



# Modern approaches to the selection and orientation of athletes for the running high jump

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## Abstract

**Background and Study Aim.** Selection and orientation are important and relevant issues in various sports, including high jump, as they aim to identify an athlete's suitability for a particular sport, reveal their abilities, ensure the effectiveness of the training process, and achieve high results. This issue is of interest in sports science and practice, primarily regarding the identification of the most talented children and their orientation toward further sports specialization. The purpose of the study is to investigate modern approaches to the selection and orientation of athletes for high jump training in the early stages of training.

**Material and methods.** The study involved 35 children who expressed a desire to engage in running high jump. The experimental group included 23 children (average age  $10.4 \pm 2.24$  years) who best met the specified selection criteria. To conduct the pedagogical experiment, the physical fitness of the study participants was tested and their anthropometric indicators (body length, body weight) were measured. The study used the following methods: analysis of scientific and methodological literature and Internet resources, generalization of the experience of leading coaches and our own experimental research, surveys, pedagogical observation, pedagogical experiment, testing, expert evaluation, medical and biological methods, and mathematical and statistical analysis.

**Results.** In the course of solving the research tasks, it was established that the selection of athletes can be successfully carried out on the basis of the comprehensive use of relevant indicators, the most important of which are anthropometric measurements, indicators of physical development, and the rate of their growth in the initial stages of training. Analysis of the data obtained during the pedagogical experiment shows a high correlation with athletic performance at a reliable level ( $p \leq 0.05$ ) for three control exercises: 20 m sprint ( $r = 0.707$ ), standing long jump ( $r = 0.642$ ), and standing vertical jump ( $r = 0.691$ ), confirming their particular importance for achieving high athletic performance in the running high jump.

**Conclusions.** The results of the study prove the need for a comprehensive approach to athletic selection and orientation in high jump based on the most informative parameters of special physical fitness, anthropometric indicators, and the formation of psychological preparedness through the introduction of modern methodological approaches, which ensures the improvement of the training process and enhances the effectiveness of predicting athletic performance.

**Keywords:** anthropometry, special physical fitness, performance, selection criteria, high jumpers, methodological approaches.

## Анотація

**Сучасні підходи відбору та орієнтації підготовки спортсменів для стрибків у висоту з розбігу**

**Передумови та мета дослідження.** Відбір і орієнтація є однією з важливих і актуальних проблем у різних видах спорту, зокрема й у стрибках у висоту, оскільки спрямована на виявлення придатності спортсмена до обраного виду спорту, розкриття здібностей, забезпечення ефективності тренувального процесу та досягнення високих результатів. Дана проблема викликає інтерес у спортивній науці і практиці у першу чергу щодо пошуку найбільш обдарованих дітей до різних видів спорту та орієнтації на подальшу спортивну спеціалізацію. Мета дослідження – дослідити сучасні підходи до відбору та орієнтації спортсменів для занять





стрибками у висоту з розбігу на початкових етапах підготовки.

**Матеріал і методи.** У дослідженні взяли участь 35 дітей, які виявили бажання займатися стрибками у висоту з розбігу. До експериментальної групи увійшли діти 23 дітей (середній вік  $10,4 \pm 2,24$  років), які найбільше відповідали визначеним критеріям відбору. Для проведення педагогічного експерименту було проведено тестування фізичної підготовленості та вимірювання антропометричних показників (довжина тіла, маса тіла) учасників дослідження. У дослідженні використано такі методи: аналіз науково-методичної літератури та інтернет-ресурсів, узагальнення досвіду провідних тренерів і власних експериментальних досліджень, опитування, педагогічне спостереження, педагогічний експеримент, тестування, експертне оцінювання, медико-біологічні методи, математично-статистичний аналіз.

