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Research Article

**EXPERIMENTAL JUSTIFICATION OF A TECHNIQUE OF
SCHOOLCHILDREN'S SELECTION FOR BADMINTON
TRAINING AT CHILDREN'S JUNIOR SPORTS SCHOOL ON
THE BASIS OF THE ANALYSIS OF THEIR
PSYCHOPHYSIOLOGICAL PARAMETERS****Roman Evgenievich Petrov*, Iulia Konstantinovna Zhestkova, Viktoria Aleksandrovna
Martynova, Sharifullina Svetlana Rafaelevna**Yelabuga Institute of Kazan Federal University, 18 Kremlyovskaya street Kazan 420008,
Russian Federation, Russia**Abstract:**

Currently, badminton gains more and more popularity among the students of generally education schools. This paper contains the conclusions and recommendations resulted from the empirical studies, the research results have been summarized and presented in charts. Competitive actions of badminton players involve the performance of technical and tactical maneuvers during the platform game. As is known, competitions can be won due to the ability to focus attention and thinking on the current situation in the game, to increase the speed of reaction of a single movement using the enemy's weak points and applying a variety of counter shots. Based on the results of the study, conclusions are drawn that will allow the badminton trainer to apply his/her experience in selecting schoolchildren for badminton training, including with the use of these tests.

It will likely be possible that the badminton athletes can use the results obtained in analyzing tactics of upcoming games, and will optimize their sports activities in the future, especially in the competitive period. It is thought that the result of the study can be used in selecting children for badminton training at children's and youth sports schools (CYSS).

Keywords: Schoolchildren, sports selection, competitions, badminton, speed of action, single movement, badminton game, reaction time.

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INTRODUCTION:

Modern sports, of course, can be described as having very high achievements, which are steadily growing, relying on the potential of the athletes' body. A diverse and complex system of sports training is implemented according to its laws, which require the creative management by a coach, corresponding to the individual characteristics of an athlete [6].

Along with such game sports as basketball, football, volleyball, hockey, tennis, characterized by great physical and emotional stress on the athlete's body, sports badminton can also be attributed to one of the rather complex sports. Only a combination of such qualities as a badminton athlete, as well as a high coordination of movements, almost instantaneous reaction to a moving object, speed and power of shots, as well as players' endurance at the platform allow achieving high results. In addition, the pace of scientific research in the athlete training theory and practice has increased along with increasing interest in badminton as one of the most accessible sports. Competently organized classes stimulate the tone of players, promote active mobilization of vital physical qualities and properties of athletes' body - endurance, strength, speed, and flexibility, necessary to overcome physical, emotional and mental stresses [1].

The main task of the selection process of badminton players at the initial stage is to disclose the athlete's abilities for achieving high results in this sport, his/her readiness for significant training and competitive loads [10]. The initial stage of training admits all children and adolescents having good physical and mental well-being, a desire to engage this sport and no medical contraindications to this. Improvement of sports skills presupposes a support not only by the individual characteristics of the athlete's body, but also the consideration of the indicators of his/her psychophysiological parameters. The developed domestic system of sports selection involves the organization of the separate actions caused by stages of long-term sports training: mass audition and testing of children with the purpose of giving them guidance to sports; the selection of prospective athletes for manning of training groups and skill perfection groups of sports schools; viewing of games and selection of perspective sportsmen at junior competitions; selection of sportsmen for their centralized training for the Olympic Games and other major international competitions [2].

Under the influence of sports training, the child's body, especially growing one, tends to changes, development and improvement. Predicting the possibilities of the athlete, the coach sets him-/herself the task of finding gifted children with the hope for a future successful sport specialization. A particularly

relevant question is to timely reveal the abilities in children and adolescents, as their motor and mental abilities undergo differentiation in the process of their body formation and development.

Well-known physiologist A.A. Ukhtomskii stated that "the powerful ability of living matter not only replenishes current losses, but also allows accumulating working potentials above the level they had before work" [3].

One of the main components in the sports selection of children for their further badminton skill improvement is the level of athletic fitness, which is based on the selection and orientation of the most capable young athletes and in-depth specialized training in the chosen sport.

