a quarter of the senior students tended to argue with the surrounding people ($p<0.001$), they had sudden changes in mood and feelings ($p<0.001$). 16.3% of boys and 12.0% of girls were hot-tempered ($p<0.01$), and 23.3% of boys and 20.0% of girls were constantly suspicious. Most of girls (56.0%), unlike boys (30.2%), were more stubborn and demanded much attention from the others ($p<0.05$). Senior male students often used physical aggression by involving themselves into fights ($p<0.01$), while girls, unlike boys of this age, never

got involved in fighting, but they often used verbal aggression to deal with conflicts and expressed it by teasing other people ($p<0.01$).

Athletic senior girls tended to quarrel with others more often, were ruder while communicating, demanded more attention to themselves than their non-athletic peers ($p<0.05$). Athletic male pupils were more likely to engage in fights than their non-athletic peers ($p<0.05$). Non-athletic male and female pupils were more likely to threaten other people ($p<0.05$).

When handling the problem of aggressive behaviour of students at school, it is necessary to demonstrate examples of socially desirable behaviour for aggressive adolescents, to purposefully and consistently teach them to communicate with other members of the school community and to use the help of not only teachers and social workers but also to engage aggressive teenagers in the conflict resolution process.

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REVIEW PAPER

MOVEMENT GAMES IN SPORT IN LATVIA (1994 – 2012 - 2019) (Questionnaire survey of couches and athletes)

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Abstract

*The promotion of children's healthful physical activity is important: to establish an early habit of lifestyle physical activity that can be sustained into adolescence and adulthood. As a result, habits developed at a childhood and adolescence can influence the habits and health indicators in adulthood. The **aim** of the study was to find out - did coaches' use and what kind of games coaches used in different sports training classes in Latvia and to compare this data with the data obtained in questionnaire survey of 1994 and 2012. Athletes were also included in the study to compare the findings with coaches. The study was conducted in 2018 – 2019 in Riga, LASE. 97 coaches and 155 athletes participated in the study. Interrogated coaches represented 28 kinds of sport, athletes represented 42 kinds of sport, which were combined in groups of related sports. We studied the attitude of coaches and athletes towards movement games in training process in various kinds of sport, as well as found out what kind of games coaches and athletes used in the training process. In the statistical processing of the data we used establish t-test. We ascertained the tendency that in the training process coaches are using movement games less often, comparing 2019 with 1994 and 2012. Usage of movement games is different depending on kinds of sports. Both coaches and athletes admit that movement games are essential in the training process and they have a will to use movement games more than they are using now.*

Keywords: *movement games, coaches, athletes, sport kinds, sports trainings classes*

Introduction

According to Eurobarometer studies nearly half of Europeans never exercise or play sport, and the proportion has increased since 2009. Two in five Europeans (40%) exercise or play sport at least once a week, including 7% who do so regularly (at least five times per week). However, almost half of respondents (46%) never exercise or play sport. The proportion of people who exercise or play sport regularly or with some regularity is highest in Finland (69%), Sweden (67%) and Denmark (63%). There are several countries where respondents are now much less likely to engage in Sport than in 2013: Croatia, ***Latvia***, Austria and Estonia. In Latvia – 56% of respondents never exercise or play sport, 6% do sports regularly, with some regularity 22%, seldom – 16% (Eurobarometer, Sport and Physical Activity, 2018). In 2018, research made by Eurobarometer, answering the question: Why do you engage in sport or physical activity? (multiple answers were possible) - The most common reasons for engaging in sport or physical activity are: to improve health (54%) and to improve fitness (47%). Other popular reasons include relaxing (38%), having fun (30%) and improving physical performance (28%). TOP 5 answers in Latvia were: to improve health 64%; to improve fitness 48%; to relax 40%; to have fun 21%; to improve physical performance 25% (Eurobarometer, Sport and Physical Activity, 2018). These numbers are similar to ones in Europe.

To improve the situation, Latvia on a national level is thinking about creating a sustainable opportunity for a physically active lifestyle for everyone, making physical activity one of the political priorities. The new sports policy strategy - Sport Policy Guidelines 2014-2020, with the guiding principle being - "Sport for quality of life". Latvian sports policy aims to increase the proportion of Latvian population who regularly engage in physical activity (Sports Policy Guidelines, 2013). It is not only about the quality of education in schools, but also about increasing the amount of extra-curricular physical activities in educational institutions – interest education in sport and beyond – in sports schools and sports clubs (Summary of Sports Policy Guidelines 2014 – 2020, 2013; Severs, 2015). Sport education is not only about developing physical activities, and it has other aspects, not only recreation. Playing different kind of sports provide knowledge and understanding about principles such as game rules, fair game, dignity, strategy, feeling of body and social consciousness, which is related with personal interaction and team work in many sports. The goal of children's and youth sports in Latvia was to create opportunities for every young person to engage in sport […], promoting the development of the talent of young athletes (European Comission, *Eurydice*, 2013).

In Latvia already five times have been organized Europe`s Sports week, which is initiative by Europe Commission with an aim to motivate people more often do sports, to increase physical activities, as well as increase understanding about what positive effects on health, work abilities and whole quality of life has physical activities. Campaign „Be Active' organized by Latvian Sports Federation Council is made with an objective to step by step change society`s attitude and habits, and to learn active lifestyle from young age, which can also be developed through movement games. Sporting habits depend on your own will to do something, but wills depend on habits which are developed in the family, kindergarden, school and sport`s school (Latvian Sports Federations Council, 2019).

Physically active and physically inactive behaviors are important in the daily lives of children and adolescents. Both have implications for fitness and health, learning, enjoyment, social interactions, and physical and psychological development (Malina, Cumming & Coelho-e-Silva, 2016). Scientist Robert Malina (2001) noted that everyday habits, including regular physical activity, are formed best in children and adolescents and can have a significant impact on a person's health later on in life. Children and adolescents who are more sufficiently physically active are more likely to be active as adult. There is a strong correlation between physical activity and health.

Physical fitness is one of the main factors impacting health. Engaging in regular physical activity is one of the best ways to improve overall health. Although there are some risks associated with activity, they are far outweighed by the long-term health benefits. Physical activity can prolong life; improve quality of life; it is also an important component of weight management. What remains a challenge is the successful promotion of regular physical activity in a population that is predominantly sedentary. Physical fitness has a major influence not only on health, but also appearance, and well-being. A sufficient level of physical fitness guarantees a higher quality of life and helps prevent the development of many "non-contagious diseases", such as cardiovascular disorders or obesity. According to the concept of Health-Related Fitness, physical fitness is one of the main factors impacting health (Lipecki & Rutowicz, 2015). Every hour of physical activity prolongs our lives. Physical activity improves our concentration, creativity and memory (Hansen & Sundberg, 2014). The [...] promotion of children's healthful physical activity is important: to establish an early habit of lifestyle physical activity that can be sustained into adolescence and adulthood (Tudor-Locke, et al., 2001). Children, to experience and to learn, need to be physically active and their innate physical activity is playing. Playing together means building relationships

with peers, means learning how to use tools and space, means addressing egocentric behaviour toward rules' respect; in summary, it means learning "Social conviviality and respect" (Serpentino, 2011). Results of scientific researches in psihology and neurobiology lead to thought that children's` senses and especially brains develop better if children have physical activity (Rudin, 2019). As a result, habits developed at a school-age can influence the habits and health indicators in adulthood.

In order to engage children in physical activity from an early age, one of the forms of physical activity are movement games, in which children can participate with their parents or under the guidance of their parents. According to Piech et al. (2016) it is not to be forgotten that every family forms the primary environment for a child in his or her engagement in any physical activity. This can be illustrated by the most basic participation of parents and children in leisurely activities and simple sport games. The parents are indeed first psychical educators for their children. Movement games also are used by kindergarten teachers, sports teachers and sports coaches. Therefore, pre-primary schools, schools and extracurricular sports in sports schools and sports clubs play an important role in providing physical activity.

Children's acquisition of fundamental movement skills is essential for children's participation and success in sport (Cowley, et al., 2010). In every sport children at first should be interested to enjoy movement, and the best way how to do it is by using the movement games. Interesting and varied physical activities establish positive attitude towards sport, that creates willingness to continue exercising. Games permits children to practise their competencies and acquired skills in a relaxed, pleasurable way. Play involves the repetition of behaviour when new skills are being learned or when physical or mental mastery and coordination of skills are required for games in sports. Practise play contributes to the development of coordinated motor skills needed for later game playing (Santrock, 2001). Games can help children develop physically, mentally and socially. Games are perfect means in development of physical properties, they facilitate sport techniques and they in the best way may contribute in developing social skills. Enough physical activity in the childhood, adolescence and youth is extremely important. Children master those motor skills that form the basis of all other physical activities lifelong in the childhood (Porozovs & Klavina, 2014). As previously mentioned, the movement games constitute an important means through which the goals of physical education can be achieved. The playful and emulating character of the movement games constitute elements that increase the pupils' interest for the teaching activity, mobilizing their energy, and emotionally stimulating them (Dobrescu, 2013).

Material and Methods

The ***aim*** of the study was to find out - did coaches use and what kind of games coaches used in different sports training classes in Latvia and to compare this data with the data obtained in questionnaire survey of 1994 (Dravniece, 1999) and 2012 (Dravniece, 2015). The study was conducted in 2018 – 2019 in Riga, LASE. 97 coaches (n=97) and 155 athletes – students of the LASE (n=155) participated in the study. Coaches were in different ages and they were studying at the LASE either in Part time studies or first level higher professional education programme "Educational and sport teaching specialist", or were participants of Professional development center courses organized by LASE. Athletes represented in the questionnaire survey were Full time students at LASE. We studied the attitude of coaches and athletes towards movement games in training process in various kinds of sport, as well as found out what kind of games coaches and athletes used in the training process. In the statistical processing of the data we used establish t-test. Interrogated coaches represented 28 kinds of sport, which were combined in 20 groups of related sports, i.e., seventeen coaches represented – Gymnastic, Fitness, Bodybuilding, Power triple, Artistic gymnastics; fourteen – Basketball, eleven – Football, nine – Ice hockey, eight - Track-and-field, seven – Wrestling sport, Karate, Judo, Kickbox, Tekvondo, six – Volleyball, four – Handball, by three – Floor-ball, Orienteering and Skiing, by two – Cycling, Shortrex, Table tennis, and by one in Swimming, Rowing, Figure skating, Mountaine skiing, Biathlon. Interrogated athletes represented 42 kinds of sport, which were combined in 30 groups of related sports in the same way. In 1994 in questionnaire answers were given by 63 coaches (n=63) and by 129 athletes (n=129), representing different sports. Interrogated coaches were combined in 15 groups of related sports and athletes in 14 groups (Dravniece, 1999). In 2012 in questionnaire answers were given by 96 (n=96) respondents, representing 37 kinds of sport, which were combined in 14 groups of related sports (Dravniece, 2015). Athletes were also included in the study to compare the findings with coaches. The questionnaire survey was anonymous, the questionnaires were prepared well in advance, they were structured and testable, have definite and concrete questions, questions were both close and open ended. The questions were the similar in 1994, 2012 and 2019.

