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Tel. 38 099 430 69 22

e-mail: sportart@gmail.com

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PERFECTION OF PHYSICAL FITNESS OF LYCEUM WITH ADVANCED MILITARY PHYSICAL TRAINING PUPILS BY MEANS OF SPORTS WRESTLING

Balushka L.M.

Lviv State University of Internal Affairs

Abstract. *Purpose:* to theoretically-methodically substantiated application of sport wrestling means in physical training of lyceum with advanced military physical training pupils. *Material:* in pedagogic observation 10 form pupils (n=119) participated. In pedagogic experiment 49 pupils participated (experimental group, n=24 and control group, n=25). *Results:* the weakest points of lyceum's pupils were found. Experimental program combined common means of physical qualities' training (70% from total time of lesson) and means of sport wrestling (30% of lesson time). In the frames of the program four typical complexes of exercises for physical culture lessons were worked out. Complex of exercises for wrestler's general physical fitness was applied in main part of lesson, which took 15-20 minutes. *Conclusions:* wrestler's physical training shall be oriented on development of different physical qualities: strength, quickness, endurance, flexibility, coordination. Optimal construction of general physical training process facilitates comprehensive and proportional development of pupil's physical qualities.

Key words: physical fitness, sport wrestling, pupils, lyceum, program.

Introduction

Physical training is a targeted controlled process of military officers' physical perfection, which is realized, considering specificities of their military-professional functioning [15, 26-28]. Physical training system shall be interpreted as organized in compliance with combat activity requirements combination of interconnected components, which are conceptual basis; the process of military officers and control over this process.

Physical education and pre-service training of lyceum pupils is realized as per academic programs of comprehensive schools with traditional methodic approaches and pedagogic conditions, which are rather ineffective concerning optimization of physical conditions [5, 8, 19] and personality's characteristics of senior pupils [19, 21].

Recent time the problem of pupils' physical perfection has been being regarded in a number of research works. In particular, by many authors much attention was paid to content and structure of school age children's physical training, its orientation and organization [10, 23]. Other authors [6, 7, 12, 16, and 23] note that new social, economic and ecological conditions require studying of a number of pedagogic influences and methodic principles. It shall ensure increase of children's workability and physical fitness.

In our previous works we regarded the following: peculiar features of physical fitness of lyceum with advanced military-physical training pupils; level of physical qualities of lyceum with advanced military-physical training pupils [1, 2]. We recommended main directions of lyceum pupils' educational process correction. It was found that by index method the best boys' results were observed in index of quickness. The worst results were registered by power index results. Optimization of pupils' physical fitness permits to increase their physical potential.

Analysis of researches and publications [13, 14, 17, 22, 24, 25] shows that there are unsolved the problems of theory, methodic and organization of physical education in system of personnel training for Ministry of Defense. Actually there is no sufficient scientific data on physical training of military profile specialists; on their physical condition in domestic scientific-methodic literature.

The purpose of the research is to theoretically-methodically substantiate application of sport wrestling means in physical training of lyceum with advanced military physical training pupils.

Material and methods

Participants: in pedagogic observation 10 form pupils (n=119) participated. In pedagogic experiment 49 pupils participated (experimental group, n=24 and control group, n=25).

Organization of the research: the research was fulfilled on the base of State lyceum with advanced military-physical training, named after Heroes of Krut (Lviv).

At *first stage* we studied physical fitness level of State lyceum with advanced military-physical training pupils [17–18]. Besides, we substantiated and worked out program of physical trainings with application of sport wrestling means.

At *second stage* we carried out comparative pedagogic experiment for testing of effectiveness of the worked out program. The experiment was conducted in second semester of academic year from January 20th to May 23rd, 2014. The pupils of the 1st group were trained by the worked out by us program, which combined commonly accepted means of physical qualities' training (70% of total time of lesson) and sport wrestling means (30% of lesson time).

Statistical analysis: the results were processed with standard methods of mathematical statistic. We determined mean arithmetic and standard deviation; confidence of differences by Student's t-criterion; temps of increment of physical fitness indicators by Braudy's formula.

Results of the research

State system of tests and normative for assessment of Ukrainian population's physical fitness is a basis of standard requirements to population's physical fitness as criterion of physical health, life activity, ability for efficient work and defense of Motherland. The main purpose of State tests for assessment of Ukrainian population's physical fitness is stimulation and further development of physical culture among all population strata for ensuring of their health [9].

Analyzing the data of our research we were guided by the following scale for assessment of lyceum pupils' physical fitness: 1 – 3 points – low level; 4 – 6 – average; 7 – 9 – sufficient; 10 – 12 points – high level.

Sufficient level of physical fitness was registered by three indicators from 11. They included: angle of emphasis on bars (7.29±4.53 points), pressing ups on bars (7.64±4.14 points), 3000 meters run (8.14±3.88 points). By the rest of indicators we registered average level of physical fitness. The results varied in average from 4.57±7.92 points (the rise of the coup on crossbar) to 6.96±3.82 points (throw of grenade F-1).

Thus, physical fitness level is assessed as average. For improvement of lyceum pupils' physical fitness it is necessary to pay attention to training all physical qualities.

At next stage we substantiated the structure and content of physical training program for lyceum pupils with application ports wrestling means. Besides, we studied its influence on physical fitness of lyceum with advanced military-physical training pupils.

The worked out program of pedagogic experiment implies application of sport wrestling means in educational process of pupils. Methodological principles of the worked out by us program is division of lesson into two parts. In one part of lesson (70% of lesson time) pupils fulfilled main tasks, and in other (30% of lesson time) lyceum pupils trained means of sport wrestling for development their quickness, strength, coordination and flexibility.

Sport wrestling is a kind of sports, in which physical fitness level is one of the main and important factors, determining success of sport perfection (in our case – physical fitness) [3].

In the frames of the program we worked out four typical complexes of exercises for lessons by topics:

- Gymnastic (exercises with weights, with loading by own body mass; acrobatic exercises; general warming up exercises; special wrestling exercises; easy wrestling; exercises for stretching);
- Light athletic (exercises with loading by partner's body mass, general warming up exercises, special wrestling exercises, skipping rope exercises);
- Athletic exercises (usage of weights, exercises on simulators, with barbell, general warming up exercises, special wrestling exercises, stretching);
- Volleyball (exercises with filled balls, exercises with expanders, general warming up exercises, special wrestling exercises, stretching).

Complex of general exercises of wrestlers physical trainings was used in main part of lesson, which took 15-20 minutes; method of training – repeated, interval. For special wrestling exercises we used frontal method, for easy wrestling kinds – game and competition methods.

Analysis of research's results witnesses that as on beginning of experiment there were no confident differences between 1st and 2nd groups ($p > 0.05$).

By most of indicators (long jump from the spot and from run, rise by strength and rise of the coup; angle of emphasis on bars; 100 meter, 1000 meters and 3000 meters run) second group pupils were ahead of the first group (though not confidently, $p > 0.05$).

For the period of experiment positive changes took place practically in all indicators of physical fitness, though temps of increment were different (see fig. 1).

By the end of experiment 1st group pupils were ahead of 2nd group by all indicators of physical fitness. In 2nd group temps of increment varied from 1.22 to 49.15%. The highest level was observed in the following indicators: rise of coup (49.15%) and by strength (41.13%) on crossbar, chin ups (26.54%), pressing up on bars (23.59%), and angle of emphasis on bars (14.77%). The rest of indicators were within 1.22 – 6.92%.

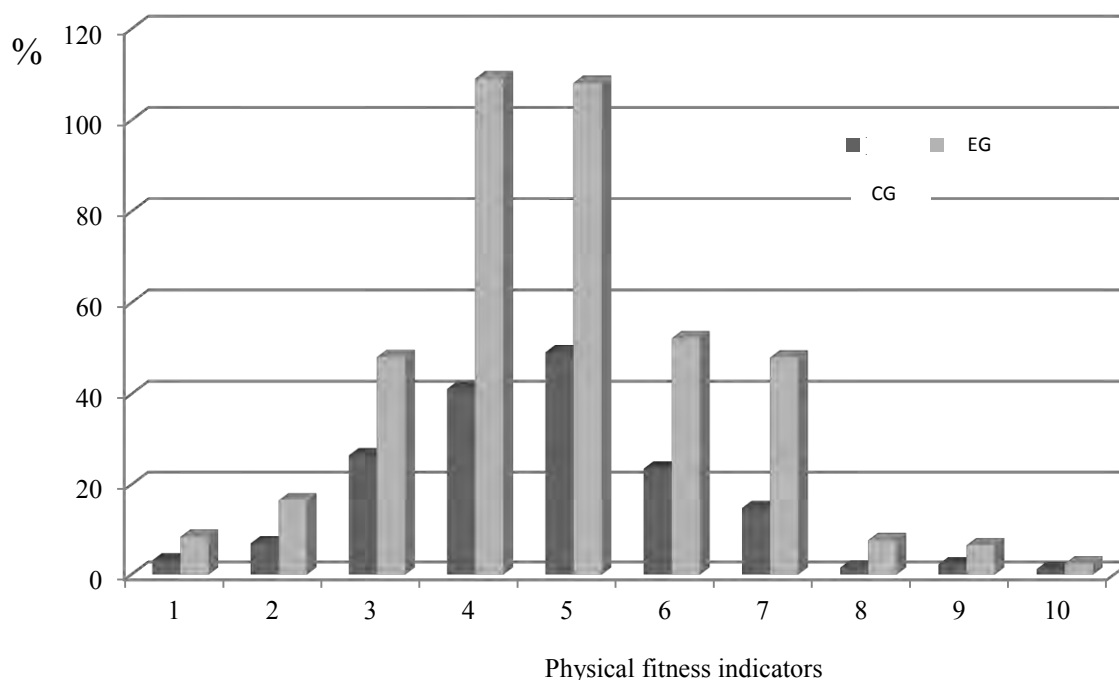


Fig.1. Increment of physical fitness indicators of 1st group pupils (n=25) and 2nd group (n=24) in the period of pedagogic experiment

1 – long jump from the spot; 2 – long jump from run; 3 – chin ups; 4 – rise by strength on crossbar; 5 – rise of coup on crossbar; 6 – pressing up on bars; 7 – angle of emphasis on bars; 8 – 100 meters run; 9 – 1000 meters run; 10 – 3000 meters run.

In 1st group the best increment was by indicators of strength of arms and girdle muscles (rise by strength – 109.16%, rise of coup – 108.20%). Increment of arms’ strength (pressing up on bars, chin ups), abdomen muscles (angle of emphasis on bars) were lower: 52.19%, 48.09% and 47.98% accordingly. Indicators of general endurance, quickness and speed power qualities of legs’ muscles had the lowest increment temps (2.44 – 16.47%).

It was found that in 1st group increment temps were much higher, comparing with group 2. It witnesses about effectiveness of the author’s program of physical qualities’ training.

In both groups we observed the lowest increment temps by indicators of speed-power qualities (long jump from the spot and from run), quickness (100 meters run), power endurance (1000 meters run) and general endurance (3000 meters run).

After pedagogic experiment first group pupils were ahead of second group by all indicators of physical fitness. By 7 from 10 indicators differences were confident ($p < 0.05$).

Sufficient level of lyceum pupils’ physical fitness was registered by 3 indicators from 11: angle of emphasis on bars (7.29 ± 4.53 points); pressing up on bars (7.64 ± 4.14 points); 3000 meters run (8.14 ± 3.88 points). By the rest of indicators we observed average level of physical fitness. The results vary in average from 4.57 ± 7.92 points (rise of coup on crossbar) to 6.96 ± 3.82 points (throw of F-1 grenade).

Discussion

Thus, we can state that in our research the following was developed: results of researches, concerning physical condition and physical fitness of senior school age children [4, 18, and 20].

For the first time:

– We experimentally proved effectiveness of methodological approach to working out physical training program for lyceum with advanced military-physical training pupils, which combines traditional means of physical qualities' training (70% of lesson time) and sport wrestling means (30% of lesson time).

– We substantiated program of pupils' physical education with priority application of sport wrestling means that facilitates more expressed increment of lyceum pupils' physical fitness indicators.

Modern requirements of society to youth physical fitness determine need in comprehensive training of physical qualities that is one of main directions of physical education. It significantly facilitates formation of motor skills, required in everyday life. Domestic [7, 15, 23] underline that a person with high physical fitness is characterized by great volume of motor skills and abilities, high functional potentials of cardio-vascular, respiratory and thermo-regulation systems; correct body constitution and healthy life style.

A number of scientists determined main approaches to re-estimation of targets, tasks and content of physical culture lessons in educational establishments. The first – is health related approach, when pupils' health is of first priority as well as physical condition and physical fitness [11, 21, and 22]. The second approach – is training with training effect being of first priority (mainly at the account of increase of compulsory physical culture lessons) [6, 8, and 23]. The third approach is curriculum – extra curriculum, which is based on rational correlation of physical culture lessons and sport training in circles [14, 17].

Pupils shall be offered system of motor (physical culture) functioning according to commonly accepted principles. These principles reflect specific laws of physical education construction. Its orientation is on development of motor skills, formation of special physical culture knowledge; understanding of demand in physical culture practicing. The mentioned system is the most perfect in technology of sport training. That is why adapted and scientifically comprehended introduction of sport training elements in physical education process is one of directions of perfection of pupils' physical functioning organization [14, 17].

Sports activity provides wide spectrum of simulation of conditions and opportunities, which can perfectly be used for moral-will training. During physical training it is necessary to overcome pain and fatigue, keep self-control, regulate emotions, sustain workability in unfavorable environmental conditions and etc. Besides, in physical trainings the most radical will qualities' cultivation is load, level of which is regulated by the character of the fulfilled exercises. With it, it should be practiced regularly, but not from time to time and gradually increase loads and complexity of tasks. Just because of this fact physical exercises shall be considered to be the best mean of physical fitness ensuring and method of will qualities' cultivation [7, 29-32].

Wrestler's physical fitness is oriented on development of different physical qualities: strength, quickness, endurance, flexibility, coordination. Optimal construction of general physical training process facilitates comprehensive and proportional development of pupil's and sportsman physical qualities. Application of sport wrestling means at physical culture lessons permits to optimize and vary trainings. Physical exercises can be used for solution of general and special tasks of physical training.

Conclusions

1. After pedagogic experiment differences in physical fitness of control and experimental groups became more expressed. Experimental group pupils confidently became ahead of control group by girdle arms muscles' condition (chin ups, rise on crossbar by strength and of coup, pressing ups on bars), by strength of abdomen (angle of emphasis on bars), quickness (100 meters run), endurance (1000 meters run).

Final testing showed that in experimental group there were confident changes ($p < 0.05$) by all indicators of physical fitness, except general endurance (3000 meters run, $t = 1.38$).

2. Results of pedagogic experiment witness that author's program with application of sport wrestling means facilitated confident ($p < 0.05$) increase of physical fitness. The program permits to achieve confidently ($p < 0.05$) increment of physical fitness without increasing training loads.

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Conflict of interests

The author declares that there is no conflict of interests.

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Information about the author:

Balushka L.M.; <http://orcid.org/0000-0002-4161-4282>;
lbalushka@gmail.com; Lviv State University of Internal Affairs;
Str. Gorodetsky, 26, Lviv, 79001, Ukraine.

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LEISURE OF UKRAINIAN SCHOOLCHILDREN AND PLACE OF MOTOR FUNCTIONING IN IT

Bodnar I.R., Kindzera A.B.
Lviv State University of Physical Culture

Abstract. *Purpose:* to determine interests and degree of average school age pupils' motor functioning in leisure time and at physical culture lessons. *Material:* in the research 5-9th form pupils participated [n=325, age 10-14 years). With the help of questioning we find structure, content of leisure and preferred activities in free time. *Results:* Children's attitude to physical culture lessons differs significantly depending on health state (health group). Leisure time is spent at TV or computer by most of children. It was found that 44.5% of children spent less than 2 hours a day for interactive activities. In days off time for TV watching or computer increases greatly and time for walks in the fresh air reduces. Time for walks differs depending on day of week. *Conclusions:* in general we observed positive attitude to physical culture lessons and physical activity. It is a contradiction that most of schoolchildren choose passive kind of rest (TV watching or computer activities). Walks in the fresh air, attendance of sport circles and mobile games near house take much less part of pupil's free time.

Key words: schoolchild, leisure, motor functioning, sports, free time.

