ORIGINAL ARTICLE

Indicators of speed and strength abilities of young fencers 12-13 years old

Olena Nesen[ABCDE], Viktoriia Klimenchenko[ABDE]

H. S. Skovoroda Kharkiv National Pedagogical University, Ukraine

Author contributions: A - Study design; B - Data collection; C - Qualitative analysis; D - Manuscript preparation; E – Funds Collection

Abstract

Background and Study Aim: The health of a young athlete in the early stages of training is a mandatory element of the training process. This is a guarantee of the integrity of the process of training athletes for the next stage of preliminary basic training. The purpose of the study is to determine the indicators of speed and strength qualities of young fencers 12-13 years old at the stage of initial training.

Material and Methods: Fencers (n=13, age – 12-13 years, sports experience – 3 years) took part in the study. The children's parents agreed to participate in the study. The following tests were used: speed of overcoming the distance of 14 meters by fencing steps forward in the on-quard position, seconds; speed of overcoming distance of 14 meters by fencing steps back in the on-quard position, seconds; hits on the target in 10 seconds, the number of times; "Standing Long Jump Test", cm; "Vertical Jump Test", sm. The computer program Excel was used: the indicators of arithmetic mean and standard deviation were determined. Correlation analysis was performed to identify relationships between the results of athletes' control standards. Statistical reliability was determined by Student's t test.

Results: A sufficient level of development of speed and strength abilities for fencers of this age and qualification has been established. The relationship between the speed and strength of the muscles of the upper and lower extremities in young fencers was observed.

Conclusions: The selected content and load of athletes fully meet the objectives of training. This is emphasized by the steady development of speed and strength abilities of athletes during fencing.

Keywords: level of development, specific movements, health.

Introduction

Fencing is not only a rapid change of position and well-coordinated movements of the dominant hand, but also fast movements and good physical training. These elements are required to perform technical and tactical techniques and achieve high sports results. In humans, the ability to speed is laid down genetically. The speed and mobility of nervous processes in 12-13 year old athletes reaches the level of an adult. Therefore, the improvement of speed and power qualities is an important factor in achieving a high level of capabilities in the most favorable periods of age development of the organism.

Another important component of the content of training in the initial stages of training is to take into account the level of load and their impact on the health of young athletes. Chacon-Cuberos et al. [1] believe that exercise for school-age children should be with adequate parameters of volume and intensity of physical activity. Calvo-Munoz et al. [2] recommend the introduction of observation periods and rigorous methods that take into account the duration of physical activity and physical performance of each subject. Another study evaluated the reactions of the cardiorespiratory functional system of boys aged 7-9 years when performing exercises in a wide range [3]. The authors attach special importance to the scientific substantiation of the normalization of children's motor activity. It is also noted that it is necessary to take into account the peculiarities of functional changes in the body of children when performing dosed muscle work. Seisenbekov et al. [4] calculated values of morphofunctional indicators for age groups used in sports practice as criteria for assessing the physical condition of athletes. Another study [5] recommends taking into account the level of individual somatic health of children, which leads to a safe zone of intense physical activity.

Improving the system of training young fencers requires finding and justifying new forms of organization of the training process on the basis of modern scientific achievements. Physical training in fencing is one of the most important components of sports training. It depends on a quick start, maneuvering on the fencing track, a long wait for a successful moment of attack and the ability to immediately make the right decisions.

Shubert [6] argues that the basis for improving athletic skills is the proper level of physical fitness of fencers. The better the health of the fencer, the more advanced the musculoskeletal system, the more opportunities open up for him in mastering

© Olena Nesen, Viktoriia Klimenchenko, 2022
doi:10.15561/health.2022.0104

complex fencing movements. Of particular importance is the level of development of speed and power qualities. The author emphasizes that the athlete gains even more confidence in their abilities during the training process and participation in responsible competitions.

Some experts [7-9] recommend in the training of athletes to follow certain approaches to the development of speed and strength. The authors recommend the use of local exercises. This makes it possible to increase the level of development of a particular muscle group. This often increases the volume of muscle fibers. According to Pitin [10], the role of muscle diameter in fencing is small. The author notes that the level of manifestation of speed force depends on the degree of mastery of movements: the higher the technique of movement, the more effective intermuscular and intramuscular coordination, more rational dynamic, spatial and temporal characteristics of movement.