Results

Questionnaire of coaches. 63 sports coaches took part in research in 1994. Among these coaches at average 85.7% were using movement games in the training process. In research in 2012 participated 96 coaches, of which

79.2% were using movement games in trainings? In 2019 from 97 coaches 70.1% were using movement games in the training process (Table 1). We ascertained the tendency, that in the training process coaches are using movement games less often. Usage of movement games is different depending on kinds of sports. In 1994 movement games mostly were used by Volleyball, Handball, Wrestling, Football, Rowing and Swimming coaches (100%), by Basketball coaches (93%), and by Skiing coaches (80%). More rarely - Track-and-Field coaches (60%), and by Gymnastic coaches (57%). In 2012 movement games were using 100% of research participants – coaches who represent Basketball, Handball, Ice Hockey, Orienteering and Skiing coaches and 86% Volleyball coaches. In 2019 we ascertained the fact that sports in which movement games were used the most of all are - Mountain Skiing (100%), Handball (91,67%), Volleyball (88,89%), Wrestling (85,71%), Football (84.85%), Basketball (83,33%). At average, in the period of 25 years, 78.33% coaches of different sports have used movement games in the training process.

63 coaches of different kinds of sports named about 50 movement games thay used in training's in 1994. Prevalently those were movement games, which are usable in sport games and other sports. For instance, Voleyball coaches named: Folkball, Pioneerball, Landball, Doggies, Octopus, Relays with a ball; Basketball coaches named: Don`t give ball to the middle one, Protection of the fortress, Catch with passes, Who is more accurate?, Folkball, Skilled dribbler, Giving the Ball in Circle, Ball to the Captain, Third Tap and others. Track-and-Field coaches named: Forbidden movement, Class in peace, White bears, Day and night, Fishing rod, One is not enough, two is too much, relays. Swimmers, Fencing athletes and representatives of other sports named movement games related to their sports. The most popular game in 1994 was Folkball, From the answers of coaches, players of almost every kind of sport were playing Folkball during training's. As clarified from answers that coaches provided, athletes of almost every kind of sport were playing Folkball in the training process.

In 2019 in the questionnaire survey coaches mentioned that they are playing different kinds of sport games and different forms of them, for instance, they make games easier to play with different regulations. Most frequently played games as in previous years are Folkball, different kinds of Doggies (with one or more catchers, in pairs, with one ball or with many balls, with tails, on lines, Squatting catchers, Frozen, etc.), Day and night, Chain or Fishing net, Viruses, Snaipers, Flags, The house is on Fire, The third is redundant, Hunters and Ducks, Calling up numbers, Fishing rod, Higher than the ground, The last pair goes separately, Fishermen, Potatoes,

imitations of similar sports, as well as games and relays from different sports that are customized for own sport.

In 2019 in the questionnaire survey we researched how coaches of different sports use movement games to different aged athletes (7 – 11, 11 - 16, 16 – 19 years) (Fig.1).

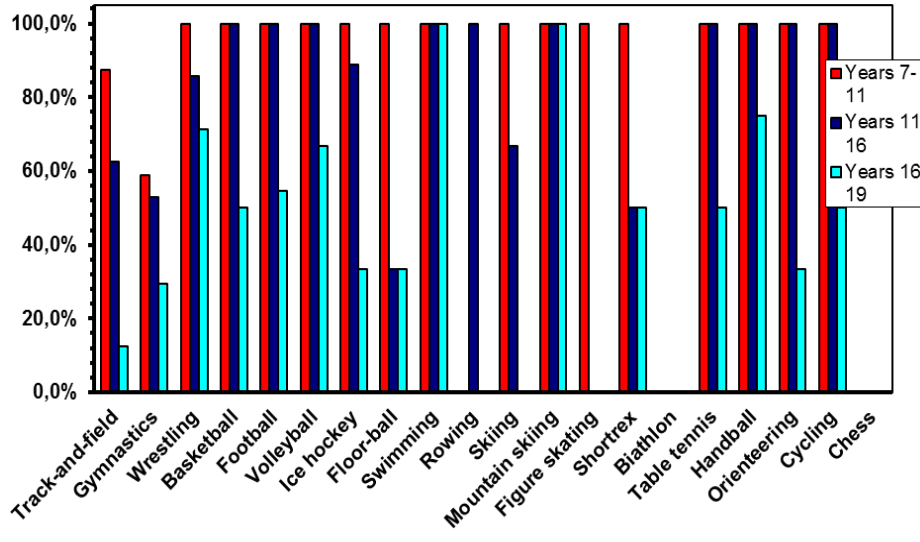

Figure 1. Games used in the trainings by coaches of different sports, by age groups (2019)

From the answers of coaches:

88.6% coaches give game movements to the athletes in the age group 7 – 11 in the trainings;

79.38% coaches are using movement games with athletes in the age group 11 – 16 in the trainings;

42.27% coaches are using movement games with athletes in the age group 16-19 in the trainings.

Comparing answers that coaches provided in different years, differences between answers in 1994 and in 2012 are not statistically significant (absolute difference – 6.5%; t-test – 1.046; $p>0.05$), also differences between answers in 2012 and in 2019 are not statistically significant (absolute difference – 9.1%; t-test – 1.447; $p>0.05$), but answers in 1994 and in 2019 are statistically significant (absolute difference – 15.6%; t-test – 2.267; $p<0,.05$). That leads to the fact that in the period of 25 years, usage of movement games in the training process has gradually and substantially decreased.

79,73% coaches have opinion that movement games are *essential* in the training process. Opinions divided in different age groups:

Age group 7 – 11, 94.85% coaches,

Age group 11 – 16, 87.63% coaches,

Age group 16 – 19, 56.7% coaches.

In 2019 in the questionnaire survey we researched whether the coaches consider movement games as essential in the training process (Fig.2).

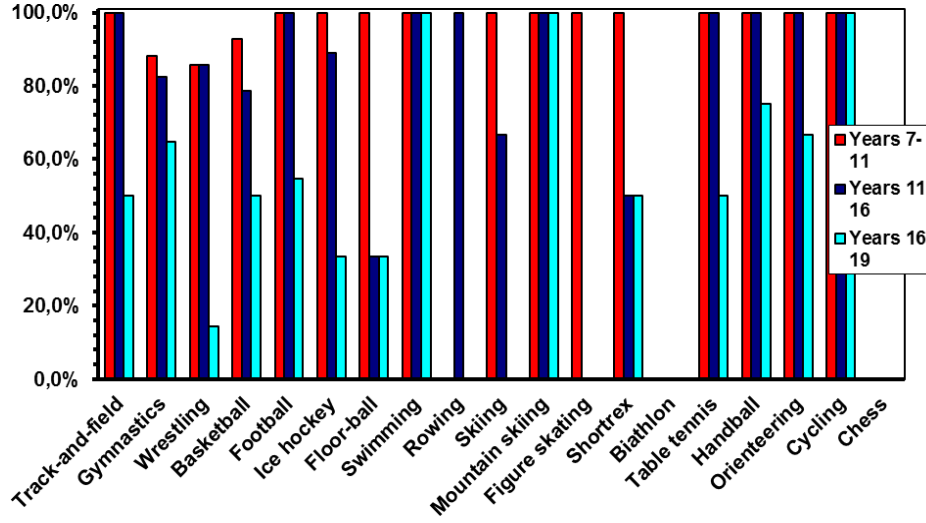

Figure 2. Coaches' answers: Games are essential in training classes, by age groups (2019)

Questionnaire of athletes. In total, 129 athletes representing different sports participated in the questionnaire survey in 1994. It shows that movement games are played by 61.2% athletes of different sports. In 2012 – 96 athletes participated, movement games were using 65.6% of them and in 2019 155 athletes participate and 64.3% of them were playing movement games. In 1994 movement games mostly were used in Ice hockey (100%), Wrestling (91.7%), Track-and-Field (78.6%), Handball (75%) classes. In 2012 games in the course of training were applied in Handball, Orienteering, Skiing (100%), Basketball (87.5%), and Volleyball (85.7%), Ice Hockey (80%) trainings. In 2019 movement games were played in: Handball (83.3%), Wrestling (80.96%), Basketball (72.2%), Swimming and Volleyball (66.67%). At average, in the period of 25 years, movement games in the trainings have used 63.7% athletes.

In 1994 the representatives of different sports kinds named only thirteen movement games used in the trainings, for instance, Basketball players named: Folkball, Potatoes, The house is on Fire, relays; representatives of Track-and-field named: Hunters and Ducks, Doggies, Folkball, Two is not enough, three is too much, Relays; Wrestling athletes named: Rooster Fights, Horsemen, Doggies; Skiing athletes named: Rabbits and Hunters, Pioneerball, Potatoes, Fishing Rod, Relays. In 2019 athletes named more games, the most populars are: Doggies, Doggies with ball (with dribble in basketball, with leading ball with feet, Folkball, Frozen, Crocodiles, Octopus, Policemen and Bandits, Day and Night, The third is redundant, Viruses, The slower you drive, the further you will get, Fishing Net, Fishing Rod, Flags, Minuses, Kings, Snipers, The house is burning, Tails, Traffic Lights, Hot Ball, The mirror, Hunters and Ducks, Potatoes, Cucumbers (Sqout), Pirates, Cities, Ships, Squatting catchers, Crayfish, The fireball, Twenty one, Three ball stealing, Relays and Obstacle lanes.

Representatives of certain sports (Swimming, Fight sport, Gymnastic, Shooting, Cycling, Orienteering) named games suitable for their sport, for instance, Swimmers named: Sunken Treasure, Star, Float; Fight sports` athletes named: Crocodiles, Bulldogs, Horsemen and other games. Most popular games in 2019 are Doggies (played in different variations) and Folkball.