In this connection, the scientifically based methods of selecting schoolchildren for playing badminton, taking into account the analysis of their psychophysiological parameters, are of great importance.

Objective of the study is the process of selecting schoolchildren for further training in badminton after a year of training at CYSS.

Tasks:

1. Study the literature devoted to the selection features of sportsmen for game sports.
2. Substantiate the theoretical recommendations and give an experimental confirmation of the schoolchildren selection system for badminton at CYSS.
3. Develop an effective schoolchildren selection model for badminton at CYSS.

METHODS:

1. In-depth analysis and generalization of scientific-methodical and special periodical literature.
2. Analysis of activities, both game and competitive.
3. Pedagogical monitoring, pedagogical observation, pedagogical testing, pedagogical experiment.
4. The method for diagnosing psychophysiological parameters: reactions to a moving object, critical flicker frequency, etc.
5. Mathematical statistics methods.

The study was conducted during training sessions hold by trainer Zhestkova Iu.K. in the CYSS "Olimp" in Yelabuga. The experiment involved 20 students of the initial training groups of the second year of badminton training: 10 persons – an experimental group, and 10 persons – a control group.

An increased level of competition in high-performance sport dictates the need to increase the effectiveness of work with young athletes, expand the search for new, non-traditional means and methods in the training process, as well as in competitions - both local and republican.

Analysis and generalization of data from scientific

and methodological literature allow us to identify the main provisions of the forecast:

1. The subject of the forecast is the potentials and qualities of the individual, which determine the ability of children to do various sports.
2. Selection should be aimed at identifying "talents" in sport, i.e. to identify children, whose potential will be a condition for their successful study and training.
3. Without knowing the peculiarities of the sport and requirements to the athlete's personality in the high-performance sport, the forecast will be unviable.

Currently, there is a growing number of studies concerning selection and orientation in the process of initial sports training.

According to various criteria, the method of determining suitability for a particular sport is characterized by its peculiarities, which are defined as special requirements to the abilities of future athletes, their physical development. In badminton, characterized by a significant level of psychoemotional stress and a long focus, the psychophysiological status of the athlete plays an important role in the formation of an adaptive response.

Such complex motor reactions, as reactions of choice and reaction to a moving object, characterize the skill level of the badminton player and refer to his/her psychophysical parameters.

In modern badminton, the shuttlecock flying speed has increased over the past decade, so have the requirements to the speed of player's reaction.

The reaction, as a response to the stimulus, depends both on the acquired experience and on the evolutionarily fixed mechanisms that provide the nerve, humoral, energy and other components of the reaction, which form a single functional system.

One of the indicators that determine the player's skill is the level of reaction. This indicator determines the timeliness of the response. The reaction consists of two parts: a sensory reaction and a motor reaction. If the sensory reaction is represented in humans almost equally, the motor reaction develops through training and its speed increases with the growth of sports skills [7]. One of the requirements imposed on the player is the speed of his/her motor actions.

The qualitative performance of motor action is impossible without a certain level of accuracy. At present, in order to achieve high results and victories in various competitions, it is necessary to have a diverse range of controlled shots and the ability to direct them to any part of the competitor's court; especially highly rated shots are those that send the shuttlecock close to the site lines. All high-level players strive to perform such shots. Thus, we can single out one more criterion for a high-level player – accuracy of the motor action. For the development of

high-performance sports, the coach responsible for the training process should have an idea of the gaps in the game situations. Based on their analysis, he/she should develop an individual training plan for each player. A coach should also have an idea about the adaptability of one or another athlete to new game actions, situations. Based on the above, we may pay attention to another criterion – the availability of the skill of action and its stability [9].

Thus, we can distinguish five main components of the selection of children for training and improvement in professional badminton:

1. athletic fitness for badminton,
2. speed of motor actions,
3. accuracy of motor actions,
4. availability (stability) of motor actions,
5. genetic factors (speed of nervous processes, excitation and inhibition time ratio)

These criteria should form the basis for the creation of new selection methods, contribute to the development of the training process of badminton players in different periods of sporting activity.

