

# Features of planning training loads of coordinating orientation in young female volleyball players aged 10-17, taking into account their age development

Roman Boichuk<sup>1ABCDE</sup>, Sergii Iermakov<sup>2ABCD</sup>, Mykola Nosko<sup>3ABCD</sup>, Yuliya Nosko<sup>4ABCDE</sup>,  
Sergii Harkusha<sup>5ACD</sup>, Zhanna Grashchenkova<sup>6ADE</sup>, Mariya Troyanovska<sup>7ADE</sup>

<sup>1</sup>Department of Physical Education and Sports, Ivano-Frankivsk National Technical University of Oil and Gas, Ukraine

<sup>2</sup> Department of Methodologies of Cross-Cultural Practices, Kharkiv State Academy of Design and Arts, Ukraine

<sup>3</sup> Department of Pedagogy, Psychology and Methods of Physical Education; T.H. Shevchenko National University “Chernihiv Colehium”, Ukraine

<sup>4</sup> Department of Pedagogy, Psychology and Methods of Physical Education; T.H. Shevchenko National University “Chernihiv Colehium”, Ukraine

<sup>5</sup> Department of Pedagogy, Psychology and Methods of Physical Education; T.H. Shevchenko National University “Chernihiv Colehium”, Ukraine

<sup>6</sup>Department of Olympic and Professional Sports; Kharkiv State Academy of Physical Culture; Kharkiv, Ukraine.

<sup>7</sup>Department of Pedagogy, Psychology and Methods of Physical Education; T.H. Shevchenko National University “Chernihiv Colehium”, Ukraine

Authors' Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection.

## Abstract

### Background and Study Aim

In the context of youth sports development, it is imperative to emphasize the critical importance of a comprehensive understanding of coordinating orientation training in young female volleyball players. Given the significant variations in physical and neurological growth patterns within this age group, addressing the methodological nuances of tailored training programs becomes paramount. This study aims to substantiate specific methodological approaches for planning coordination training among young female volleyball players, with a keen focus on accommodating the unique intricacies of their developmental journey.

### Material and Methods

Participants in this study included female volleyball players aged 10 (n=25), 11 (n=20), 12 (n=30), and 13 (n=20). The second phase of the study involved the analysis of four years of observations of female volleyball players aged 14 to 17 (n=24), who were carefully selected from a large pool of young candidates. Prior to their participation, both the children and their parents were provided with detailed information about the study, and informed consent was obtained. In the study, a series of tests were utilized, including “Backward Throw to Target”, “Stepping over a gymnastics stick”, “Running to numbered balls”, and “Backward Shuttle Run (3x10 m)”. An expert assessment was conducted, involving the participation of highly qualified specialists (n=25).

### Results

The study has demonstrated a substantial increase in coordination abilities among female volleyball players aged 10 to 17. A significant improvement was observed in kinesthetic differentiation abilities (2.3 times). A somewhat smaller increase was noted in their abilities to coordinate and restructure movements and spatial orientation (1.4-1.6 times). The most pronounced and statistically significant improvements were observed in the age group of 10 to 12 years. Changes in volleyball players aged from 12 to 13 and from 13 to 14 in tests assessing the development of spatial orientation and coordination of movements were less apparent. Motor coordination indicators improved significantly in the age group of 14 to 16.

### Conclusions

The identification of age-related characteristics in the development of coordination abilities is crucial for implementing the principle of aligning biological development with pedagogical and training methods. Understanding the various ontogenetic stages is essential for effectively managing the long-term athletic development of young female volleyball players.

### Keywords:

female volleyball players, coordination, abilities, dynamics, development.

## Introduction

The goal of the modern sports education system

in volleyball is to refine a training strategy for producing highly skilled players. This strategy, built on fundamentally new approaches to system development, aims to ensure the sustainable long-term improvement of female volleyball players' sporting achievements. According to Schnabel

[1] and Starosta [2], these approaches place a strong emphasis on the methodological role of the 'technique-coordination' factor. Researchers recommend prioritizing coordination training, defining tasks, means, and methods in accordance with the stages of long-term athletic development.

