

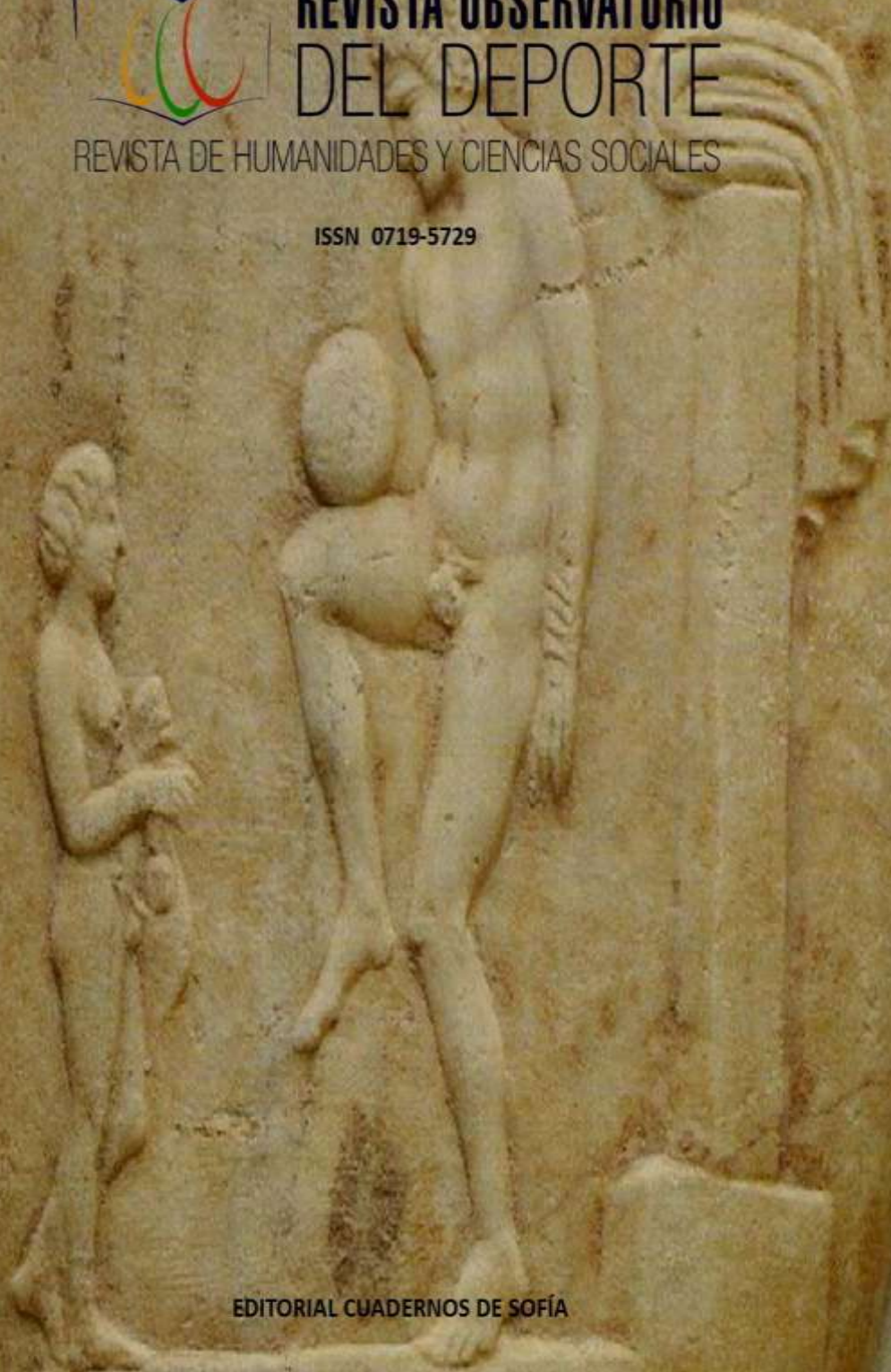
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**MEASURING SPEED OF REACTION UNDER THE CONDITIONS OF IMPAIRED VESTIBULAR  
EQUILIBRIUM IN 13-15 YEARS-OLD BOXERS (TEST- RETEST)**