Introduction

Leisure is one of the most important components of human life. As on to day, specificities of scientific-technical progress and shortening of physical loads result in immobility and strengthening of nervous-psycho fatigue. In such situation correct organization of children's leisure acquires especial importance. In modern society person has still less and less free time. That is why it is very important to spend it with high quality. Leisure is time for self development, for rest and preferred activities [1, 8]. That is why it is important to correctly distribute this time and use it with profit.

Recent decade there has been appearing a number of scientific works dealing with structure and content of children's and youth's physical activity in leisure time and its influence on human organism. Specialists [5, 16, 20, 23] regard physical functioning as a basis of healthy life style. The authors determined significance and influence of physical functioning on health of different age children:

- A model of adolescents' health culture formation was offered, which included in its structure four subsystems: health-preservation technologies; health related technologies; technologies of healthy life style teaching; formation of personality's qualities, which facilitate health strengthening. It was found that the offered model orients pupils on formation positive individual picture of health as the necessary condition of their life activity [4];
- Conclusions were presented about academic disciplines' realization of their functions, when familiarizing pupils with health components; pupils training for healthy life style as well as realization of children's and adolescents' health monitoring [10];
- Physical functioning functions at different stages of human life were elucidated: reasons of person's immobile way of life were found and their after effects in health were pointed at. Conclusion about health related, therapeutic and training effect of physical exercises was made [6];
- Monitoring of different age schoolchildren's health, who live in hills and plains of Carpathian region, was fulfilled. It was found that independent on region of residence there is close connection between physical fitness, somatic health indicators, physical condition and motor functioning level of schoolchildren [9];

Other scientists [11, 13, 19 21] note that with physical activity increase in educational process, schoolchildren's learning progress improves. The authors determined:

- Scientific theoretical principles of different health groups' schoolchildren's integrative physical education in comprehensive educational establishments. They offered the system of current testing and express assessment of schoolchildren's health and physical fitness [1];
- Youth feels serious crisis in respect to own identity in free time. Information about ways to spend free time out of school is provided [12];

- It is necessary to urgently implement programs for increasing adolescents' physical functioning [14];
- Young people and adults shall spend free time, mainly, practicing different physical functioning forms. Children shall be informed about movements' positive influence on human organism. Children shall know that physical exercises improve physical form and health [23];
- Three the most popular kinds of leisure are: computer games; shopping or coffee taking; listening to music or watching TV [22];
- Girls spend more time at home or in shopping. Boys are more oriented on external world, sports, technologies and earning money [17, 18].

The authors note that still more schoolchildren chose passive kinds of leisure. They say that interactive activities (TV watching and computer-sitting) conquer still larger audience and become more often the main kind of leisure spending. All these sharply reduce volume of schoolchild's physical functioning. Most of pupils do not follow recommendations of World health protection organization concerning daily norm of physical functioning (60 minutes a day) [3].

In our previous works we found that physical culture lessons take above average level of popularity among children of average school age: more than half of children assess it with highest quantity of points; next 30% assess their attitude by 9 and 8 points; in conditions of health worsening we also observed a tendency to worsening of schoolchildren's attitude to physical functioning: (from 9.17 ± 1.50 points to 8.89 ± 1.13 points, $p > 0.05$) [2]. We found what kinds of motor functioning can be preferred by schoolchildren at physical culture lessons [1]. In particular we determined that rating of sport games' popularity (54.8%) substantially prevails over other kinds of sports. But there was no comparison of desired and admissible kinds of activities in free time as well as the structure and content of schoolchildren's leisure has not been studied sufficiently yet.

Study of schoolchildren's leisure, assessment of modern status and place of physical functioning in schoolchild's life will permit to work out recommendations on effective monitoring of young generation formation. Determination of favorite time spending will help to more successfully influence on quality of schoolchild's leisure.

The purpose of the research is to determine interests and degree of average school age pupils' motor functioning in leisure time and at physical culture lessons.

Material and methods

Participants: in experiment 325 schoolchildren (161 boys and 164 girls) of 5-9th form of Lvov, Poltava, Kiev comprehensive schools participated.

Organization of the research: for determination of schoolchildren's favorite leisure kinds we worked out a questionnaire, which consisted of 24 open and closed questions. So, character of rest, quantity of time for certain kind of activity and schoolchildren's favorite activities were determined.

Statistical analysis: for results' processing SPSS 22 programs were used.

Results

Physical functioning is an integral part of every person's life. The scope of day motor functioning is conditioned by a number of social-economic and cultural factors. It depends on organism's morphological-functional characteristics, type of nervous system; quantity of free time and accessibility of sport facilities. In schoolchild's physical activity his/her attitude to physical culture lessons is a decisive factor. The data of our questioning show, that schoolchildren's attitude to physical culture lessons and their activity at these lessons differ depending on their health group. Average school age children's attitude is above average and is 8.4 points (by 10-points scale, where ten – is the highest mark). With it, popularity of physical culture lessons gradually weakens with worsening of pupils' health: in main health group it was 8.7 points, in preparatory group – 7.8 points and in special health group (here and after SHG) – 7.3. It proves the data of research [2].

The same tendency of attitude to physical culture worsening was marked also in pupils' assessment of their activity at physical culture lessons (see fig.1): main health group pupils get pleasure at physical culture lessons (57%); among preparatory group – only 25% of children get pleasure from teacher's tasks; in special health group there are only 12.1% of such pupils. Preparatory group pupils the most often (39%) miss physical culture lessons and do not fulfill teacher's tasks always. SHG pupils (30%) often try to avoid participation in physical culture lessons. That is pupils' belonging to definite health group influences on their activity on physical culture lessons.

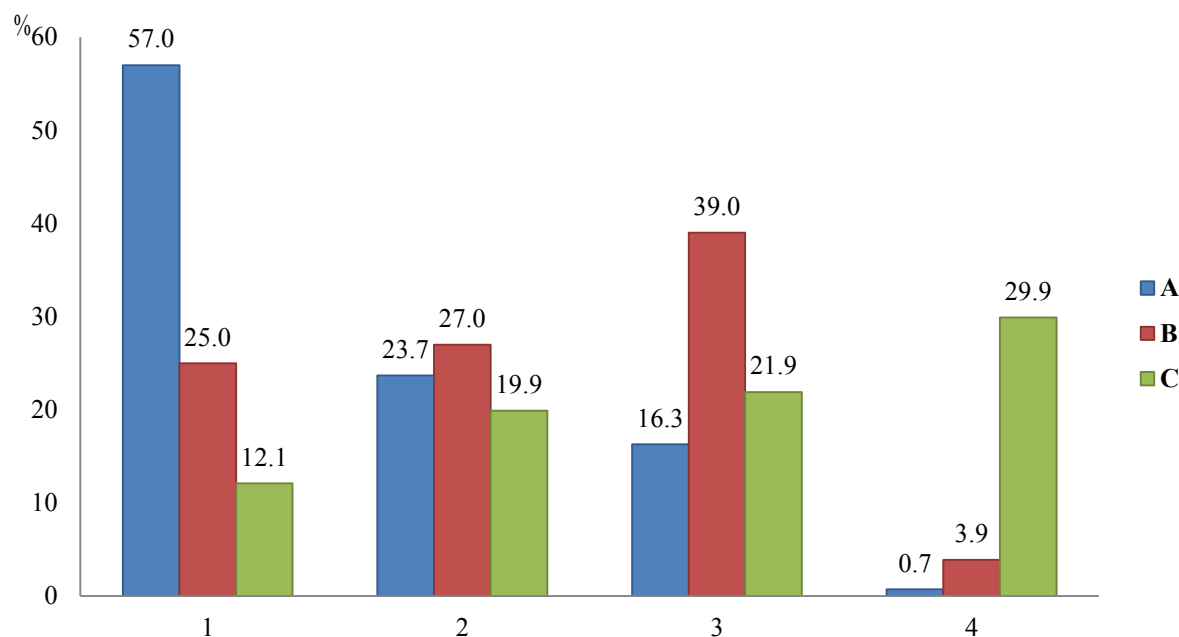


Fig.1. Degrees of schoolchildren’s activity at physical culture lessons: A - Main group; B – Preparatory group; C – Special health group; 1 – all teacher’s tasks are fulfilled with pleasure; 2 – all teachers tasks are fulfilled but without pleasure; 3 – sometimes I mess lessons; 4 – I avoid participation in lessons.

In modern conditions school can not ensure required for schoolchildren’s health motor functioning to the fullest extent. That is why out of school time acquires special importance: before or after classes or during vacations. Results of our questioning show that in leisure time schoolchildren mainly play computer games, communicate in social sites or watch TV (66.8%; 75.8%; 79.0% respectively). It is proved also by the data of other authors [1, 7, 8]. At the same time percentage of those, who prefer active leisure is much less: 36.6% of schoolchildren play out door games; 12.8% practice hiking; 17.7% attend sport competitions; 43.9% practice sports in circles; 65.6% walk with friends in the fresh air; 44.6% of schoolchildren help their parents with housework; 28.7% have classes with tutor (see fig.2). Sports and outdoor games take 7-8th places in rating of out-of-class activities in average school age. The majority of 5-9th form pupils have passive leisure. Most of free time they are watching TV or sitting at computer. For them the only source of physical functioning is physical culture lessons in school. For such children active leisure kinds are not popular.

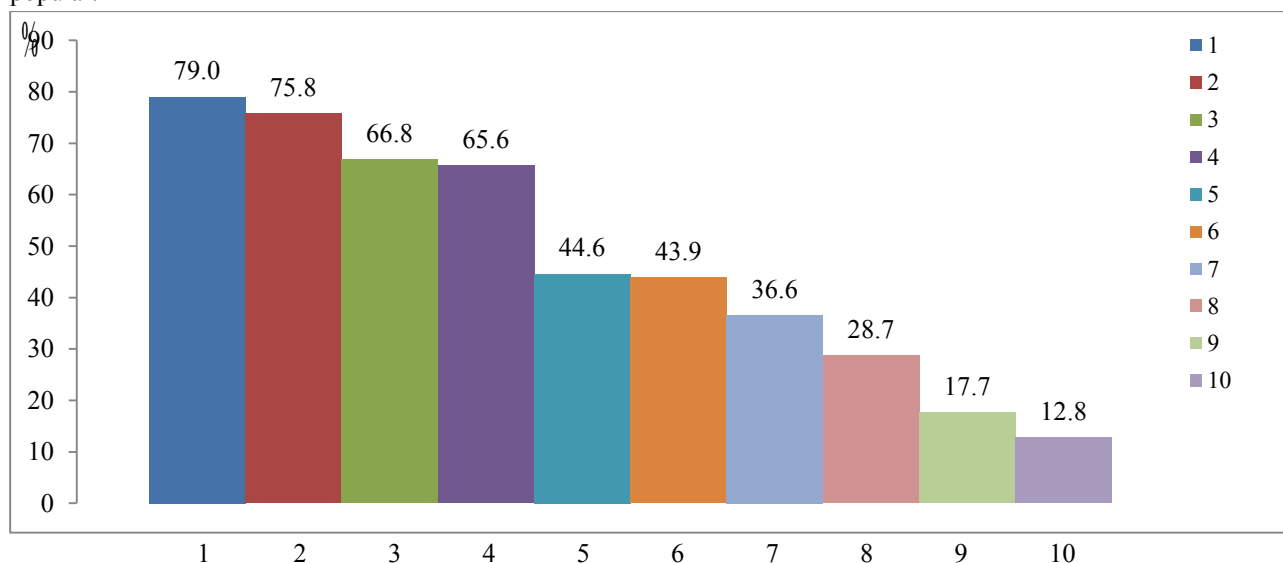


Fig. 2. Schoolchildren’s activities during leisure time: 1 - Watching TV; 2 - Communication in social sites; 3 - Computer games; 4 - Walks with friends; 5 - Help with housework; 6 - Attending of sport circles; 7 - Outdoor games; 8 - Out-of-school classes with tutor; 9 - Attendance of sport competitions; 10 - Hiking.

Special and preparatory groups’ pupils spend their free time more passively than pupils of main health group, SHG pupils spend most of their time for interactive games and watching TV: 92.8% of SHG pupils play computer games every day; 89.5% communicate in internet; 91.2% watch TV every day. This indicator is much higher than in preparatory and main health groups (58% and 67.4% respectively). Main health group prefer more active leisure kinds: outdoor games (37.1% of main health group pupils, 27% of preparatory group and 19.3% of SHG pupils).

Every second main group pupil (49.2 %) practice sports in circles. In preparatory and special health groups this percentage is much less: every third pupil of preparatory group (31.0%) practices the preferred kind of sports and 3.2% of special group pupils attend additional sort classes.

Table 1. Schoolchildren’s activities at leisure time

Description of activity	Main group (%)	Preparatory group (%)	SHG (%)	Total (%)
Watching TV	76.5	77.0	91.2	79.0
Internet communication	69.7	82.9	89.5	75.8
Computer games	67.4	58.1	92.8	66.8
Walks with friends	63.6	64.8	62.1	65.6
Outdoor games	37.1	26.8	19.3	36.6
Help with housework	46.2	40.0	21.6	44.6
Sport circle	49.2	31.0	3.2	43.9
Classes with tutor	28.0	33.2	22.3	28.7
Sport competitions	16.7	13.1	4.5	17.7
Hiking	12.9	13.8	4.1	12.8

Schoolchildren were put the question: which activity they prefer most of all in free time (see fig.3). They answered: sport circles trainings (14.8%); walks with friends (13.7%); computer games, mobile telephones or notebook games (11.7%); cinema going (6.5%) and watching TV (5.7%) compose the second by rating of interests group of activities. Outdoor games and swimming rather lag behind (3.6%). This fact witnesses that children interest in sports (may be feeling demand in additional motor functioning); though their attention is distracted by modern interactive entertainments, which, as on today, displace usual communication and outdoor games.

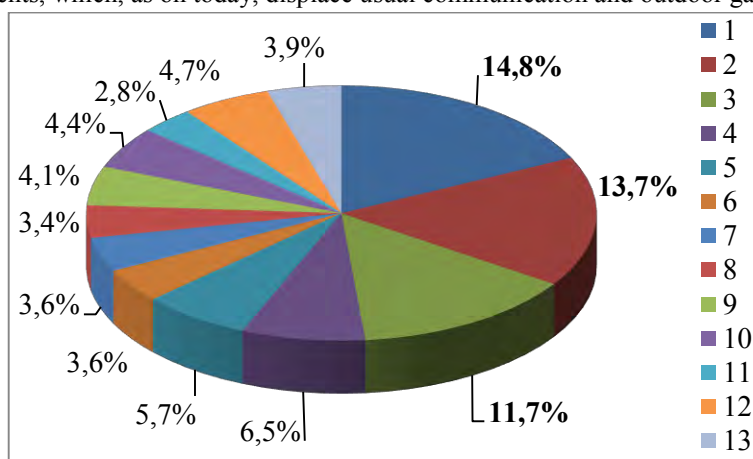


Fig.3. Schoolchildren’s the most favorite activities: 1 - Sport; 2 - Walks with friends; 3 - Computer games; 4 - Cinema going; 5 - Watching TV; 6 - Outdoor games; 7 - Swimming, competitions; 8 - Visiting friends; 9 - Singing; 10 - Reading; 11 - Rest, sleeping in day time; 12- Internet; 13 - Visiting summer cottage.

Schoolchildren were asked, how much time they usually spend at computer, notebook or TV. Analysis of results showed that on weekdays 27.5% of schoolchildren practice such activity for less than one hour; 28% of children spend time with computer for one-two hours and 44.5% - spend more than two hours a day (see fig. 4). Regular spending of two and more hours with computer is inadmissible. It worsens eyesight, causes unfavorable processes in skeletal-motor apparatus, muscles and joints; facilitate stresses and nervous disorders. That is why, in days off it is necessary to compensate deficit of motor functioning. Our research shows that quantity of time, spent at computer or TV increases in days off: 70.9% of schoolchildren spend more than two hours for interactive entertainments. Such critical situation is connected with substantial quantity of schoolchildren, who overdo with internet entertainments. It witnesses that it is necessary to seek ways for increase of motivation for motor functioning.