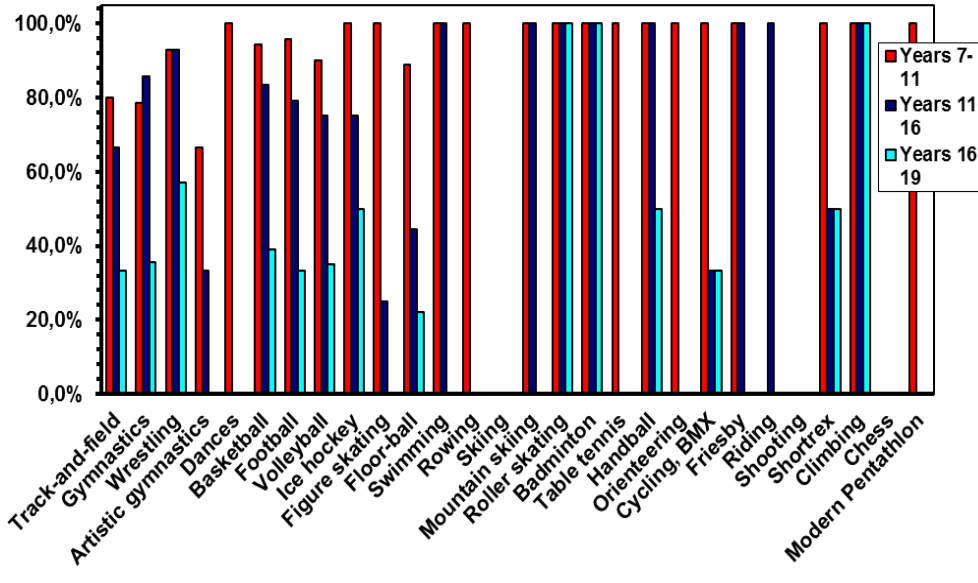

Figure 3. Games played in the training by athletes of different sports, by age groups (2019)

Answers given by athletes:

Age group 7-11, movement games in the trainings were playing 89.03% athletes

Age group 11-16, movement games in the trainings were playing 69.68% athletes

Age group 16-19, movement games in the trainings were playing 34.19% athletes

Comparing answers that athletes provided in different years, differences between answers in 1994 and in 2012 are not statistically significant (absolute difference – 4.9%; t-test – 0, 656; $p > 0.05$), also differences between answers in 2012 and in 2019 are not statistically significant (absolute difference – 1.1%; t-test – 0.179; $p > 0.05$), and answers in 1994 and in 2019 are also not significant (absolute difference – 3.8%; t-test – 0.564; $p > 0.05$). Decrease or increase of movement games used in the trainings is not vital.

Differences between coaches` and athletes` answers about usage of movement games in the trainings in all age groups are not statistically significant ($p > 0.05$).

82.58% athletes consider movement games as essential in the training classes, by age groups:

Age group 7 – 11, 98.71% athletes,

Age group 11 – 16, 90.96% athletes,

Age group 16 – 19, 58.06% athletes.

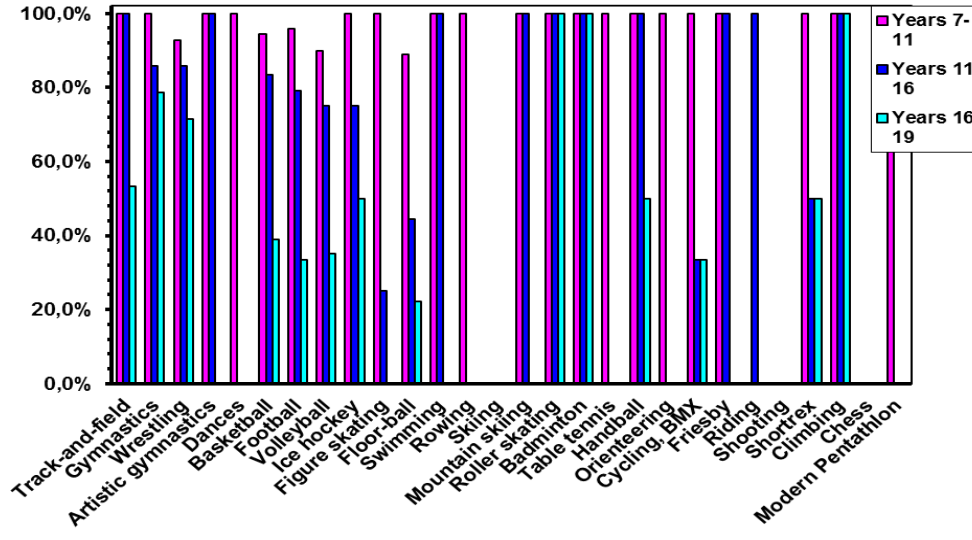

Figure 4. Athlete's answers: Games are essential in the training classes, by age groups (2019)

Differences between coaches` and athletes` answers about importance of movement games and their usage in the training process are not statistically significant ($p>0.05$). Both coaches and athletes consider movement games being important part of training process.

In the Table No 1 is provided usage of movement games in the training process (in 1994, 2012, 2019) by coaches` and athletes` answers.

Table 1

Answers about Playing movement games in the training process (answers of coaches and athletes)

	1994		2012		2019	
	Abs.No	%	Abs.No	%	Abs.No	%
Coaches	63	85.7%	96	79.2%	97	70.1%
Athletes	129	61.2%	96	65.6%	155	64.3%

Differences between answers about usage of movement games in the training process given by coaches and athletes were statistically significant in 1994 (absolute difference – 25%; t-test – 3.284; $p<0.05$), and also in 2012 (absolute difference – 13.5%; t-test – 2.099; $p<0.05$). Differences between coaches` (n=97) answers and athletes` (n=155) answers in 2019 are not statistically significant in all age groups (absolute difference – 5.6%; t-test – 0.915; $p>0.05$).

Coaches and athletes had to answer questions about the meaning of movement games - whether games develop physical properties; if it`s possible to improve the technique of sport through movement games; whether movement games facilitate social skills. Answers provided by coaches and athletes are given in the Table No 2.

Table 2

Answers about Meaning of movement games in the training process (answers of coaches and athletes) (2019)

Functions of games	Coaches		Athletes	
	Abs.No	%	Abs.No	%
Games develop physical properties	94	96.9	154	99.4
Games improves the technique	92	94.8	146	94.2
Games facilitate social skills	95	97.9	148	95.5

Differences between answers about meaning of movement games given by coaches and athletes are not statistically significant ($p>0.05$). Both – coaches and athletes consider that with movement games it is possible to develop physical properties, improve the technique, and facilitate social skills.

Discussion

The questionnaire survey comprised questions in total relating to the application of movement games in the training process, about necessity of games in trainings, and functions of games in trainings.

Both – coaches and athletes admit that movement games are necessary in the training process. The facts that movement games are important also confirm scientific researches – works published by scientists, specialists and also questionnaire survey conducted.

Both respondent groups used in the research, convincingly provided answer that movement games can develop physical properties, improve the technique, facilitate social skills. Senior Sport Coach Standard (2004) and Sport Coach profession`s Standard (2003) define that coaches should have a knowledge about content of sciences as pedagogy and medical biology which are integrated in sport`s science, so they are able to do tasks which are required in their profession. Coach`s obligation is to develop postive and active attitude towards sport and physical activities. In the standard it is provided that sport coaches should know how to organize and lead movement games at the application level. However, in the making of questionnaire survey, we concluded that in the last 25 years the reality and situation with movement games, has become slightly worse. Maybe research results are affected by the fact that already more than 10 years in Latvian Academy of Sport Education in Professional Bachelors higher education programme „Sport Science" in qualification „Senior Sport Coach" students do not have subject matter „Movement games". Yet, it is positive that in Academy students obtain two qualifications at the same time, which means that large amount of students are getting profession of Coach and Sport teacher both at the same time. Students in Sport teacher qualification are having subject matter "Basics and didactic of movement games at pre-school and at school" (Latvian Academy of Sport Education, 2019). Bonus, LASE has subject matter of choice Outdoor activities, which is acquired in the programme of Recreation and offer to students recreational games and activities. But unfortunately Part of graduates from LASE coaches, who did not have second qualification as Sport teacher, to their students can only offer movement games that obtained in their own personal experience from their coaches.

Sports trainings classes – it is time that children and adolescence use in their leisure time outside of school and home. The role of sport and movement games is essential, despite today's popularity in computer games and on-screen activities, in which scientists are trying to find meaning in for the increased physical activity. Known as exergames, these active videogames are often presented in the market as a ludic substitute to

traditional sport. Although they present the benefit of being engaging, to date, the content and modality of interaction of these games cannot be granted as a regular mean to do exercise (Landry, et al., 2013). At least during sports training, children are separated from the screens and focused on real life, physical activity, interactions with peers and coach.

We hope when the coaches study games organization and management methodology at LASE, as well as understand the tremendous role of games in the athlete's educational process, they will use them more in various kinds of sports.

As Professor Paul Godbout from Laval University in Canada has written in the foreword of the book "Team Sports and Games": "According to a saying from the late 19-th Century in England – *If we give a person a fish to eat, we nourish that person for a day. If we teach someone how to fish, we nourish that person throughout his or her entire lifetime"* (Grehaigne, Richard & Griffin, 2008).

Based on the literature and experience, we are confident that when coaches know and apply movement games, that increase athlete's interest and pleasure about sport, physical activity, active and healthy lifestyle, because sports and games can be fun, educative, and challenging and enhance health. Habits related to physical activities that are taught in childhood and young age are most likely to remain in life.

Conclusions

The results of the research show that:

Both: coaches and athletes use movement games in sports trainings classes; usage of movement games depends on kinds of sports.

In the answers of coaches statistically significant differences are detected, comparing 1994 and 2019, in 2019 usage of movement games have decreased by 15.6%. In the period of 25 years, there are no statistically significant differences detected in the answers of athletes.

Coaches most often use movement games with young athletes in the age group 7-11 years – 88.6%; with increase of athletes` age, usage of movement games decrease till 42.27% in the age group 16 – 19 years.

From answers provided by athletes in the age group 7-11 years, movement games in the trainings were playing 89.03% athletes, in the age group 16-19 years movement games in the trainings were playing only 34.19% athletes. Differences between coaches` and athletes` answers about usage of movement games in the trainings in all age groups are not statistically significant.

79.73% of coaches and 82.58% of athletes consider movement games as essential in the training process, in age group 7-11 years – 94.85% coaches and 98.71% athletes have an opinion – movement games are

essential. We established tendency, that coaches and athletes have a will to use movement games more than they are using now.

Comparing movement games that are named in 1994 and in 2019, the conclusion can be drawn that the diversity of movement games has increased, but from our experience we can tell that diversity is more in game titles than in game content. Most popular games in 2018-2019 are Doggies played in different variations and Folkball.