**Результати.** У процесі вирішення завдань дослідження було встановлено, що відбір спортсменів можна успішно здійснити на основі комплексного використання відповідних показників, найважливішими з яких є – дані антропометричних вимірювань, показники розвитку фізичних якостей та темпи їх приросту на початкових етапах тренування. Аналіз отриманих даних протягом педагогічного експерименту показує високий кореляційний зв'язок зі спортивним результатом на достовірному рівні ( $p \leq 0,05$ ) трьох контрольних вправ: бігу на 20 м з ходу ( $r = 0,707$ ), стрибка у довжину з місця ( $r = 0,642$ ) та стрибка вгору з місця ( $r = 0,691$ ), що підтверджує їх особливу значущість для досягнення високого спортивного результату у стрибках у висоту з розбігу.

**Висновки.** Результати дослідження доводять необхідність комплексного підходу до спортивного відбору й орієнтації у стрибках у висоту на основі найбільш інформативних параметрів спеціальної фізичної підготовленості, антропометричних показників, формування психологічної підготовленості через впровадження сучасних методичних підходів, що забезпечує удосконалення тренувального процесу та високу ефективність прогнозування спортивних результатів.

**Ключові слова:** антропометрія, спеціальна фізична підготовленість, результативність, критерії відбору, стрибки у висоту з розбігу, методичні підходи.

## Introduction

Sports selection is a pressing issue in various sports, as it addresses key aspects of athlete training: identifying an athlete's suitability for a chosen sport, guiding them toward sports specialization in subsequent training, and achieving high athletic results.

This issue is of interest in sports science and practice, primarily in terms of identifying the most gifted children for various sports and guiding them toward further sports specialization. Researchers have examined various aspects of sports selection, including its structure, sequence, duration, and the relationship between its stages and the long-term development of athletes [1, 2, 3, 4, 5], the genetic makeup and abilities of children, and their comprehensive assessment during selection for sports [6]. Specific aspects of sports selection and orientation in team sports as well as specific aspects of selection and orientation in team sports [8]. Work has been published on the effectiveness of sports orientation for young track and field athletes in the initial training groups of children's and youth sports schools [9] and on the most effective measures and factors influencing the system of athletic selection for track and field [10].

However, issues of athletic selection for high jump training remain relevant, taking into account the specifics of the sport, modern approaches, and their implementation in practice.

**The purpose of this study** is to explore

modern approaches to selecting and orienting athletes for high jump training during the initial stages of training.

## Research materials and methods

### Participants

The study involved 35 children who expressed a desire to practice running high jump. The experimental group included 10-year-old children ( $n = 23$ ) who best met the specified selection criteria.

The study participants were classified as belonging to the primary health group, as determined by their medical certificates. The children's interest in high jump with a running start was determined through interviews and surveys. It is worth noting that of the 35 children who expressed a desire to practice high jump with a running start, 23 had the support of parents who have a positive attitude toward the sport and supported their choice.

Analysis of scientific and methodological literature and online resources, summarizing the experience of leading coaches and our own experimental research, pedagogical observation, testing, surveys, expert evaluation, pedagogical experiment, medical and biological methods, and mathematical and statistical analysis.

### Ethics Statements and Participants

All study participants gave their consent to participate in the study in accordance with the



Helsinki Declaration of Human Rights and were informed of the purposes and procedures of the testing, as well as the possibility of withdrawing consent at any time and for any reason.

#### Study design

To determine the physical fitness of the study participants, testing of their physical abilities (speed, strength, endurance, agility, flexibility) was conducted, which allowed us to determine their level of physical fitness (below average and average). Based on the results of the initial control tests, a rank of the level of development of physical qualities was determined by adding up all the places that the athletes under study took in each of the control exercises. For example, young athlete K. took 5th place in the 20m dash, 7th place in the 30m dash from a low start, 3rd place in the standing long jump, and 10th place in the deadlift. By adding up the places taken, we obtain the rank of special physical preparedness ( $5 + 7 + 3 + 10 = 25$ ), In this case, the total score was 25. Moreover, the lower the total score, the higher the level of specialized physical fitness.

Every six months, all young athletes underwent control tests to determine the rate of improvement in speed, speed-strength abilities, and foot dynamometry. Using rank correlation, the relationship between the running high jump result and the performance of each control exercise was examined.

Additionally, the young athletes' anthropometric indicators (body length, body weight) were analyzed. A comparative analysis of the dynamics of anthropometric indicators was conducted using a scale we developed (Table 1).

