STUDY AND EVALUATION OF INDICATORS OF RELATIONSHIPS MOTOR ANALYZER SPORTSMEN OF ARMSPORT

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Annotation. The purpose of the article was to study and evaluate the relationship indicators of the functional state of the brush armsport athletes and those working at the amateur level. The results of measuring of tremor and assess the accuracy of the efforts of athletes. The study involved 29 people (20,79 ± 0,77 years), divided into experimental and control groups. The fine coordination of hand muscles on the run-time test, the number of touches and squeezing on the wrist dynamometer given effort. Affirmed a lower level of physiological tremor in athletes. The data are interpreted as evidence of the importance of the functional state of the brush for effectiveness in armsport. It is shown that changes in physiological tremor can be used in the assessment of athletes. Application of the correlation matrix established affinity states surveyed.

Key words: arm sport, athletes, physiological, tremor.

Introduction

Complex studying of arm- sports sportsmen, which had been carried out by us for a number of years, permitted to mark out some factors, influencing on its success and efficiency [1-3]. They include special features, optimization of which by training means, by perfection of functional state monitoring permit to ensure increase of preparation level, prevention from health disorders in the process of training. Analysis of anthropometric, bio-mechanical, ergonomic aspects of this kind of sports render the coaches and trainees with information, which is necessary for improvement of selection, increase of training process efficiency and achievement of the best results in this kind of sports [1-3, 8-10]. Considering the importance of complex development of hand in this kind of sports, these aspects include the state of motor analyzer, evaluated by the hand's fine coordination.

In this connection it was interesting to study this feature of arm-wrestlers with different level of preparation. The work has been fulfilled as per plan of scientific & research works of Kharkov national pedagogical university, named after G.S, Skovoroda.

Purpose, tasks of the work, material and methods

The purpose of the work is studying and evaluation of indicators interconnection, which characterize functional state of professional arm wrestlers' and amateurs hands.

The material of the research. 29 persons of (20,79±0,77) years old took part in the research. The participants were divided into two groups: experimental (EG) – 15 sportsmen of (21±1,01) years old with the level from grade III to master of sports and control group (CG) – 14 persons of (20,57±1,21) years old – arm wrestling amateurs. For achievement of our target we used methods of tremor-metering (TM), determination of effort accuracy (EA) and statistical analysis of the obtained data.

Fine coordination of hand muscles was studied with the help of tremor meter, which permitted to evaluate physiological tremor by two indicators: the time of tremor test (probe moving by special recesses of different shape) and the quantity of collar touches during probe movement [4]. The standardized quantity of touches per minute was calculated. In our previous works we grounded and proved the validity of this method for selection in arm wrestling and prevention from possible health disorders [1].

EA method means triple squeezing of hand dynamometer with the set effort of 10 rg without visual control [5]. The tested had three attempts with visual control just to be familiarized with this method. After this, the tested tried to carry out the test for three times and the results were registered.

The obtained results were processed with the help of licensed electronic tables Excel with determination of parametrical Student's criterion and non parametrical criteria of Wilkinson – Mann – Witny, Pirson's correlation indicators [6]. For analyzing of the built correlation matrixes we used indicators, which were proposed in work [7].

Results of the research

The obtained results are given in table 1. Confidential overrating of standardized touches number with tremor metering in KG (p<0,01) attracts attention. In our opinion it confirms the best level of fine sportsmen's hand coordination in comparison with amateurs. It permits to consider this quality rather important for determination and prognostication of success in this kind of sports and offer it both for selection and for operative and current control of sportsmen's functional state.

Table 1

Evaluation results of hand functional state of arm sports representatives

Indicator	Experimental group	Control group
Left hand		
Tremor metering time, sec.	22,67±2,15	21,29±2,58
Quantity of touches, abs.	31,47±2,23	35,86±1,63
Quantity of touches, min^{-1}	95,65±1,67[1]	114,92±1,72
EA-1, kg	12,00±0,70	12,29±0,72
EA-2, kg	11,60±0,88	11,57±0,67
EA-3, kg	12,13±0,66	10,71±0,54
Правая рука		
Tremor metering time, sec.	22,73±2,26	19,71±1,58
Quantity of touches, abs.	30,07±2,41	34,43±2,54
Quantity of touches, min^{-1}	91,16±1,66[1]	116,45±1,94
EA-1, kg	12,00±0,83	11,86±0,80
EA-2, kg	11,87±0,89	12,29±1,09
EA-3, kg	10,93±0,58	11,29±0,65

Notes. EA– determination of effort accuracy; number means serial number of attempt 1- difference from control group are confidential (p<0,01).

Other indicators illustrate the closeness of mean value in the tested groups and the absence of confidential differences, determined with Student's criterion.

Also there were no confidential differences between attempts fulfilled by right hand and by left hand. Like in our previous works, it gives foundations for application of non parametrical criteria [6]. For comparing of EA data we used criterion of Wilkinson – Manna – Witny (U), as the most powerful in this group. Its calculation confirmed confidential (p<0,01) test time increase and less quantity of left hand touches in EG than in CG. Wilkinson – Manna-Witny's indicator was, accordingly, 47,07 and 39,15. Thus, on the one hand TM execution takes sportsmen more time, but with it, they make fewer mistakes. In our opinion, the obtained results confirm the peculiarities of arm sports training, the differences between sportsmen and amateurs.