The following methods were used to solve the research tasks:

- analysis of scientific and methodological literature on the research problem;
- pedagogical observation;
- psychophysiological methods of research.

1. Analysis of scientific and methodological literature.

In order to obtain objective data on the issues studied and to clarify the state of the problem, a review and analysis of the relevant literature was carried out.

2. Pedagogical observation.

An important method of research is pedagogical observation, with the following subject in the training sessions:

- correspondence of the content of means, program requirements to the tasks of the training session, the level of physical development and physical fitness of children, their emotional state, the conditions for conducting classes; organization of individual classes; visual observation of the performance of motor actions; the body's response to physical stress during exercises aimed at the development of reaction speed.

3. Psychophysiological methods of research.

Badminton players need accurate time and space perception. The space the fixed eye can see is called the field of view. This quality is essential for athletes, especially in sports with complex coordination of movements: in gymnastics, acrobatics, diving, figure skating, badminton, tennis, etc. Badminton requires having the following skills: to see the site, the flying shuttlecock and the actions of the partner. The development of this quality depends on the field of

vision and the degree of development of the eye muscles.

An intense mode of playing leads to considerable fatigue of the visual analyzer, reduces its operation level. Sometimes the athlete does not have time to follow the shuttlecock, his/her focus is dissipated. The main efforts of the visual analyzer are mainly aimed at finding the flying shuttlecock. The lack of sufficient illumination in sports halls can lead to improper game task solving.

The process of spatial orientation when playing badminton involves many receptors, but the main role is played by visual and motor ones. The crucial role in all sports games belongs to the rate of muscle contraction. Sports games differ in that they require very delicate control of the speed of movements, which determines the range and accuracy of the ball or shuttlecock flight.

In most cases, the shuttlecock in badminton must be sent to a certain distance in accordance with a certain game situation. A particularly important aspect in all sports games is the spatial accuracy of the movements, which determines the accuracy of sending a ball or a shuttlecock. Another significant factors in badminton are the speed of the motor reaction and the ability to control the time of movements. The athlete, having seen the start of the shuttlecock flight, must decide as soon as possible where the shuttlecock is flying to and how soon it can reach this point. The plan of the next action depends on how quickly and correctly the athlete will solve this task. The ability to quickly solve the tasks set depends on the qualification of the athlete and can be specially developed by creating conditions where such tasks are modeled. Despite the variety of motor actions performed in sports games, it is still possible to give them a comparative characteristic on the basis of two indicators: the relative power of work and the degree of complexity and speed of solving motor tasks [8].

A distinctive feature of the control of movements in sports games is the need to make urgent decisions on situationally arising motor problems. The degree of complexity of their solution is determined by various circumstances: anticipation of the actions of the game partners and unraveling of the enemy's intentions, quick analysis of the current situation, making a decision on the most expedient action; An important factor determining the complexity of the movement control in badminton is the degree of urgency of the task solution, depending on the speed of the players' actions on the site [5].

High accuracy in badminton is achieved with the hand movement in any direction – underhand, side, overhand, with the participation of numerous arm joints with the most complex structure. It is enough to

make a one-degree mistake in every movement to miss many centimeters. The explanation to such a high accuracy of movements without visual control should be sought in the peculiarities of the articular receptors and in the fact that their signals easily reach consciousness. Skilled badminton players develop their own methods of focusing attention, repeat silently the serial number of the shot at the time the shuttlecock bounces from the racket strings [4].

One of the most common indicators of the accuracy of perception of time and spatial characteristics of motion is the accuracy in the reaction to a moving object (MOR) – the determination of the impact point of a moving object with a fixed point, verbally specified in the trainer's instruction. To determine the ratio of the processes of excitation and inhibition in the cerebral cortex, such a rather complex space-time reflex as a reaction to a moving object (MOR) is used as a test. The subject must find some prediction interval by calculating and taking into account his/her speed capabilities, the speed of the object movement and the remaining distance to it.

