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Original Article

Improvement of sportsmen physical fitness during previous basic training (based on sport orienteering material)

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Abstract:
Aim of the research is to increase the effectiveness of the orienteers' physical preparation at the stage of previous basic preparation which is based on a differentiated approach to the development of physical qualities. Article consists of 10 pages, 5 conclusions, are used 3 figures. During research were used next methods: theoretical analysis and generalization; pedagogical supervision; pedagogical experiments; methods of mathematical statistics. The analysis of the literature suggests that one of the ways to improve the quality of the young sportsmen workout process is the diversification of their physical training. The structure of sportsmen physical fitness in orienteering of different ages and qualifications was compared and identified by the use of correlation and factor analysis methods. To determine the effectiveness of various pedagogical approaches in physical training programs we conducted the formative educational experiments with the participation of 14-15 year old sportsmen of the III-II sport categories. The experiment revealed minor effect of purely comprehensive program and the one that combines comprehensive physical training (70% of total time) with the differential development of the leading physical qualities of sportsmen (30% of time) in comparison to the program that includes both a comprehensive physical preparation (70-75% of total time for training) and differential development of underdeveloped physical qualities of each sportsman (30-25% of total time).
Key words: sport orienteering; physical fitness; diversification, stage of previous basic training.

Introduction

The rapid growth and development of sport orienteering provoked its popularity all over the world including Ukraine. However, the present long term sport training of sportsmen is hardly effective. Nowadays the major issue is the physical training of sport reserve, namely the young sportsmen who consequently could fill up the rows of Ukrainian national orienteering team. Most probably this issue arose due to the fact that at the early stages of training sportsmen the coaches often neglect personal biological and physical profiles of each trainee i.e., the growing rate of physical qualities ontogeny, thus later the effect of all the training technics and methods on sportsmen is undermined. Therefore our research aims to resolve this issue.

Based on processing the scientific and methodological literature and also the information provided by the Internet sources the importance of physical preparation in the training process of orienteers has been revealed. But at the same time the analysis of sources mentioned above shows contradiction between existing requirements for the structure and content of the physical preparation of orienteers in the early stages of sports improvement and the modern sports science achievements in different sports. Thus, based on the analysis of research (Andres, 2006; Basylchuk , 2002; Briskin, 2015; Chichkan , 2004; Gnatich , 2007) which was conducted with the sportsmen of different age and qualification in various sports, the diversification of the physical preparation is recognized as one of the promising areas of the quality improvement in training process of sportsmen. In accordance to this, there is a need to use a differentiated approach in the constructing the process of physical preparation of orienteers at the stage of their previous basic preparation.

The study was carried out with the active assistance of the department of Olympic, professional and adaptive sports of Lviv State University of Physical Culture. Financial support was conducted with the assistance of its own funds and financial support from patrons of sport orienteering in Lviv. Material and technical base provided by coaches of sport orienteering and devices and methods were implemented by Research Institute of Lviv State University of Physical Culture.

Aim of the research is to increase the effectiveness of the orienteers' physical preparation at the stage of previous basic preparation which is based on a differentiated approach to the development of physical qualities.

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Methods & material

Theoretical analysis and generalization; pedagogical supervision; pedagogical experiments; methods of mathematical statistics. Pedagogical supervision and experiments were conducted on the bases of the Junior sports school №6, Children's center of tourism, sports and excursions and Lviv Regional Center of regional studies, excursions and tourism of youth (Lviv, Ukraine). The participants of our research were the 14-15 years the orienteers with 4-5 years' experience in sports activities (III-II sport categories; at the stage of previous basic training, from 20 to 32 people at different phases of research) and the orienteers with experience of sports activity up to 6-8 years (I category and Candidate master of sports; stage of specialized basic training; 16 people). All participants of the research were notified and understood all features of the experiment. Research was conducted at the territory of Lviv State University of Physical Culture. All participants at the have followed all rules and all requires during the experiment. The results of the research show only positive aspect for the participants that have increased their mastership level. So, the total influence that was done on participant is positive and didn't give a risk for their health (moral, physical and spiritual). Every effort that was made was to protect the interest and welfare of participants and researchers.