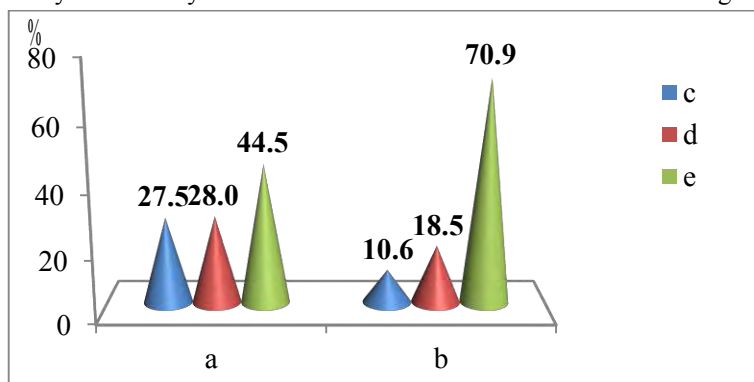


Fig.4. Quantity of time spent at computer, notebook or TV:
a – weekdays; b – days off; c – less than 1 hour/day; d - 1-2 hours/day; e - 2 and more hours/day.

It is interesting that quantity of time spent at computer differs depending on health group. Main group pupils spent at computer/TV less time that pupils of preparatory group and SHG (see fig. 5). More than 2 hours/day are spent by the following pupils: SHG – 55.5%; preparatory group – 49.1%; main group – 38.5%.

In days off quantity of time spend before monitor increases in all groups. But main group pupils spent much less time for interactive games than preparatory group and SHG even in days off.

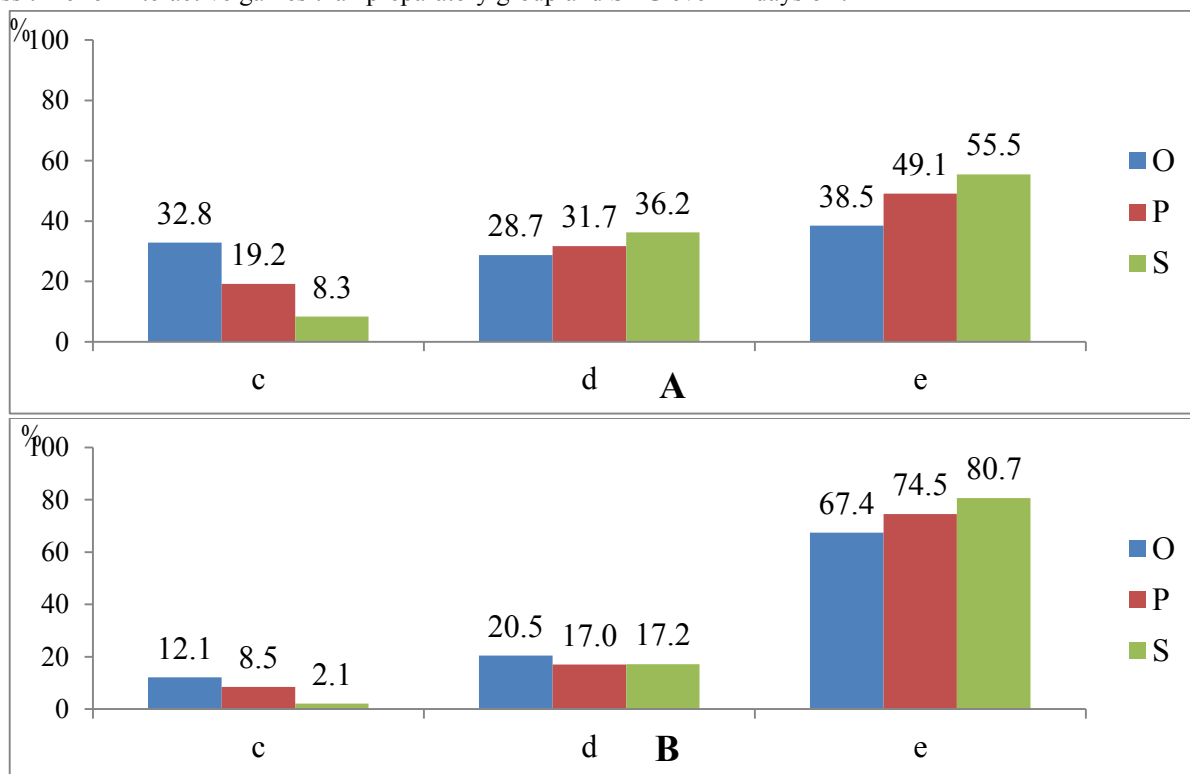


Fig.5. Quantity of time spent by pupils at computer in weekdays, depending on belonging to health group (A) and in days off (B): O – main group; P –preparatory group; S – SHG; c – less than 1 hour/day; d - 1-2 hours/day; e - 2 and more hours/day.

Of not less importance is the quantity of time spent in the fresh air. Analysis of results showed that every fifth pupil (19.9%) spends in the fresh air on weekdays less than 1 hour a day (see fig.6). It is a negative tendency. Walks in the fresh air are extremely important for young organism. Deficit of such walks render negative impact on child's health [5]. Scientists say that absence of regular walks in the fresh air results in somatic health worsening. This reason is one of the most important and makes 25 cases per 100 children.

In days off more pupils find time for walks: 56.2% say that they have here and more hours' walk a day. We did not observe any substantial distinctions in indicators of different health groups' pupils in respect to duration of walks.

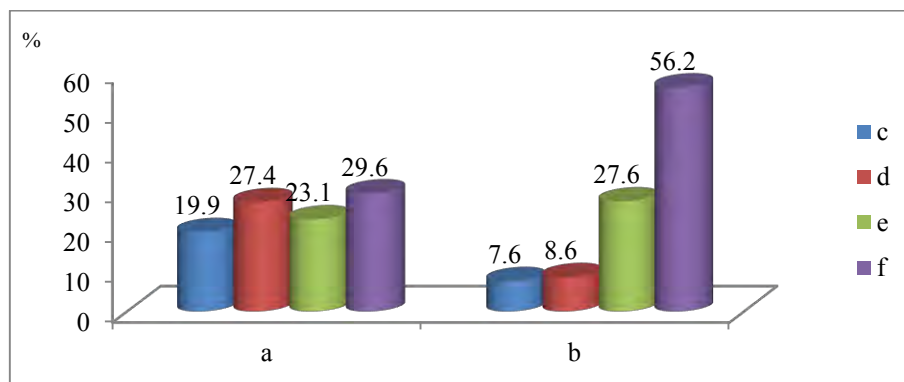


Fig. 6. Schoolchildren's walks in the fresh air:

a – weekdays; b – days off; c – less than 1 hour/day; d - 1-2 hours/day; e - 2 and more hours/day; f – more than 3 hours a day.

Discussion

The fulfilled by us research proves and supplements special literature results [8, 9]. Most of pupils prefer passive activities in free time: watching TV or computer games. With it, recent time quantity of children, spending time in this way, sharply increased. Much time is devoted by children to physical functioning. It can negatively influence on children's health.

Our results prove the data of other researches [11, 12, 20]: sport circles and outdoor games are one of favorite activities alongside with watching TV and computer games. In contrast to our research [20] children also prefer listening to music and hiking. But these activities take much lower place in rating of favorite activities.

Generalization of the research results proved [1] presence of clear dependence between health status (health group belonging) and pupils' self-assessment of pleasure with physical culture lessons.

We, for the first time, found: significant quantity of modern pupils (44.5% of pupils in weekdays and 70.9% in days off) spend before monitors much more time than it is admissible; first rating place is taken by sports (giving way only to interactive entertainments). The further researches shall be devoted to this phenomenon as well as to seeking way out from critical situation.

We also determined that duration of walks in the fresh air equals to time of sitting at computer. For testing validity of pupils' answers it is necessary to fulfill objective study of regularity and duration of children's different leisure activities.

Conclusions

Attitude to physical culture lessons is assessed by pupils as above average (8.4 points by 10-points scale). Attitude to physical culture lessons and activity at them differ depending on health group belonging: main group pupils like these lessons more (8.7 points).

Most of schoolchildren spend their leisure passively, with computer or watching TV: sports practicing and outdoor games take 7-8th places in rating of leisure activities. There are some distinctions, depending on health group

belonging. Main group schoolchildren are more active in leisure time. They oftener than other prefer outdoor games, participation in sport competitions and sport circles or hiking. It was found that sport practicing is one of favorite kinds of leisure. Among favorite activities schoolchildren also call walks with friends and computer (telephone, notebook) games.

As usual schoolchildren spend in average not less than 2 hours a day for computer games. It exceeds maximal admissible time, which can be spent at computer without harm for health. On days off the quantity of children, who overdo with time for computer entertainment, increases.

The quantity of time for walks in the fresh air much differs, depending on day of week. Most of schoolchildren say that in days off they spend in the fresh air three and more hours a day.

Conflict of interests

The authors declare that there is no conflict of interests.

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Information about the authors:

Bodnar I.R.; <http://orcid.org/0000-0002-7083-6271>;
ivannabodnar@ukr.net; Lviv State University of Physical Culture; 11, Kostushko str., Lviv, 79007, Ukraine.

Kindzera A.B.; <http://orcid.org/0000-0002-0777-1532>;
anytka7793@ukr.net; Lviv State University of Physical Culture; 11, Kostushko str., Lviv, 79007, Ukraine.

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FORMATION OF PERSONALITY'S ACME-QUALITIES AS A COMPONENT OF PHYSICAL EDUCATION SPECIALISTS' ACMEOLOGICAL COMPETENCE

Dereka T.Hr.

Borys Grinchenko Kyiv University

Abstract. *Purpose:* to determine characteristics of acme-qualities' formation in physical education specialists and determine correlations between components. *Material:* in the research students of "Physical education" specialty (n=194) participated. For assessment personality's qualities special tests were used. Organization abilities, communicative abilities, creative potential, demand in achievement, emotional information level, control of emotions and etc. were assessed. *Results:* we determined components of personality's acme-competence component in physical education specialists. We found density and orientation of correlation and influence of acme-qualities on personality's component. By the results of factorial analysis we grouped, classified components by four factors and created their visual picture. The accumulated percentage of the studied factors' dispersion was determined. *Conclusions:* continuous professional training of physical education specialists on acme-principles resulted in formation of personality's acme-qualities. They facilitate manifestation of personality's activity in the process of professional formation and constant self-perfection.

Key words: acmeology, competence, personality's, professional training, physical education.

Introduction

In 2003 Ukraine joint Bologna process. By this, Ukraine officially declared intentions to reform higher education in compliance with standards and recommendations of European space of higher education (ESHE). It was reflected in new Law of Ukraine "On higher education" <http://zakon4.rada.gov.ua/laws/show/1556-18>), which completely corresponds to modern European and world specimens and provokes implementation of educational innovations. One of such innovations was implementation of new teaching paradigm of European space of higher education – student-centered teaching. In the basis of such student-centered teaching was competence approach to construction and realization of educational programs. European scientists think that acquiring knowledge and skills by youth shall be oriented on perfection of their competence. It would facilitate intellectual and cultural progress of a personality; formation his (her) ability to quickly respond to requirements of time [14, 18]. Just because of it is important to understand conception of competence itself. It is important to understand, what competences shall be formed. Specialist's prediction of education results is an important stage of realization of educational programs.

As European authors note as on the present time education programs have been revised and changes to them have been introduced. The mentioned changes are oriented on creation of foundation for studying. Result of such changes is formation of required competences [15, 16].

The task of professional training is formation of competent specialist, able to constantly systemically generalize world and domestic experience as well as formation of specialist, able for innovative search of self-realization methods in conditions of continuous changes in modern society [13].

Adult person as individual, personality and subject of activity are in the center of acmeology attention [12]. Acmeology is a science, which appeared on the cross of sciences about man: philosophy, psychology, pedagogic and sociology. Within professional acmeology researches marked out the following directions [1, 9]: pedagogic acmeology, school, social, military, creative, medical, synergetic, correcting, characteristic and ethnologic. To the mentioned acmeology of administrating and acmeology of higher education should be added. It is worth to mark out within professional acmeology such directions as sport and physical culture acmeology. In the center of physical culture acmeology there will be adult and mature person as well as dynamic of his (her) personality's progress and growth as subject of professional activity.

Scientists interested in different aspects of human life. On acme-principles of holistic approach to study of personality they researched acme-targeted programs of creative potentials self-realization in outstanding scientists in their whole lives (M.I. Pirogov, P.F. Lesgaft, V.M. Bekhterev, B.G. Ananyev, K.S. Kuzmin). The results of these researches showed the following regularities:

- Early professional self-determination in family and family's support;
- Meeting with teacher, who recognized creative potential of future scientist and gave him confidence;
- Own creative activity at stage of students' years and in post graduate courses;
- Early interest in methodology and methods of research; inventiveness and creativity in them;
- Sufficient mastering of conceptual scientific apparatus and written language;
- At mature stage – ability to involve students and post graduates in creative research work [2].

In studying of adult person and specificities of his (her) progress, scientists determined subjective and objective factors, which conditions personality's acme-achievement. Correlation and inter-influence of acme and popularity were also studied [1]. Acme-professionalism of a pedagogue is efficient usage of "all internal resources for progress of pupils/students, for preparation to successful entering other pedagogic systems" [8].

Scientists noted that it is important to pay attention to acmeological invariants of professionalism. Professionalism's invariants are main characteristics, skills and abilities of professional, which ensure high effectiveness and stability of functioning, independent on its content and specificity [3].

In our researches we studied foreign physical education specialists' professional training. Besides, we analyzed modern tendencies of physical education specialists' training in countries of European Union and studied the same in the USA. We also analyzed normative and methodic provisioning of specialists' professional training in CIS. As a result we determined modern status of continuous physical education specialists' training in Ukraine [4]. In the researches of acme-principles of physical education specialists' continuous training we substantiated the structure of their acme-competence. Acme-competence consists of the following components: acme-motivation, cognitive, activities', personality's acme-qualities [6, 7].

The main conceptual idea of the present research is principle that continuous professional and personal progress of physical education specialist can manifest during all life and professional functioning. The main condition: professional training shall envisage formation of specialist's motivation to achievement of own "acme". Such training can be realized at the account of realization of specialist's professional and personal qualities [4, 5].

The purpose of the research is to study formation of acme-qualities in physical education specialists' personalities in the process of their professional training based on acmeology.

Material and methods

Participants: in the research students of "Physical education" specialty (n=194) participated. For pedagogic experiment we formed control (n=98) and experimental (n=96) groups of students.

Procedure: the researches were conducted on the base of Kyiv University, named after Borys Grinchenko. During 2010-2015 we used acme-oriented active teaching methods in process of physical education specialists' training. They are lectures (information lectures, problem lectures, binary lectures, topical lectures, reviews, conferences, lecture-visualization and consultations) and seminars (inter-disciplinary seminars, seminars-conferences, discussions, seminar research, role game, "brain storm", and analytical seminar). For assessment of personality's qualities we used special tests [4, pg. 423]. Organization abilities, communicative abilities, creative potential, demand in achievement, emotional information level, control of emotions and etc. were assessed in the process of the researches. The mentioned acme-qualities were determined twice a year (January and May).

Statistical analysis: we used standard methods of statistical data processing (method of mean values, calculation of Student's t-criterion, correlation and factorial analysis) with the help of «Statistica» programs. [4].

Results of the research

Personality's component of acme-competence we determined by level of the following acme-qualities formation in "Physical education" students. Formation of personality component's parts is shown in fig. 1.