**MEDICIÓN DE LA VELOCIDAD DE REACCIÓN DE BOXEADORES DE 13 A 15 AÑOS  
EN CONDICIONES DE EQUILIBRIO VESTIBULAR ALTERADO (TEST-RETEST)**

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**Resumen**

El boxeo es un deporte extremadamente dinámico, caracterizado por una alta intensidad de competición deportiva. Esto determina la necesidad de preparar a los boxeadores para la implementación efectiva de actividades motoras complejas, en su mayoría acíclicas, que se realizan en las condiciones de un entorno dinámicamente cambiante de transición continua de fase de ataque a fase de protección. La eficiencia de la actividad de carreras en el cuadro está determinada en gran medida por la velocidad de reacción de los atletas. En el contenido del presente artículo científico, el punto principal esboza la idea del significado especial del sistema de diagnóstico y evaluación para mejorar la calidad del control en la capacitación multianual de boxeadores. El enfoque principal de este estudio es crear una prueba de entrenamiento disponible para medir la rapidez boxeadora de respuesta de los boxeadores de 13 a 15 años de edad en condiciones de equilibrio vestibular alterado.

**Palabras Claves**

Boxeo amateur – Atletas jóvenes – Test-retest – Velocidad de reacción – Test psicológicos  
Control y manejo de deportes

**Abstract**

Boxing is an extremely dynamic sport characterized by a high intensity of sport competition. This determines the need to prepare boxers for the effective implementation of complex, mostly acyclical motor activities, which are performed under the conditions of a dynamically changing environment of continuous transition from phase attack to phase of protection. The efficiency of racing activity in boxing is largely determined by the speed of athletes' reaction. In the content of this scientific paper, the main point outlines the idea of special significance of the diagnostic and evaluation system for improving the quality of control in the multi-year training of boxers. The main focus of this study is

**Measuring speed of reaction under the conditions of impaired vestibular equilibrium in 13-15 years-old boxers (test- retest) pág. 08**

on creating a readily available coaching test to measure the response rate of 13-15 year old boxers under the conditions of impaired vestibular equilibrium.

**Keywords**

Amateur boxing – Young athletes – Test-retest – Reaction speed – Psychological tests  
Sports control and management

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In the context of the new realities of life in contemporary Bulgarian society and the dynamic development of sport and athletic achievements, the priority is to rethink and modernize basic concepts related to the achievement of high sporting results in the field of amateur boxing.

One of the most important features of this group is the direct play with the opponent. Boxing competitions take place in a varied, poorly predictable environment, characterized by constantly changing parameters. Depending on their specificity, the combinations imply and require less precision and stability of performance, such as variety of actions, improvisation and creative decisions, choosing the most appropriate for the given situation action. The regulation of behavior and actions is aimed at providing maximum flexibility and adaptability to the context of the environment<sup>1</sup>.

By its nature and specificity it belongs to acyclic sports, to those that are characterized by constant regulation and continuous movement of movements under extremely dynamic conditions. This requires extreme coordinated changes in the central nervous system. Competitors' arsenal has automated action in the form of individual skills and formed driving habits in the form of complex coordination. They appear in response to the individual movements of the opponent during the boxing match.

It is this dynamics in the boxing match that requires the competitor to have an extremely fast response rate to ensure success in the fight.

During the fight, contestants receive multiple shots, which undoubtedly influence their psycho-motor abilities.

That is why the main focus of the current scientific research is to create a readily available coaching practice to measure reaction speeds under disturbed vestibular equilibrium in 13-15 year-old boxers.

According to N. V. Zimkin and V. S. Farfel, three basic forms of speed can be differentiated:

- Speed of separate movement at low resistance;
- Frequency of movement at a small amplitude;
- latent time of motor reaction<sup>2</sup>.