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REVIEW PAPER

KEY FACTORS FOR QUALITATIVE REALISATION OF DUAL CAREER IN PERSPECTIVE OF THE SPORTS LEADERSHIP

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Abstract

The Murjani Sports Gymasium (MSG) is the only specialized sports education institution in Latvia which provides high school education and simultaneously the realisation of high-performance sports career. Despite the fact that this educational institution has about 400 students/athletes in seven sports, crucial part of the Latvian national teams in these 7 sports contains of the current and graduated students of the MSG. Therefore, the aim of this study is to evaluate the dual career maintenance i.e. situation in Latvia, by particularly assessing the key factors of qualitative dual career realisation. In this matter, based on the literature research the key factors to maintain qualitative dual career were selected. Additionally, the sports leadership evaluated the importance of these factors in dual career realisation. In particularly, five national sport federations' presidents and the Deputy State Secretary-Director of the Sports Department at Ministry of Education and Science of the Republic of Latvia (MES) were asked to evaluate the dual career system in Latvia and to give suggestions for development which has significant meaning in dual career system improvement and development in the Latvian sports industry. The results of the interviews with the sports leadership indicate that all determined key factors proposed by the scientists that influence qualitative dual career realisation play an important role. It could also be surely concluded that dual career maintenance i.e. athletes' support system is in its very early stage of development and the work on the dual career systems' progression must been intensified. Furthermore, based on the research results it would be possible further to develop a more accurate model for the enhancement

of the qualitative dual career realization in Latvia and put forward recommendations for improvement of the dual career structures in Latvia.

Keywords: *dual career, sports, education, high-performance sports, sports leadership*

Introduction

In dual careers the focus is set on link and interaction between the sports career and the education process (Alfermann and Stambulova, 2007; Stambulova and Wylleman, 2014) to ensure successful and simultaneous transitions in both athletes' careers. Thus, sport and education are identified as central components of a dual career.

In particular, the dual career and its realisation or assurance in school age is in sport science a research object since the 1980s (Teubert, 2009). While a large number of scientists have studied the overload of new athletes in school and high-achievement sport, only a few have focused on the coordination or collaboration of these two structures, namely school and high-performance sport (Teubert, 2009).

Moreover, in the latest time the interest in dual career has grown strongly by producing recommendations, models and guidelines on the dual career realisation and improvement in its structures. Thus, these scientific models and recommendations should attain all involved stakeholders and their consciousness in this dual career system. The most important stakeholders or drivers of dual career development and promotion are the athletes themselves, coaches, teachers, sports and education systems, sports federations, government, society et. al. Moreover, based on data from the European Union conducted research study "Study on Minimum Quality Requirements for Dual Career Services" (2016), the importance of qualitative dual career maintenance or realization persist in the interaction between all stakeholders. Therefore, qualitative dual career structures offer potential and opportunities for positive development. According to this EU study there are real operational steps: (a) the participating organizations evaluate their willingness and support for dual career development and support; (b) new opportunities for international cooperation (c) encouragement of existing dual career cooperation, (d) establishment and enhancement of the dual career monitoring and/or evaluation system(s). In this matter, were selected the leaders i.e. presidents of the national sports federations and the leader in the sports field from the national government to collect their professional opinion about the quality of the dual career in Latvia. In particular, *the interview content covers five topics: (a) leadership; (b) policy, legislation and governance; (c) funding; (d) recognition and agreements; (e) measuring impact.*

Furthermore, the realization of the dual career can be successful if clear and open communication and information on the rules and decision-making process is provided. Besides, if the clear communication and transparency is required then analyse of the environment plays a crucial role as well. When studying the influence of the environmental factor on the dual career, it is necessary to distinguish between external or macro-environmental and internal or micro-environmental effects. Macro-environment as an essential factor in the process of personalization includes:

- society – economic, political, cultural, climatic, ecological, geographical, hygienic environment and its factors that directly interact with personality throughout one's life;
- social conditions – social, material and mental – that in one way or another influence personality and its development. Additionally, particular importance has the daily life, well-being, traditions and customs of a certain part of the society (Masteralexis, Barr, Hums, 2005; Abele, 2009; Krona, 2011).

The microenvironment is related to the social environment surrounding the athlete's daily activities. Family, childhood experiences, peers, friends, school or study environment as well as media have traditionally provided the greatest impact on the micro-environment (Abelkalns, 2013). Likewise, the scholars Henriksen et al. (2010) divided the micro- and macro environment in his athletic talent development environment model - ATDE. The ATDE model consists of micro and macro levels in sports career and in other non-sports fields, which comprises education and private life. The main purpose of the ATDE model is to help create the necessary conditions and support for young athletes to make the transition from junior to high achievers in adulthood (Henriksen et al., 2010).

The successful transition from junior to high achievers in adulthood is well researched field of leading scholars in this field like Stambulova, Alfermann (2009) and Wylleman, Lavallee (2004). Contributing factors to dual career development are traditionally recognized drivers / stakeholders at the micro level, such as coaches, coaching staff, family, and more. (Cote, 1999; Cote et al., 2007). In contrast, Alfermann, Stambulova and Zemaityte (2004), as well as Stambulova, Stephan and Jarphag (2007), from a comprehensive perspective discovered new factors at the macro-environmental level: national culture and national sport system. Macro-environment describes the social environment that influences but not forcibly interacts with young athletes.

Hence, the coordination of these two dual career structures – sport and education – is less scrutinised in the students'/athletes' school age. In this particular research the sports leadership's professional opinion as

stakeholders from the macro environment were examined and their evaluation about the dual career's systems development in Latvia were compiled.

To sum up, the tasks of this study is to evaluate the importance of in literature research selected key factors for maintaining qualitative dual career in perspective of the sports leadership in Latvia. To conduct this study, six semi – structured interviews were held to evaluate the dual career maintenance i.e. situation in Latvia, by particularly assessing the key factors of qualitative dual career realisation.

Material and Methods

Research data were collected in two ways; the investigation and analysis of the scientific literature sources, as well as EU and national regulations, and a semi-structured interview with the experts in the sports field. Expert judgment is a qualitative research method and gives an objective and reliable insight into the phenomenon being studied, as experts impart the knowledge in this field (Albrehta, 1998, Kristapsone, 2008). According to this definition, the expert's selection was based on their academic and work experience. Concretely, all selected experts have obtained an academic degree and they have at least 5 years' experience in the sports sector as a governmental body.

Within this empirical study, a semi-structured interview with pre-prepared questions and free answers was used. This type of interview firstly allows the researcher to ask additional questions during the interview and obtain detailed information if necessary, secondly, free answers reduce the interviewee's response to certain answers (Kroplijs, Rascevska 2004; Geske, Grinfelds 2006; Kristapsone 2008); obtaining objective information. Interviews are an important research method, which involves obtaining information through close social interaction between the respondent and the researcher. This is a time-consuming process as it has to be done with each respondent individually.

In this case 6 interviews were held with six male sports leaders - five national sport federation presidents and the Deputy State Secretary-Director of the Sports Department at Ministry of Education and Science of the Republic of Latvia. The average duration of these interviews reaches 40 minutes. The individual interviews were documented in audio form, then descripted for factor analysis. In the factor analysis the determined factors were selected on the on the basis of the EU Minimum Quality Requirements for Dual Career Services (2016), which was developed by Professor of Sport Sciences at the University of Applied Sciences Amsterdam under the guidance of Dr. Cees Vervoorn. In particular, the interview questions cover

following topics: (a) leadership; (b) policy, legislation and governance; (c) funding; (d) recognition and agreements; (e) measuring impact. Fallowing, the interviewed experts' responses about the dual career qualitative realization in Latvia in all previous mentioned fields were collected and analyzed in terms of factor analyse. Finally, the final factors were evaluated in two categories which were elaborated by the authors of this research.

Results

Related to the aim and objectives of this study the key factors to maintain qualitative dual career in Latvia were evaluated. In this matter, the results were categorized based on the responses of six semi-structured interviews which were conducted with sports leadership in Latvia.

Again, based on the EU Minimum Quality Requirements for Dual Career Services (2016) the key factors or main topics for the maintenance and /or realization of dual career in Latvia were pre-selected. The responses of the six semi-structured interviews were evaluated by means of the factor analyse and so were selected the final key factors: age of the athlete; structure of the educational system; support system of the dual career; integration in the labour market after the graduation or discontinuation of the dual career; monitoring; provision of physical environment and infrastructure.

Moreover, the interview questions provide information about the developed key factors or criteria for the maintenance and /or realisation of dual career. (Table 1)

Table 1

Interview questions

Leadership	Whether dual career is part of an explicit organisational strategy and vision.
	Whether programmes for dual career exists to implement strategy.
	Whether strategies for dual career is accompanied by a dialogue with stakeholders.
	Whether early awareness of arrangements for dual career is created with athletes and stakeholders.
Policy, Legislation and Governance	Dual career is embedded in the national or regional policy.
	Whether the policy cycle is implemented according to responsibilities, implementation, evaluation and monitoring.
	Whether agreements are in place between sport and the education domain.
	Whether agreements are in place between sport and the labour market.
	Whether agreements are in place between education and the labour market.
	Whether such agreements lead to functional partnerships.
Funding	Are there any projects or financial investments planned by the Ministry of Education and Science in the next few years for the development of dual career paths in any form of athletic support in education?
	Whether an educational bursary system is in place.

1 Table continuation

Funding	The presence of scholarships for individuals for studies, counselling, coaching and help in entering the transition to the labour market.
	Institutional support for the implementation of programmes for dual career.
Recognition and agreements	The presence of a general or a sport-specific classification system for talented and elite athletes;
	Whether a classification system is organised at national level.
	Do you have events, handouts, materials, etc., for your interest groups to highlight the importance of dual careers?
	Is dual career also a topic in your international sports federation?
Measuring impact	The registration of talented, elite and post-elite athlete.
	The existence and implementation of a monitoring cycle.
	The existence of quality indicators for success, based on academic and/or sporting performance.

First, in frames of the answer about leadership and policy, legislation and governance following key factors could be elaborated: age of the athletes and structure of the educational system. Primarily, the age of the athletes when they carry out their dual career is related to their sports. As the MSG is the object of this research, then the age of the dual career athletes / students was selected by determined sports peculiarities and the regulations of the national sport federations. Secondly, the MSG is the only high school with national regulations of the Ministry of Education and Science (MES) in Latvia where is a clear structure of the educational system to combine it with high performance sport and so to fulfil a dual career. Following, the questions about funding were related to the key factor: support system of the dual career. Herewith, to have a support system and recruit people to maintain a dual career structures it is crucial to have a solid financial base. Nonetheless, funding is one of the main requirements to have a support system of dual career but not the only component for support system in dual career. In addition, to interview questions about the recognition and agreement allowed evaluating the key factors: integration in the labour market after the graduation or discontinuation of the dual career, as well as, about the provision of physical environment and infrastructure. Finally, based on the expert response about the measuring impact the situation about the monitoring in dual career could be viewed.