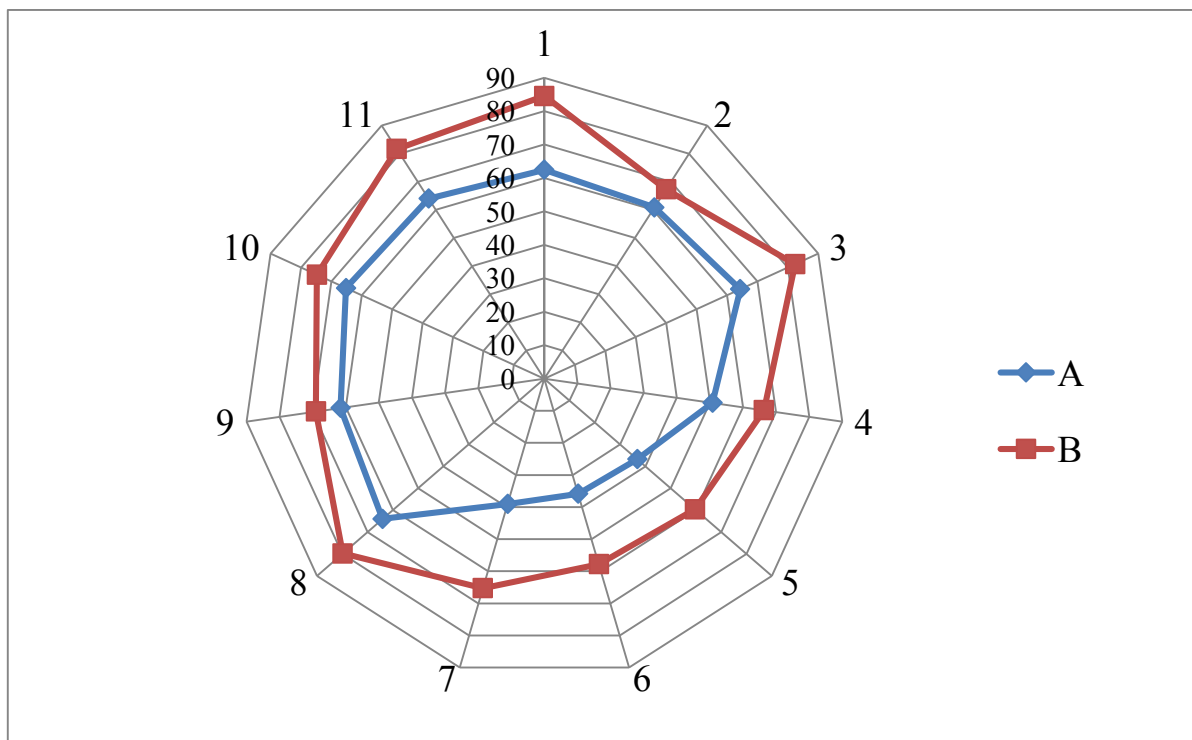


Fig.1. Formation model of acme-competence personality's component in physical education specialists: 1 – attitude to own “Self” (“Self”-conception); 2 – sense of civil duty; 3 – ability to be psychologically close to other persons; 4 – organization abilities; 5 – communicative abilities; 6 – creative potential (creativity); 7 – demand in achievement; 8 – emotional information level; 9 – control of emotions; 10 – empathy; 11 – recognition of other people emotions;; A – control group; B - experimental group.

Formation of personality's component takes place during all period of study in higher educational establishment not evenly. Acme-competence components influence differently on final formation level of personality's component.

Correlation analysis permitted to determine density and orientation of acme-qualities' correlations and influence on personality's component. We grouped acme-qualities by the strength of their correlations.

Thus, high correlation by level of personality component's formation have: creative potential (creativity) ($r = 0.91$) and communicative abilities ($r = 0.91$); organization abilities ($r = 0.89$).

Creativity implies systemic quality of mind and combination of human psyche characteristics, ensuring realization of person's individuality. In experimental group creativity was 57.8% by the end of master's course. In control group this indicator was 35.86% that was by 21.9% less than in experimental group.

We determined important for professional functioning communicative abilities: ability to communicate with colleges (parents, pupils), ability to find correct approach to them; ability to predict the result of pedagogic action. In experimental group such qualities were formed by 59.6%, while in control group this indicator was by 22.8% less and equaled to 36.76%.

Organization abilities, ability to arrange activity of collective, optimize own functioning (to plan, to control) was formed in experimental group by 66.3%, while in control group this indicator was by 15.5% less and equaled to 50,79%.

Next group of acme-qualities with high correlation with personality component's formation included: demand in achievement ($r = 0.76$), attitude to own “Self” (“Self”-conception) ($r = 0.74$) and ability to be psychologically close to other person ($r = 0.74$).

Demand in achievement is one of main personality's qualities. It is especially important for “Physical education” students. In the base of insistence in overcoming obstacles there is strive to exceed already achieved level in fulfillment of certain action; competition with oneself or with other person. In process of continuous professional

training demand in achievement was formed in experimental group students by 65.3%, while in control group this indicator was by 26.25% less and equaled to 39.1%. Y

“Self”-conception includes understanding of own physical and intellectual in-born abilities, self-assessment, subjective self-perception. All these characterize influence of environmental factors on personality. In experimental group students by 84.5%, while in control group this indicator was by 22.04% less and equaled to 62.46%.

For profession of “person-to-person” type it is important the following: ability for psychological closeness with other person; ability to listen; demand in spiritual closeness; level of formation. The level of this component’s formation in experimental group students increased up to 82.4%, while in control group this indicator was by 18% less and equaled to 64.36%.

Correlation analysis permitted to determine acme-qualities, which have significant correlation and influence of personality component’s formation. They are: civil duty ($r = 0.65$), empathy ($r = 0.64$), ability to recognize emotions of other people ($r = 0.6$) and emotional information level ($r = 0.53$).

Civil duty sense is connected with such personality’s qualities as: patriotism, interest to social-political phenomena, professional responsibility; demand in communication and collectivism. At modern stage of Ukrainian society’s development the sense of civil duty is a necessary condition of formation of competent compatible, modern pedagogue. Such pedagogue will be able to educate young generation of Ukrainians at proper level. The level of civil duty formation in experimental group students increased up to 67.3%, while in control group this indicator was 60.9%. At present time there are contradictions in social-political life of Ukraine. It negatively influences on formation of this quality in students.

Empathy is also important acme-quality: it is ability to co-feel, to perceive feelings of other person; it is a demand in altruistic creation of favorable conditions for positive emotions and life activity of person, who requires support. Empathy is one of indicators of humanistic, spiritual component of society in the whole. In experimental group students it is 74.8%, while in control group this indicator was 65.21%. It was by 9.59% less than indicator of experimental group.

Recognition of other people’s emotions is an indicator of personality’s “emotional intellect”. This fact says that the person can control emotions and feelings of vis-à-vis; recognize and feel emotional component of intra-personal relations. In profession of “person-to-person” type, profession of pedagogue formation of this personality component’s quality is very important. In experimental group students it is 81.65%, while in control group this indicator was 79.8% that is by 17.65% less than indicator of experimental group.

Emotional information level reflects person’s knowledge about laws and phenomena of affective life as well as understanding of what emotional reaction can be caused by any event, word or action. In experimental group students it is 79.8% that is by 15.77% than higher indicator of control group (64%).

Correlation analysis showed that personality’s acme-quality of emotional control has moderate correlation with formation level of acme-competence- personality’s component ($r = 0.44$).

Emotional control reflects person’s ability to control influence of external psycho-traumatizing factors on own emotional state (ability to defend against negative influences). The level of this ability’s formation in experimental group was 69%. This indicator was only by 7.45% higher than in control group (61.55% accordingly).

Thus, the level of personality component’s formation on all educational levels was 73.9%. In control group it was 54.68%. It was by 19.22% less than indicator of experimental group.

By results of factorial analysis we grouped components by four factors: motivation-personality’s factor, personality’s, emotional-psychological, studying and studying on research base.

All marked out factors combine 79.8% of all indicators, all components. The most significant was the first factor (motivation-personality’s), which has the highest percentage of general dispersion – 43.53%. The biggest factor scores have motivation of achievement (0.83), abilities for psychological closeness with other person (0.8), attitude towards own “Self” (“Self”-conception) (0.79), empathy (0.77), learning-cognition motives (0.74), prestige motives (0.71), professional motives (0.70).

Personality’s (second) factor has 17.6% of general dispersion that points at sufficient significance of this factor. The highest factor scores have social motives (0.68), demand in achievement (0.57), communicative abilities (0.56), organization abilities (0.55), creative potential (0.48).

Analysis of after-experiment results shows that in experimental group there are statistically significant distinctions. It related to acme-competence in general and the level of its components' formation ($p < 0.05$). In control group we observed certain dynamic. But we did not register any statistically significant distinctions in acme-competence and its components ($p > 0.05$).

Discussion

Systemizing of scientific literature data permitted to conclude: application of specialists' acme-oriented professional training facilitates formation of their acme-competence. Acme-qualities of physical education specialist were determined. The conducted research proved results of other authors' works on professionally important qualities of physical education specialists [2, 3, and 8]. These authors noted that teacher shall have such professional qualities: integral psychic features of personality (attention, memory, and thinking); psychic characteristics (emotional warmth, tolerance); personality's professional qualities (organization, communicability, responsibility, discipline, initiative), will qualities [10, 17].

Researchers determined main qualities, skills and internal forcing reasons, which ensure high efficiency and stability of functioning; active self-development and realization of specialist's creative potential [9]. The offered conception of professionalism acmeological invariants permits to accelerate specialist's individual-professional progress [8]. Our research has supplemented information about modern approaches to physical education specialists' training on acme-principles.

The author's conception of physical education specialists' continuous training on the base of acme-principles is realized in educational process of higher educational establishment. Professional training is oriented on formation of acme-competence of physical education specialists.

For the first time we used factorial analysis for grouping and classification of physical education specialists' acme-competence components.

Such approaches are especially important at initial levels of higher education and in first year of bachelor's period. Educational process of physical education specialists' training, based on acme-principles shall be oriented on prevailing formation of acme-motivational component of acme-competence as far as acme-motivational component (as combination of strives and conditions) determines, directs and regulates specialist's acme-oriented development. With it, personality's acme-qualities are the foundation of professional formation in higher educational establishment. Such qualities facilitate self-perfection and self-development during all life.

Further working out of teaching-methodic provisioning for acme-oriented training of physical education specialists seems to be a promising direction of researches.

Conclusions

1. The results of the research witnessed effectiveness of application of acme-oriented methods and forms of physical education specialists' training; relevance of acme-enrichment of academic disciplines of professional and practical cycle.
2. Correlation analysis permitted to determine group of personality's acme-qualities, which have significant correlation and render influence on formation of personality's component of physical education specialists' acme-competence.
3. By results of factorial analysis we grouped acme-competence components of physical education specialists by four factors.

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Conflict of interests

The author declares that there is no conflict of interests.

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Information about the author:

Dereka T.Hr.; <http://orcid.org/0000-0001-8636-0792>;
t.dereka@kubg.edu.ua; Borys Grinchenko Kyiv University; 18/2
Bulvarno-Kudriavska Str, Kyiv, 04053, Ukraine.

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METHODIC OF PEDAGOGIC CONTROL OF 16-17 YEARS' AGE GIRLS' MOTOR FITNESS

Ivashchenko O.V.

H.S. Skovoroda Kharkiv National Pedagogical University

Abstract. Increase of schoolchildren's motor fitness is connected with organization of pedagogic control at physical culture lessons. It was assumed that the basis for pedagogic control of 16-17 years' age girls' motor fitness was discriminant model. *Purpose:* to determine methodological approaches to pedagogic control of 16-17 years' age girls' motor fitness. *Material:* in the research 28 senior form girls (fourteen 16 years' age 14 girls of 17 years' age girls) participated. Materials of the research were processed in statistical analysis program— IBM SPSS 20. *Results:* in the process of discriminant analysis we created prognostic model for belonging to group. This model builds discriminant function in the form of linear combination of predicting variables, which ensures the best division of groups. Correlation coefficient between calculated values of discriminant function and indicators of belonging to group was $r=0.843$ and witnesses about high prognostic potential of first canonic function. *Conclusions:* 16 years' age girls have better speed-power fitness than 17 years' girls. It points at the fact that in 17th years' age the reason of lagging behind 16 years' age girls is their insufficient motor activity. On the base of canonic coefficients of discriminant function it is possible to classify 16 and 17 years' age girls by level of their motor fitness, according to their age. It is of practical importance for working out effective programs of senior form girls' physical training. Discriminant model can be used for pedagogic control of 16 and 17 years' age girls' fitness.

Key words: discriminant, function, function, motor, fitness, modeling, girls.

Introduction

Increase of schoolchildren's motor fitness is connected with organization of pedagogic control at physical culture lessons [8, 9], selection of test tasks and working our control normative [1, 11, 12] as well as by methodological approaches to control of children's and adolescents' motor fitness [5, 6, 7, 10]. Classification of motor and functional fitness is a component of pedagogic control. Taking decision in control over children's and adolescents' physical education depends on it [13, 16, 24]. The authors show potentials of classification of girls' age distinctions on the base of functional and coordination fitness testing [13]. The authors found that in factorial model of motor fitness complex training of motor abilities, general coordination; coordination of different body parts' movements, vestibular stability are distinguished [24].

One of classification methods can be discriminant analysis [26, 27]. It permits to maximally exactly divide pupils into groups [25]. On the base of such approach recreational-health related technology for pupils' health improvement can be offered [27].

In previous works it was found that discriminant analysis can be effectively used in classification of boys and girls of secondary [23, 24, 28] and senior forms [21, 22]. The received data point at prognostic significance of discriminant function in assessment of schoolchildren's motor and functional fitness [7].

However, in available scientific literature insufficient attention is paid to modeling method for classification of school age girls' motor and functional fitness.

Hypothesis of the research: it was assumed that the basis for pedagogic control of 16-17 years' age girls can be discriminant model.

The purpose of the research: to determine methodological approaches to pedagogic control of 16-17 years' age girls' motor fitness.

Material and methods

Participants: in the research 28 senior form girls (fourteen 16 years' age 14 girls of 17 years' age girls) of gymnasium No.144 (Kharkov) participated.

Organization of the research: testing program included common tests, given in table 1 [8, 11, 12, 14, 15]. For assessment of functional state we used Shtange's, Genchy's and Serkin's tests [3].

Statistical analysis: the materials of the research were processed in statistical analysis program— IBM SPSS 20. In the process of discriminant analysis we created prognostic model for belonging to group. This model builds

discriminant function (or, if there are more than two groups – a set of discriminant function) in the form of linear combination of predicting variables, which ensures the best division of groups. These functions are built by a set of observations, for which belonging to group is known. Further, these functions can be used for new observations with known predicting variables with unknown group belonging. For every variable the following statistics are calculated: mean values; standard deviations; single-factorial dispersion analysis for every variable (Box's M test; in-group correlation matrix; in-group co-variation matrix; co-variation matrixes for separate groups; general; co-variation matrix). For every canonic discriminant function we calculated: own value; dispersion percentage; canonic correlation; Wilks' Lambda; χ^2 - Chi-square. For every step: a-priori probabilities; coefficients of Fisher's function; non-standardized coefficients of function; Wilks' Lambda for every canonic function were determined.

Results of the research

In table 1 we gave comparative analysis of 16-17 years' age motor and functional fitness. 16 years' girls showed better results in long jump from the spot. They made less mistakes in assessment of run time for 5 seconds ($p < 0.05$). By results of other indicators the difference is statistically unconfident ($p > 0.05$).

Table 1. Results of analysis of 16-17 years' age girls' motor and functional fitness

№	Description	16 years' girls		17 years' girls		t, p
		X	s	X	s	
1	Jumps with addings, times	3.588	.374	2.833	.405	$p > 0.05$
2	Long jump from the spot, cm	195.882	4.368	176.917	8.198	2.204; $p < .05$
3	Long jump from the spot for 1/3 from maximal effort	18.007	3.128	23.317	6.318	$p > 0.05$
4	Long jump from the spot for 1/2 from maximal effort	15.479	2.399	10.441	1.981	$p > 0.05$
5	Long jump from the spot for 2/3 from maximal effort	9.369	1.822	13.325	2.462	$p > 0.05$
6	5 sec. run, mistake in seconds	.429	.065	.725	.088	-2.748; $p < .05$
7	10 sec. run, mistake in seconds	1.04	.183	.90	.192	$p > 0.05$
8	20 sec. run, mistake in seconds	2.176	.447	2.0	.353	$p > 0.05$
9	Shuttle run 4x9 sec.	9.394	1.314	7.958	1.706	$p > 0.05$
10	Pressing ups, times	6.176	.665	8.417	1.010	$p > 0.05$
11	Chin ups, times	2.529	.429	3.083	.608	$p > 0.05$
12	Hanging on bent arms, sec.	18.294	1.338	15.917	2.524	$p > 0.05$
13	Shtange's test, sec.	48.529	3.676	45.0	3.963	$p > 0.05$
14	Genchy's test, sec.	30.294	1.441	28.833	1.718	$p > 0.05$
15	Serkin's test, 1st phase, sec.	39.235	2.890	35.833	2.197	$p > 0.05$
16	Serkin's test, 2nd phase, sec.	18.823	1.829	22.083	1.653	$p > 0.05$
17	Serkin's test, 3rd phase, sec.	36.235	3.544	30.750	2.181	$p > 0.05$

For determination of distinctions between total results of 16-17 years' age girls' motor and functional fitness indicators we carried out discriminant analysis. Results are given in tables 2-4.