The expert assessment of the level of physical fitness (stage I of selection), special physical fitness and analysis of the athletes' sports results (stage II of selection) were carried out by experienced coaches who train running high jumpers.

In order to study the prognostic value of the initial level of development of physical qualities and the rate of their improvement over 3 years, the pedagogical experiment was divided into two stages, each lasting 1,5 years.

#### Results

Sports practice shows that determining aptitude for a particular sport is a lengthy and complex process, requiring the study of both the natural talents and abilities of children, including not only physical capabilities but also changing morphological and psychological factors, in accordance with the individual developmental characteristics of the body and life processes [2; 7, 4, 5]. This leads to a consistent selection process and targeted training of young athletes at each stage of their long-term development, taking into account the specifics of the sport.

Based on an analysis and summary of scientific and methodological literature and our own experience, we selected the most significant criteria for the selection of children for running high jump training for the pedagogical experiment: health status (based on medical review data), motivation, anthropometry, and physical fitness.

During the first stage of the pedagogical experiment, differences in the body length and weight of the young athletes were determined, according to the developed scale (Table 1).

Analysis of the correlations between body length, body weight, and the results of the high jump with a running start of the study participants indicates increasing positive relationships with age (Table 2).

The greatest increase in body length and mass occurred between the ages of 12 and 14, coinciding with the period of active pubertal development and the formation of morphofunctional characteristics.

**Table 1. Evaluation of body length and body mass of young high jump athletes**

Level	Low level		Intermediate level		High level	
	Age/Physical Development Indicators	Body height (cm)	Body weight (kg)	Body length (cm)	Body weight (kg)	Body length (cm)
11-12 years	до 144	до 37	145-154	38-47	155 and above	48 and above
13-14 years	до 160	до 50	161-177	51-67	178 and above	68 and above

**Table 2. Correlation between anthropometric indicators and athletic performance of young high jump athletes**

Anthropometric indicators	Age group (p) of jumpers / Result of high jump with a run (cm)			
	11 130 cm	11,6 140 cm	12 155 cm	14 170 cm
Body height	0,478	0,491	0,502	0,529
Body weight	0,455	0,459	0,461	0,493



Advantages in physical development-body length and relatively low body mass-were the primary criteria for the further selection of young athletes (ages 13-14) for the running high jump.

It is known that a high level of mastery of physical exercise technique depends on the development of the necessary physical qualities for the chosen sport, including the high jump [13, 14, 15, 16]. Therefore, another important selection criterion was the assessment of the physical qualities of running high jumpers based on testing of speed, foot strength, and speed-strength abilities. Experts [17, 18, 19, 20] believe that potential in running high jumps can be determined by the rate of growth of these physical qualities.

The rate of development of physical qualities varies among athletes, as it is determined by individual abilities to improve. However, the initial level of natural talent is crucial, as it determines individual children's aptitude for a particular sport. Therefore, when selecting groups of young high jumpers, our study took into account the initial level of development of those physical qualities that, firstly, largely determine success in this athletic discipline and, secondly, are difficult to develop through training.

To monitor specific physical fitness indicators and further develop the running high jump, a series of follow-up tests were conducted after 6 months, 1 year, and 3 years of training. To determine the most informative parameters at these age periods, a correlation analysis was conducted between running high jump performance and specific physical fitness indicators (Table 3).

In 11-year-old athletes, a correlation was found between the results of the high jump with a running start and only two indicators: the 20 m running start ( $r = 0,559$ ) and the vertical jump from a standing position ( $r = 0,578$ ).

The data obtained indicate that the level of natural abilities, which determine speed and speed-strength abilities, are genetically determined, significantly influences the athletes' future performance. Regarding the standing long jump, experts argue that this exercise cannot serve as a universal test for determining high jump ability with a running start [13, 17, 20]. This is explained by the fact that the result of the standing long jump depends not only on specific physical qualities but also on the ability to direct one's efforts at the required angle during the jump. This fact was confirmed in our studies. Beginners as young as 11 years old do not yet have the necessary skill and fear of falling upon landing, so they tend to jump more upward than forward, not fully realizing their physical capabilities. If we limit ourselves to the results of the initial testing, the potential capabilities of beginners can be predicted with a certain accuracy based on their overall results in all control exercises. Thus, this testing does not provide an accurate picture of the potential capabilities of young athletes for the coming years, but it does reliably determine their suitability for high jumps with a run-up.