In general, according to the interviewed experts the realization and maintenance of dual career in Latvia is very insufficient. Only the key factors about the age of athletes and structure of the education system is clear and could be positively evaluated. However, the education system for dual career athletes / students is only assured in the MSG, where about 400 students are obtaining the high school diploma / graduation. It allows to determine the rarity and selection of the dual career opportunities for high

school students. To continue, the all other key factors were evaluated as absent or insufficiently provided as well.

Overall, to have development in dual career structures in Latvia and observe some positive changes in near future it is necessary to carry out some actions or processes. In this matter, the opinions and assessments of the interviewed experts / leaders were divided in two categories or action plans: (a) preventive actions for dual career development (b) involvement of stakeholders in the process of dual career realization.

Table 2

Preventive actions for dual career development in Latvia

Key Factors (modified by EU study Minimum Quality Requirements for Dual Career Services, 2016)	**Categories**	
	Preventive actions for dual career development	*Involvement of stakeholders in the process of dual career realization*
Management and support system of the dual career	The Ministry of Education and Science, as well as, national sport federation do not have a main strategy or vision for the dual career structures and implementation. However, there is understanding about the importance and necessity of dual career and it is emphasized in the National Sports Policy Guidelines.	The national sports federations have not carried out yet any activities to inform all stakeholders about dual career relevance and issues. The importance and strategy of dual career in its realization is not sufficiently discussed and analyzed among the leadership and all interest groups involved. This communication needs to be improved in the near future.
Structure of the educational system	Generally, dual career cooperation agreements are not concluded at national level. However, sports federations and MES cooperate with Latvian Academy of Sport Education (LASE) to prepare young professionals for the professional career in the sports field / domain. Yet, dual career cooperation agreements are successfully concluded between national sports federations and international sport federations. Nontheless, these agreements are concluded in insufficient number.	The greatest responsibility for dual career realization and success have the athletes themselves. In addition, it can be concluded that there is an unsufficient support from the MES, national sports federations and other driving forces /stakeholders who are involved in the dual career realization processes.

2 Table continuation

Support system of the dual career	For development of a support system of the dual career are necessary a appropriate financial base. The Latvian Sports Federations Council (LSFC) provides scholarships for athletes to combine their sports careers with higher education. The bulk of the interviewed leaders of sports federations emphasize that the amount of scholarships is not sufficient for successful dual career.	The LSFC is at the moment the most active finance provider in the dual career system in Latvia.
Provision of physical environment and infrastructure	The MSG physical environment and infrastructure is not fulfilling the European standards. To improve this situation is necessary to find necessary finances to improve the physical environmental, especially, sport / training centres and education buildings.	Mainly the governing bodies should ensure an appropriate environment / infrastructure for sports and educational domain in dual career.
Monitoring	The main essence of dual careers is that their goals are not fully perceived at national government level and there is a lack of regulations, guidelines and other informative documents, as well as, activities and programs to improve this situation. Dual career monitoring and athlete register do not have an appropriate structure. There are records only about the athletic success / results.	Dual career guidance systems should be re-designed with the creation of a team of competent people who understand the specifics of sport and the globalization and digitization of sport.

One the one hand, these pro-activities or fulfillment of these categories could allow conducting a stabile dual career structure in Latvia. On the other hand, to reach a clear a qualitative dual career realization in Latvia there should be clearly defined responsibilities and duties of all involved stakeholders.

Discussion

In order to develop a dual career structures in Latvia, especially in the MSG, the following key factors need to be addressed and fulfilled:

- age of the athlete
- structure of the educational system
- support system of the dual career
- integration in the labour market after the graduation or discontinuation of the dual career
- monitoring
- provision of physical environment and infrastructure

The results of this empirical research according to the theoretical part of this paper allow interpreting and evaluating which key factors of qualitative dual career realization are executed in a sufficient or positive level and which factors are insufficient or poorly realized in Latvia.

Hence, weaknesses or key factors that are not optimally provided in the dual career realization in Latvia include dual career system support, athletes and graduates' integration in the labor market, monitoring and provision of physical environment and infrastructure.

To change the poor situation in the dual career realization in Latvia the driving forces i.e. sports leadership like presidents of national sport federation and representatives of the MES should determine what dual career opportunities and improvements in Latvia would be necessary or desirable and which supporting systems should be provided to increase the motivation of athletes to commit their lives to high performance sport and simultaneously complete self-realization in the academic field and afterwards in the labor market.

For further development there should be not only some established guidelines or regulations and carried out some round table discussions on dual career but also there should be set specific common goals and responsibilities as well as tasks for sports and education leaders to have clear structures and good governance to maintain a qualitative dual career realization in Latvia.

Conclusion

To conclude, the evaluation of the key factors for qualitative dual career realisation in the perspective of sport leadership reveal the actual situation in Latvia and what kind of improvement and orientation would be necessary for further development. Furthermore, this research discloses the perspective of the driving forces in the macro-environment. Stakeholders from the micro-environment like athletes themselves, coaches, teachers, parents, friends etc. should assess the key factors for qualitative dual career

Realization in Latvia as well. This would allow having a holistic view on this phenomenon and creating common ground of interests of all involved parties. Also, clear communication on main aims and vision would foster the quality and successful realization of dual career in Latvia.

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REVIEW PAPER

CONSIDERATION OF THE DOMINANT SIDE IN APPLICATION OF LOCAL VIBROSTIMULATION

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Abstract

Local vibrostimulation (with RE-21 device) has advantage of applying it directly to the target area, therefore avoiding unnecessary vibration of other parts and tissues of human body. Our previous researches show, that parameters of local vibrostimulation (amplitude and frequency) car vary according to area and tissue affected, as well as effect to be achieved. In some sports the dominant extremity play an important role, so purpose of our study is to determine differences (if there is any) in application of local vibrostimulation parameters on dominant or non-dominant extremity - is it necessary to change parameters for dominant extremity? Study included 18-23 y.o. female subject (n=20), divided in two groups depending on application of local vibrostimulation on dominant and non-dominant lower extremity between three sets of continuous leg extension exercise, counting maximum repetitions. Study show, that there is no significant difference between stimulated dominant and non-dominant extremity, it is not necessary to apply different vibrostimulation parameters.

Keywords: *local vibrostimulation, dominant side,, lower extremity*

Introduction

Vibration has been used in sports for two main reasons – to help athlete to recover faster (this effect is often called relaxing effect) of to help athlete to increase muscle tone, to prepare muscles for upcoming activity (then it is named toning effect). Vibration has many parameters that may vary, depending of aim of vibration. In whole body vibration devices the main parameters are acceleration, down force (usually bodyweight of a athlete), amplitude of vibration (distance the platform or vibrotode travel between ending positions) and frequency of platform movements per period

of time and a amount of time of vibration application. In order to achieve a tonic or relaxing effect the parameters must change – low frequency and amplitude vibration lead to relaxing effect, but aggressive amplitude and frequency values can lead to tonic effect of human muscle.

There is two common types of vibration devices – a still platforms or devices, where whole body can be vibrated and exercises can be performed on them (Cardinale, Bosco, 2003); a portable devices, that can apply vibration locally. These devices have their purpose of application – on solid devices and platforms it is possible to carry out whole body vibration and perform an exercises on them (Rittweger, 2010) to increase human motor abilities, especially flexibility in Vladimir Nazarov's research (he called his vibration technique a biomotor stimulation) (Назаров, Спивак, 1987), maximal power for elite athletes (Issurin, Tenenbaum, 1999) and however, some researches did not show noticeable increase in strength and speed (Delecluse, Roelants, Diels, Koninckx & Verschueren, 2005). There can be also a negative vibration effect – if vibration parameters and time of vibration duration exceeds recommended, there can be possibility of vibration disease (Abercromby, Amonette, Layne, McFarlin, Hinman, & Paloski, 2007). Also, whole body vibration involves many tissues and parts of human body in vibration process even if that is not needed for training or experimental purposes. Different body tissues have their own mass and consistency, so the vibration effect will be different for each part of body because of different resonating effect of body tissues.

Local vibration devices often are used to apply vibration effect only to target location, without affecting other parts of body, also these devices are small and portable, it is possible to carry out vibration procedure in different training location (stadium, gym and other sport facilities) during training process.

Previous research show, that achieving relaxing or toning effect much depends of chosen vibration parameters (Krauksts, Ņemčenko, 2012), moreover, in case of local vibrostimulation these parameters can vary from chosen target location. Local vibration relies much on mechanical oscillations, created and amplified by vibration device (Михеев, 2007). The vibrotode oscillates specific muscle parallel to a bone – as narrow are angle of continuous oscillation wave, as more toning the vibration effect will be and on the other hand – if relaxing effect must be achieved, then oscillation waves must travel parallel to a bone with wide angle. It can be achieved with variation in frequency and amplitude of vibrotode, but these parameters will be different for each muscle and even change if it is necessary to achieve acute or chronic effect of vibration (Cardinale, Wakeling, 2005). Moreover, these parameters may vary from condition of a muscle – for

trained muscles will require more aggressive vibration parameters comparing to an untrained muscle.

There is also one parameter that cannot be measured correctly – down force of the vibrotode. If using a whole body vibration a down force will be created with a personal body weight, then applying a local vibration down force will be created by a physician, pressing down the vibrotode.

Effects of vibration can be used in some sports with general recommendation, but almost every muscle of athlete requires different vibration parameters (Krauksts, Ņemčenko, 2012), a physician needs to make notes for parameters of every athlete. Still the question is – is it possible to use the same vibration parameters on each side of body (left vs right m.bicep brachii, for example) and is it necessary to take in consideration a dominant side of body (left handed, right handed).

In many sports (tennis, boxing, martial arts) dominant side can play an important role in training process and competition, so it can matter to choose the same parameters or assess a different ones.

Material and Methods

We carried out experiment in a facility of Riga Stradins University to find out variance of parameters according to dominant body side extremity stimulated. We asked a 20 female subject aged 18 – 23 and with at least 2 years of previous experience in sports or other physical activities to perform continuous leg extension exercise on pneumatic trainers HUR OY. These subjects were divided into two groups with 10 subjects in each, no other anthropometric data were taken into account, as leg extension machine is adjustable and resistance was calculated as percentage of personal bodyweight. Experiment was carried out in a same day for each group of subjects. Subjects performed 3 sets of countinuous leg extensions and local vibrostimulation on m.rectus femoris muscle group between these sets, while recovering. Only difference between groups was stimulation of dominant or non-dominant leg, both groups were experimental. During an experiment and local vibrostimulation subjects remained seated in leg extension machine.