Effective work on the development of speed force is associated with the integrated use of various methods, means of strength training, simulators, special equipment. An experienced coach relies on practical knowledge. He finds certain means of training athletes that are best suited for each individual. But at any stage of improving speed and strength qualities it is necessary to follow the recommended sequence and intensity of exercises.

According to Kriventsova [8], training at least 6 hours a week is an important condition for success. The authors note the need for proper assembly of sets of exercises, which will increase the percentage of efficiency of the athlete.

In the above aspects, it is important to: adjust the training process; identify shortcomings in the development of physical and psychological qualities of athletes. All this helps the coach to implement routine testing in training in accordance with the programs of children's and youth sports schools [11].

The purpose of the study is to determine the indicators of speed and strength qualities of young fencers 12-13 years old at the stage of initial training.

Material and methods

Participants.

Fencers (n = 13, age - 12-13 years) took part in the study. All athletes had 3 years of sports experience. The children's parents agreed to participate in the study. This study was approved by the University's Bioethics Committee and conducted in accordance with the Declaration of Helsinki.

Research design.

Classes in the group were conducted in accordance with the curriculum of sports schools [11]. The main tasks of the training process: health promotion, development of physical qualities, learning the basics of fencing techniques and tactics. Weekly lesson plan: 5 lessons of 2 hours – that is 10 hours per week and 508 training hours per year.

Testing of physical abilities was conducted after a warm-up for two days at the end of the school year.

The following tests were used:

- "Steps forward" - the speed of overcoming the distance of 14 meters fencing steps forward in the on-quard position, seconds (fig 1);
- "Steps backward" - the speed of overcoming the distance of 14 meters fencing steps back in the on-quard position, seconds;
- "Hit the target" in 10 seconds, number of times (fig. 2);
- "Standing Long Jump Test", cm (fig. 3);
- "Vertical Jump Test", sm (fig. 4).

Statistical analysis.

The computer program Excel was used: the indicators of arithmetic mean and standard deviation were determined. Correlation analysis was performed to identify relationships between the results of athletes' control standards. Statistical reliability was determined by Student's t test.

Results

The results of tests of fencing in comparison with the control requirements of the curriculum [3] are shown in Table 1. It was found that the results of athletes were at a high level and corresponded to the results of transferring athletes to the next group of basic training.

It should be emphasized that the difference in the result of overcoming the distance of 14 meters in the fighting stance steps forward and backward had no statistical significance ($t = 1.89$ at $p > 0.05$). This fact may be evidence of the uniform mastery of athletes in these movements on the track.

Table 2 shows that there is a high degree of positive relationship between forward and backward indicators ($r = 0.91$). The results of the "Vertical Jump Test" and the "Standing Long Jump Test" showed a medium degree of correlation ($r = 0.89$). Between the results of tests with jumps ("Vertical Jump Test", "Standing Long Jump Test") and the results of tests with steps ("Steps forward", "Steps back") traced the average degree of relationship ($r = -0.42 – -0.88$). There is a medium to a high degree of correlation between the "Hit the Target" tests and the results of the step tests ("Steps Forward", "Steps Backward") ($r = -0.74, -0.95$, respectively). A close and medium degree of correlation ($r = 0.94, 0.72$, respectively) was established between the "Hit the Target" and the "Vertical Jump Test" and the "Standing Long Jump Test".