As a result of their research, M. Godik and V. Zaciorski<sup>3</sup> find that the speed capabilities of athletes are characterized by another specific form of speed: the ability to move quickly. This ability is of particular importance in boxing because of the specifics of racing activity in it. As a quality, speed in sports includes: its own speed of movement, its frequency and the speed of the motor response. An important role in the speed of movements and actions is the will efforts of the athlete, his psychological attitude. The speed of the boxer is characterized by his ability to effectively perform both simple and complex reaction<sup>4</sup>.

<sup>1</sup> Т. Янчева, Личност и състезателна реализация. София: (2004): 75-76.

<sup>2</sup> Цв Желязков and Д. Дашева, Основи на спортната тренировка. София, ГЕРА АРТ 2002.

<sup>3</sup> М. Годик and В. Защиорский, Теория и практика физической культуры, num 7 (1965).

<sup>4</sup> М. И. Романенко, Бокс, Киев, Изд. объединение „Вища школа“. 1978.

The simple reaction in boxing in a "pure" form is hardly to be found during a race, but only in training process. There are complex reactions of two types in the ring game: the reaction of a moving object, ie the opponent and the reaction of choice<sup>5</sup>.

For B. Beckman the success of the boxer depends to a great extent on the speed and the suddenness of the actions, i.e. the ability to change the speed of his movements. Speed is defined as the ability to express speed in a variety of movements. Among the most important manifestations of the boxer is the hidden reaction time, the speed of the single movement, the speed of the ring movement, the pace of the series of blows<sup>6</sup>.

In the scientific literature, there is sufficient evidence that the ability to perform the movements and actions quickly is one of the most important qualities of a boxer.

The applied Line Test does not require special equipment and is easily applicable in the natural conditions of the training process.

The purpose of the test is to find the rate of reaction speed under impaired vestibular equilibrium.

The scope of the survey is 161 boxers at 13-15 years of 19 boxing clubs in the Republic of Bulgaria.

Required tools and conditions: plastic ruler with a length of 30 cm; assistant.

How the test is performed:

The competitor stands on the starting position, at the signal of the assistant, the examiner makes 10 quick turns around the longitudinal axis of his body in a clockwise direction. Immediately afterwards, he resumed his starting position, with a hand placed in front, folded under 90 degrees in the elbow joint and the arm resting against the body. The fingers of the hand are open- index finger and thumb, with a distance of 10 cm between them. The competitor strives to catch the landing line with a thumb-index finger. Two attempts are made, one after the other, to avoid losing the effect of disturbed vestibular equilibrium. The best attempt is recorded.

The statistical processing of the obtained data from the conducted empirical study was carried out with the help of the specialized software IBM SPSS Statistics Version 20. Statistical Package for Social Science (SPSS) is a computer program running on the Windows operating system, that specializes in systematizing, processing and analyzing statistical information. According to L. Petkova, the minimum number of trials (minimum test length) for the evaluation of the reliability of the engine tests is two attempts.

The test-retest method is characterized by the fact that "each person in the study group has to perform the initial length test (the number of trials determined in the methodology) twice, with a minimum interval between experiments. The use of the dispersion analysis allows checking the statistical reliability of the test with the line<sup>7</sup>.

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<sup>5</sup> М. И. Романенко, Бокс, Киев, Изд. объединение „Вища школа“ 1978.

<sup>6</sup> Б. Бэкман, Бокс. Тренировки чемпионов. Ростов н/Д, Феникс. 2006.

<sup>7</sup> Л. Петкова and М. Квартирникова, Тестове за оценяване на физическата дееспособност. София, Медицина и физкултура. 1985.



Reliability and validity were checked by the test-retest method of the line test with a three-week time interval between the two tests. The results show high measurement accuracy and stability of results ( $r = 0.778$ ,  $p < 0.001$ ,  $N = 161$ ), i. E. the methodology is reliable. The statistical processing of the results obtained from the line measurement (test retest) shows the same mean values of the two tests: test-retest-1 ( $M = 1.40$  cm,  $Std = 4.75$  cm); test-retest-2 ( $M = 1.40$  cm,  $Std Deviation = 3.81$  cm).