The procedure included general and special warm up, then subject was asked to sit in a leg extension trainer, adjust resistance to 10% of personal bodyweight and execute leg extension with both legs as many repetitions as they can within a whole amplitude of leg extension movement till both extremities exhausted and was unable to perform within specified amplitude. After first set on one group of subjects we applied local vibrostimulation on dominant, other group of subjects on non-dominant extremity. Subjects were asked to adjust frequency of vibrostimulation by

themselves to achieve relaxing effect and be able to continue leg extension for additional set, frequency is adjusted by analogue potentiometer of device. Average frequency subjects chose was 50Hz. Amplitude remained unchangeable – 1.5mm. Vibrostimulation was applied on m.quadriceps femoris from distal to proximal part with repeated gliding movement without exceeding 4min of total time on single muscle group. Then all subjects repeated leg extension with same resistance and same procedure was repeated for 3 sets in total and 2 sessions of local vibrostimulation between each. We noticed that after first session of local vibrstimulation subjects were tended to raise frequency of stimulation till 55Hz in average, amplitude remains the same – 1.5mm.

Results

After a research we observed following results.

Observing results for stimulated dominant extremity there is no significant difference between extremities according to paired t-test, although the result increase in three sets for stimulated leg was significant – 4.6 repetitions, (p=0.0221). (Fig.1)

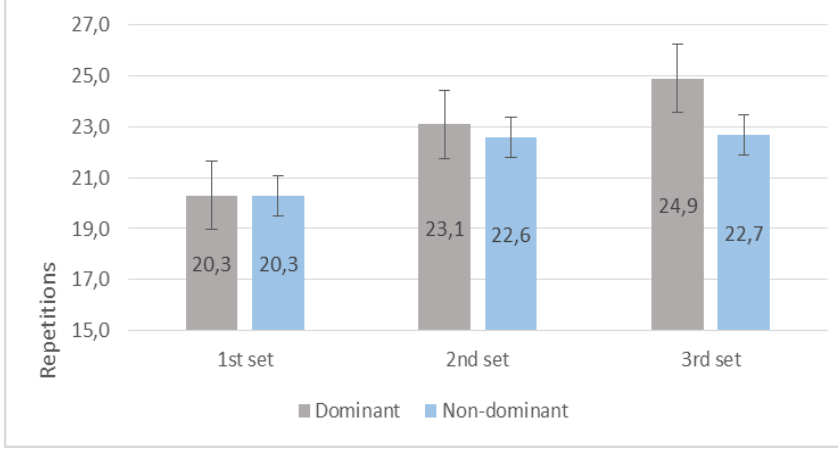

Figure 1. Maximal repetitions of continuous leg extension with stimulated dominant extremity in three sets (n=10)

With non-dominant leg stimulation we also observed confident increase in average repetitions in third set comparing to first set – 1.9 repetitions (p=0.0313), but no significant difference between extremities.

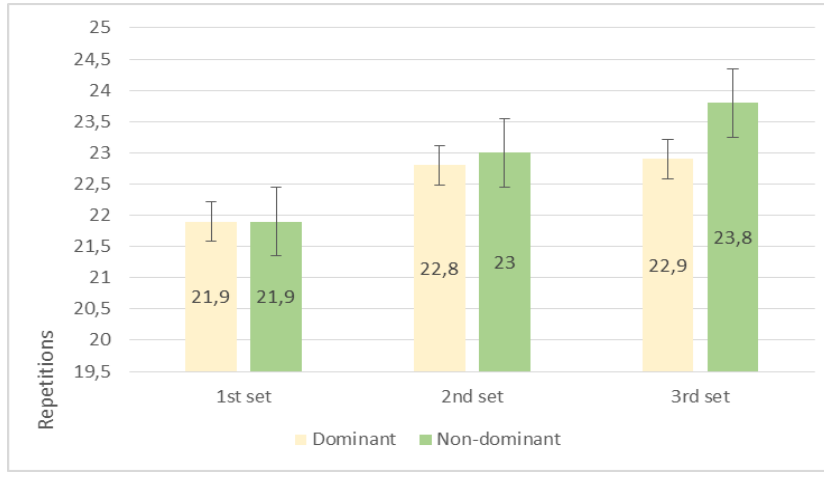

Figure 2. Maximal repetitions of continuous leg extension with stimulated non-dominant extremity in three sets (n=10)

Discussion

There must be taken into consideration fact, that different local vibrostimulation machines provide different results, making contradictions of application of local vibrostimulation (Issurin, 2005). Since LASE are provided with RE-21 local vibrostimulation machine, we researched effect of local vibrostimulation on strength and speed dynamics, permanent effect of local vibrostimulation and changes of muscle biomechanical parameters after local vibostimulation (Ciematnieks, 2011), we was questioned about parameter changes in dominant extremity, in practical application of local vibrostimulation some athletes experienced muscle spasms in dominant side after local vibrostimulation. In research no spasms were observed and there was no significant difference in maximal repetitions in dominant and non-dominant extremity.

Comparing repetitions of stimulated dominant (24.9±2) and repetitions of stimulated non-dominant extremity (23.8±2) there was not significant difference.

Conclusions

Based on the results of the study we can conclude that there is no need for physician to take into consideration dominant and non-dominant extremity for small groups of athletes. Still, there must be a individual approach of each athlete and each muscle even, so vibrostimulation records must be carried out to apply proper dynamics of frequency and amplitude of vibrostimulation. If there is possibility, then each athlete may be allowed to adjust frequency of vibrostimulation to acquire relaxing effect.

As research shows, vibrostimulation still allows relaxing muscles between sets of repetitions, so it can be used in competitions and training process, where continious strength endurance must be maintained.

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REVIEW PAPER

EFFECTIVENESS OF PLYOMETRIC TRAINING WITH BLOOD FLOW RESTRICTION ON EXPLOSIVE POWER IN Taekwondo ATHLETES

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Abstract

The purpose of this study was to investigate the effects of plyometric training with blood flow restriction on explosive power in Taekwondo athletes. Twenty Taekwondo athletes who were volunteers to participate in the research (under 17 years old, at least 2 years in the provincial league and the minimum red belt), were selected .athletes were randomly assigned into two groups of plyometric exercises (n=10) and BFR group (n=10), for both groups the pre-test the Sargent Vertical jump test was used to measure the explosive power. Then plyometric training program for two groups, including six weeks of practice, each week two sessions selected but in one of the groups before exercise, vascular obstruction was performed in the thigh area by closing an elastic cuff around the thigh muscle in the proximal portion of both legs and a pressure of 120mmHg was used. After the completion of the six weeks protocol and the intervention both the group's subjects were assessed to compare the groups covariance analysis was used ($\alpha<0.05$). All computations were performed using SPSS software version 19. The comparing of the results of the training process of the experimental group in pre-test and after the post-test showed there was not a statistically significant difference in vertical jump of group that they did plyometric training with blood flow restriction. Neural adaptations such as increased activation and synchronization of motor units have been regarded as important factors for improving maximal power outputfor.

Keywords: *plyometric training, blood flow restriction, Taekwondo*

Introduction

In the past decade, more efforts have been made by coaches and athletes to optimize their exercise strategies to improve their ability. The dynamic performance of athletes has been concentrated and athletes are now doing different drill exercises, as well as explosive exercises are used in a ballistic or plyometric training (Markovic, 2007). Functional movements and athletic success depend on both the proper function of all active muscles and the speed at which these muscular forces are used. The term used to define this force–speed relationship is power. When used correctly, plyometric training has consistently been shown to improve the production of muscle force and power (Godek, 2005). The plyometric exercises are mainly used to increase the power and explosive capability (Madaram, 2011), enhancing the strength and speed of skeletal muscles. Plyometric exercises will not only strengthen the fast twitch fibers but increase their quantities inside of muscles. Muscles contract quicker when fast twitch fibers are stronger. These exercises also boost speed and power by empowering the nervous system. The stretch–shortening cycle (SSC) involves three distinct phases: Phase I is the eccentric phase, which involves preloading the agonist muscle group(s). During this phase, the series elastic component (SEC) stores elastic energy, and the muscle spindles are stimulated. As the muscle spindles are stretched, they send a signal to the ventral root of the spinal cord via the Type IA afferent nerve fibers. To visualize the eccentric phase, consider the long jump. The time from touchdown of the foot to the bottom of the movement is the eccentric phase. Phase II is the time between the eccentric and concentric phases and is termed the amortization (or transition) phase. This is the time from the end of the eccentric phase to the initiation of the concentric muscle action. There is a delay between the eccentric and concentric muscle actions during which Type IA afferent nerves synapse with the alpha motor neurons in the ventral root of the spinal cord. The alpha motor neurons then transmit signals to the agonist muscle group. This phase of the SSC is perhaps the most crucial in allowing greater power production; its duration must be kept short. If the amortization phase lasts too long, the energy stored during the eccentric phase dissipates as heat, and the stretch reflex will not increase muscle activity during the concentric phase. Consider the long jumper mentioned earlier. Once the jumper has touched down and movement has stopped, the amortization phase has begun. As soon as movement begins again, the amortization phase has ended. The concentric phase, phase III, is the body's response to the eccentric and amortization phases. In this phase, the energy stored in the SEC during the eccentric phase either is used to increase the force of the subsequent movement or is dissipated as heat. This stored