According to Šimonek [3] and Rathod and Rai [4], the long-term training system for volleyball players should be informed by the age-related characteristics of various types of motor coordination development. This approach allows for the implementation of Bernstein's principle [5], which emphasizes aligning pedagogical influences with the specifics of human biological development. Researchers highlight that the effects of training on young athletes can vary significantly depending on their developmental phase. In certain age stages, motor-oriented training can yield optimal results, while in others, the impact may be more neutral. Only by understanding the nuances of ontogeny periods and adjusting training loads accordingly can we effectively oversee the individual development of young athletes.

To determine the appropriate training load, it is advisable to rely on data related to the age-related development of motor qualities, while considering the concept of 'sensitive periods.' Research examining the age-related development of these qualities has delineated distinct phases characterized by active growth, stabilization, and reduced growth rates [6, 7]. It's noteworthy that sensitive phases extend beyond the development of motor qualities and encompass intellectual, musical, and mathematical domains as well [5].

Within this context, Lyakh et al. [8] introduced a grading system for assessing motor quality development, categorizing it into three levels. Research findings suggest that a growth rate exceeding 3% designates a sensitive period, necessitating the allocation of up to 30% of training time to focus on that specific quality. Qualities with an average growth rate of 2% are recommended to receive 20% of the training time per year. In cases where the growth rate is low, dedicating 10% of training time to address that particular quality is advisable.

The examination of coordinative abilities among schoolchildren in relation to age has been extensively detailed in previous works [7, 9]. Researchers have identified heterochronous development patterns for coordination abilities across different age groups. However it is also valuable to compare age-related dynamics of coordination abilities between schoolchildren who do not participate in sports and young athletes [10]. This comparative analysis not only sheds light on the impact of targeted sports training on the pace of coordinative ability development but also provides essential data for crafting long-term sports training

programs in children's and youth sports schools.

Simonek et al. [11] emphasize the significance of planning and customizing training loads, considering the training potential, for young volleyball players of varying ages, genders, and fitness levels within the coordination training system. According to the authors, the effectiveness of selectively targeted development of motor qualities directly correlates with the specific time period during which they undergo improvement. Researchers identify 'maximum rates of progress' when targeted interventions align with the periods of greatest age-related growth. During periods of submaximal and moderately high progress, a lesser increase in coordination abilities is observed.

Ljach and Witkovski [12] highlight the variability in opinions among different authors regarding the concept of sensitive periods. There remains no unanimous consensus on whether the most significant training effects consistently occur during periods of accelerated development of specific motor skills. What is universally acknowledged, however, is the methodological stance that underscores the importance of accommodating each young athlete's individual pace and development specifics. It is essential for coaches to focus on refining maturing functions within the 'zone of proximal development' [13, 14, 15] rather than attempting to influence already fully matured functions.

However, considering the sensitive developmental stages of coordination skills alone is not sufficient for the successful implementation of young athletes' training processes [16]. The author convincingly argues that it is equally important to incorporate a diverse range of training methods throughout the athletes' development journey. This approach contributes significantly to the formation of robust motor memory among young athletes, facilitating more efficient motor activity restructuring and rapid acquisition of new motor skills. In the author's view, the challenge of planning and normalizing coordination training while accounting for the complexity of training loads remains an area that requires further development.

So, a contradiction arises between the need to determine the age dynamics of the development of coordination skills of young female volleyball players aged from 10 to 17 and, on the basis of this, to develop practical recommendations for improving the training process effectiveness on the one hand and insufficient scientific development of methodological support for solving them educational task on the other hand. This determines the practical and scientific relevance of the research problem.