N= 161	Test-retest 1 - line cm	Test-retest 2 - line cm
Average arithmetic values	1,40	1,40
Standard deviation	4,75	3,81

Tab. 1  
Mean values and standard deviation of test-retest (line test)

As can be seen from the following graphs, the values of the two tests do not differ significantly, demonstrating the reliability, validity and objectivity of the test with the line:

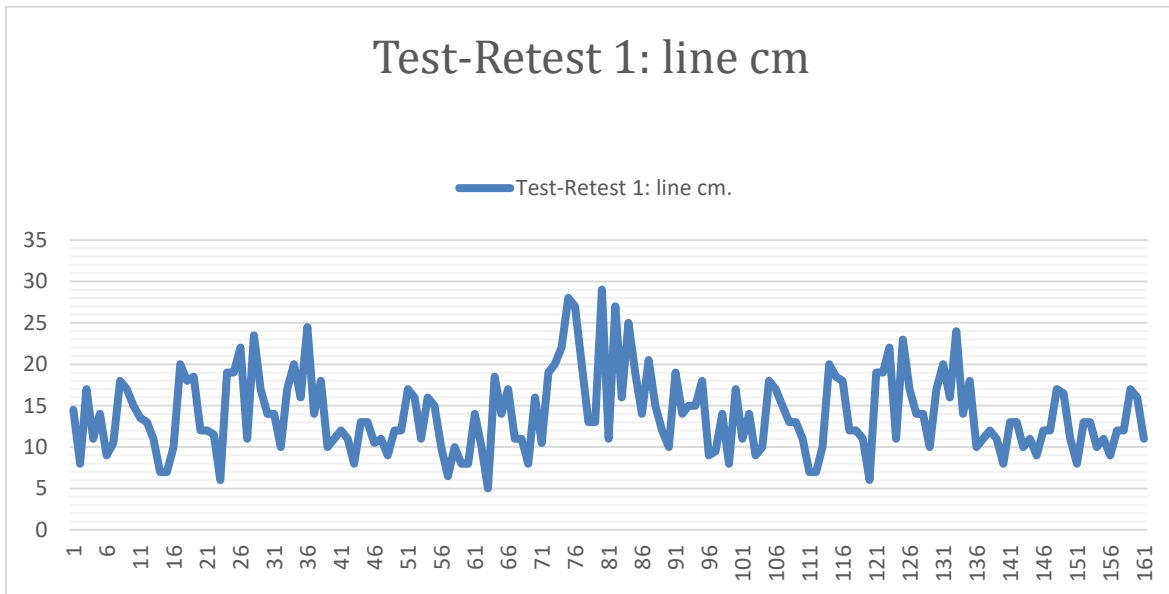


Figure 1  
Test results with line - test-retest -1

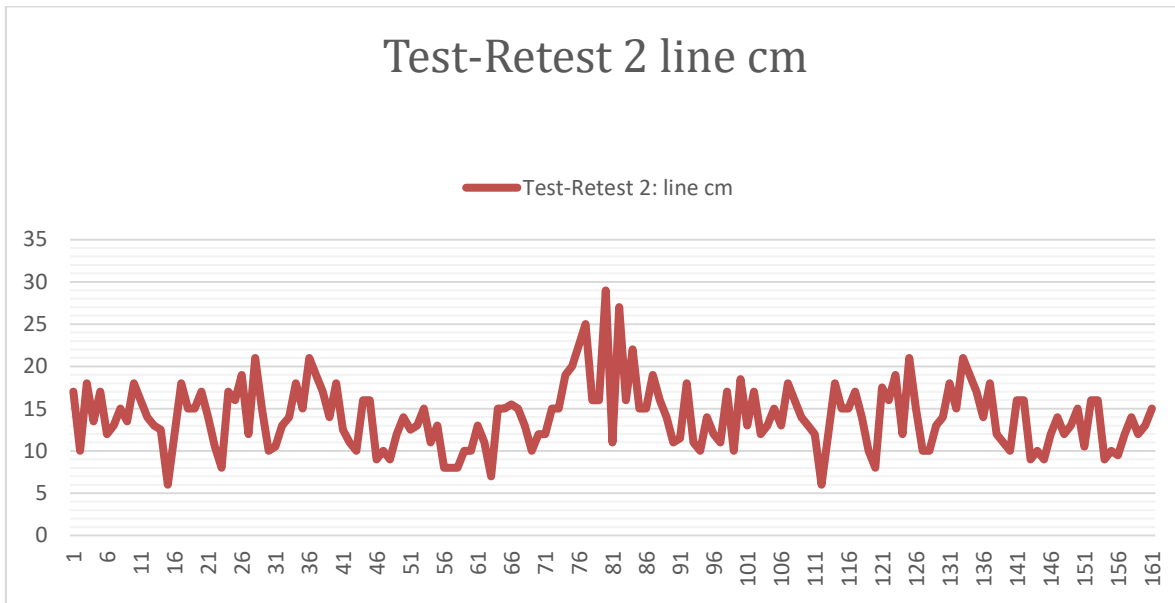


Figure 2  
Test results with line - test-retest - 2