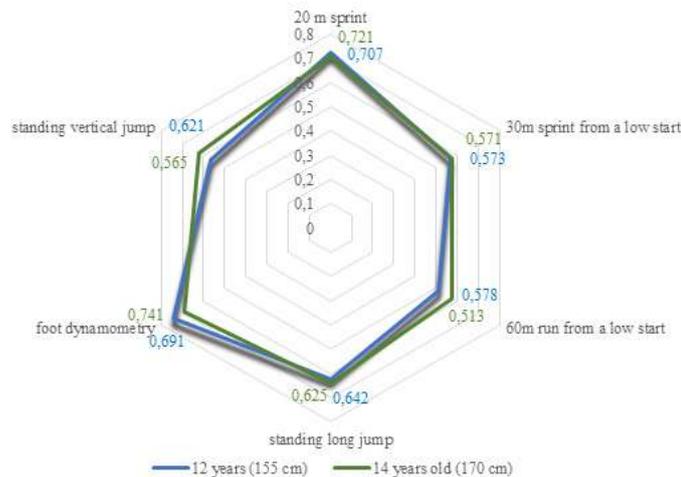
The lack of statistically significant correlations with other indicators at age 11 is explained by the insufficient development of explosive strength and coordination skills necessary for successful low starts and standing long jumps, as well as the poor development of motor skills in jumping exercises. These results were taken into account when adjusting the training content for young jumpers.

After six months, a correlation was noted between the competitive exercise and the standing long jump ( $r=0,665$ ), indicating an increase in speed-strength potential in the horizontal plane and is also important for an effective takeoff in high jumps. At the same time, the correlation

**Table 3. Correlation analysis of the results of the high jump with a run-up and the indicators of special physical preparedness of young high jump athletes aged 11-14**

Age (years)/High jump result with a run-up		20 m sprint	30m sprint from a low start	60m run from a low start	standing long jump	standing vertical jump	foot dynamometry
11	130 cm	0,559	-	-	-	0,578	-
11,6	140 cm	0,658	-	-	0,665	0,572	-
12	155 cm	0,721	0,571	0,513	0,625	0,741	0,565
14	170 cm	0,707*	0,573	0,578	0,642*	0,691*	0,621

Note: \* - reliability of indicators  $p \leq 0,05$



**Figure 1.** Comparative analysis of the correlation between high jump performance and special physical fitness indicators in running high jumpers.

with the 20-meter running sprint increased (from  $r=0,559$  to  $r = 0,658$ ), confirming the development of speed abilities.

To refine the prediction, long-term observations were conducted over 1.5 to 2 years of training, allowing us to study the physical capabilities of young athletes with the goal of improving the range of physical qualities necessary for successful specialization. Accordingly, after one year of training, six tests correlated with the athlete's performance.

The athletic performance of young athletes at age 12 was found to be closely correlated with the results achieved after two years of training (age 14) (Figure 1).

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The athletic performance of young athletes at age 12 was found to be closely correlated with the results achieved after two years of training (age 14) (Figure 1).

High correlation values confirm that the 20-meter dash from a running start is a basic test for assessing the specific speed fitness of high jumpers with a running start, which is reflected in the run-up speed of jumpers of both ages.

The low correlation between the 30-meter sprint from a low start and the high jump performance with a running start indicates that this indicator serves as an auxiliary test of specific physical fitness. The ability to quickly reach maximum speed has a positive impact on high jump performance with a running start at both 12- and 14-year-olds.

The 60m sprint from a low start also shows

a low correlation, but a significant increase of 12,7% ( $r = 0,513$ ,  $r = 0,578$ ) was noted compared to other indicators from ages 12 to 14.