*Hypothesis.* It is assumed that determining the dynamics of development of those types of coordination skills that play a leading role in ensuring high efficiency of game activity in volleyball will help to optimize the educational and

training process of young female volleyball players aged 10-17. Conducting an expert assessment of the predominant use of certain means of coordination training at different ages will improve the quality of the process of learning motor actions and the effectiveness of their use in changing game situations.

*The study aim* is to specify some methodological approaches for planning the coordination training of young female volleyball players, taking into account the special features of their age development.

## Materials and Methods

### Participants

Volleyball players aged 10 (n=25), 11 (n=20), 12 (n=30) and 13 (n=20) took part in the experiment. The results of the tests analyzed with the participation of female volleyball players of the above-mentioned age categories were of a “cross-sectional” nature. The second part of the study consists of the results of a four-year observation of female volleyball players aged from 14 to 17 (n=24) who were selected from a large number of young candidates. The children and their parents were informed about all the features of the study and gave their consent to participate in the experiment.

### Research Design

The pedagogical experiment lasted 3 years. Well-known motor tests were used to determine the level of coordination readiness of female volleyball players [8, 17, 18]. As part of the study, the level of development of the abilities for kinesthetic differentiation, spatial orientation, restructuring of motor activity and movement coordination was determined:

Test 1: “Backward Throw to Target” (number of times);

Test 2: “Stepping over a gymnastics stick (s)”;

Test 3: “Running to numbered balls (s)”;

Test 4: “Backward Shuttle Run (3x10 m)” (s).

An expert assessment was the next step of the study. Highly qualified specialists (n=25) took part in the survey. During the training seminar, the

coaches were asked to select, differentiate and group the coordination training means, as well as to determine their proportion depending on the age characteristics of the players.

### Statistical analysis

Statistical data processing was carried out using Microsoft Excel and SPSS programs. The following values were determined for each indicator: arithmetic mean ( $\bar{X}$ ), standard deviation (S), standard error (m), assessment of the significance of differences according to the Student’s t-test with the corresponding significance level (p). Differences were considered significant at a significance level of  $p < 0.05$  [19].

## Results

When determining the age dynamics of the development of coordination abilities in young female volleyball players aged from 10 to 17, a statistical discrepancy between the previous and subsequent ontogeny stages was found. In addition to the arithmetic mean of the test results and the standard deviation, the growth rates from one age period to the next one are also given in Tables 1-4. The study showed that female volleyball players between the ages of 10 and 17 show a sharp increase in all indicators of the examined coordination abilities. In particular, there was a significant increase in the indicator characterizing the ability to kinesthetic differentiation (2.3-fold).

A somewhat smaller increase was revealed in the indicators the ability of to coordinate and restructure movements, spatial orientation (1.4-1.6 times). A greater increase in results is noted in tests that are more complex in the coordination sense as age development increases. The assessment of coordination abilities using relatively simple motor tasks does not allow one to “catch” individual changes in the ability to control movements.

The development of individual coordination abilities occurs heterochronously and in different directions. Based on single tests, it is impossible to obtain complete information about the changes taking place in the development of all types of

**Table 1.** Dynamics of the development of movement parameter differentiation ability in young female volleyball players (targeted ball throws)

Age, years	$\bar{X}$	t	p	Increase rate, %
10	7±2.6	-	-	-
11	8.1±1.06	1.23	0.233	15.7
12	10.3±1.9	2.7	0.011	27.2
13	9.9±1.79	1.63	0.138	-4.04
14	10.7±1.25	2.23	0.053	8.08
15	12.42±1.98	2.49	0.025	16.7
16	14.57±1.90	3.20	0.019	17.3
17	16±1.52	2.34	0.058	9.8

**Table 2.** The dynamics of spatial orientation development in young female volleyball players (running to numbered balls)

Age, years	$\bar{X}$	t	p	Increase rate, %
10	17.87±1.34	-	-	-
11	16.96±1.12	1.87	0.075	5.4
12	13.88±1.32	6.43	0.001	23
13	13.20±1.07	1.27	0.219	5.2
14	12.57±0.52	2.20	0.059	5
15	12.23±0.41	1.31	0.24	2.8
16	11.67±0.59	3.65	0.011	4.8
17	11.87±0.81	-0.78	0.465	-1.7