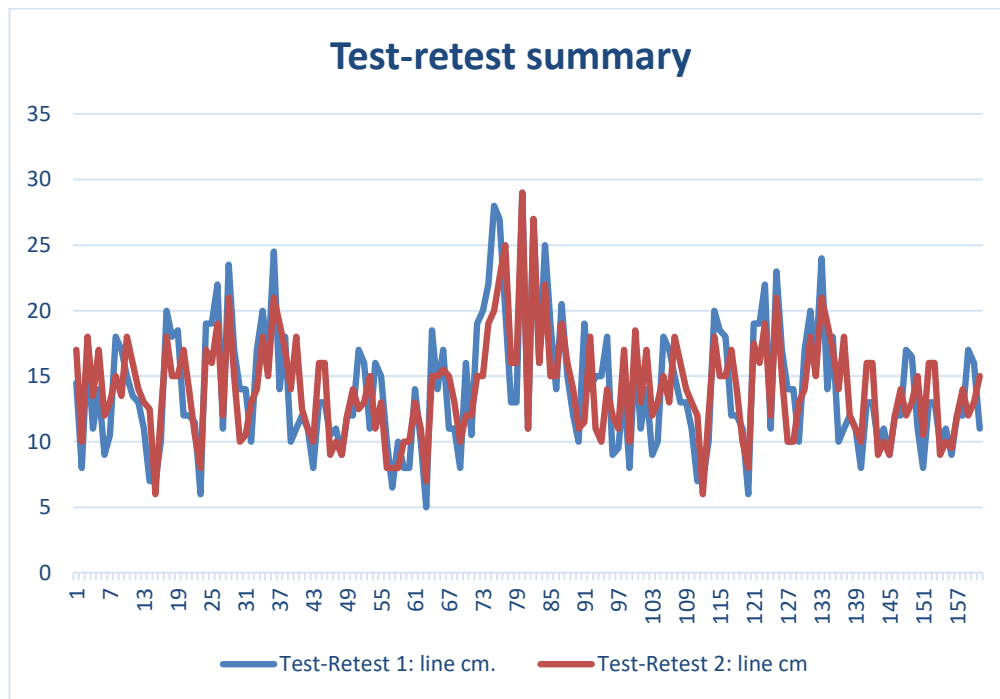


Figure 3  
Test results on the line test (test-retest) summary

The empirical study, which encompasses the application of a system of tests to assess the significant anthropometric, motor and psychological parameters of the athletes' perspective in amateur boxing (ages 13-15). It has enabled us to obtain interesting and detailed information about the strength and direction of dependencies between variables. These variables in turn determines the possibility of outlining trends and prognosis orientations related to the model of control boxing.