The first canonic function explains variation of results by 100%. This fact witnesses about their high informative potential (see table 1). Correlation coefficient between calculated values of discriminant function and indicators of belonging to group was $r = 0.843$. It witnesses about high prognostic potential of first canonic function. The first canonic function's own value witnesses about its successfully selected coefficients.

Table 2. Canonic discriminant function. Own values.

Function	Own values	% of dispersion	explainedCumulative %	Cnonic correlation
1	2.454	100.0	100.0	.843

In table 2 we provide results of canonic function's analysis. The first row contains values $\lambda=0.290$ and statistical significance $p=0.05$ for all canonic functions. The first function has high discriminant potential and values in interpretation in respect to general population.

Table 3. Canonic discriminant function. Wilk's Lambda

Checking of function	Wilk's Lambda	χ -Chi-square	Degrees of freedom	p
1	.290	22.931	17	.050

In table 3 we presented results of groups' classification (93.1% of the data were classified correctly). So, discriminant analysis permitted to answer the question: how confidently we can distinguish one class from other by set of the offered variables; which of these variables influence on classes' distinguishing the most substantially; to which class object belongs on the base of discriminant variables' values.

Table 4. Results of groups' classification

	Classifier (age, years)	Predicted belonging to group (age, Total years)		Function value in groups' centroids
		16	17	
%	16	100.0	.0	1.270
	17	16.7	83.3	-1.799

Discussion

For practical application of discriminant analysis results coefficients of canonic discriminant function are used (see table 4). In table 5 we give information about discriminant function values for first 5 cases and belonging to one of groups is determined. Value P ($G=g | D=d$) is a measure of belonging to one of groups. I.e. it is a probability of the fact that certain case belongs to the predicted group. This group is calculated on the base of placing variables' values in corresponding to this case, function.

Table 5. Coefficients of canonic discriminant function

Description	Function 1
Jumps with addings, times	.065
Long jump from the spot, cm	.066
Long jump from the spot for 1/3 from maximal effort	-.003
Long jump from the spot for 1/2 from maximal effort	.106
Long jump from the spot for 2/3 from maximal effort	-.080
5 sec. run, mistake in seconds	-1.100
10 sec. run, mistake in seconds	1.393
20 sec. run, mistake in seconds	-.591
Shuttle run 4x9 sec.	.138
Pressing ups, times	.044
Chin ups, times	.368
Hanging on bent arms, sec.	-.134
Shtange's test, sec.	-.027
Genchy's test, sec.	.250
Serkin's test, 1st phase, sec.	-.018
Serkin's test, 2nd phase, sec.	-.130
Serkin's test, 3rd phase, sec.	.073
(Constant)	-18.552

Table 6. Statistic for separate cases

	№	Actual group	First group				Second group				Discriminant points of Function 1
			Predicted group	P(D>d G=g) p	df	P(G=g D=d)	Square Mahalonobis distance to center	of Group	P(G=g D=d)	Square Mahalonobis distance to center	
Data	1	17	17	.707	1	.996	.141	17	.004	11.867	-2.175
	2	17	17	.014	1	1.000	5.987	16	.000	30.424	-4.246
	3	17	16**	.156	1	.668	2.015	17	.332**	2.721	-.150
	4	17	17	.298	1	.999	1.084	16	.001	16.893	-2.840
	5	17	17	.230	1	.663	1.441	16	.337	3.491	-.599

Analysis of the received results witnesses that 16 years' age girls have better speed-power fitness than 17 years' girls. It points at the fact that the reason of 17 years' girls' lagging behind 16 years' girls is reduction of motor functioning.

The received results expand information about development of children's and adolescents' motor abilities as well as about possibility to receive new information with the help of modeling method (S.S. Iermakov [4]; Adashevskiy V.M., Iermakov S. S. [17]; Khudolii O.M., Ivashchenko O.V. [16]; Vlasov A., Demichkovskiy A., Ivashchenko O., Lopatyev A., Pityn M., P'anylo Ya., Khudolii O. [2]).

For analysis of motor fitness we used discriminant model. Effectiveness of discriminant function usage in classification of motor and functional fitness was proved in works by Geoffrey D. Broadhead and Gabie E. Church [19], Dorita Du Toit, Anita E. Pienaar & Leani Truter [18], Khudolii O.M., Ivashchenko O.V. [16]. The obtained data also point at prognostic significance of discriminant function in assessment of 16-16 years' age girls' motor and functional fitness.

In researches on physical education and sports multi-dimensional models and methods are used for classification of disciples by motivation for sport practicing (Milić, M., Milavić, B., & Grgantov, Z. [33]), by motor functioning (Gert-Jan de Bruijn and Benjamin Gardner [20]), for classification of groups into sportsmen and not sportsmen (Lulzim I. [32]), for determination of dynamic of 9-12 years' age children condition under influence of fitness program (Dorita Du Toit, Anita E. Pienaar & Leani Truter [18]), for summarizing control of children's and adolescents' functional and motor fitness [6, 7, 29]. Geoffrey D. Broadhead And Gabie E. Church [19] point at possibility of discriminant analysis usage for classification of 5-12 years' age children's motor activity, depending on its volume. Equations of discriminant function permit to classify correctly 93% of grouped data.

The received results supplement scientific data about demand in structural [24, 25, 29] and functional analysis [16, 21] of children's and adolescents' motor fitness. These results prove the idea that discriminant model [22, 23, 28] can be used for pedagogic control of fitness level of 16-17 years' age girls.

The prospects of further researches imply determination of effectiveness of discriminant function usage in planning children's and adolescents' physical loads.

Conclusions

16 years' age girls have better speed-power fitness than 17 years' girls. It points at the fact that 17 year's age girls lag behind 16 years' girls owing to less motor functioning.

On the base of canonic discriminant function's coefficients it is possible to classify 16 and 16 years' age girls by motor fitness according to their age. It is of practical importance for working out physical training programs for senior school age girls. Discriminant model can be used for pedagogic control of 16-17 years' age girls' fitness.

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Conflict of interests

The author declares that there is no conflict of interests.

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Information about the author:

Ivashchenko O.V.; <http://orcid.org/0000-0002-2708-5636>;
public@tmfv.com.ua; H.S. Skovoroda Kharkiv National
Pedagogical University; Alchevskikh str. 29, Kharkov, 61002,
Ukraine.

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MOTOR AND SPORT COMPONENTS IN HIERARCHY OF NON PHYSICAL CULTURE PROFILE PEDAGOGIC SPECIALTIES STUDENTS LEISURE

Ilchenko S.S.

Pavlo Tychyna Uman State Pedagogical University

Abstract. The research is directed at determination of non physical culture profile, pedagogic specialties 2nd-4th year students' objective preferences in choosing motor or sport functioning from admissible range of leisure kinds, offered by university or life circumstances. *Purpose:* to find rank place of motor and sport functioning in hierarchy of non physical culture profile, pedagogic specialties 2nd-4th year students' objective preferences in choosing motor or sport functioning from admissible range of leisure kinds. *Material:* in experiment 180 2nd-4th year students of Pavlo Tychyna Uman State Pedagogical University participated (90 girls and 90 boys). *Results:* indirectly it was found that students understand the usefulness of motor functioning and sport practicing for organism's normal functioning. It was also found that in hierarchy of leisure kinds the forms, offered by university, are not preferred by students. Sport practicing as one of leisure kinds, was preferred only by 4th year student; with it boys put it on the 1st place and girls - on the 3rd. For 2nd and 3rd year students motor and sport functioning are not significant and gave the way to other immobile forms. *Conclusions:* determination of motor and sport functioning rank places in students' leisure hierarchy permits to prognosticate their health related activity and direct teachers' efforts at influencing on students' understanding importance of active way of life.

Key words: students, motor functioning, sport activity, leisure.

Introduction

Vitally important level of motor functioning is a guarantee of human organism's normal development and functioning that is witnessed by numerous scientific researches of domestic and foreign scientists [8, 10, 13, 14, 15]. Motor activity is a biological demand of every living organism. Motor functioning deficit of Ukrainian pupils and students is 60–75% from required for sustaining normal health level. Only 13% of Ukrainians have required physiologically conditioned level of motor functioning. At the same time, in European Council countries they are – 40–60%; in Japan –70–80% [2].

M. Dutchak, T. Krutsevych, S. Trachuk inform that in Ukraine especially disturbing is low level of children's and students' health culture. By their data only 6% of Ukrainians practice sufficiently health related motor functioning that means: every fifth schoolboy or schoolgirl and every tenth student or girl student (the lowest indicator in Europe) [3]. Insufficient motor functioning is determined as one of main factors causing young people's excessive weight and obesity [18, 20].

In questions of youth's health protection world society counts for the person him (her) self, i.e. a person shall rely on oneself in fight for own health [16]; for creation of favorable social environment, required for healthy development, in educational establishment [17, 19].

Since first years, students obey their life regiment to educational requirements of universities. Their academic activity and leisure relate, to one or other extent, to educational sphere and university. The level of students' health and potential of professional development will depend on to what extent they have wish to practice active motor and sport life in extracurricular time.

Hypothesis: questioning shall state students' objective preferences in choosing motor and sport functioning from available kinds of leisure in university as well as in choosing of life conditions (desired). Thus, there appears opportunity to find out to what extent students understand the usefulness of motor functioning and sport activity for organism's normal functioning.

The purpose of the works is to find rank place of motor and sport functioning in hierarchy of non physical culture profile, pedagogic specialties 2nd-4th year students.

Material and methods

Participants: in experiment 180 2nd-4th year students of Pavlo Tychyna Uman State Pedagogical University participated (90 girls and 90 boys).

Procedure: we conducted students' sociological questioning about their involvement in motor and sport functioning; about their advantages in leisure. Diagnostics was fulfilled in conditions of usual academic day at methodic classes (with 2nd year students) and in extra-curricular time (with 2nd-4th year students).

Statistical analysis of the data was fulfilled with the help of Excel 2010 programs. The samples of the research data were tested for normal distribution.

Results of the research

On university faculties different circles, clubs of interests, leisure studios and other small forms (soloists, duets, declamatory) function. In total they are 44. Art studios and art collectives are a solid foundation of any creative project of university [6]. Physical education and formation of healthy life style are realized only in compliance with governmental documents and programs of sport-mass work development. In the base of such work there are physical education classes by 15 kinds of sports. Besides, sports club functions. Students have opportunity to raise their sportsmanship in light athletic, basketball, volleyball, football, ping-pong and rhythmic gymnastic circles [11].

Let us analyze, which kinds of leisure activity are preferred by pedagogic specialties students of different years (see tables 1-2). We can find if forms, offered by university, are important for students.

Table 1. Leisure preferences of different years' pedagogic specialties students (boys)

Hobby	Year of study					
	second Sum of points	Rank	third Sum of points	Rank	forth Sum of points	Rank
Communication with friends	58	1	78	1	83	2
Reading fiction	186	4	161	3	184	4
Singing, musical instruments play	242	6	245	6	287	12
Listening to music	64	2	99	2	132	3
Attending disco	177	3	203	5	210	5
Sport	258	7	189	4	74	1
Learning foreign language	259	8	290	12	262	8
Computer games	294	11	251	7	222	6
Drawing	264	10	325	13	296	13-14
Doing technique	346	15	276	10	278	11
Car driving	338	13-14	285	11	296	13-14
Help to parents	212	5	258	8	270	9
Attending of church	338	13-14	328	14	271	10
Meeting with boy/girl	302	12	274	9	229	7
Reading special literature	262	9	338	15	339	15
Miscellaneous						

From this list we can see that preferences of leisure kinds of both sex respondents are similar. The main preference (1st rank) of boys (except 4th year students, who are the only, who put "sports" on the first place) as well as of girls is "communication with friends". 4th year boy students put "communication with friends" on 2nd place. All students (except the mentioned 4th year students) put on 2nd place "listening to music". From 3rd rank certain distinctions in places are observed. It requires special analysis by sex and years of study.

For boys, hobbies of priority in hierarchy (especially from 3rd rank, see table 1) have some distinctions, which depend on year of study. Only data of 2nd year students in the most important leisure kinds (1st-5th rank) completely coincide with 3rd - 4th year girl students. 2nd year boy students put on 3rd place "attending disco", while 3rd year students put on the same place "reading fiction" and 4th year students - "listening to music". The boys' kinds of hobby from 4th to 5th rank are the same. Distinction is only in ordeal place (for 2nd and 4th year students "reading fiction" is on 4th place; 3rd-4th year students put "attending disco" on 5th place. "Help to parents" is of priority only for 2nd year boys; for 3rd-4th year students this activity is of little significance (8th-9th rank). "Sport" is of priority also for 3rd year students (4th rank), but is of little significance for 2nd year. "Play on musical instruments and singing": for 2nd-3rd year students - 4th rank; for 4th year - 12th rank. "Computer games" are of little significance for 2nd-4th year boy students

(7th and 6th ranks) as well as “meeting with boy/girls” (9^h and 7th ranks). 2nd year boys students rejected these time spending at all (9^h and 12th ranks).

Table 2. Leisure preferences of different years’ pedagogic specialties girl students

Hobby	Year of study		third		forth	
	second Sum of points	Rank	Sum of points	Rank	Sum of points	Rank
Communication with friends	73	1	58	1	57	1
Reading fiction	157	4	186	4	197	4
Singing, musical instruments play	247	8	242	8-7	229	7
Listening to music	128	2	64	2	117	2
Attending disco	145	3	177	3	225	6
Sport	203	6	258	9	186	3
Learning foreign language	232	7	259	10	257	9
Computer games	278	11	294	11	249	8
Drawing	267	10	242	8-7	271	11
Doing technique	358	15	346	15	329	13
Car driving	351	13	338	14-13	361	15
Help to parents	202	5	197	5	206	5
Attending of church	354	14	338	14-13	323	12
Meeting with boy/girl	252	9	302	12	337	14
Reading special literature	299	12	240	6	270	10

On last (15th rank) places 3rd-4th years boy students put “reading special literature”; 2nd year students – “doing technique”. Boys also reject “attending church” (12^h – 14th ranks in 2nd- 3rd year students) and 10th rank in 4th year student). “Car driving” takes 13th – 14th rank in 2nd and 4th year students and “drawing” takes 9th rank in 3rd year students.

Priority places in all kinds of leisure of girls take the same places (from 1st to 5th ranks) see table 2. In 2nd-3rd year girl students “listening to music” takes 2nd rank and “attending disco” and “sport” – 3rd rank. 4th year girls students put “reading fiction” on 4th place and “help to parents” – on 5th place. The last places (rejected hobbies) are: “doing technique” (the last 15th place in 2nd – 3rd year girls students), “car driving” (13th and 14th ranks in 2nd-3rd years’ and 14th rank in 4th year girl students, “attending church (13th and 14th ranks in 2nd-3rd year girl students and 12th rank in 4th year). “Meeting with boy” was put by 3rd year girl students on 12th rank and by 4th year – on 14th rank. A little better situation (9th rank) was in second year girls. Of little significance were “drawing” (10th rank in 2nd year girl students, 9^h rank in 3rd year and 8th-7th ranks in 3rd year), “computer games and “play on musical instruments”, “reading special literature” and “learning foreign languages”.

Thus, in hierarchy of leisure in university students are offered with places of little significance. Sport was of priority only for 4th year students. With it, boys put it on 1st place and girls – on 3rd. For 2nd and 3rd year students motor and sport functioning are on places of little significance and gave way to passive forms.

Discussion

The received by us sociological data prove results of Yu.A. Borodin, G.N. Arziutov [1], O. Ivanochko, A. Maliovaniy, Ye. Moroz, O. Novitskiy [7], I.V. Remzy, D.V. Sychova, D.M. Vodolazkiy [9], Yu.P. Kobiak [4, 5], S.M. Futorny [12] about students’ low interest in motor functioning.