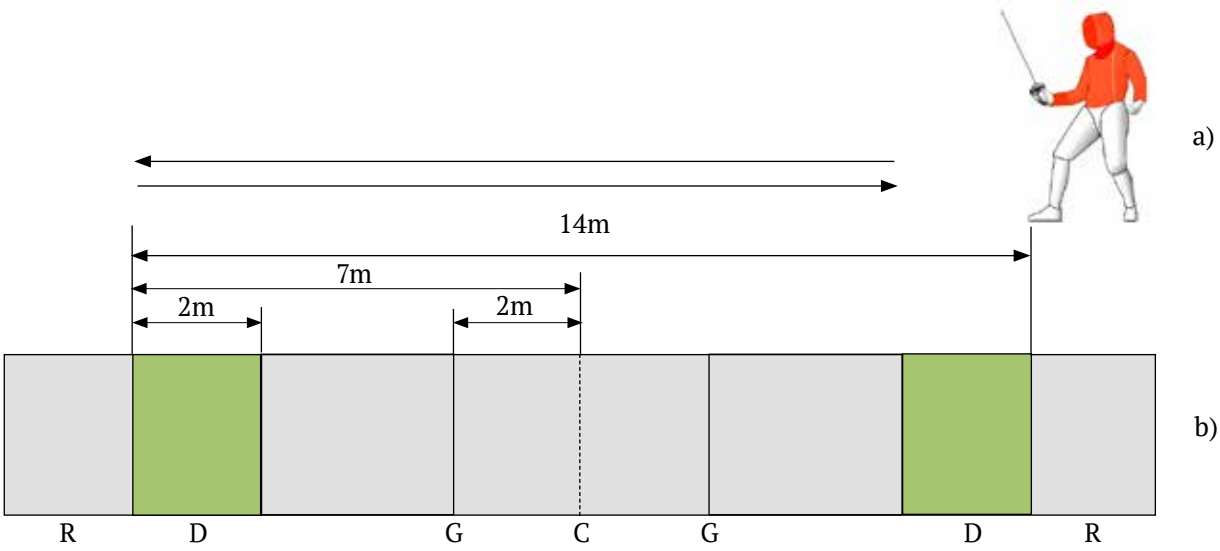

Figure 1. a) Targets (shaded areas) and on-quard position [12]; b) Fencing strip: C = center line; G - guard line; D = last two meters zone.

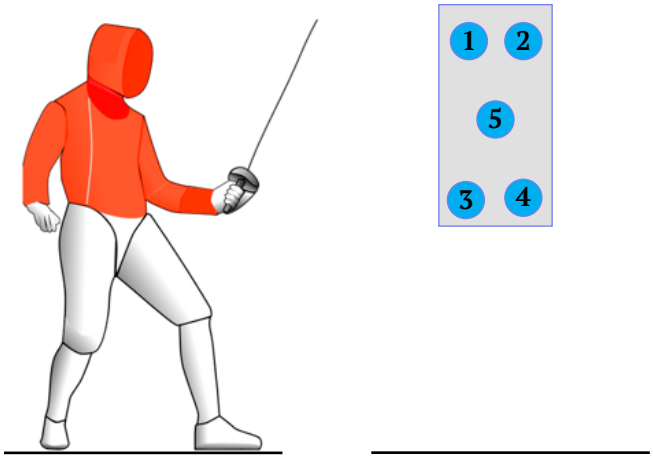

Figure 2. "Hit the target" in 10 sec., number of times: a) on-quard position [12]; b) Target.

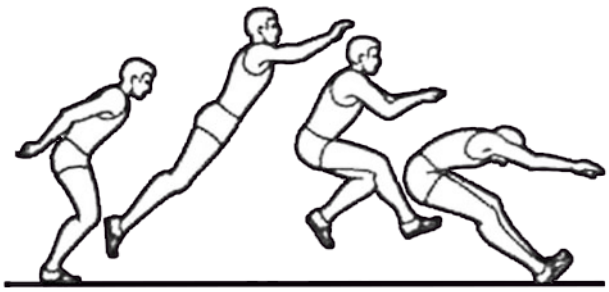

Figure 3. Standing Long Jump Test [13]

Figure 4. Vertical Jump Test [14]

Table 1. Indicators of speed and power abilities of fencers aged 12-13 years (n = 13)

Statistical indicators	Tests				
	Steps forward, sec.	Steps backward, sec.	Hit the target», number of times	Standing Long Jump Test, sm	Vertical Jump Test, sm
$\bar{X}$	4.95	5.87	50.75	176.25	34.25
σ	0.90	1.43	2.75	30.90	6.08

Table 2. Correlations of speed and power abilities of young saber players

Indicators	Standing Long Jump Test, sm	Vertical Jump Test, sm	Steps forward, sec.	Steps backward, sec.	«Hit the target» in 10 seconds, number of times
Standing Long Jump Test, sm	-				
Vertical Jump Test, sm	0.899	-			
Steps forward, sec.	-0.697	-0.427	-		
Steps backward, sec.	-0.885	-0.607	0.909	-	
«Hit the target» in 10 seconds, number of times	0.948	0.722	-0.747	-0.954	-

Discussion

Many authors point out the important role of individual physical abilities for fencers. Poliszczuk et al. [15] emphasize the importance of developing a speed of response to both auditory and visual stimuli. Norjali et al. [16] focuses on the study of motor coordination in athletes of different qualifications. Şahin et al. [17] indicate that aerobic and anaerobic abilities of athletes, lower body flexibility, reaction speed and coordination skills play an important role in fencing. Petronijevic et al. [18] emphasizes the role of speed in the work of the fencer's hands. Turner et al. [19] substantiate the need for fencers to develop strength and coordination skills. The authors recommend explosive training. Pavel et al. [20] reveal close correlations between the level of development of physical qualities of fencers and their technical and tactical skills. We fully agree with the above recommendations of the authors regarding the areas of decision-making control over the development of physical qualities of fencers.