Tracking the relationship between independent variables, line test and the victories are as follows: (dependent variable) of young boxers highlights strong influence and statistically significant results ( $r = 0,445$ ;  $r^2 = 0,198$ ;  $F(1, 158) = 39,096$ ;  $p = 1,091$ ;  $t = -6,253$ ;  $p = 0,000$ ) because  $\text{sig} < 0,05$ . The correlation coefficient  $R$  is 0.445 and the  $R$  Square determinant is 0.198, which means that nearly 20% of the victories on the ring are explained by the impact of the line test.

The analysis of the obtained measurement data establishes significant relationship ( $\text{sig}$  less than 0.05) between Line Test (cm) and the Difference Wins - Losses ( $r = 0,535$ ;  $r^2 = 0,287$ ;  $F(1, 158) = 63,457$ ;  $b = -1,304$ ,  $t = -7,966$ ,  $p = 0,000$ ), the coefficient  $R$  is 0,535 - the influence is strong. In this case, the  $R$  Square coefficient is 0.287, which means that nearly 29% of the athletes' victories are explained by the impact of Line Test achievements.

The F-statistic used (ANOVA, Fisher's F-Criterion or Dispersion Analysis), which evaluates the significance of the determination coefficient, describes the adequacy of the applied dependency comparison method and the relationship between the target variables ( $F(1, 158) = 63,457$ ;  $p = 0,000$ ).

The direction of dependence varies - with an increase in test results, the line (cm) reduces the difference wins and losses ( $b = -1,304$ ;  $t = -7,966$ ;  $p = 0,000$ ) and vice versa - with decreasing value in the line test, the victory of the young boxers.

The tracking of the relationship between the Independent Variable Active Sports Period (months) and Line Test (cm) in its position of dependent variable ( $\text{sig}$  is less than 0.05 - have statistical significance) reveals the following information:

Active period (months) - Line test (cm) ( $r = 0,375$ ;  $r^2 = 0,120$ ;  $F(1, 159) = 21,772$   $p = 0,000$   $b = -0,209$   $t = -4,666$   $p = 0,000$ ). The test fixes a bond strength of 0.375, increasing the value of the line test ( $b = -0,209$ ). It is found that 12% of the line test results are explained by the impact of the period of activity in the field of boxing.

The conceptual specification of the parameters of the empirical study, showed the existing need in sports practice of elucidation of the specific practical and applied dimensions of the addressed problem. All of this contributed to the development of an accessible and easy to use method for determining the rate of reaction speed under impaired vestibular equilibrium, for boxing.

The development of amateur boxing in our country depends on a whole set of factors at a different level, which are in complex interaction (social, financial, economic, demographic, etc.). One of the most important factors is the professional competence of the coaches, their conceptual and innovative attitude towards the contemporary preconditions and conditions for increasing the efficiency of the training process. That is why the issue of preparing the coaches to successfully cope with the challenges of their professional activity is of particular importance for establishing the prestige of the Bulgarian amateur boxing world-wide.

The leading function of the coach as an organizer of the training process is also bound to stimulate and promote the development of the boxer's self-control, his interpersonal motivation for achievement, self-confidence and confidence in his abilities,

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etc. Interpreting the training process as an interaction between the coach and the boxer puts the focus on the athlete's active participation in his own sports self-improvement.

Improving the control system and its subsystems of a lower order: measuring, evaluating and optimizing are an important prerequisite for overcoming the severity of multi-year training of boxers.

Diagnosis and evaluation in sports selection are closely related to the methodological clarification of questions related to control in the training process.

There are close integrative links and dependencies between the control, diagnosis and selection in sport. In fact, the disclosure of the basic principles and regularities in the implementation of the control activity at the different stages of the training process contributes to the scientific justification of the diagnostic tool.

The functional purpose of diagnosing and evaluating of athletes is related not only to the selection of prospective young boxers, but also to improving the individual training programs, making the necessary adjustments and promoting the motivation of adolescents for sports self-improvement.

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