The reaction to a moving object can be assessed by means of a chronometer. The circle of movement of the arrow on the chronometer dial was 1 min., one division - 0.01 s. The subject had, while looking at the dial, to stop the arrow as close as possible to the mark "0" a second after the chronometer starts. The absolute value of the error time is considered without its sign. Each incomplete division of 0.01 s is counted as complete. The average arithmetic time value of errors of ten test attempts is counted.

Speed ability testing. The presentations and information about the functional state of the organism during the period of athletes' training acquire paramount importance for trainers and other specialists in physical culture and sports, since they concern the matter of career guidance and selection, planning of the motor load regime based on the indicators of physical fitness and wellbeing of the athlete's body.

Control exercises (tests) for assessing the speed abilities are divided into four groups: 1) for assessing the speed of both simple and complex reaction; 2) for assessing the speed of a single movement; 3) for assessing the maximum speed of movement in different joints; 4) for assessing the speed shown in integral motor actions, most often in short distance run.

Control exercises for assessing the speed of a simple and complex reaction. High speed ability is a specific, multifunctional property of the central nervous system, ability to high speed of movements, performed in the absence of significant external resistance and requiring low energy inputs. The time

of the motor reaction to any stimulus consists of two segments: latent time and motor reaction time.

Control exercises for assessing the speed shown in integral motor actions. 30, 50, 60, and 100 m speed run (both crouch and high start). The time was measured in two ways: manually (stopwatch) and automatically using photo electronic and laser devices that allow recording the most important indicators: speed dynamics, length and frequency of steps, and time of individual phases of motion.

Control exercises for assessing the maximum frequency of movement in different joints. The motion frequency of the arms and legs is estimated using tapping tests. The number of movements of arms (alternatively or one only) or legs (alternatively or one only) for 5-20 seconds is recorded.

Motor reaction speed test. The exact speed of the motor reaction to a single signal is determined by means of electronic equipment.

During the process of determining the reaction to a moving object (MOR), it is necessary to constantly keep an eye on the object, which has a high speed of movement. To improve the results, use exercises where the speed of the object increases gradually, the object appears suddenly and in different places, and the observation distance decreases. It should be noted that the time of a complex reaction is much reduced if the object (a ball, a shuttlecock in the game) is already fixed by a glance before the movement starts. The accuracy of the reaction to a moving object is improved in parallel with the development of its speed. The complexity of the selection reaction depends on the options for changing the situation, on the variety of conduct of the opponent or teammate. Such reactions are also fast, but have a longer latent period as compared with simple reactions, resulting from a large amount of information entering the brain and requiring its processing.

Approximately the reaction time can be determined with the help of a falling gymnastic stick. A round gymnastic stick with a diameter of 2 cm is marked with the divisions through each centimeter along its entire length. The coach holds the gymnastic stick at one end (above the divisions) vertically downward. The student holds his/her palm around the gymnastic stick so that the upper part of the palm is at the level of zero scale division. The coach unexpectedly releases a gymnastic stick, and the student should grab it as soon as possible. The faster the student grabs a gymnastic stick, the better his reaction is (faster). Evaluation of the speed of the falling gymnastic stick: excellent result – 10 cm or less, good – not more than 15 cm, satisfactory result – more than 15 cm. It can be approximately assumed

that the division of 10 cm corresponds approximately to 140 milliseconds of flight, 15 cm – to 170 milliseconds.

Single action speed test. The coach stands against the student at arm's length. In the right hand the coach holds a tennis ball. The student holds out both hands towards the coach. The student's legs are slightly bent so that he/she can sit down freely and catch the ball at low level. The coach releases the ball from the hand, and the student must grab the falling ball or hit the ball from above. Palming the ball from below, is not allowed as well as hit the ball from the side; the number of repetitions of ball throws is 10. The score "excellent" – 9 or 10 successfully caught balls or touches, "good" – 8-7, "satisfactory" – 5-6, and "unsatisfactory" – 4 or less.