Results and discussion

At the beginning of our research by use of correlation analysis we detected that the achievements of the sportsmen at the stage of previous basic preparation are more reliable ($p \leq 0.05$-0.001) and more correlated to the components of their physical preparedness unlike the results of their more skilled colleagues. Noteworthy here is that at the stage of long term physical preparation the sports achievements and results are greatly related to the following qualities of physical fitness: general endurance (r from 0.659 to 0.803); strength of wrist (r from 0.629 to 0.718); speed endurance (r from 0.533 to 0.635); strength endurance (r from 0.383 to 0.707) and to some extent explosive strength of the lower limbs (r = 0.397). The results in competition activities of the more qualified and experienced sportsmen are significantly related to the level of general endurance (r from 0.682 to 0.821) and rapidity endurance (r from 0.757 to 0.864). Last but not the least should be mentioned the following physical qualities: the mobility in the hip joints and the joints of the spine (r from 0.550 to 0.616); strength endurance (r from 0.528 to 0.563) and strength of wrist (r from 0.546 to 0.565).

The analysis of the correlation matrix of the components of physical preparedness of sportsmen in the stage of previous basic preparedness revealed 46 significant interconnections of different density levels (from $p \leq 0.05$ to $p \leq 0.001$) between researched physical qualities and various forms of their performance. It is noteworthy that 44 of them had direct character and 2 - reverse. Here is the list of the qualities that have the greatest number of direct correlation interconnections of high level density ($p \leq 0.001$) with indicators of other physical qualities: rapidity and rapidity endurance - 8; strength of wrist, stature dynamometry, strength endurance abdominal muscles and general endurance - 6; explosive strength of upper limbs and front of torso - 5; explosive strength of the lower limbs - 4; agility - 3. There has also been identified the inverse relationship between the indicators of static equilibrium and the ability for orientation in space to strength endurance of leg muscles, the activity of hip joints and spine activity. By means of correlation analysis we obtained important scientific knowledge that can be used for constructing the training process that would be more effective for physical qualities. It is highly important to develop those physical qualities that have dense and direct interconnections to combine them in training sessions and thus accumulate adaptive processes as opposed to physical qualities that have inverse relationship, these should not be combined to avoid negative mutual influences. The qualified and experienced sportsmen are proven to have significant preference ($p \leq 0.05$) in most of the physical preparedness indicators (Figure 1).

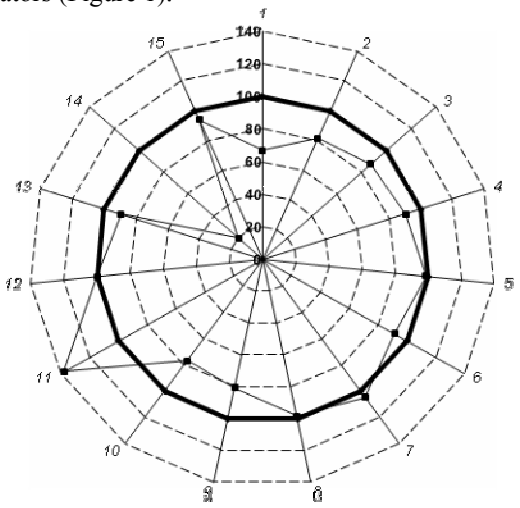

Figure 1. Indicators of the physical preparedness of orienteers with different qualifications (%): 1. hand dynamometry (kg); 2. stature dynamometry (kg); 3.long jump from standing position (cm) 4. the throw of the 1

kg stuffed ball (cm); 5. 60 m race with high start (sec); 6. ten-time hop from on lifting legs without bending at 45 angle (number of times); 8. 400m race (s); 9. 5000m race; 10. frontsplit (cm); 11. forward bend from high stand (cm); 12. Bondarevsky test (sec); 13. Rotations on gymnastic bench per 20 sec (number of rotations) 14. walking in straight line (cm deviation from the line); 15. Zigzag running at 30m (sec);

▬▬▬ I sport category-Candidate master of sports; _____ III-II sport categories

Notably, the orienteers at the stage of specialized basic preparation have almost half (80.6%) better results in ability for space orientation than those who are trained at the stage of previous basic preparation. The significant differences were also found in the stature dynamometry, mobility in hip joints and strength (from 18.7 to 33.0%). In contrast to those mentioned above the indicators of complex speed, strength of abdominal muscles and static equilibrium were not significant ($p > 0.05$) moreover less skilled sportsmen were significantly ($p \leq 0,05$) predominating their experienced colleagues (37.6%) in the hip joints and spine joints activity.