**Table 3.** Dynamics of the development of motor action restructuring ability in young female volleyball players (backward shuttle run, 3x10 m)

Age, years	$\bar{X}$	t	p	Increase rate, %
10	14.53±1,13	-	-	-
11	13.80±1,32	1.41	0.171	5.3
12	12.49±1,34	2.40	0.026	10.5
13	12.04±0,27	1	0.33	3.7
14	11.67±0,44	2.13	0.049	3.2
15	10.82±0,61	3.4	0.003	7.9
16	10.23±0,40	4.09	0.005	5.8
17	10.41±0,59	1.22	0.26	- 1.8

**Table 4.** Dynamics of the development of coordination abilities in young female volleyball players (stepping over a gymnastics stick).

Age, years	$\bar{X}$	t	p	Increase rate, %
10	18.8±4.05	-	-	-
11	16.3±3.9	1.65	0.11	15.34
12	15.1±2.22	0.93	0.36	7.9
13	12.2±1.2	3.98	0.001	23.8
14	12.91±1.84	-1.18	0.25	-5.7
15	12.73±1.2	0.25	0.81	1.4
16	11.67±1.57	0.97	0.370	9.1
17	11.56±1.11	0.197	0.85	0.95

coordination abilities. Generalization of the results obtained allows us to consider the characteristic trends related to the dynamics of the development of these abilities. Characteristically, the most dynamically and statistically significantly studied indicators can be improved in children aged from 10 to 12. Sufficiently dynamic growth in this age range is ensured by exceptionally favorable social, mentally intellectual, anatomical, physiological and motor conditions.

In volleyball players aged 13 to 14, changes in the level of movement control and regulation became less apparent (Table 3). Among volleyball players aged 12 to 13, changes in the development of coordination abilities also became less evident (Table 4).

At this age, there is a certain stabilization and partial deterioration in the development of coordination abilities. Specifically, there was an unreliable improvement in indicators related to the ability to restructure movements and spatial orientation, while the ability to assess spatial-dynamic parameters of movements somewhat deteriorated. These findings are likely associated with puberty. During this period, unfavorable morphofunctional changes occur in the body, leading to disturbances in the ability to control and regulate complex coordination movements.

Our next task was to group the coordination training means and determine their percentage depending on the age characteristics of the players.

**Table 5.** Scheme of ranking the coordination training means for young female volleyball players

Levels, scores	Training means and conditions	Recommended stage (age) of use
10	Double-sided game with special tasks for the players.	Stage of specialized basic training (15-17 years old)
9	2x2 and 3x3 Games-Challenges with One or Two Touches	Stage of specialized basic training (15-17 years old)
8	Attacking different areas of the playing field using single and group blocking	Stages of preliminary and specialized basic training (13-16 years old)
7	Receiving the ball after serving (darkened net is used).	Stage of specialized basic training (15-17 years old)
6	Serving the ball for accuracy (after a previously performed attack)	Stage of preliminary basic training (13-14 years old)
5	Passing the ball for attack (the participant is positioned with his face/back to the direction of the pass)	Stages of preliminary and specialized basic training (13-16 years old)
4	Performing a variety of preparatory and introductory exercises for high-quality mastery of technical elements	Stages of initial and preliminary basic training (10-14 years old)
3	Exercises on the coordination stepladder in combination with the implementation of technical methods of playing volleyball	Stage of preliminary basic training (13-14 years old)
2	Running 6, 9, 12 m from different starting positions and in different ways (side steps, with one's back to the direction of movement)	Stages of initial and preliminary basic training (10-14 years old)
1	Outdoor games, relay races, acrobatic exercises, jumps in various ways.	Initial training stage (10-12 years old)