Analysis of the correlation of standing long jump indicators shows that the horizontal component of the take-off gradually becomes more important in 14-year-old jumpers due to improved run-up and takeoff techniques, increased horizontal velocity during the takeoff phase of the running long jump, and improved coordination between the vertical jump and the standing long jump. Thus, the correlation between standing long jump indicators and running vertical jump results ( $r = 0,625$  and  $r = 0,642^*$  at  $p \leq 0,05$ ) confirms the need for systematic speed-strength development in young jumpers.

It was found that the correlation between the standing vertical jump and the running high jump was highest at age 12 ( $r = 0,741$ ) and second highest at age 14 ( $r = 0,691^*$ ). The decrease in the correlation from age 12 to age 14 indicates that the athlete's running high jump performance at age 14 is influenced by morphological changes in their bodies. This affects the development of key physical abilities: run-up speed, take-off force, coordination, and, consequently, the technique of the running high jump. Thus, the standing vertical jump plays a leading role in the structure of the specialized fitness of 14-year-old running high jumpers, a finding confirmed by statistical significance ( $p \leq 0,05$ ).

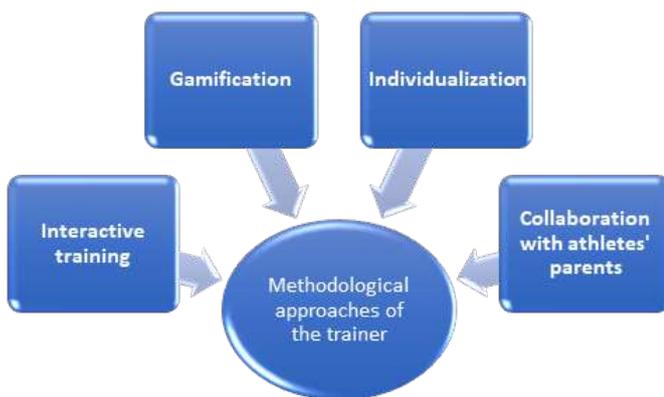
The correlation between foot dynamometry and vertical jump from a running start increased among study participants from 12 to 14 years of age, reaching  $r = 0.565$  and  $r = 0.621$ , respectively. This is explained by changes in physical development—strengthening of the ligament-tendon apparatus of the foot, refinement of push-off technique, and more efficient use of foot elasticity during push-off, as well as biomechanical optimization of the foot's strength capabilities and their

transfer to other kinematic chains.

The analysis of the data obtained during the pedagogical experiment shows a high correlation with the sports result at a reliable level ( $p \leq 0,05$ ) of three control exercises: 20 m running ( $r = 0,707$ ), long jump from a place ( $r = 0,642$ ) and vertical jump from a place, their special significance for achieving a high sports result in high jump with a run-up of 14-year-old athletes.

The study's findings indicate that the predictive value of speed and speed-strength abilities in high jumpers (20-meter running sprint and standing vertical jump) during selection is approximately 33%. However, a significant increase in these indicators was observed—up to 77%—when the cumulative the rate of physical ability growth over the first two years of training was taken into account. Adolescents who, while possessing sufficiently high speed-strength abilities, also demonstrated rapid improvement in high jump performance.

It should be noted that modern methods and methodological approaches aimed at enhancing the motivation of young athletes for the high jump with a running start also played a significant role in the pedagogical experiment (Figure 2).



**Figure 2.** Methodological approaches aimed at increasing the motivation of young athletes to engage in high jumps with a running start.

The above-mentioned modern methodological approaches were used in the training process:

1. Interactive methods – the use of information and communication technologies (ICT) to analyze video recordings of athletes' own training sessions and competitions; viewing videos of the training process and participating in competitive activities of highly qualified high jumpers; multimedia materials (illustrations, infographics, presentations, animations, 3D models).

2. Gamification – the use of game elements and competitive activities in the training process aimed at achieving set goals; earning incentive points.

3. An individualized approach, which included differentiating theoretical and practical tasks by difficulty; the ability to monitor athletes' physi-

cal condition and adjust training intensity based on their individual needs using modern gadgets (heart rate monitors, fitness trackers, smart-watches).