The expressed assumption was confirmed in the results of the factor analysis of the physical preparedness of sportsmen in research groups mentioned before (Figure 2). For instance the major factor for the sportsmen of the III-II categories is determined endurance (34.1%). The factors of ability to orientation in space (13.1%) and static balance (10.8% contribution to the total variance of the sample) also have great value. For the orienteers of the I category and Candidate master of sports the most important factor is the strength preparedness (34.9%), endurance (21.0%) and flexibility (11.7% contribution to the total variance of the sample).

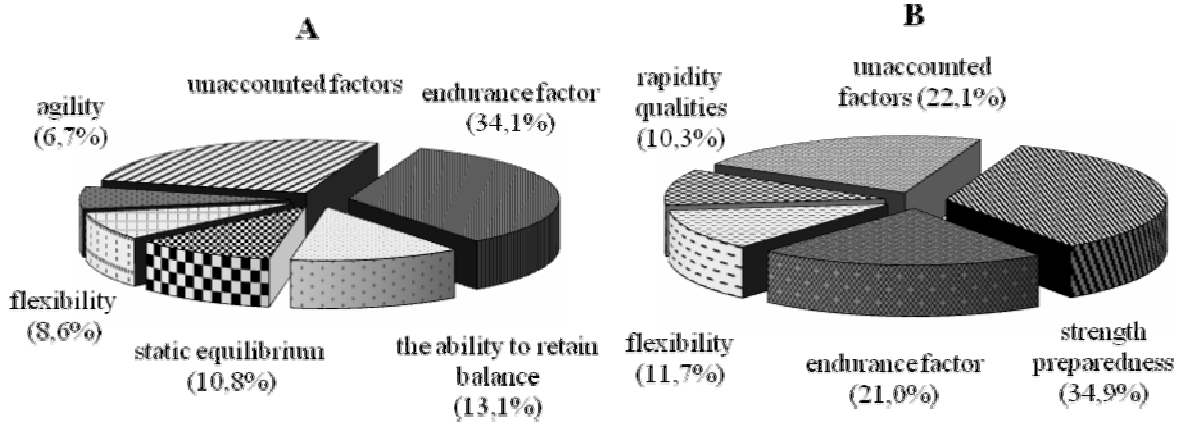

Figure 2. The structure of physical preparedness of the III-II sport category orienteers (A; n=32) and I sport category - Candidate master of sports (B; n=16)

According to the described results of research we have developed the programs of physical preparation of orienteers at the stage of previous basic preparedness. The content of the programs is based on the principles of the adaptation theory (Lynets, 1997; Meerson, 1988), the theory of building various structural formations for preparation of the sportsmen (the training sessions, the micro- and mesocycles), the theory of physical qualities development (Gnatich, 2007; Platonov, 2004; Briskin 2016). Certainly, we took into account the age peculiarities of young sportsmen, their individual profiles of physical preparedness and the scientific results of previous researches (Shyrinan, 2010; Siroshtan, 2002; Briskin, 2014).

The effectiveness of approaches suggested by the programs was verified by two pedagogical experiments. The first experiment was comparative and devoted to detection of two programs efficiency - of the comprehensive physical preparation and program that combined comprehensive physical preparation (70% of time) with the differentiated development of underdeveloped physical qualities of each sportsmen (30% of total time for training session). The experiment lasted from the 12th of January till the 12th of April 2009. It contained 3 mesocycles (two basic and one control-preparatory) and, accordingly, 12 microcycles of preparation with various amounts and intensity of physical activity.

According to the results of the comparative pedagogical experiment it has been detected that the total average increase of indicators of physical preparedness among the sportsmen who were trained under the program, which included a combination of comprehensive physical preparation with the differentiated development of underdeveloped physical qualities of each sportsman was by 8.7% higher than it was for sportsmen who were trained under the program of comprehensive physical preparation.

The second part of the research was devoted to comparing the effectiveness of two opposite approaches to the differentiated physical preparation of the orienteers at the stage of previous basic preparedness. One of these was aimed on the development of underdeveloped physical qualities, the other on the development of the leading physical qualities of each sportsman. This was applied to the 25% of the total time for physical training; the rest 75% were aimed at a comprehensive physical preparation. To improve the reliability of the scientific results, we used cross pedagogical experiment. It consisted of two 5 months phases. The first phase started on the 7th of November and was completed on the 25th of March 2012. Upon the end of this period the researched orienteers took part in competitions for two and a half months. The preservation of achieved level of the physical preparedness in this period was carried out by usage of the comprehensive program of physical preparation. The

second phase was held from the 9th of July till the 25th of November 2012. At this stage of the experiment the sportsmen of both experimental groups exchange programs of physical preparation and accordingly changed the direction of the differentiated approach in the training process to the opposite.