Şahin et al. [17], Turner [21] confirm the relevance of assessing the level of development of individual physical abilities of fencers for effective and timely correction of the training process. We agree with the authors and therefore this fact is made in the preconditions of our study.

Turner et al. [19] emphasize that in fencing, the analysis of the training of athletes must be conducted taking into account the requirements of competitive activities. The authors recommend assembling test batteries and systematically determining the various aspects of fencing training. The same view is shared by Weichenberger et al. [22]. The authors propose a new test to determine the endurance of fencers. The need to emphasize that tests to assess the physical abilities of athletes must be clearly consistent with the specifics of competitive activities.

The results of the "Standing Long Jump Test" in our study are similar in value to the results of other authors [16, 23]. The authors also point out that timely determination of fencing strength will make it easier for the coach to identify the most trained athletes.

Şahin et al. [17] give quantitative values of vertical jumps of Turkish fencers aged 12-13 years lower than those obtained by us. It should be noted that in the author's study there was no distribution of the contingent of the study by gender of a certain age. Therefore, we can assume that taking into account the gender of athletes, the results will be similar to the results of our study.

Conclusions

The selected content and load of athletes fully meet the objectives of training. This fact is emphasized by the steady development of speed and strength abilities of athletes during training. High correlations between the results of individual test exercises allow us to recommend reducing the number of test exercises in subsequent studies. So, it will be enough to choose one test: steps on the track in the battle post forward or backward; jump up from a place or long jump from a place.

Conflict of interests

The authors declare there are no competing interests.