First of all, in arm sports wrestling is carried out by both hands, that is why sportsmen pay substantial attention to training and development of both hands and owing to it, they eliminate natural physiological scewness. At the same time, amateurs are characterized by less intensive trainings and scope of training loads that, naturally, influence to the less extent on elimination of the mentioned physiological disproportion. And, considering the fact, that most of people have leading right hand, the absence of confidential differences in groups can be understood.

Besides it, decreasing of EG members' quantity of touches against the background of test time execution's increasing permits to estimate the sportsmen's fine coordination of hand muscles and movement accuracy as higher, because they fulfill TM more carefully, though they spend more time for it. From the point of view of workability estimations such approach to estimation is quite valid, because accuracy indicator is always considered more important than the speed of test execution [4].

V.A. Plakhtiyenko, Yu.M. Bludov [5] suggest evaluating of EA results as reflection of neuro-dynamic shifts in organism. Analysis of results permits to affirm the absence of such changes in the tested groups. The obtained results are sufficiently close and permit to say about fulfillment of this test both by sportsmen and by amateurs. So, in EG general mean result of EA was (11,60±0,42) kg for right and (11,91±0,43) kg for left hand. In CG these results were, accordingly, (11,81±0,49) kg and (11,52±0,38) kg. Thus, deviation from the set test result was 1,2-1,5 kg, that, in general, coincides with the data, given in works by V.A. Plakhtienko, Yu.M. Bludov [5], and permits to consider the obtained results to be within statistical norm. Using of parametric as well as non parametric criteria did not permit to confirm the presence of substantial differences between groups. In our opinion, it witnesses about the functional state balance of both tested groups, insufficiency of the applied physical loads for breaching the balance. We consider necessary to conduct further researches for evaluation of informational character of this test as a criterion of arm sports preparation peculiarities'.

Construction of correlation matrixes also confirmed the closeness of results in the tested groups, evaluated from the positions of functional systems' state. The main indicators, proposed in the work by A.N. Zosimov. [7] for their characteristics, are given in table 2.

Table 2

Correlation matrixes indicators of hand functional state

Group	Specific weight of confidential connections (%)	Specific weight of important connections (%)	Labialization/synchronism's indicator (%)	Mean correlation coefficient
EG	19,23	46,15	16,43	0,68
CG	20,51	46,15	16,61	0,69

Equal specific weight of important connections, which permits the state of systems in both cases as close to be stable is noticeable. The difference by other indicators does not exceed even little part of 1 percent, that again gives foundation to consider functional state of both tested groups to be nearly similar and confirms the absence of substantial differences. One more factor in favor to this statement, in our opinion, is that mean correlation coefficient of both groups relates to interval of mean values. When evaluating goniometric peculiarities of arm sports, we made a conclusion that the state of sportsmen is more stable, functional tension level is lower than in control group, because of the fact that in control group this indicator was average while in experimental group it was high [3]. In this very case the positioning of the indicators in one interval permits to consider the state of the tested to be within functional possibilities.

In our opinion, interconnections between indicators, which characterize TM are of the highest interest. So, in EG the presence of confidential direct correlation between test execution time by right and left hands (r=0,91), reverse interconnection between the time test by right hand and touches' quantity of left hand (r=-0,48) and direct correlation between touches quantity by right and left hands (r=0,57) was confirmed. At the same time, in CG interconnections between these indicators had the following look, accordingly, 0,91, -0,16 and 0,76. The second of the mentioned peculiarities is of highest interest. First of all, it reflects interconnection between speed and accuracy of TM, which are in reverse dependence, execution. In this very case speed is function of test fulfillment time and quantity of touches is a value, which is reverse to the accuracy of fulfillment of this work. Confidential connection between these indicators in EG reflects the balance of both hands' work that is characteristic for sportsmen in connection with the peculiarities of trainings. The presence of insignificant connection in CG, in our opinion, reflects amateurs' disproportion of this indicator that confirms suggestions, made earlier.

Summary

The conducted researches permit one more to confirm the importance of hand's functional state for achievement of success in arm sports. Confirmation of sportsmen's less tremor level illustrates the importance of this indicator in this kind of sports. The changes of physiological tremor shall be used for evaluation of sportsmen's state, they permit to judge, to some extent, about the level of preparation, reflect balance of organism's adapting systems. Application of method of correlation matrixes permitted to consider the state of all tested to be similar and within functional norm.

The prospects of further researches in this direction shall be oriented on formation of series of tests, which would evaluate functional state of persons, doing arm sports on different levels, prognosticate their successfulness in this kind of sports. Comparative analysis of qualities, determination and evaluation of interconnections between them will permit not only to raise the quality and efficiency of preparation, but they will facilitate prevention from possible health disorders in the process of trainings.

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