For this purpose, a survey of coaches (n=25) was conducted (Table 5). The study showed that at the stage of initial training, training means are used that have a complex effect on all types of coordination abilities. In particular, these are outdoor games, relay races, running and jumping in various ways. At the stage of preliminary basic training, preparatory and introductory exercises are actively used for quick and high-quality mastery of volleyball techniques. In turn, at the stage of specialized basic training, training means predominate, which require the implementation of techniques in more complex conditions in terms of coordination. The analysis of expert opinions and practical experience made it possible to create a classification scheme for training means of coordination training and their correlation in the process of many years of training (Fig. 1).

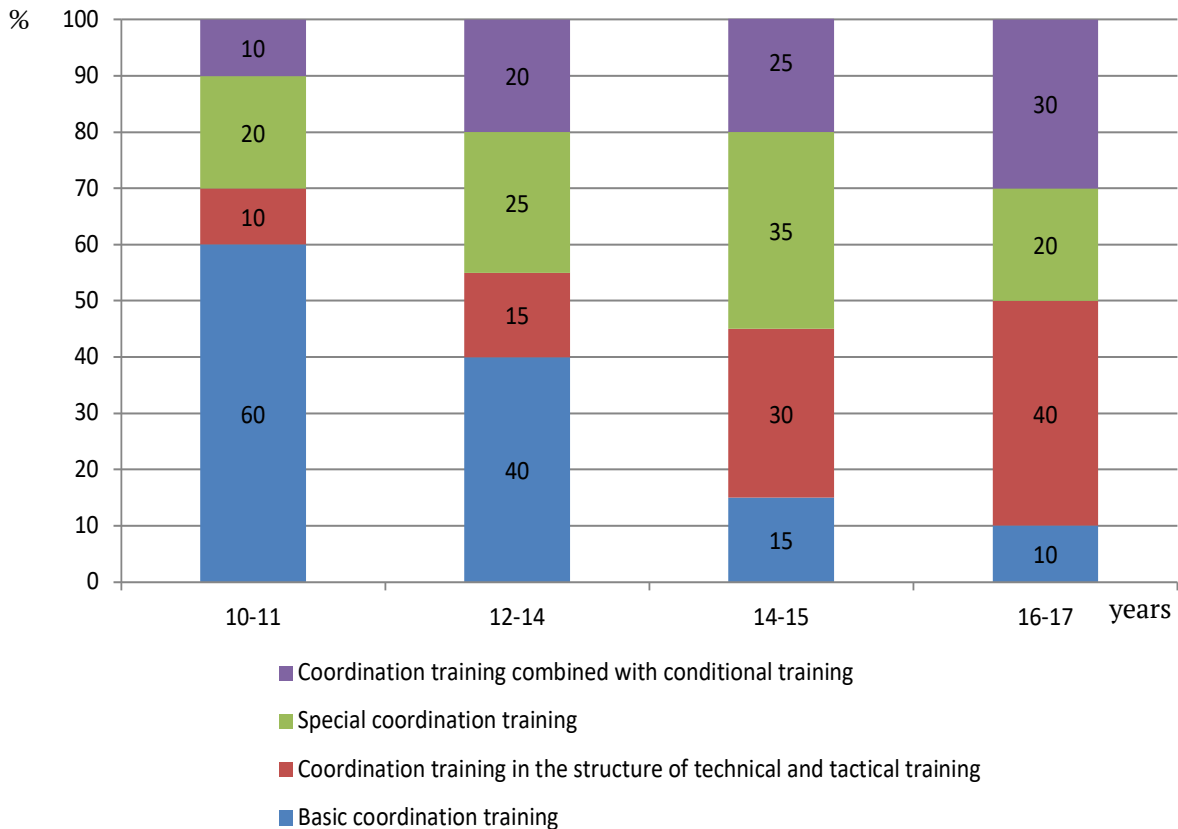
## Discussion

The aim of the work was the attempt to specify methodological approaches for planning the process of improving the coordination abilities of female volleyball players, taking into account their age development. After all, studying age-related characteristics of the development of the coordination abilities of young female volleyball players is of paramount importance in optimizing the initial training process. Finally, the natural evolution of the player's body systems has a well-defined sequence and cyclicity. Phases of