During the first stage of the experiment the remarkable growth of the physical fitness was observed among the athletes of the EG-1 group trained under the program, which combined comprehensive physical training and differentiated development of the underdeveloped physical qualities of each orienteer. However, the significant ($p \leq 0.05$) changes occurred inside both groups. The progress was observed in fourteen indicators of the physical fitness of EG-1 group athletes. Twelve out of the fifteen indicators improved for group EG-2 athletes, who were trained under the program that combined integrated and differentiated physical preparation of the leading physical qualities of each sportsman. The analysis of total average growth of physical preparedness level also revealed the preference of EG-1 athletes (11.1%) compared with athletes EG-2 (8.1%).It is noteworthy that in five aspects (the strength of leg muscles endurance, the overall speed and endurance, the static and dynamic balance) the athletes of EG-1 group had significantly ($p \leq 0.05$) higher growth rates than the athletes of EG- 2 group though the training intense and the amount of sessions were the same for both groups.

Within the second phase of the pedagogical experiment the sportsmen of EG-1 group, who at the first phase of the experiment were trained by the program of differentiated physical preparation with a focus on the underdeveloped physical qualities began to develop the leading physical qualities. Meanwhile the athletes of EG-2 group changed orientation of training from dedicated to the development of the leading physical qualities to promotion of underdeveloped ones. Following the second stage of the pedagogical experiment we found out that the positive changes of vast majority of physical preparedness indicators of sportsmen in both experimental groups were significant ($p \leq 0.05$). For instance, the orienteers of EG-1 group showed significant changes in eleven out of the fifteen indicators of physical preparedness, whereas the sportsmen of EG-2 group had positive changes in all of the test exercises. For the sportsmen of the EG-1 group these advances were ranged from 0.2 to 13.2%, while in EG-2 group the variations of changes were from 0.3 to 23.8%. Besides it all the sportsmen of the EG-1 group had the tendency of the adverse changes in the quality of leg muscles strength endurance, although it has not been confirmed statistically ($p > 0.05$) (Figure 3).

