Contemporary methods and technological advancements for evaluating the swiftness and precision of thrusts in swordsmanship

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Abstract

Objective of the study was to create a technological tool for training and assessment, the «Electronic-mechanical fencing target», and to demonstrate its effectiveness in evaluating the swiftness and precision of sword-based thrusts.

Methods and structure of the study. The goal of the proposed invention is to monitor and assess the speed and precision of sword thrusts during training. To assess the impact of incorporating the developed simulator into the training regimen, a pedagogical experiment was conducted. The experiment aimed to verify our hypothesis that the «electronic-mechanical fencing target» enhances and improves the speed, strength, and coordination of fencers. The experiment was conducted among athletes aged 12, during the competitive period, and the experimental group was instructed to incorporate «Electronic-mechanical fencing targets» into their specialized training.

Results and conclusions. The implementation of the «fencing, electronic-mechanical target» and the conducted trial demonstrated a significant improvement in the performance of the experimental group, particularly in terms of accuracy and errors across all exercises. There was no substantial increase in the performance of the control group. Overall, the experimental group outperformed the control group, with the exception of certain metrics in specific exercises. The increasing technical difficulty of the movements is evident in the results achieved by both groups.

Keywords: *fencing, target, develop, simulator, electronic-mechanical, utility model, experiment.*

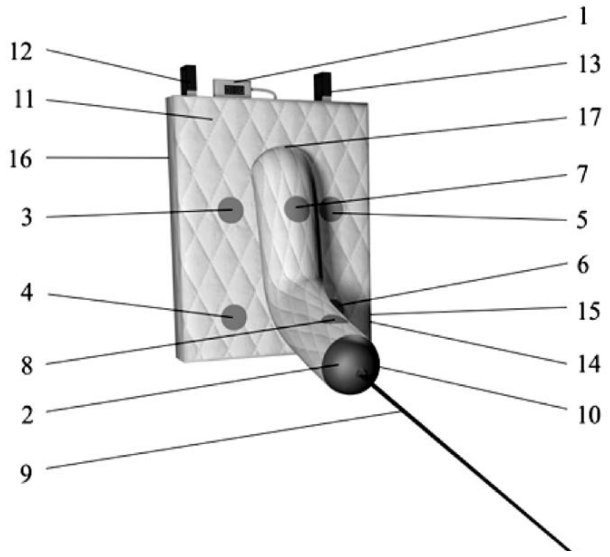
Introduction. The stability and variability of the technical techniques and actions performed in fencing largely depend on coordination and speed-strength preparedness, and the integral indicator is an accurate and timely thrust, which requires an objective instrumental assessment. However, the parameters of performing thrusts in fencing with epees, the methods and techniques for determining the accuracy of thrusts, touched upon in the works of some specialists, do not have an accurate and objective instrumental assessment [1, 4-6]. The objective data obtained on coordination and speed-strength indicators using special equipment allows us to reasonably talk about the problems of objective recording and evaluation of the performance of technical actions and thrusts at all stages of training in fencing [9-11].

Instrumental assessment of the parameters of speed and accuracy of thrusts among domestic fencing specialists in different types of weapons has been touched upon by a number of authors, but in our opinion has not been sufficiently studied. The use of training equipment, including various targets in fencing, is fully applicable at all stages of training in order to improve the skills of fencers, accelerating the assimilation of specific martial arts tools [2-6, 8].

Objective of the study was to create a technological tool for training and assessment, the «Electronic-mechanical fencing target», and to demonstrate its effectiveness in evaluating the swiftness and precision of sword-based thrusts.

Methods and structure of the study. We have developed a «Fencing target, electronic-mechanical».