4. Collaboration with athletes' parents. Parents of young athletes were involved in competitions, as spectators, and in discussions of their children's achievements, which helped increase motivation and support their athletic aspirations.

The use of modern methodological approaches in the training process of high jumpers has increased their interest in their chosen sport, encouraged them to engage in further training sessions, and strengthened their motivation, confidence, and psychological resilience to achieve athletic results.

## Discussion

One of the key challenges in improving athletic training and achieving high athletic performance is the selection of talented children for various sports. Numerous studies in this area [1, 2, 5, 6, 11] have confirmed the relevance of scientific research in various sports [7, 8, 9], due to differing perspectives on this issue [3, 4, 10, 12] and the limited number of such studies in the high jump.

To explore modern approaches to selecting children for the running high jump, we considered the results of research [2, 6] on selecting children with a natural aptitude for the chosen sport, including not only physical abilities but also morphological and psychological factors, as well as variable factors [7, 4, 5]. In our research, important criteria for selecting young athletes for the running high jump included body length and a relatively low body weight.

Of particular note is the identified correlation dynamics between vertical jump performance and specific physical fitness indicators across age groups.

While 11-year-old athletes exhibited correlations ( $r = 0,559-0,578$ ) only for individual indicators, 12-year-olds demonstrated correlations across all studied parameters (from  $r = 0,513$  to  $r = 0,741$ ).

The emergence of a correlation between vertical jump performance and standing long jump performance is explained not only by improved physical abilities, but also by improved technical skills and overcoming a psychological barrier—the fear of falling when landing in jumps. The progressive increase in correlations reflects the increasing functional capabilities of young athletes, which is consistent with the principles of sports improvement theory at different stages of long-term training [1, 2].

The identification of a correlation between all the studied indicators in 12-year-old athletes and



the highest correlation with the vertical jump from a standing position ( $r = 0.741$ ) is consistent with studies [18, 19] regarding the determination of the most informative sports parameters, as well as sensitive periods of development [9, 10]. It is at age 12 that the optimal balance of natural talent and established motor skills is observed, indicating that this age period is the most informative for predicting performance in subsequent stages of long-term development.

The athletic performance demonstrated by young athletes at age 12 is closely correlated with the results achieved after two years of training. This confirms the effectiveness of athletic selection and orientation and is consistent with research data [10] on the specifics of athletic selection during the initial training stage in track and field, as well as with recommendations for long-term monitoring to improve the prediction of future athletic achievement [4].

A summary of the obtained research results allows us to establish that, during the initial stages of training high jumpers, it is advisable to focus on speed (20-meter running) and explosive power (standing vertical jump, standing long jump). After two years of training, comprehensive monitoring of the development of all speed-strength indicators is necessary.

At the same time, we have established that the effectiveness of sports selection largely depends on the creation of a motivational environment that facilitates the implementation of modern technologies and is consistent with scientific recommendations [3, 4, 5, 19] regarding the search for new technologies and alternative approaches to improving the effectiveness of sports training and athlete selection at all stages of long-term development.

## Conclusions

The study found that when selecting children for running high jump training, it is advisable to conduct the selection in two stages. The first stage is an initial examination based on anthropometric indicators and physical characteristics to select who best meet the requirements of this athletics discipline. The second stage is the selection of young athletes with high rates of physical development. The final selection of athlete groups should be based on long-term observations over a period of 1–2 years.

The study's results demonstrate the need for a comprehensive approach to athletic selection and orientation in high jumps based on the most informative parameters of specific physical fitness, anthropometric indicators, and the development of psychological preparedness through the implementation of modern approaches and technologies. This ensures an improved training

process and highly effective prediction of athletic performance. These modern approaches provide the foundation for improving the quality of selection and orientation of talented children for the high jump, as well as for optimizing the training process for high jumpers with a running start at various stages of long-term development.

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## Supplementary Information

### Article details

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### Ethical statement

The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. All participants and their parents or legal guardians were informed about the purpose and procedures of the study, as well as their right to withdraw at any time without consequences. Written informed consent was obtained prior to participation. All procedures were non-invasive and complied with relevant national and institutional ethical standards.

### Conflict of interest

The authors declare no conflict of interest.

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