Complicated single action speed test. The conditions are the same as in the previous test, but in this case the coach holds a tennis ball in each hand and can release any ball, and the student must try to grab the ball from above or touch the ball from above. The score "excellent" – 8-10 caught balls, "good" – 6-7 balls, "satisfactory" – 4-5 balls, and "unsatisfactory" – less than 4 balls.

The above methods allow us to determine the level of development of space-time reactions of school-age badminton players.

The results were processed on the basis of the 3 reaction speed tests. The corresponding diagrams were drawn up, used to monitor the development dynamics of the abilities of young athletes.

When determining the level of development of the motor reaction, the speed of the reaction of a single movement, the speed of the reaction of a single complex movement, we found that at the beginning of the study the indicators in the experimental group were slightly better than in the control group.

During the formative experiment, the control group performed training exercises normally 3 times a week, and the experimental group performed the same tasks 3 times a week and additionally used exercises to develop their reaction speed. Special exercises can start with simple options: high-clear smashes from the baseline, "windmills" with drop-shots and smashes, blocks and net crosses, flat shots, and tipping – all this should be combined with the return to the middle of the site, alternatively, with a certain line touching (complex form). To identify the effectiveness of the developed technology, we tracked the dynamics of three indicators of the athletes' reaction speed: a motor reaction test (Figure 1); a single movement reaction speed test (Figure 2); and a complex single movement reaction speed test (Figure 3).