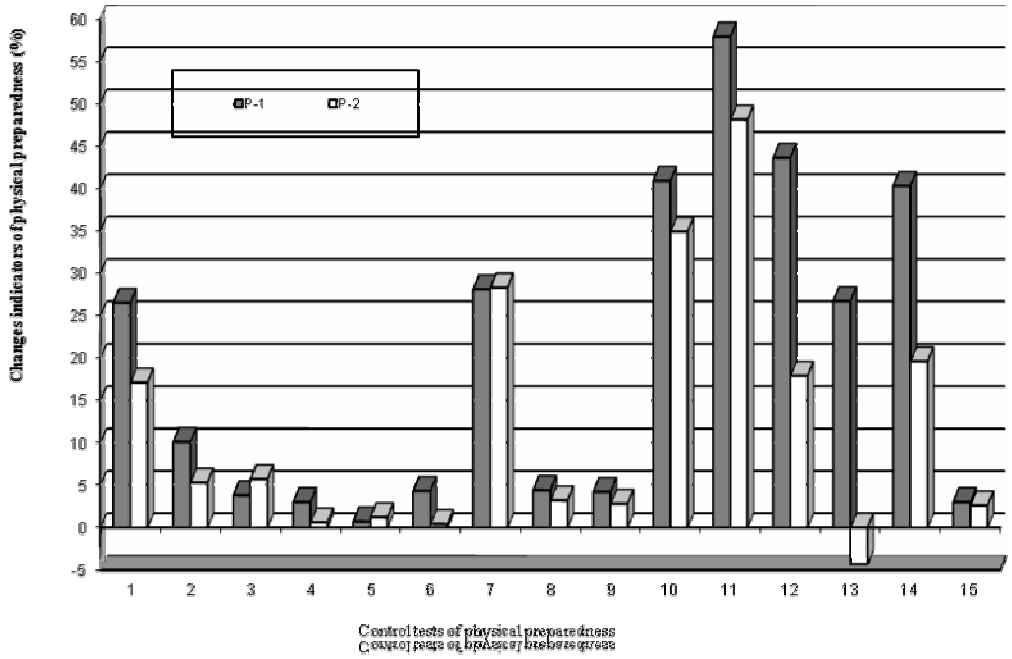

Figure 3. The average total of changes of the indicators for physical preparedness under the differentiated physical preparation programs influence: P-1 – the program of differentiated physical preparation with intense development of underdeveloped physical qualities; P-2 – the program of differentiated physical preparation with promotion of the leading physical qualities; 1. hand dynamometry (kg); 2. stature dynamometry (kg); 3.long jump from standing position (cm) 4. the throw of the 1 kg stuffed ball (cm); 5. 60m race with high start (sec); 6. ten-time hop from on Lifting legs without bending at 45 angle (number of times); 8. 400m race (s); 9. 5000m race; 10. frontsplit (cm); 11. forward bend from high stand (cm); 12. Bondarevsky test (sec); 13. Rotations on gymnastic bench in 20 sec (number of rotations) 14. walking on the straight line (cm deviation from the line); 15. Zigzag running at 30m (sec)

Following the logic of the results description it is worth investigating the intergroup differences of the researched groups at the end of the cross experiment. Essentially the sportsmen of the EG-1 group had significant ($p \leq 0.05$) advantage in the level of the leg muscles strength endurance development (1.1%) and the rapidity endurance (0.1%). Whereas the sportsmen of EG-2 group were significantly ($p \leq 0.05$) the best in the aspect of flexibility (10.2%), the endurance of abdominal muscles strength (6.4%) and the ability to orientation

in space (5.0%). The total average of changes of the researched parameters of the physical preparedness at the second phase of the pedagogical experiment for the orienteers of the EG-1 group amounted to 4.2%, while for the orienteers of the EG-2 group this indicator was amounted 8.2%.

Summing up the results of conducted cross pedagogical experiment (Fig. 3) it should be noted that regardless of the stage of the experiment and the contingent of the researched sportsmen the most significant positive changes were observed in the level of physical preparedness of the orienteers, who were trained under the program that combined diverse physical preparation with the intense development of the underdeveloped physical qualities of each athlete. The total average of the positive changes under the influence of participation in this program amounted to 19.8% whereas for the program of diverse physical preparation combined with profound development of the leading physical qualities of each athlete such changes are amounted only 12.2%.

Conclusions

The 14-15-year-old orienteers in the stage of previous base preparation (III-II sports categories) have significant (r from -0.473 to 0.803) relation to general endurance, strength, rapidity endurance and strength endurance. The results of the competitive activity of professional athletes (I sport category-Candidate master of sports) are closely (r from 0.528 to 0.864) related to the level of the general and rapidity endurance ,the mobility in the hip joints and the joints of the spine, the strength endurance and the strength. We observed significant ($p \leq 0.05$) relation of both direct (r from 0.374 to 0.943) and inverse (r from 0.379 to 0.487) character among the indicators of physical preparedness of 14-15-year-old orienteers (III-II sport categories). In accordance to the theory of physical qualities transfer the above mentioned indicators should be taken into account while planning certain training sessions and microcycles.

The structure of the physical preparedness of the orienteers has significant differences depending on qualifications of the sportsmen. For instance the sportsmen of the III and II categories proved to possess five significant factors ("the endurance" – 34.1%, "the ability to retain equilibrium" – 13.1%, "the static equilibrium" – 10.8% "the flexibility" – 8.6%, "the agility" – 6.7%), whereas the sportsmen of the I category and Candidates master of sports revealed four significant factors ("the strength of preparedness" – 34.9%, "the endurance" – 21.0% "the flexibility" - 11.7% "the rapidity qualities" – 10.3%). The fitness of the orienteers in the stage of previous basic preparation who were trained by the program that combined comprehensive development of the physical qualities (70 or 75% of the total time for the training session) and differentiated development of the underdeveloped physical qualities of each sportsman (25 or 30% of the total time) contributed to significantly ($p \leq 0.05$) faster growth of their physical preparedness (8.7%) than the training by the program which allowed to improve only the leading physical qualities of the athletes. The positive effect of the program of differentiated physical preparation with a focus on underdeveloped physical qualities of each orienteer was significant ($p \leq 0.05$) and contributed to greater (7.6%) advance in the level of physical preparedness of the 14-15-year-old orienteers in the stage of previous basic preparation than the effects caused by the program of the differentiated physical preparation with a focus on the leading physical qualities of each orienteer.

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