elastic energy increases the force produced during the concentric phase movement beyond that of an isolated concentric muscle action (Bardis 2013). In addition, the alpha motor neurons stimulate the agonist muscle group, resulting in a reflexive concentric muscle action. The efficiency of these subsystems is essential to the proper performance of plyometric exercises. Again, visualize the long jumper. As soon as movement begins in an upward direction, the amortization phase has ended, and the concentric phase of the SSC has begun. In this example, one of the agonist muscles is the gastrocnemius. Upon touchdown, the gastrocnemius undergoes a rapid stretch (eccentric phase); there is a delay in movement (amortization phase), and then the muscle concentrically plantar flexes the ankle, allowing the athlete to push off the ground (concentric phase). For some time, the Blood Flow Restriction (BFR) has been introduced. In this way, the flow of the blood entering the active muscle during an exercise is limited by closing the cuff (tourniquet) or flexible rubber, around the proximal portion of the arm or thigh (Sato, 2005). Blood Flow Restriction has been observed to result in skeletal muscle hypertrophy (Yasuda, 2010) increased strength (Karabulut, 2007).Taekwondo has evolved into a modern-day Olympic combat sport. From a physical conditioning perspective, the goal of Taekwondo training is to prepare competitors to effectively manage both the physical activity and the physiological demands of combat. This approach to conditioning requires detailed knowledge of both the physiological demands of competition and the physical capabilities of the competitors (Casolino E, 2012). In championship combats, competitors perform brief periods of fighting activity [attacks] (1–5s) interposed with longer periods of non-fighting activity [pause] at average ratios between 1:2 and 1:7 in different Taekwondo styles (Tornello F 2013). These contests elicit near maximal heart rate (HR) responses (90% HR peak) and high lactate concentrations (7.0 – 12.2mmol l-1), which infer that high demands are imposed upon both aerobic and anaerobic metabolism during the bouts (Bridge, 2013). The physical activity and physiological requirements of Taekwondo competition require athletes to be competent in several aspects of fitness, including aerobic and anaerobic power, muscular strength, muscular power, flexibility, speed and agility (Bouhlel, 2006).It is therefore important that coaches and sports scientists collect objective information about their athletes. Taekwondo is one of the fastest martial arts that athletes use kicks and jumps too much, because of that plyometric and jumping training in daily training of athletes are important. Since plyometric training is popular among individuals involved in dynamic sports, and plyometric exercises such as jumping, hopping, skipping and bounding are executed with a goal to increase dynamic muscular performance and Taekwondo competitions

involved in standing, startups, and changes in a sudden state of affairs, and given that proper training methods for athletes are constantly changing and updated, the research approach has led to optimization of exercises and on the other hand there is no evidence of study of the effects of plyometric exercise and blood flow restriction has been used on explosive power in Taekwondo athletes, this study was designed to answer the question whether plyometric exercises with blood flow restriction effect on Taekwondo athletes explosive power.

Material and Methods

The study included Taekwondo athletes aged under 17 years old who trained at the start of the study (September 2018) and met the inclusion criteria: the Taekwondo athletes has no acute or last month injuries, actively and regularly participates in the training process, under 17 years old, at least 2 years in the provincial league and the minimum red belt, the permission of the Taekwondo athletes involved in the study has been received, as well as the athletes agreed to participate in the study and the study includes only male participants both in intervention and the control group. The participants of the study were divided into one of two groups – experimental or control, using convenient sampling. The Group-A includes 10 participants and the Group-B includes 10 participants. After the evaluation, both groups were educated for a period of six weeks. from both groups the pre-test (Figure 1) for the variable studied, vertical jump, done.

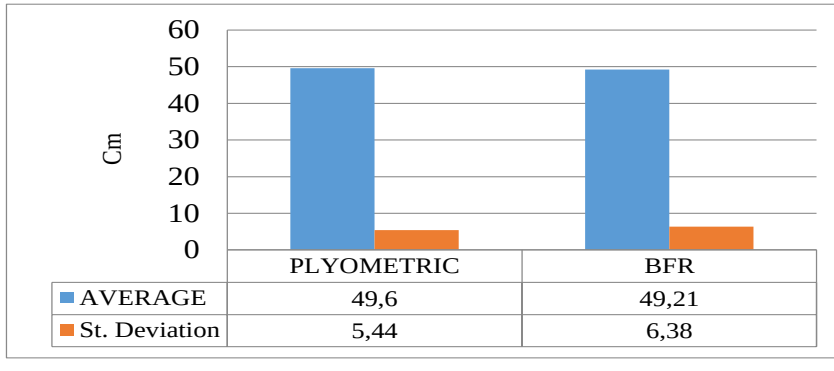

Figure 1: Shows the Pre-Test for Vertical Jump in both groups

In this test the athlete warm up for 10min and then he stood side onto the wall, keeping both feet remaining on the ground, reaches up as high as possible with one hand and marked the wall with the tips of the fingers(M1) The athlete from a static position jumped as high as possible and marks the wall with the chalk on his fingers (M2) .

The researcher measured and recorded the distance between M1 and M2. The athlete repeats the test 3 times and the researcher calculated the average of the recorded distances and used this value to assess the athlete's performance, then plyometric training program (table 1) for the two groups, including six weeks of practice, each week two sessions, and the time of each session was 45 to 60min, except that in one of the groups before exercise, vascular obstruction was performed in the thigh area, obstruction of the vessels by closing an elastic cuff around the thigh muscle in the proximal portion of both legs and a pressure of 120mmHg was used to press the cuff.

Table 1

Six-week plyometric exercises (Vaczi, 2013)

	First week	Second week	Third week	Forth Week	Fifth Week	Sixth Week
Jump ankle	3 * 10	1 * 10				
Box jump	3 * 10	1 * 10				
Vertical Jump	3 * 10	2 * 10	1 * 10			
Skater jump	3 * 7	1 * 7				
Lateral cone hops		3 * 10	2 * 10	2 * 10		
Single leg jump		3 * 5	3 * 5	3 * 5	3 * 5	3 * 5
Squat one leg jump			3 * 10	3 * 10	3 * 10	3 * 10
Standing long jump			3 * 5	3 * 5	3 * 5	3 * 5
Jump lunge			3 * 5	3 * 5	2 * 5	2 * 5
Jumping jack				3 * 5	3 * 5	3 * 5
Lateral plyometric jump				3 * 5	3 * 5	3 * 5
Froggy jump					5 * 1	5 * 1
Tuck jump					5 * 3	5* 3

The control group didn't receive any blood flow restriction and they were just allowed to do the plyometric training. From the studied, all the Taekwondo athletes completed the study (regularly exercising the research set up by the researcher, integrated into the training process; engaged in re-evaluation; did not leave the study on their own) and the functional evaluation test protocols were complete. Thus, all selected participants could be included in the results analysis. All data collected were manually entered using Microsoft Excel and analyzed using SPSS for Windows (version 19). In order to compare the groups in terms of the characteristics, pre-test and post-training changes in each group, the use of covariance analysis was used ($\alpha < 0.05$). The study was conducted in accordance with ethical principles. Confidentiality and anonymity were respected in both data collection and analysis. The study has an Ethical approval from the LASE Ethics Committee.

Results

After the completion of the 6 weeks protocol and the intervention the subjects were assessed to take the post-test values. The post-test assessment was done by using the Sargent vertical jump for measuring the explosive power of Taekwondo athletes. (Figure 2)

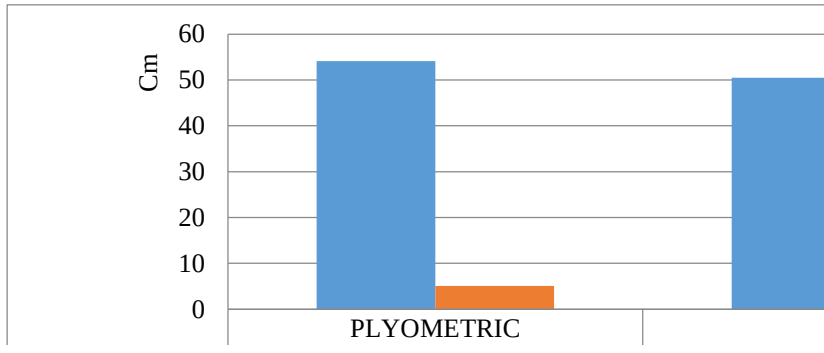

Figure 2: Shows the post-test values of Vertical jump in both groups

In the Figure 2, the subjects for intervention group were 10 Taekwondo athletes and average vertical jump was 50.46cm and the standard deviation for BFR group was 6.32. For Plyometric group the subjects were 10 Taekwondo athletes and the vertical jump was 54.13cm and the standard deviation for Plyometric group was 5.11. The subjects for control group were 10 Taekwondo athletes and the maximum jump in the plyometric group was 68cm and the minimum jump was 32.93cm and the average was 54.13cm. Comparing the results of the training process of the experimental group in pre-test and after the post-test there was not observed a statistically significant difference in vertical jump of group that they did plyometric training with blood flow restriction. In pre-test the vertical jump in BFR group was 49.21cm and standard deviation was 6.38. After six weeks of training and in post-test for BFR group the vertical jump was 50.46cm ($\alpha > 0.05$). The standard deviation was 6.32 (Table 2).

Table 2

The Statistical data related to pre-test and post-test of the scores of vertical jump of the research groups

Variable statistical indicators	Group	Pre-test		Post-test	
		Average	Standard Deviation	Average	Standard Deviation
Vertical jump (cm)	Plyometric	49.6	5.44	54.13	5.11
	BFR	49.21	6.38	50.46	6.32

Table 3 showed the results of covariance analysis on the effect of group membership on vertical jump in two groups. According to the comparing between pre-test and post-test the plyometric training with blood flow restriction does not have a significant effect on explosive power in Taekwondo athletes. Many athletes are required to concurrently develop power, speed, muscular size and strength in conjunction with other physiological qualities specific to their sport. Training for numerous adaptations is obviously time consuming and demanding on an athlete's body.

Table 3

The results of covariance analysis on the effect of group membership on vertical jump in two groups

Research variable	Variable	Degrees of Freedom	Average	F	P
Vertical Jump (centimeter)	pre-test	1	744/45	111/04	0/001
	Group membership	1	58/06	8/66	0/007
Agility (second)	pre-test	1	10/00	57/32	0/001
	Group membership	1	1/44	8/28	0/008

Comparing the results of the post-test, the results of this study showed that plyometric training with blood flow restriction does not have a significant effect on explosive power, but the records of the plyometric training group without BFR showed a significant difference in the agility and explosive power record.