We also supplemented the data of I.V. Remzy, D.V. Sychova, D.M. Vodolazkiy [9], about level of modern pedagogic specialties students’ motor activity, which does not improve for the years of study at university. Besides, students do not receive any training effect from motor functioning, which they have. It is known that only high motor functioning (specially organized physical culture classes and intensive sport games, health related trainings) is oriented on health recovery and prophylaxis. This component of motor functioning is used by many students only in the form of compulsory lessons on physical education. If there is no such classes in academic day motor functioning is absent. For achievement of physical fitness and physical condition’s high and above high levels it is necessary to choose

individual regime of specially organized activity. From hierarchy of students' leisure kinds it is not seen that they worked out individual interest and desire to independently practice physical exercises and increase own motor functioning.

Conclusions

Analytical review showed that modern conditions of university's educational process put a student in situation, in which he (she) must choose priorities. The problem of students' motor functioning implies deficit of time for such practice and absence of motivation for physical exercises. The main reason is that educational establishments are oriented rather on giving knowledge to students.

Hierarchy of non-physical culture profile, pedagogic specialties students' leisure kinds is rather monotonous. The main hobby (1st rank) is "communication with friends" And only for 4th year boy students "sport" takes 1st place. The second rank place is equal for students of both sex and all year of study. Exception was only 4th year students: for them it is "communication with friends".

The offered by university forms are not supported by students. Motor and sport activities were put on places of little significance by 2nd-3rd year students. They gave way to more passive forms.

Conflict of interests

The author declares that there is no conflict of interests.

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Information about the author:

Ilchenko S.S.; <http://orcid.org/0000-0001-6212-0217>; Sergiy130587@mail.ru; Pavlo Tychyna Uman State Pedagogical University; Sadova str., 2, Uman, Cherkassy region, 20300, Ukraine.

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ASSESSMENT OF MORPHOLOGICAL-FUNCTIONAL STATE OF CHILDREN WITH COCHLEAR IMPLANTS

Pysanko V.M.

Institute of Otolaryngology

Abstract. *Purpose:* assessment of morphological-functional state of pre-school age children with cochlear implants and substantiation of need in post-operative rehabilitation in period of preparation for comprehensive school. *Material:* we tested weakly hearing children with cochlear implants (n=127, age – 5.6±0.6 years). They were the main group. Control group consisted of children with normal hearing (n=70, age – 5.7±0.4 years). Morphological-functional state was assessed by indicators of physical and biological condition, visual analyzer, posture parameters and foot arch, muscular system and level of coordination. We calculated index of integral morphological-functional state assessment. *Results:* Morphological functional state of most of children (with cochlear implants) was characterized by low physical condition indicators and disharmony. We observed delay in biological development. Index of morphological-functional state integral assessment witnesses, that such child can not study in comprehensive school. Rehabilitation program can reduce the gap between children with normal hearing and those with cochlear implants. *Conclusions:* Rehabilitation program facilitates quicker domestic and social rehabilitation of children at the account of widening the circle of communication, learning new actions and conceptions. It can permit for such children to study at school together with their healthy peers.

Key words: deaf, children, cochlear, implantation, rehabilitation.

Introduction

At present the only way to full restoration of hearing in patients with sensor-nervous deafness is cochlear implantation (CI). It implies surgical operation, during which in patient's ear a system of electrodes is implanted. It ensures reception of audio information with the help of electric stimulation of hearing nerve's preserved fibers [4, 13, 15, and 20]. It is reasonable to fulfill CI up to age 4-5 years or even earlier. In later age "brain plasticity" to certain extent becomes lower; interconnection between centers of hearing and speaking inhibits and it makes training child's speech quite a problem [10, 16, and 19].

Analysis of modern domestic and foreign scientific sources permits to say that there are no researches on physical rehabilitation of such children contingent. The problem of their state correction is regarded only as a pedagogic one. The main purpose of post-operative rehabilitation is restoration of audio-speech development. Indeed child hears sounds but does not understand them and, that is why, he/she can not reproduce them consciously [11, 17, 22]. Pre-school age children's organism is formed in conditions of hearing deprivation. It results in disordering of speech development. As on the moment of operation, children's organism is characterized by the whole complex of secondary deviations in physical condition, resulted from deafness [2, 3, and 6]: delay in physical and psycho-motor development; lagging behind healthy peers by all parameters of physical fitness. All these complicate socialization process and require rehabilitation. Such children have expressed low life quality. Their rehabilitation does not permit full correction of hearing if hearing problem became heavy. But children with cochlear implants, providing full rehabilitation, can attend comprehensive school in the future. So, they have chance to become proper members of society. Actually such are conditions of favorable rehabilitation potential [5, 9, and 11]. Just study in usual school is the highest level of children's with cochlear implants adaptation. Such contingent requires examination as per usual schema, applied at entering comprehensive school. It permits to find health problems and provide effective correction.

For entering comprehensive school child shall have certain morphological-functional state (MFS) of organism. This state reflects complex characteristic of organism's intra-systems links and is regarded as health marker. Readiness for school is determined by level of child's psychic and morphological-functional development. Proper child's health will permit to adapt to requirements of systemic teaching. For such children loads shall not be excessive and will not result in social-psychological adaptation failure, reduction of teaching effectiveness and health problems [1, 7]. It is recommended to assess children's readiness for school in unified way with the help of feasible tests [7].

So it is necessary to create physical rehabilitation program for children with cochlear implants on the base of their morphological-functional state.

The purpose of the research: assessment of morphological-functional state of pre-school age children with cochlear implants and substantiation of need in post-operative rehabilitation in period of preparation for comprehensive school.

Material and methods

Participants: we tested 127 pre-school age children (5.6 ± 0.6 years) in post-operative period (installation of cochlear implants), who were the main group (MG). Control group (CG) consisted of 70 children with normal hearing of age 5.7 ± 0.4 years, who attended pre-school educational establishments.

Organization of the research: the researches were conducted on the base of Institute of otolaryngology, named after prof. O.S. Kolomiychenko of national Academy of medical sciences of Ukraine. Children's morphological-functional state was assessed by indicators of physical (level, harmony) and biological (start of baby teeth replacement, "Filipino test") condition; by visual analyzer's state (binocular eyesight, visual acuity); by posture parameters (shoulder and backbone vertical curve indices) and foot arch (index of foot arch); by muscular system (static endurance, flexibility); by coordination level (static and dynamic balancing, fine motor abilities) [7]. Every indicator was assessed in points. We calculated index of morphological-functional state integral assessment by the following formula:

$$I = \Sigma a / 16,$$

Where I is index of children's MFS; Σa – total points of the studied characteristics; 16 – total quantity of the considered indicators. The received index value was identified according to the following criteria [7]:

- 1.00 – 1.35 – high level – readiness for school;
- 1.36 – 2.00 – average level – presence of separate MFS deviations;
- 2.01 – 2.31 – low level – numerous MFS deviations.

In the research we used the following tests [7]:

For physical condition, its harmony by body mass and chest circumference we used assessment tables of physical conditions for senior pre-school age children (scale of regression by body length).

Baby teeth replacement: we considered all stages of permanent teeth growth. Results' assessment was: 1 point, if baby teeth replacement started by entering school; 2 points if it does not started.

Filipino test was carried out in the following way: child stands upright, brings his/her arm above head top and tries to touch left ear with right hand fingers or right ear with left hand fingers. Head shall be kept upright. Assessment: 1 point – finger touch the opposite ear; 2 points – fingers do not touch it.

Testing of binocular vision: the simplest and the most reliable for mass examinations is Reyneke's test (USA) with two pencils. Child takes sharpened pencil and is asked to drop pencil's tip by straightened arm on the sharpened tip of other pencil, kept in horizontal position by examiner. Assessment: if any problems with binocular vision, this operation will not be successful (2 points).

Vision acuity test "Black hand": on paper of A5 size there is a picture of human hands (table 1). The hands are under different angles. In the first row hands are of big size; in the second – they are 2 times less than in the first. In the third row hands are 2 times less than in the second. Distance between examined child and table shall be 3 meters. The purpose is determination of hand's direction on the picture. With normal visual acuity 2 years' children points correctly hands' direction in the first row; 3 years' age children – in the second row and 4-6 years' children – in the third row (1 point). If senior pre-school age child can not point correctly direction of black hands fingers in the third row it will be assessed in 2 points.

Muscular skeletal apparatus: posture disorders are characterized by increase or reduction of backbone natural curves; by deviation of girdle segments', torso, head and lower limbs' positions from physiological. Assessment is fulfilled by medical worker.

Examination of right and left feet arches: child stands barefoot on solid surface (chair). Feet are parallel at distance 10-15 cm. Position of heel bone in respect to shin and status of longitudinal and transverse arches are assessed.

Normal physiological position of foot implies being of shin axis and heel bone at one level. If child rises on tiptoes – there shall be deepening of internal and external feet arches.

Functional state of muscular system: determination of *back muscles' static endurance* is fulfilled from initial position lying on abdomen. Hands are on the waist, legs are fixed; upper part of torso is kept parallel to floor; head and chest are a little raised. Static endurance of back muscles is assessed in seconds with stopwatch by time of torso keeping in such position (see table 1).

Table 1. Static endurance of back muscles (sec.)

Age, years	Sex	Levels of static endurance of back muscles			
		Weak muscles	Average	Above average	High
	Points	4	3	2	1
5	Boys	≤17.73	17.74-23.56	23.57-29.39	≥29.4
	Girls	≤18.48	18.49-23.87	23.88-29.28	≥29.29
6	Boys	≤21.67	21.68-28.07	28.08-34.45	≥34.46
	Girls	≤23.92	23.93-29.82	29.83-35.71	≥35.72

For determination of *flexibility* child shall slowly bend forward from initial position standing on gymnastic bench (arms are straightened, directed downwards, legs shall not be bent in knees). *Flexibility assessment* was carried out by measurement of distance from are of feet support (surface of gymnastic bench) to hands' fingertips with the help of rule (or measuring tape). Results are compared with table 2 data.

Table 2. Flexibility assessment (cm)

Age, years	Sex	Flexibility High	Above average	Average	Insufficient
	Points	3	2	1	3
5	Boys	≤ - 0.61	- 0.60 – 3.09	3.10 – 6.81	≥ 6.82
	Girls	≤ - 0.72	- 0.71 – 2.05	2.06 – 4.84	≥ 4.85
6	Boys	≤ - 0.31	- 0.30 – 4.87	4.88 - 10.06	≥ 10.07
	Girls	≤ - 0.64	- 0.63 – 1.77	1.78 - 4.18	≥ 4.19

Coordination and balance: these abilities are assessed by results of two tests, which determine functional state of central nervous system. Test “*Rope*”: child stands upright with one foot in front of other on one line; toe touches heel of front foot; arms are straightened forward with fingers parted and eyes closed. For convenience one can draw a line on the floor or use decorative elements of floor. Which foot (right or left) shall be in front position is up to child's opinion. Result of the test is assessed by time of keeping body position without disordering coordination (swaying, change of feet or arms position) and compared with table 3 data. Test “*Tree*” is for stability in keeping body on one leg. Foot of one leg touches the knee of other leg and this leg's knee is moved aside maximally; arms are directed upwards and then move to horizontal position; eyes are opened. Child chooses on which leg he/she will stand by him/herself. Result of the test is assessed by time of keeping body position without disordering coordination (swaying, change of feet or arms position) and compared with table 3 data.

Fine motor abilities of hands assessment (test of N.I. Ozeretskiy): children are offered a card with picture of several circles (central circle – of 5 cm diameter) is depicted by bold line. The task is to cut out the circle by central, bold line. Time of fulfillment (1minute) is measured with stopwatch from the start of cutting. During 1 minute not less than 8/9 of circle shall be cut out. The following deviations from bold line re admitted: 1) not more than two times, if in work one thin line is cut, 2) not more than one time, if two thin lines are cut. Assessment of the test: 1 point means high level of fine motor abilities (test fulfillment from the first attempt); 2 points – average level (two attempts); 3 points – low level – test is not fulfilled.

Statistical analysis: statistical processing of the received data as fulfilled with the help of standard Microsoft Excel programs. We determined Student's t-criterion for statistic verifying of hypothesis about confidence of differences between indicators of CG and MG.

Table 3. Assessment of coordination tests' results (seconds)

Indicator	Coordination and balance levels					
	Below average	Average	Above average	Below average	Average	Above average
Points	3	2	1	3	2	1
Age, years	"Rope" test			Girls		
5	Boys			Boys		
	≤ 7	8 – 12	≥ 13	≤ 9	10 – 14	≥ 15
6	≤ 9	10 – 14	≥ 15	≤ 11	12 – 16	≥ 17
	"Tree" test			Girls		
5	Boys			Boys		
	≤ 3	4 – 8	≥ 11	≤ 4	5 – 9	≥ 10
6	≤ 4	5 – 10	≥ 11	≤ 4	5 – 9	≥ 10

Results of the research

When assessing MFS of pre-school age children with CI and with normal hearing we found the following regularities.

Screening indicators of children's physical condition are height, mass, chest circumference. Among children with CI we found great percentage of persons, who lag behind in physical development by all tested indicators. The reasons of it are diseases, endured by a child and general somatic weakening. The same tendency was found in study of biological age (see table 4).

Table 4. Children's MFS

No	MFS indicators	Characteristics	Points	CG, % of persons found	MG, % of persons found
1	Physical condition				
		Average level	1	78.57	54.33
1.1	Physical condition level	Body length indicator from above average to high level		14.29	6.35
		Body length indicator from below average to low level	2	7.14	39.32
1.2	Harmonious of physical condition by body mass	Harmonious by body mass	1	72.86	40.94
		Disharmony at the account of insufficient or excessive body mass	2	27.14	59.06
1.3	Harmonious of physical condition by chest circumference (CC)	Harmonious by CC	1	87.14	39.37
		Disharmony at the account of excessive or insufficient CC	2	12.86	60.63
2	Biological condition				
2.1	Start of baby teeth replacement permanent	Baby teeth replacement started by	1	77.14	66.93
		Baby teeth replacement did not start	2	22.86	33.07
2.2	"Filipino test"	Fulfills	1	88.57	62.99
		Not fulfills	2	11.43	37.01
3	Visual analyzer assessment				
3.1	Assessment of binocular vision	Child connects tips of pencils	1	97.14	88.19
		Child does not connect tips of pencils	2	2.86	11.81
3.2	Assessment of vision acuity by "Black hand" test	No mistakes	1	91.43	82.68
		Mistakes are present	2	8.57	17.32
4	Functional state of posture				
4.1	Assessment of posture in sagittal plane by shoulder index (SI)	<i>Physiological posture</i> (PP 90 – 100 %)	1	91.43	69.29
		Kyphosis of posture (SI up to 90 %)	2	8.57	30.71

No	MFS indicators	Characteristics	Points found	CG, % of persons	MG, % of persons
4.2	Assessment of posture in frontal plane by index of backbone vertical curve (BVC)	Physiological posture (BVC 90 – 100%)	1	97.14	93.70
		Scoliosis of posture (BVC is more than 110% or less than 90%)	2	2.86	6.30
5	Foot arch				
5.1	Assessment of right foot arch by index of foot arch	Normal foot arch	1	87.14	75.59
		Flat or increased foot arch	2	11.43	21.26
		Flat foot or foot with voids	3	1.43	3.15
5.2	Assessment of left foot arch by index of foot arch	Normal foot arch	1	85.71	74.80
		Flat or increased foot arch	2	12.86	21.26
		Flat foot or foot with voids	3	1.43	3.94
6	Functional state of muscular system				
6.1	Static endurance of back muscles	High	1	4.29	
		Above average	2	10.00	
		Average	3	82.86	68.50
		Weak muscles	4	2.86	31.50
6.2	Flexibility	Average	1	84.29	56.69
		Increased flexibility	2	10.00	
		Insufficient or excessive flexibility	3	5.71	43.31
7	Coordination				
7.1	Test “Tree”	Above average	1	11.43	
		Average	2	88.57	11.81
		Below average	3		88.19
7.2	Test “Rope”	Above average	1	10.00	
		Average	2	90.00	11.81
		Below average	3		94.49
7.3	Fine motor abilities (by Ozeretskiy’s test)	Fulfillment of test from first attempt	1	91.43	7.87
		Fulfillment of test from second attempt	2	8.57	81.10
		Test has not been fulfilled	3		11.02

When assessing visual analyzer we found that children with CI lagged behind healthy children by vision acuity and binocular vision. Posture disorders are evidences of muscular system’s weakening and general somatic weakness (by indices of posture and backbone vertical curve) as well as bent to platypodia (by index of foot arch). CI children’s physical qualities were characterized by low endurance of back muscles and insufficient flexibility.