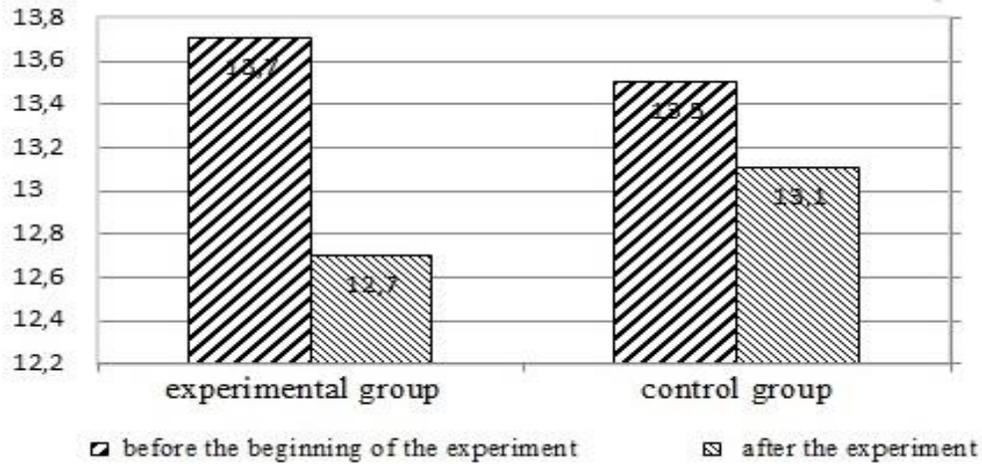


Fig.1: Indicators of average value of the motor reaction test

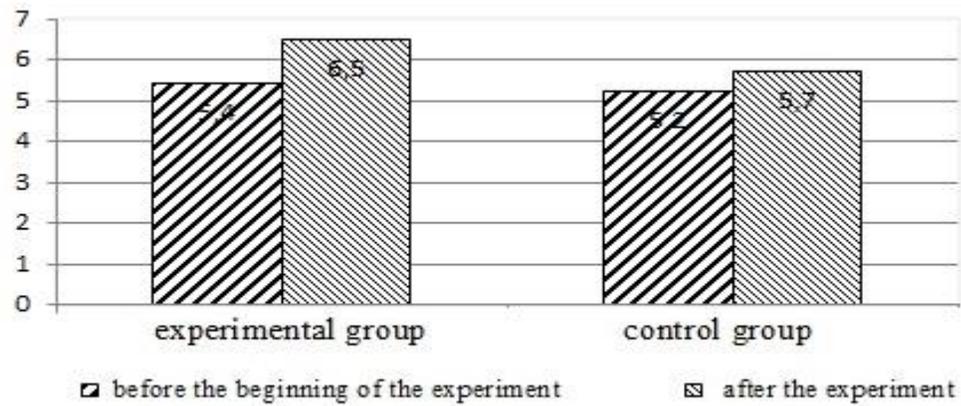


Fig. 2: Indicators of average value of the single movement reaction speed test

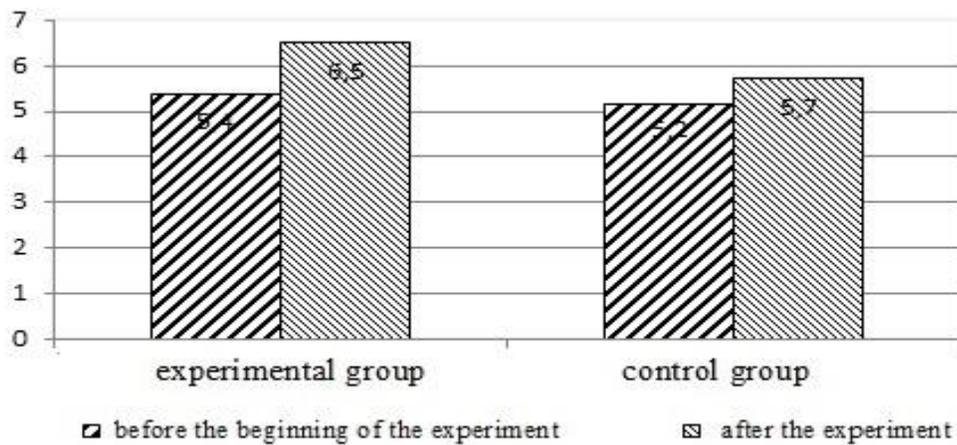


Fig.3: Indicators of average value of the complex single movement reaction speed test

RESULTS AND DISCUSSION:

As we can see from Fig. 1, the experimental group has significantly improved its motor reaction. Compared with the ascertaining experiment, the change is 1 cm, and in the control group – only 0.4 cm, which in turn is less than in the experimental group by 0.6 cm. It should be noted that the lower the value of the indicator is, the better the result is.

Fig. 2 shows that the experimental group has improved its single movement reaction speed. Compared with the ascertaining experiment, the change is 1.1 balls, and in the control group – only 0.5 balls, which in turn is less than in the experimental group by 0.6 balls. Consequently, the higher the value of the indicator is, the better the result is.

According to Fig. 3, the experimental group has significantly improved its complex single movement reaction speed. Compared with the ascertaining experiment, the change is 1.1 balls, and in the control group – only 0.5 balls, which in turn is less than in the experimental group by 0.6 balls. Consequently, the higher the value of the indicator is, the better the result is.

The results of the study show a clearly visible change in the values of the indices in both groups. At the beginning of the experiment, the rates of reaction in both groups were almost identical. However, after the experiment, significant improvement occurred in the experimental group on these indicators.

SUMMARY:

At the end of the pedagogical experiment we can make the following conclusions:

1. The developed selection methodology based on psychophysiological parameters allowed the schoolchildren engaged in badminton to discover new psychophysical qualities and growth in technical skills: an increase in shot speed in game combinations; increase in shot accuracy in game combinations; and increase in shot force in game combinations;
2. During the experiment, the badminton players of the experimental group improved their performance and results in achieving sports categories.
3. According to the results of the study, the experimental group significantly improved its parameters for all three tests: motor reaction, single movement reaction speed and complex single movement reaction speed.
4. Based on the results of the city's badminton championship among schoolchildren, it was noted that the children of the experimental group took four first places, and the children of the control group – only 2.
5. This allows predicting future sports results with sufficient accuracy, and, consequently, correctly solve the problem of choosing the most optimal kind of sport for each applicant.

CONCLUSION:

General sport result depends on many individual factors. The children engaged in badminton optimized the

development of the following qualities: communicative, adaptive, self-reliant, purposefulness, self-actualization.

The results of the study can be used by both badminton trainers and trainers of the republican level for the selection of subjects and planning of the training process.

Thus, our athletes' selection methodology for badminton at CYSS on the basis of psychophysiological parameters gave a positive result.

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