Discussion

The purpose of this study was to investigate the effects of plyometric training with blood flow restriction on explosive power in Taekwondo athletes. Performance in Taekwondo may be determined by a competitor's technical, tactical, psychological, physical and physiological characteristics (Pieter, 2003). Taekwondo training is therefore structured to target these specific performance mediators. Taekwondo training involved in standing, startups, jumping and changes in a sudden state of affairs. From a physical conditioning perspective, the goal of Taekwondo training is to prepare competitors to effectively manage both the physical activity and the physiological demands of combat. This approach to conditioning requires detailed knowledge of both the physiological demands of competition and the physical capabilities of the competitors (Casolino, 2012). In championship combats, competitors perform brief periods of fighting activity [attacks] (1–5s) interposed with longer periods of non-fighting activity [pause] at average ratios between 1:2 and 1:7 in different

Taekwondo styles (Tornello, 2013,). These contests elicit near maximal heart rate (HR) responses (90% HR peak) and high lactate concentrations (7.0–12.2mmol l-1), which infer that high demands are imposed upon both aerobic and anaerobic metabolism during the bouts (Bridge, 2013). The physiological responses to blood flow restriction training are very similar to those seen in regular physical activity. The peripheral blood flow response to blood flow restriction exercise acts in a similar fashion to regular physical exercise while blood coagulation activity, oxidative stress and nerve conduction velocity do not appear to be adversely affected by low intensity blood flow restriction exercise (Loenneke, Wilson, Wilson, Pujol, & Bemben, 2011).the changes in the rate of jumping among the subjects in the common blood flow restriction group, which coincided with the plyometric training was not meaningful. Blood flow restriction training typically employs training volumes ranging from 45 to 75 repetitions of each exercise per session. Several investigations have utilized blood flow restriction combined with low-load resistance exercise to volitional fatigue (Takarada, 2000).When considering the totality of evidence; it appears that individuals new to blood flow restriction training should take care to avoid regularly training to muscular failure. In this research we used plyometric training with blood flow restriction and the volume of every exercise repetition was 30 to 45 repetitions and it can be one of the result that this volume was not sufficient when we used blood flow restriction to get significant result. Interestingly, evidence suggests that the responses to blood flow restriction exercise in athletes may be dependent on the type of athlete. Takada et al. (2012) observed that metabolic stress during blood flow restriction exercise was significantly greater in endurance runners than in sprinters. It is possible that the endurance runners, who had a higher aerobic capacity than the sprinters, are essentially more dependent on oxygen delivery during exercise, and therefore suffered a greater disturbance in energetic metabolism during blood flow restriction exercise. Furthermore, it is likely that the sprinters were physiologically more accustomed to the anaerobic environment induced by blood flow restriction, and thus were not metabolically stressed to the same degree as endurance runners (Takada, 2012). These findings should be investigated further to assess whether these acute differences in metabolic stress between different types of athletes do in fact result in dissimilar muscular adaptations. Another reason that result was not significant is related to the Limitations and Contraindications for blood flow restriction training, while blood flow restriction appears to benefit skeletal muscle adaptation, it is important to recognize the potential limitations and contraindications associated with this method. A 2006 survey of Japanese facilities that were employing blood flow restriction

exercise reported the most common side effects to be subcutaneous hemorrhage and numbness, which were experienced by 13.1 and 1.3% of participants, respectively (Nakajima, 2006) and as it was reported by some of athletes in this research and maybe the numbness in their legs didn't let them to reach the best benefit of blood flow restriction.

Plyometric exercises are often focused on increasing muscle strength. Rahimi et al (2005) did a Research about the effect of 6 weeks of plyometric and power training on explosive power and muscle strength, results showed that strength and plyometric exercises lead to increased explosive power and muscle strength, but the combination of these two types of exercises in it ,is also more effective to increase muscle strength, also, the results of this study are based on the findings of Arazi et al (2011), Manimmanakorn et al (2013) all of which have a positive effect on plyometric exercises on vertical and explosive power exercises reported, but not consistent with Abe(2005) and Madaram (2011) research results that blood flow-restricted training does not improve performance in track and field male and untrained young men. Abe and Colleagues (2005) performed resistance training with vascular obstruction for two sessions per day for eight days they gave. Due to the increase in strength (6.9%) and hip circumference, the performance of the jump did not change. Interpretation of no increase in jump due to exercise program, insufficient exercise time and increased muscle strength and strength they said this. In another research, Madaram et al (2011), the effect of obstructive training they examined the vessels on the practice of jumping untrained young men. Results of improved jump performance with increased hypertrophy and muscle strength (19.6%) did not show. The researchers said that the lack of improvement in Jumping performance may not be explained by increasing power. In this research neural adaptation was not investigated but in addition to nerve adaptations such as enhancing the activation and coordination of motor units that is important factors in improving maximum output power. Tendon characteristics may also be related to the results of this study, because the tendon plays an important role in Jump activity through the storage and release of elastic energy, and this feature produces power more during dynamic movements. Neural adaptations such as increased activation and synchronization of motor units have been regarded as important factors for improving maximal power output. Previous studies on blood flow restriction training failed to show changes in motor unit activation after a period of BFRT (Kubo, 2006). One of the most important factors to consider when applying blood flow restriction is the width of the cuff. Researchers have used a range of cuff widths for both the legs (4.5 – 18.5cm) and the arms (3 – 12cm) (Fahs, 2012). Wider cuffs (13.5cm) have been shown to cause greater ratings of volume during low-load blood flow

restriction, knee extension exercise when compared with narrow cuffs (5.0cm) inflated to the same restrictive pressure (Rossow, 2012) some individuals did not reach complete arterial occlusion using narrow cuffs on the legs and it can be one of the reasons that in blood flow restriction group there was not significant result in vertical jump. Loenneke et al (2012) demonstrated that systolic blood pressure was not able to explain additional variance in estimation of lower body arterial occlusion pressures and questioned the continued use of this method to determine blood flow restriction pressures.

Conclusion

The results of this study showed that plyometric training with blood flow restriction does not have a significant effect on explosive power. The responses to blood flow restriction exercise in athletes may be dependent on the type of athlete.in this study the Taekwondo athletes were under 17 years old and the training programme were new and different for them (plyometric training with blood flow restriction). The hemorrhage and numbness were reported by some of athletes in this research and maybe the numbness in their legs did not let them reach the benefit of blood flow restriction. The duration of the training period maybe was not sufficient, and the athletes had six weeks to prepare for competition, and these factors could be the cause of non-compliance. For the strength and conditioning coach looking to incorporate blood flow restriction exercise into the training program of healthy athletes, it is important to ensure that athletes are periodically exposed to heavier loads, according with the periodized training plan.

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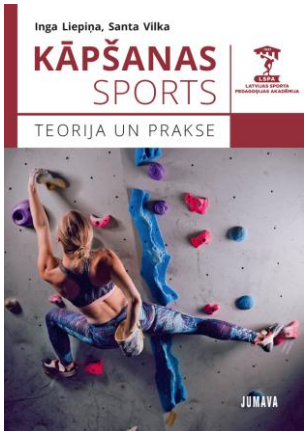
SHORT COMMUNICATION

Review on the monograph "CLIMBING SPORTS: THEORY AND PRACTICE"



Authors: Inga Liepiņa, Santa Vilka

Long-term collaboration between Dr.paed Inga Liepiņa, an associate professor at the Latvian Academy of Sport Education (LASE) and Daugmale Children and Youth Center pedagogue, MPaed Santa Vilka has resulted in a monograph "Climbing Sports: Theory and Practice".

The monograph is based on several years of practical experience of both authors, as well as on the theoretical findings of the authors' own research, which are based on extensive analysis of the practical experience and theoretical insights of foreign specialists. It is important to educate young athletes, which the authors also successfully launch, introducing the history and development of climbing sports. It is important to highlight the specifics of the hitherto little known sport by introducing several climbing disciplines. The subordination the chapters of the book is logical, proceeding from the specifics of athletes from anatomically physiological point of view, the safety characteristics, the specifics of sports training, with particular emphasis on the development of physical characteristics, technical and tactical preparedness of athletes. The three chapters of the monograph reflect the authors' own didactic approach to the sport - how to teach and how to learn the sport by the students themselves.

Especially should be emphasized the inclusion and analytical substantiation in the monograph one of the important aspects of Inga Liepiņa's doctoral thesis (I.Liepiņa, 2011) on the "Promotion of equilibrium abilities of sports climbers according to the principle of sensory system influence". The analysis of the correlation between the authors' empirical and practical research contributes to the development of practical recommendations for the promotion of balance development for athletes and the development of balance training programs for the needs of coaches.

Both authors are outstanding lecturers and trainers in practical work with students, young people and children. It is a significant achievement and a dream for every professional to be able to combine their narrative, demonstration and didactic approach with a written book in their professional work. At the moment, the demand for good sports literature from Latvian sports and education specialists is evident, especially in the relatively new sport - climbing. The monograph of Inga Liepiņa and Santa Vilka is the first Latvian edition of such content, which can be considered as an important contribution to the development of this sport in Latvia.

I am grateful to the authors for their commitment and devotion in preparing and publishing the monograph "Climbing Sports: Theory and Practice", incorporating in it the latest findings of European and world practice, research and their pedagogical experience.

Inga Liepiņa and Santas Vilka's monograph “Climbing Sports: Theory and Practice” is a new, contemporary view in the field of sports science. The monograph is recommended for sports coaches, sports teachers, students, athletes. The monograph is an excellent basis for the development of the climbing sports in Latvia and Europe.

Juris Grants, PhD
Professor, rector of
Latvian Academy of Sport Education

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Latvian Academy of Sport Education

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CONGRATULATION

The Sports Science Promotion Council made a unanimous decision to grant **Aiga PAIKENA**, former PhD student of the Latvian Academy of Sports Education (LASE), a PhD in Sport Science in the subfield of Sports Pedagogy for her defended promotion work "High Performance Sports Management in Latvia".

In Dr. paed. Aiga PAIKENA's thesis is evaluated the implementation of high performance sport policy in the country and its impact on the success of Latvian athletes, as well as elaborated a success oriented sports management model and worked out recommendations for its implementation.

Up to now, high performance sports management in Latvia has been poorly studied and described. The doctoral thesis focuses on the historical development of the Latvian sports management system and provides a detailed overview of the contemporary sports sector legal regulation. The study provides a description of the most important macroeconomic indicators for the Latvian sports industry in the period 2010 - 2017.

The study elicits the views of three groups of respondents – representatives of recognized sports federation managers, certified sports specialists and high-performing athletes, identifying also key factors contributing to athlete's success in the opinion of each group.

The success oriented model of high performance sports management is fixing of the current situation in Latvia and the recommendations are developed by summarizing the existing problems in the field of sports, in high performance sports management. Changes can be made to model factors, their order and recommendations as national sport policy changes.

The supervisor of Aiga Paikena's doctoral thesis is the Head of LASE Department of Management and Communication Science, associate professor Dr. paed. Signe LUIKA, the consultant - Vice-Rector for Studies, Professor Dr. paed. Andra FERNĀTE.

Aiga PAIKENA (née Dombrovska) is a lecturer at the Academy of Sport Education and the Director of the Latvian Coaches Further Education Center.

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

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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.

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Claessens (2010) found evidence that attention will be given to multi-compartment models, such as the 3-water, 3-mineral and 4-compartment models, to assess percentage of body fat. However, Raslanas, Petkus and Griškonis (2010) noted that Aerobic physical load of low intensity got 35.1 % of total trainings time. Research on physical loading also focused on identifying the basis of many years' research of physical activity (Bytniewski et al. 2010). According to Ezerskis (2010), "… heavy physical loads had the undulating character depending on the dynamics of workloads…" (p. 71) yet girls are more ascertained that the Track & Field training helps to develop courage.

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