The most expressed were disorders in coordination: no CI children could fulfill tests “Rope” and “Tree” at above average level. Most of them could not fulfill these tests at all or fulfilled at level “below average”. It witnesses about deep functional disorders in vestibular-cochlear apparatus. Fine motor abilities were regarded as preparation for writing. This indicator in CI children was also unsatisfactory: part of children could not fulfill Ozeretskiy’s test at all.

Index of MFS integral assessment was 1.44 ± 0.23 conv.un. (average level) in group of healthy children. These children physically are ready for school but they require consultations of appropriate specialists and application of correcting measures.

Result of calculation of MFS integral assessment index for CI children was 2.21 ± 0.15 conv.un. (low level) ($p < 0.05$ in respect to CG indicator). Such children physically are not ready for school. They require profound examination of specialists, working out individual rehabilitation programs, application of prophylaxis-correction measures. It proves the idea that such children shall endure psychological, audio-speech and intensive physical rehabilitation. Improvement of such children’s physical condition and functional parameters is impossible with the help of only pedagogic methodic.

Discussion

MFS reflects complex characteristic of organism's intra-systems' links and is regarded as a health marker. The level of certain progress of 5-6 years' age child's organism for systemic studying at school is the basis of health preservation. Readiness for school is determined by organism's psychic and morphological-functional condition, under which requirements of systemic studying will not be excessive and will not result in social-psychological adaptation failure and reduction of education effectiveness and child's health worsening [7]. So, the found in our research disorder in CI children health (if no their correction) can result in posture disorders, platypodia, eyesight worsening in the future. They can complicate mastering of writing and reading; result in disordering of other organs' functioning [3, 9].

The raised by us problem of CI children rehabilitation is closely interconnected with the data of domestic and foreign studies [9, 12, 16, 21].

Results, received in the process of our research, prove and supplement the data about lagging behind in physical and psych-motor development, in parameters of children's with hearing problems physical fitness, comparing with their healthy peers [2, 3, 6, 14].

CI children are, indeed, new contingent of physical rehabilitation. The obtained by us results are new approach to CI children rehabilitation as well as they are a substantiation of the fact that the worked rehabilitation programs shall be based on detected MFS disorders and assessed by a number of standard tests for entering comprehensive schools. The recommended means of physical rehabilitation are massage (for strengthening muscular system), kinesis-therapy (as independent (with parents) trainings and trainings with instructor).

The assumption about possibility of physical load's positive influence on physical development of children with hearing problems is based on the data of other researches. Their authors say that in such children physical activity reduces secondary disorders [2, 3 6].

As on the present time, in Ukraine there is no unified rehabilitation program for children with cochlear implants. In the list of recommendations of implants for post-operative rehabilitation producers only audio-speech correction is mentioned. No attention is paid to physical rehabilitation [8, 11, 18].

Pre-school age is characterized by quick growth of children's physical activity indicators. It is important for their complete development. That is why our rehabilitation program can reduce CI children's lagging behind in physical progress from their healthy peers. Such program facilitates quicker domestic and social rehabilitation at the account of widening of communication circle; mastering new actions and conceptions. Rehabilitation of such children shall be complex. Collective of specialists shall compulsory have a specialist in physical rehabilitation. It will permit to recreate deaf child as valuable member of society with normal hearing and normal physical condition. CI children's entering comprehensive school in proper time will improve their life quality; reduce psycho-emotional tension in their families and social-economic expenses of the state for their rehabilitation and their financial support.

Conclusions

Pre-school age children with cochlear implants lag behind their healthy peers by parameters of organism's morphological-functional state (indicators of physical and biological condition, visual analyzer; parameters of posture and feet arch; muscular system and coordination). All these make impossible such children's studying in comprehensive school and requires physical rehabilitation.

The prospects of further researches imply creation of physical rehabilitation programs for different age children after cochlear implantation.

Conflict of interests

The author declares that there is no conflict of interests.

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Information about the author:

Pysanko V.M.; <http://orcid.org/0000-0002-5117-7768>;
zastavnaolya@mail.ru; Institute of Otolaryngology; Str.
Zoological, 3, Kiev, 04119, Ukraine.

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SUBSTANTIATION OF TIME PERIODS OF INFORMATION TECHNOLOGIES' APPLICATION IN MINI-FOOTBALL TRAININGS OF UNIVERSITIES' FIRST AND SECOND YEAR GIRL STUDENTS

Tamozhanskaya A. V.

Kharkov State Academy of Physical Culture

Abstract. *Purpose:* substantiation of optimal time periods for girl students' active perception of learning material from electronic manual of mini-football. *Material:* in first stage 1st year girl students (n=22), participated; in second stage – 2nd year girl students (n=21). We determined time periods of manual material optimal perception by girl students. Indicators were registered with system "Polar Team System" and device for measurement of quasi-stationary cortex potential. *Results:* it was found that learning process is the most effective for 1st year girl students, if material is demonstrated during 20 minutes. 2nd year girl students perceive material the most effectively during 25 minutes. We determined quantitative indicators of heart beats rate, quasi-stationary potential of cortex and energy losses, which reflect girl students organism's reaction to mental loads. *Conclusions:* we substantiated time periods, during which it is necessary to apply computer means of learning in girl students' out of class trainings.

Key words: informational, computer, manual, pulse, reaction, girl students.

Introduction

At modern stage of higher education development application of information technologies has been becoming still more wide spread [2, 6, 10]. With it multimedia computer manuals, application of which substantially increase quality of material mastering, [1, 5, 8]; effectiveness of training of different sport games' techniques and tactic [3, 4, 7] are of certain interest. Among such works there are researches, devoted to mini-football [5, 17]. In some researches technology of electronic manuals' application for junior football players was grounded [5, 16]. In other researches the need in the following was described:

- Consideration of kinesthesia state in conditions of accuracy of differentiation of football players' muscular efforts [12];
- Consideration of training loads' correlation during competition period [20];
- Improvement of control over development of ball techniques' fulfillment quickness [13];
- Consideration of speed-power and explosive power influence on sportsmen's fitness [19];
- Formation of football players' ability to orient in conditions of complex motor functioning [18].

It was found that problem of modern information technologies' application in system of students' physical education system has been worked out insufficiently. On example of mini-football there were nearly no appropriate researches [9]. In our previous publications we noted that one of promising directions of girl students' health improvement was application of information technologies in out-of-class mini football trainings [9]. In other our researches it was shown the following:

- Possibility of application of specific and non specific mini football means' optimal correlation [22];
- Consideration of psychological factors in physical education classes [21, 23];
- Directions of youth's physical condition, physical development, physical fitness monitoring [24].

The mentioned above conditioned conduct of our own experimental researches.

Hypothesis of the research: it was assumed that study of heart beats rate parameters, quasi-stationary cortex potential and energy losses permitted to substantiate time periods of active multimedia manuals material perception by 1st and 2nd year girl students.

The purpose of the research: to conduct experiment for substantiation of time periods, during which 1st and 2nd year girl students master electronic manuals' material in the best way that ensure effectiveness of mini-football training.

Material and methods

Participants: in first stage 1st year girl students (n=22), participated; in second stage – 2nd years girl students (n=21). All girl students did not practiced mini-football before entering university. Every girl student gave written consent for participation in experiment.

Organization of the research: experiment took 4 months. At first stage we determined time periods of manual material's perception by 1st year girl students by topics: principles of selection, learning and training. At second stage we substantiated optimal time periods of work with multimedia manual for 2nd year girl students. These girl students already had one year mini-football experience. At every stage of the research we conducted 28 lessons in computer class room, each of them 45 minutes duration. Every lesson was divided into nine segments, 5 minutes each. During every of these segments we registered girl students' indicators, which reflected their reaction to material of manual. The indicators were registered with "Polar Team System" and device for measurement of quasi-stationary cortex potential. The following indicators were registered: heart beats rate, parameters of quasi-stationary cortex potentials, energy losses. By the idea of the research we mainly used materials of second chapter "Principles of football techniques' training" and third chapter "principles of game tactic training". Besides, the girl students were offered to pass testing after mastering certain portion of material.

Statistical analysis: statistical processing of material was realized on the base of Statistics 10.0 programs. Confidence of differences between samples' indicators was checked with Student's t-criterion (value was considered to be statistically significant at $p < 0.05$).

Results of the researches

In table 1 we present indicators of 1st year girl students in 68 cases. From table 1 it is seen that the highest indicators of information perception from electronic manual activity were registered in first 20 minutes of classes. Parameters of pulse frequency, quasi-stationary cortex potential and energy losses point at activation of girl students' workability just in this time period. During first 20 minutes, in every 5 minutes of classes we registered the highest value of heart beats rate ($84.7 \pm 1.3 \text{ bpm}^{-1}$), quasi-stationary cortex potential ($61.7 \pm 0.59 \text{ conv.un.}$) and energy losses ($13.5 \pm 0.21 \text{ kcal.}$). Every next 15 minutes of looking through learning material were followed by insufficient reduction of the studied parameters.

From 5th to 10th minutes heart beats rate was $81.5 \pm 1.31 \text{ bpm}^{-1}$, parameters of quasi-stationary cortex potential – $60.8 \pm 0.54 \text{ conv.un.}$ and energy losses – $13.1 \pm 0.19 \text{ kcal.}$

Table 1. Characteristics of heart beats rate, quasi-stationary cortex potential and energy losses of 1st year girl students, registered during mastering multimedia manual's material

Time periods, min.	Dynamic of parameters, reflecting activity of information perception by 1 st years girl students					
	Heart beats rate, bpm^{-1} (n=68)		Quasi-stationary cortex potential, conv.un. (n=68)		Energy losses, kcal. (n=68)	
	\bar{X}	m	\bar{X}	m	\bar{X}	m
0 – 5	84.7	1.34	61.7	0.59	13.5	0.21
5 – 10	81.5	1.31	60.8	0.54	13.1	0.19
10 – 15	80.9	1.29	59.9	0.51	12.4	0.17
15 – 20	79.7	1.27	58.5	0.48	11.9	0.16
20 – 25	70.5	1.24	41.3	0.40	8.4	0.14
25 – 30	68.3	1.23	40.6	0.39	7.7	0.13
30 – 35	67.9	1.15	39.4	0.37	6.9	0.12
35 – 40	67.6	1.18	38.9	0.35	5.6	0.11
40 – 45	67.4	1.11	38.4	0.34	5.5	0.10

Time period from 10th to 15th minutes was characterized by the following: heart beats rate – 80.9±1.29 bpm⁻¹, quasi-stationary cortex potential – 59.9±0.51 conv.un., energy losses – 12.4±0.17 kcal. From 15th to 20th minutes we registered the following values: heart beats rate – 79.7±1.27 bpm⁻¹, quasi-stationary cortex potential – 58.5±0.48 conv.un., energy losses – 11.9±0.16 kcal. From 20th minute we observed sharp confident reduction (p<0.05) of indicators of psychic workability resources' mobilization and mental activity of 1st year girl students. I.e. time period from 20th to 25th minutes was characterized by the following parameters: heart beats rate – 70.5±1.24 bpm⁻¹, quasi-stationary cortex potential – 41.3±0.40 conv.un., energy losses – 8.4±0.14 kcal. In time period from 25th to 30th minutes indicators of heart beats rate were 68.3±1.23 bpm⁻¹, quasi-stationary cortex potential – 40.6±0.39 conv.un. and energy losses – 7.7±0.13 kcal. From 30th to 35th minutes we registered the following: heart beats rate – 67.9±1.15 bpm⁻¹, quasi-stationary cortex potential – 39.4±0.37 conv.un. and energy losses – 6.9±0.12 kcal. Time period from 35th to 40th minutes was characterized by the following: heart beats rate – 67.6±1.18 bpm⁻¹, quasi-stationary cortex potential – 38.9±0.35 conv.un., energy losses – 5.6±0.11 kcal. As we can see in table 1 the highest decrease of pulse, quasi-stationary cortex potential and energy losses was observed during last five minutes of work in computer class. It witnesses about weakening of their ability to master electronic manual's material. For example, during the mentioned time period we registered the following indicators: heart beats rate – 67.4±1.11 bpm⁻¹, quasi-stationary cortex potential – 38.4±0.34 conv.un., energy losses – 5.5±0.1 kcal.

Results of the research point that the most optimal time period for application of multimedia manuals for 1st year girl students' mini-football training is first 20 minutes of classes.

The second stage of experiment envisaged analogous researches. They involved 21 girl students of 2nd year, who already had one year experience³⁴ of mini football training. In table 2 we present results of 2nd year girl students in 64 cases. In the process of one-year experiment we determined that 2nd year girl students perceive computer manual's material most actively during first 256 minutes of lesson in computer class room. Activation of their mental workability just in this time period is witnessed by registered quantitative indicators of pulse frequency, quasi-stationary cortex potential and energy losses. For example, during first five minutes of looking through learning material heart beats rate was, in average, 84.5±1.37 bpm⁻¹, quasi-stationary cortex potential – 62.4±1.05 conv.un., energy losses – 13.8±0.22 kcal.

Table 2. Characteristics of heart beats rate, quasi-stationary cortex potential and energy losses of 2nd year girl students, registered during mastering multimedia manual's material

Time periods, min.	Dynamic of parameters, reflecting activity of information perception by 1 st years girl students					
	Heart beats rate, bpm ⁻¹ (n=68)		Quasi-stationary cortex potential, conv.un. (n=68)		Energy losses, kcal. (n=68)	
	\bar{X}	m	\bar{X}	m	\bar{X}	m
0 – 5	84.5	1.37	62.4	1.05	13.8	0.22
5 – 10	81.0	1.33	61.3	0.57	13.3	0.20
10 – 15	79.8	1.25	60.8	0.55	12.5	0.19
15 – 20	79.3	1.23	60.2	0.51	12.0	0.18
20 – 25	78.9	1.20	59.4	0.47	11.0	0.17
25 – 30	69.0	1.19	40.9	0.37	7.8	0.14
30 – 35	68.7	1.15	39.5	0.36	7.0	0.13
35 – 40	67.3	1.12	39.0	0.34	5.4	0.12
40 – 45	67.1	1.09	38.9	0.31	5.2	0.11

It was found that just the mentioned average quantitative indicators of 2nd year girl students were the highest during all experiment. At the same time, during every first 25 minutes of classes we did not register confident differences ($p < 0.05$) between studied parameters in adjacent time periods. It was determined that rather high mobilization level of psychic workability was observed during first 5 minutes and during following 20 minutes of every lesson. For example, from 5th to 10th minutes of lesson we registered the following: heart beats rate – $81.0 \pm 1.33 \text{ bpm}^{-1}$, quasi-stationary cortex potential – $61.3 \pm 0.57 \text{ conv.un.}$, energy losses – $13.3 \pm 0.20 \text{ kcal}$. Time period from 10th to 15th minute was characterized by insufficient reduction of heart beats rate ($79.8 \pm 1.25 \text{ bpm}^{-1}$), quasi-stationary cortex potential ($60.8 \pm 0.55 \text{ conv.un.}$) and energy losses ($12.5 \pm 0.19 \text{ kcal}$). In time period from 15th to 20th minutes we also registered insignificant worsening of information perception's activity: heart beats rate - $79.3 \pm 1.23 \text{ bpm}^{-1}$, quasi-stationary cortex potential – $60.2 \pm 0.51 \text{ conv.un.}$, energy losses – $12.0 \pm 0.18 \text{ kcal}$. The same tendency was registered in period from 20th to 25th minutes: heart beats rate – $78.9 \pm 1.20 \text{ bpm}^{-1}$, quasi-stationary cortex potential – $59.4 \pm 0.47 \text{ conv.un.}$ and energy losses – $11.0 \pm 0.17 \text{ kcal}$. Starting from 25th minute we observed sharp reduction ($p < 0.05$) of 2nd year girl students' mental workability. Time period from 25th to 30th minutes was characterized by the following indicators: heart beats rate – $69.0 \pm 1.19 \text{ bpm}^{-1}$, quasi-stationary cortex potential – $40.9 \pm 0.37 \text{ conv.un.}$, energy losses – $7.8 \pm 0.14 \text{ kcal}$. From 30th to 35th minutes we registered the following parameters: heart beats rate – $68.7 \pm 1.15 \text{ bpm}^{-1}$, quasi-stationary cortex potential – $39.5 \pm 0.36 \text{ conv.un.}$, energy losses – $7.0 \pm 0.13 \text{ kcal}$. From 35th to 40th the values were as follows: heart beats rate – $67.3 \pm 1.12 \text{ bpm}^{-1}$, quasi-stationary cortex potential – $39.0 \pm 0.34 \text{ conv.un.}$ and energy losses – $5.4 \pm 0.12 \text{ kcal}$. By results of the conducted experiment the highest reduction of activity of information perception by girl students was found in last five minutes of work with manual: heart beats rate – $67.1 \pm 1.09 \text{ bpm}^{-1}$, quasi-stationary cortex potential – $38.9 \pm 0.31 \text{ conv.un.}$ and energy losses – $5.2 \pm 0.11 \text{ kcal}$.