References

1. Chacon-Cuberos R, Zurita-Ortega F, Ramirez-Granizo I, Castro-Sanchez M. Physical Activity and Academic Performance in Children and Preadolescents: A Systematic Review. *Apunts Educacion Fisica Y Deportes*. 2020(139):1–9. https://doi.org/10.5672/apunts.2014-0983.es
2. Calvo-Munoz I, Kovacs FM, Roque M, Seco-Calvo J. The association between the weight of schoolbags and low back pain among schoolchildren: A systematic review, meta-analysis and individual patient data meta-analysis. *European Journal of Pain*. 2020;24(1):91–109. https://doi.org/10.1002/ejp.1471
3. Krutsevich T, Pangelova N, Trachuk S, Diedukh M. Features of the Reaction of the Cardiorespiratory System of Schoolchildren with Physical Loads on the Tradmile. *International Journal of Applied Exercise Physiology*. 2020;9(1):113–121.
4. Seisenbekov Y, Abishev A, Tastanov A, editors. Morphofunctional evaluation of physical development of school-age children. *International Scientific Congress on Applied Sports Sciences (ICASS) - Balkan Scientific Congress on Physical Education, Sports, Health*. Sofia: Bulgaria; 2019. P. 15–16;
5. Svystun JD, Trach VM, Shavel KE, Kukujuk JM. Hygienic aspects of physical education and health of schoolchildren. *Pedagogics, Psychology, Medical-Biological Problems of Physical Training and Sports*. 2017;21(6):301–307. https://doi.org/10.15561/18189172.2017.0607
6. Shubert VS. *Physical training of fencers*. Lviv: LSUPC; 2019. (In Ukrainian).
7. Driukov V. Physical training of swordsmen at the stage of preliminary basic training. *Sportivna nauka Ukraini*, 2013;2(53):35–38. (In Ukrainian).
8. Kriventsova IV, Klimenchenko VG, Ivanov OV, Blizniuk SS. Methods of development of speed and strength qualities in students engaged in fencing. *Edinoborstva*, 2018; 2(8):42–50. (In Ukrainian).
9. Bikova OO, Pomeshchikova IP, Strelnikova YeYa, Lyakhova TP. Changes in speed-power-capacity beach handball players of 14–15 years under the influence of specially selected exercises. *Slobozhanskii naukovo-sportyvnyi visnyk*, 2015; 50.6: 30–4. https://doi.org/10.15391/snsv.2015-6.004.
10. Pitin MP. *Fundamentals of methods of development of physical qualities*. Lviv: LSUPC; 2015. (In Ukrainian). https://dniprorada.gov.ua/upload/files/o_1dfihabfi5ve5rr1nsk1cf61ma71a.pdf
11. Busol VA. *Fencing: training program*. [Internet]. Kiev, 2014 [updated 21 Jun 1; cited 2021 Jun 5]. (In Ukrainian). Available from: https://dniprorada.gov.ua/upload/files/o_1dfihabfi5ve5rr1nsk1cf61ma71a.pdf
12. Chirashnya I. Parents' Guide to Fencing. Academy of Fencing Masters; 2014.
13. *Athletics Ireland. Run jump throw workahops*. [Internet]; 2021 [cited 2021 May 25]. Available from: https://www.fingalliansathletics.com/adminbackend/resources/long-jump-rjt-workshop-week-3-2.pdf
14. Struzik A, Rokita A, WiniarskiS, Popowczak M. Relationships between variables describing vertical jump and sprint time. *South African Journal for Research in Sport, Physical Education and Recreation,* 2017;39(1): 177-188.
15. Poliszczuk T, Poliszczuk D, Dąbrowska-Perzyna A, Johne M. Asymmetry of Complex Reaction Time in Female Épée Fencers of Different Sports Classes. *Polish Journal of Sport and Tourism*, 2013;20:25–9. https://doi.org/10.2478/pjst-2013-0003
16. Norjali R, Mostaert M, Pion J, Lenoir M. Anthropometry, physical performance, and motor coordination of medallist and non-medallist young fencers. *Archives of Budo*. 2018;14:33–40.
17. Şahin G, Koç H, Baydemir B, Abanoz H, Coşkun A, Burak Günar B. Analysis of some performance parameters of fencer according to gender and age. *Kinesiologia Slovenica*, 2019;25,1:27–34.
18. Petronijević S, Petrović A, Ćopić N, Jovanović S, Gajić I. The influence of maturation on the speed of the individual hand movements in fencing. *Homo Sporticus*, 2019; 2:31–6
19. Turner A, Miller S, Stewart P, Cree J, Ingram R, Dimitriou L, Moody J, Kilduff L. Strength and Conditioning for Fencing. *Strength and Conditioning Journal*, 2013; 35.1:1–9. https://doi.org/10.1519/SSC.0b013e31826e7283
20. Pavel LP, Pavel AV, Kriventsova I, Potop V, Jurat V. Characteristics of the technical-tactical and physical training of ėpėe fencers aged 8 to 10 years. *Discobolul – Physical Education, Sport and Kinetotherapy Journal,* 2019; 58.4:80–4.
21. Turner AN. *Physical preparation for fencing: tailoring exercise prescription and training load to the physiological and biomechanical demands of competition*. [PhD thesis]. Middlesex University; 2016,
22. Weichenberger M, Liu Y, Steinacker JM.A Test for Determining Endurance Capacity in Fencers. I*nternational Journal of Sports Medicine*, 2012;33(1):48–52. https://doi.org/10.1055/s-0031-1284349
23. Ntai A, Zahou F, Paradisis G, Smirniotou A. Tsolakis C. Anthropometric parameters and leg power performance in fencing. Age, sex and discipline related differences. *Science & Sports,* 2017; 32.3:135–43. https://doi.org/10.1016/j.scispo.2016.06.011

Information about the authors:

Olena Nesen; (Corresponding Author); Associate Professor, PhD; https://orcid.org/0000-0002-7473-6673; helena.nesen@gmail.com; H. S. Skovoroda Kharkiv National Pedagogical University; Kharkiv, Ukraine.

Viktoriia Klimenchenko; http://orcid.org/0000-0001-9431-8172; lubich310@gmail.com; H. S. Skovoroda Kharkiv National Pedagogical University; Kharkiv, Ukraine.

Cite this article as:
Nesen O, Klimenchenko V. Indicators of speed and strength abilities of young fencers 12-13 years old. *Pedagogy of Health,* 2022;1(1):23–28.
https://doi.org/10.15561/health.2022.0104

This is an Open Access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited (http://creativecommons.org/licenses/by/4.0/deed.en).

Received: 25.05.2021
Accepted: 25.06.2021; Published: 18.01.2022