This utility model relates to the field of sports equipment, to devices for training epee fencers. The technical task of the declared utility model is to record the speed and accuracy of epee thrusts in the training process [7]. The device consists of the following elements: (1) display, (2) fencing epee guard, (3) left upper sensor, (4) left lower sensor, (5) right upper sensor, (6) right lower sensor, (7) upper sensor on the hand, (8) lower sensor on the hand, (9) fencing epee blade, (10) internal bracket for the epee, (11) front panel, (12) outer left bracket, (13) outer right bracket, (14) on/off toggle switch, (15) on/off toggle switch for the sound signal of a thrust, (16) back wall, (17) fastening element for the fighting hand. The fighting hand acts as an imitator of the opponent's armed hand and contains elements 2, 7, 8, 9, 10, 17.



Fencing target, electronic-mechanical (front view)

To evaluate the effectiveness of the implementation of the training device developed by us, a pedagogical experiment was conducted, which was aimed at confirming our hypothesis that the «electronic-mechanical fencing target» allows to increase the level and improve the speed-strength and coordination abilities of epee fencers. The experiment was conducted among 12-year-old athletes (3rd year of basic training), during the competitive period and was aimed at the experimental group, to include the «Electronic-Mechanical Fencing Target» in the special training of 12-year-old epee fencers. Thus, the EG used the advantages and functionality of the training device in special training, the control group used conventional mechanical targets. During the experiment, two groups of trainees were randomly formed, the control (CG) and the experimental (EG), with 10 people in each, consisting of epee fencers aged 12 years, the experiment was conducted during the competitive period and lasted six weeks. During one training session, each athlete of the EG and CG performed a series of exercises (from the three above-mentioned positions) in the main part of one session, a weekly microcycle, and also performed a series of thrusts proposed by us from three positions, at the end of the weekly microcycle at the beginning of the control training, after the warm-up. For control, two modes were selected from the «target» functionality: «red mode» left side and «green mode» right side, the same for both groups. The reliability of differences between the groups and after the experiment was calculated using the Mann-Whitney U-criterion, the growth rates using the Brody formula.

Results of the study and discussion. In the CG in the on-site exercise, high growth dynamics (13 and 14%) were recorded in both modes in the number of misses. In other indicators, the growth dynamics are low (up to 4,6%) and demonstrate a large intra-group spread, a number of indicators demonstrate stabilization.

In the on-site exercise in the EG, we also observe significant increases in the accuracy indicators of hits, the growth indicators of the EG are significantly higher compared to the CG. In speed indicators, the average group indicators of hits are better in the EG compared to the CG. Significant dynamics of reliable increases were obtained in the EG: the number of hits «red mode» (14,1%), the number of misses «red mode» (33%), the number of misses «green mode» (30,4%). Changing the conditions of the exercise showed a similar picture of the increase in the accuracy of the thrusts in the CG, but the magnitude of the increases on average was no higher than 7,9% (the number of hits «red mode»). At the same time, in both exercises, the number of misses during the experiment demonstrates stabilization of the indicators.

The indicators of the EG with a lunge for all the accuracy indicators of the thrusts are significantly better than those of the CG. Reliably high indicators of the EG increases in the «green mode» were obtained in the number of hits (14,2%), the number of misses (17,5%), which indicates the effectiveness of using the target when performing a more complex coordination movement. We do not observe reliably high differences between the CG and EG in terms of time indicators.

In the third, more complex exercise (step/jump lunge), high indicators of increases were obtained in the EG in both exercises: the number of hits (24,1 and 26,7%), the number of misses (29,1 and 41,4%). In the control group, no reliably high increases were obtained.

Conclusions. The implementation of the «Fencing Target, Electronic-Mechanical» and the experiment showed high dynamics of increases in the EG, primarily in the recorded indicators of accuracy and misses in all exercises. In the CG, high, reliably significant increases were not recorded. In general, the dynamics of increases in the EG are better than the CG indicators, except for individual indicators in individual exercises. The increase in the technical complexity of the form of movements is clearly visible in the results obtained in both groups. The use of the target developed by us allowed us to analyze, evaluate and check the accuracy and speed of special indicators of the execution of thrusts by 12-year-old epee fencers. The use of this method and the technical solution developed by us allows us to obtain objective data and indicators of the execution and accuracy of thrusts in various combat situations, based on the capabilities of the recorded indicators of the electronic target.

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