Analysis of the research's materials (2nd year girl students) showed that the highest effectiveness of mini-football training with the help of electronic manuals is ensured during 25 minutes. Just in this period of time there is activation of mental workability of girl students with one year experience of mini-football practicing that is proved by registered indicators of heart beats rate, quasi-stationary cortex potential and energy losses.

Discussion

In our opinion demand in substantiation of certain technology of electronic manuals application in training of 1st and 2nd year girl students to mini football has already been formed. Existence of such demand is conditioned by a number of factors. First: application of manuals ensures qualitative demonstration of new techniques [11, 14, and 15]. Thus, in the process of looking though girls students acquire idea about some or another technique and realization of visual perception is ensured [7, 10]. In condition of parallel application of other method (method of ideomotor training, when seen exercise is "processed" in thoughts before its fulfillment) the quality of training process significantly increases. Second: on this basis more effective mastering of knowledge by students is stipulated. Because it is of common knowledge that qualitative theoretical training is one of factors of effective sport training in general [16].

There is another factor, connected with application of informational technologies. It conditions studying of girl students organism's reactions to mental loads. It is of common knowledge that up to the present time only fragmentary researches of activity of information perception from computer manuals have been fulfilled [1, 5]. With it, it is also known that registration and application of appropriate characteristics permit to ensure individual approach in trainings' planning and conditions effectiveness of training process's control [7, 9].

Separately it should be noted that existence of the determined time periods for application of multimedia manuals in the process of girl students' training to mini-football is conditioned by age characteristics of girls' psyche. This fact is proved also by other researches [4, 9].

Conclusions

1. Analysis of literature sources, questioning of leading coaches, sportsmen, teachers and students showed that the problem of modern information technologies' application in system of students' physical education has been worked out only fragmentary. One of ways of this problem solution is determination of optimal time periods for computer manuals' usage in out-of-class trainings that can ensure higher effectiveness of girl students' training to mini-football.

2. Pedagogic experiment permitted to find optimal time periods of multimedia learning means' application by girl students. For example, it was determined that 1st year girl students the most actively perceive material of electronic manuals during 20 minutes and 2nd year girl students – during 25 minutes.

3. Materials of the research permitted to substantiate quantitative indicators of heart beats rate, quasi-stationary cortex potential and energy losses, which reflect reaction of girl students' organism to mental loads in work with electronic manual. Such indicators can be used for control over effectiveness of computer learning means' application in mini-football trainings.

The prospects of further researches shall be connected with substantiation of volumes of information technologies' application in annual cycle of university girl students' mini-football trainings.

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Information about the author:

Tamozhanskaya A. V.; <http://orcid.org/0000-0003-2430-8467>;
kulichka79@ukr.net; Kharkov State Academy of Physical
Culture; Klochkovskaya str. 99, Kharkov, 61022, Ukraine.

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TRAINABILITY OF BODY COMPOSITION, AEROBIC POWER AND MUSCULAR ENDURANCE OF CADET WRESTLERS

Bahman Mirzaei¹, Farhad Rahmani-Nia¹, Navid Lotfi², Seyed Mohammad Nabati³

¹Professor of Exercise Physiology, Department of Exercise physiology, Faculty of Physical Education and Sport Sciences, University of Guilan, Rasht, Iran

²PhD in Exercise Physiology, Department of Exercise physiology, Faculty of Physical Education and Sport Sciences, University of Guilan, Rasht, Iran

³MSc, Department of Physical Education, Ghorveh Branch, Islamic Azad University, Ghorveh, Iran

Abstract. *Purpose:* The purpose of the present study was to investigate the trainability of body composition, aerobic power and muscular endurance of cadet wrestlers. *Subjects:* Fifteen cadet wrestlers (age: 15.20±0.94 years) participated in this study. *Methods:* The testing was conducted twice, before and after four-week training period. The physiological parameters included aerobic power, muscular endurance and body composition. *Results:* A significant decrease in the body fat was observed following the training ($P < 0.05$). No significant changes were found in the weight, aerobic power and muscular endurance measures ($P > 0.05$). *Conclusion:* Our results indicated that wrestlers experienced significant changes in their body fat percentage during four-week training period. Cadet wrestlers' aerobic power, muscular endurance and body composition are trainable, although these improvements may be less than what has been observed in junior and senior wrestlers.

Key words: cadet, wrestling, conditioning, periodization.

Introduction

Wrestling is one of the heaviest combat sports and wrestlers need to have a high level of physical, mental, technical and tactical preparation. Frequent changes in wrestling rules during last ten years, especially rules related to duration of competition has exposed various physiological requirements of this Olympic sport with a lot of challenges including interference of aerobic and anaerobic energy systems, recovery between two competitions and measuring and evaluating physical fitness factors [13]. The factor that makes this matter more complicated is considering wrestling as a sport which need weight classification.

One challenge that has attracted attention of sport coaches and specialists is identification of the physical and biological factors that affect participants' performances. Talent identification in the fields of sport, selecting young athletes who have high capacity in different sports can contribute considerably to championship achievements through spending the least amount of time and the lowest amount of the budget at the same time [20]. After identifying the talented athlete with the related potentiality, applying proper preparation and training programs are required. Sport specialists and coaches can get useful information by using fitness tests to evaluate their current conditions and identifying the type of the physical capacities of the elite athletes [14]. In addition for setting criteria to compare other with athletes, this information helps to identify their weaknesses and strengths and provides operational strategies for designing training.

Sensitivity of adolescence age is an important factor in the one hand and the lack of the proper related knowledge of the coaches on the other hand encounter the adolescents with a lot of risks and dangers [19]. The researchers have demonstrated that adolescents are not young adults and it's not reasonable to do the same amount and type of exercises with the lower intensity [10]. Lack of adequate knowledge to prepare young athletes and lack of coaches' attention to specific characteristics of adolescents prevents them from achieving success and directs them to the irreversible path of fatigue and injury at the same time. The matter which is often ignored is the physical development and maturation of these adolescents. Adolescents' bodies have enough capacity to respond even to wrong exercises and trainings. For adolescence championship in is not so important and is not the main goal in many developed countries and based on some researches championship programs need 8 to 10 years of training [3], but many coaches ignore this important fact and they try to make athletes a champion in wrestling through applying unsystematic training and unfortunately they are sometimes called successful coaches. Today, it has been found that these exercises

put the athletes at risk of health problems. Although through proper training, cadet wrestlers can be successful considerably, this success is temporary and does not last for a long time and sometimes the athlete is forced to give up wrestling because of improper training programs chosen by some coaches.

The studies relates to physiological characteristics and physical capabilities of the wrestlers and has demonstrated that physical fitness is the basis for training programs and wrestlers' success, and it has been noted that each wrestler should be exercised only with a certain percentage of his aerobic and anaerobic capacities [11]. Arabaci and Canakya (2000) investigated the effects of the training program on some physiological parameters in young wrestlers and have reported significant increase in the strength, aerobic capacity, flexibility and the anaerobic power of the wrestlers who regularly participate in the preparation period compared to those who received no training [1]. Buford et al (2006) have studied the impact of competition season on body weight, hydration and muscle performance of college wrestlers. They have reported significant increase in body weight and muscular performance of wrestlers at the end of competition season [5]. In another study, Buford et al (2008) have reported that 2.9 % increase in the amount of body fat before and after the season [6].

Published information about cadet wrestlers is limited. Wrestling training recently has been started systematically in very countries and it means that coaches are not familiar enough with the periodization of training and with factors influencing wrestling. Also, to identify the time required to effectiveness of wrestling training on physical fitness factors, the purpose of present study was to investigate the trainability of body composition, aerobic power and muscular endurance of cadet wrestlers.

Methods

Subjects

Fifteen cadet wrestlers were recruited from wrestling clubs in Iranian province of Kurdistan and served as objects in this study. They all had at least 3 years training experience and were representative of the top wrestlers of Kurdistan competing in national competitions. Before participating, the subjects' parents were informed of the potential risks and gave their written informed consent for their children to participate in this study, which was consistent with the human subject policy of the Guilan research center. Subject characteristics were as follows (mean \pm SE): age (15.20 \pm 0.94 yr); height (169.07 \pm 8.38 cm); and weight (47.69 \pm 13.86 kg).

Training program

The exercise program consisted of 28 sessions (2 sessions of combat (live) wrestling, 1 session reviewing and practicing techniques, 2 sessions of interval running, 1 session of endurance training and 1 session of power training each week). Due to the possible risk of weight training for adolescent athletes, wrestling specific exercises using body weight was employed in the strength training. Between any two exercise sessions enough time was given for adequate recovery. In general, the training emphasized cardiovascular endurance and muscular strength factors.

Table 1. Weekly training program

Days	AM	PM
Monday	Interval running	off
Tuesday	off	review of techniques
Wednesday	Interval running	Power training
Thursday	off	Combat wrestling
Friday	off	off
Saturday	off	Endurance training
Sunday	off	Combat wrestling

Testing procedures

The testing was conducted twice, before and after 4-week training period. Physiological parameters included cardiovascular endurance, muscular endurance and body composition. Subcutaneous body fat was measured at 3 sites (chest, abdominal and thigh) with a Lafayette caliper. Body fat percentage was calculated with the formula developed by Jackson & Pollock (1978) [9]. Height and weight were also recorded.

12 minute run test was used to estimate VO₂max. After warm up, the object runs as far as possible during 12 minutes. Tester records distance covered (kilometers, and meters). VO₂max was assessed by the following formula: VO₂max = (22.351 × kilometers) - 11.288 [7].

A pull-up test (with palms facing the subject) was used to assess muscular endurance and a 1-minute bent-knee sit-up test was used to assess abdominal muscular endurance. The bent-knee sit-up test required object to lock at his hands behind his head and touch his elbows to the thigh with a partner holding his ankles [15]. The testing was completed in three days in standardized order to allow adequate recovery [16]. Coaches and teammates provided verbal encouragement throughout each test.

Statistical methods

All descriptive data are expressed as means ± SD. The obtained results were analyzed using paired-samples t-test, to compare the two stages of preparation ($P \leq 0.05$). Statistical analysis was conducted using SPSS 16.0 for Windows.

Results

The values of body composition (weight and body fat), muscular endurance and aerobic capacity are presented in Table 2.

Table 2. Body composition, aerobic capacity and muscular endurance of the subjects before and after four-week preparation

	Body Weight	Body Fat (%)	VO₂max	Sit-up	Pull-up
Pre-test	47.69±13.86	6.25±2.10	42.79±7.03	45.66±6.21	16.53±9.60
Post-test	51.42±7.87	5.08±2.13	44.98±7.21	48.53±5.24	18.66±10.93
t	t=-1.12	7.16	-2.38	-1.69	-2.54

The results showed that body fat percentage of the objects decreased significantly after 4 week wrestling training ($P < 0.05$). Also, the result showed that body weight of the subjects decreased after 4 week wrestling training and this change was statistically significant ($P < 0.05$).

The results of muscular endurance showed that the number of the sit-ups test increased after 4 week wrestling training, but this change was not statistically significant ($p > 0.05$). Also, the result of chin-ups in the post test increased comparing with the pre-test measurements but the differences were not significant ($p > 0.05$). Maximal oxygen uptake (VO₂Max) as an aerobic capacity index increased after 4 week wrestling training, but this change was not statistically significant ($p > 0.05$).

Discussion

Measuring body fat in the untrained participants has been studied frequently and its importance in wrestling has also been considered even more. Coaches have always considered weight loss in wrestling as a main concern in the process of improving the wrestlers' performances. Fat loss after endurance training has been well accepted [3]. Also it has been indicated that body composition can have a significant effect on physiological responses [2]. In the present study, the body fat percent of the cadet wrestlers have significantly decreased after four weeks of training which is probably the result of the endurance training sessions.

A significant decrease in the body fat after endurance training is consistent with Rahimi (2006) and Fathi et al., (2009) [8, 17]. They have reported that physical activity has an effect on the body composition. The results are also consistent, with the Baer et al (1983) and Arabaci & Çankaya (2000) studies on young wrestlers [1, 2]. In contrast, Shriver et al (2009) have reported that wrestles cannot change their body fat percentage during the period of preparation [18]. This is probably due to the age of subjects and the exercise protocol.

Also, there has been a slight increase in body weight comparing with the pre-test data. It seems that slight increase in body weight is probably due to the lack of power training in preparation program (4 sessions). It should be noted that during wrestling training, performing many techniques such as reverse lift may also be considered as a part of power training.

In the present study, aerobic capacity of objects increased. However, this increase was not statistically significant. It seems that, four weeks training is not a sufficient time to make significant increase of $VO_2\max$. This result is consistent with the results of Matos & Winsley (2007) [10]. They have reported that adolescents like adults can improve their aerobic capacity through endurance exercises. In contrast, Arabachi and Canakya (2008) have reported a significant increase of aerobic capacity in cadet wrestlers [1]. This is probably due to differences in training protocol, object's fitness level and training duration. There was no significant increase in the muscle endurance (sit-up and pull-up tests).

In contrast, Arabachi and Çanakya (2008) have reported a significant increase of upper body endurance [1]. This difference may be the result of using different tests to estimate the muscular endurance, preparation phase and fitness levels of the objects. According to recent changes in wrestling rules, it seems that in wrestling, endurance and aerobic capacity are less important comparing with anaerobic capacity. Of course, this does not mean that aerobic exercises should be removed from the fitness (preparation) schedules of wrestlers. Through well-designed and scheduled exercises, wrestlers can control their weights, and also this could be involved in faster and better recovery of wrestlers between two heavy training sessions or two wrestling matches. On the other hand, high aerobic capacity index ($VO_2\max$) in wrestlers will guarantee their faster recovery during competition [12].

However, no significant increase was observed in muscular endurance based on test results. It seems that aerobic capacity factor and muscular endurance have less trainability (need more practice) and require more than four weeks training to have a significant increase. Accordingly, wrestling coaches are recommended to start endurance training sooner and put more emphasis on it.

Conclusion

In general, although a lot of factors including skill, mental, genetic and other fitness factors render some influences on a wrestler's success, improvement of physical fitness plays an important role in championship. Based on results of the present study more time is needed to improve muscular and cardiovascular endurance, therefore wrestling coaches and trainers are recommended to pay special attention to these factors. It is recommended that similar studies done on more objects and other fitness factors that influencing the success of athletes.

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Information about the authors:

Bahman Mirzaei; Professor of Exercise Physiology; <http://orcid.org/0000-0002-4615-7295>; bmirzaei2000@yahoo.com; University of Guilan; Khalij Fars highway, 5th kilo meter of Ghazvin road, Postal Code 4199613776, Rasht, Iran.

Farhad Rahmani-Nia; Professor of Exercise Physiology; <http://orcid.org/0000-0001-7021-0060>; frahmani2001@yahoo.com; University of Guilan; Khalij Fars highway, 5th kilo meter of Ghazvin road, Postal Code 4199613776, Rasht, Iran.

Navid Lotfi; PhD in Exercise Physiology; <http://orcid.org/0000-0002-1366-5058>; navid_lotfi2008@yahoo.com; University of Guilan; Khalij Fars highway, 5th kilo meter of Ghazvin road, Postal Code 4199613776, Rasht, Iran.

Seyed Mohamad Nabati; MSc; <http://orcid.org/0000-0003-3756-8612>; mohamad9208@yahoo.com; Ghorveh Branch, Islamic Azad University; Janbazan Sq, Ghorveh, Iran.

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CONTACT INFORMATION

box 11135, Kharkov-68, 61068, Ukraine

phone. 38-099-430-69-22

<http://www.sportpedagogy.org.ua>

e-mail: sportart@gmail.com

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