accelerated growth are periodically replaced by phases of slow development. It has been studied that the body of a young athlete reacts differently to training means in these phases [20, 21, 22]. The use of training means of the same scope and intensity has a different pedagogical effect and increases the speed of development of one or another motor quality during the period of natural age-related acceleration. There is no doubt that these periods of time are of considerable importance for children and youth sports. The fact is that the motor skills that are not realized at a certain age can sometimes be less fully or not at all achieved at a later age through longer exercises. Experts [23, 24, 25] point out that the temporal boundaries of periods of accelerated development of motor abilities in boys are much wider than in girls and cover almost the entire period of schooling. In girls they are more concentrated in time and, starting from the age of 12, the development of motor qualities is only occasionally characterized by high rates.

When conducting sports selection, sensitive phases shall also be taken into account in order to be able to correctly assess the body states of the participants and the peculiarities of the development of their motor abilities. However, according to [26, 27], when characterizing the age limits of sensitive periods, it is necessary to focus not on the passport but on the biological age of pupils. This is necessary because the acceleration of children and adolescents has expanded the range of individual disagreements,





**Figure 1.** Correlation of coordination training means in the process of many years of sports training of young female volleyball players

where, along with accelerators, retardants are also involved – children who lag behind in growth and body formation at certain stages of ontogeny. As a result, the same passport age unites a contingent of children with different levels of biological maturity.

Given that the physical activity of young athletes is also a condition that stimulates the development of intellectual, emotional and other spheres, the need for scientific development of issues of the educational and training process and physical education of children and adolescents becomes obvious. As a result, in this age period, the development of biomechanical systems of motor actions takes place, which determine the effectiveness and quality of sports, technical and tactical training, as well as morphological and functional transformations that ensure this development [28, 29, 30].

This process (both in the natural and individual age-related evolution of a person, and in sports ontogenesis) proceeds unevenly and is characterized by favorable and unfavorable phases of development of motor qualities that are important for sports performance. A well-balanced system of long-term sports training should provide for the possibility of organizing educational and training influences appropriate to the sensitive periods of age-related development of motor functional parameters and ensuring the success of

the stimulating development of sports equipment and tactical readiness [31, 32, 33].

The study results confirmed the opinion and experimental data of other authors [7, 9] that the studied indicators have two periods with the highest natural increase in results, which shall be taken into account when planning long-term sports training programs for young athletes. It should be taken into account that the authors studied the development of coordination abilities in schoolchildren. It should be noted that the level of these abilities in young female volleyball players is higher than that of their peers who do not play sports systematically. However, the overall dynamic is the same.

If we talk separately about the period of 10-12 years, then the most dynamically and statistically reliable studied indicators improve precisely in this age period. The authors [3, 10, 34], who came to similar conclusions, point out that in the ontogenesis of motor coordination development, the child's maximum ability to develop new motor actions is achieved precisely at this age. Additionally, the researchers argue that at the same time, the body's ability to build muscles and develop the ability to absorb new materials greatly increases. Moreover, it is particularly favorable at this age to develop speed and flexibility. For this reason, this age group is described by many authors as particularly suitable for physical training [35, 36, 37].

At the age of 12 to 13, this is accompanied by a stabilization and partial deterioration of motor coordination in young female volleyball players. These data are fully consistent with the results of other studies showing a strong slowdown in motor function development in girls aged 12–14 years [38, 39]. The authors associate this with the complex morphofunctional restructuring that take place during this age period. During puberty, regressive changes in a number of features of the central nervous system functions are determined. These features reflect not only sensory processes (perception, attention organization), but also central mechanisms of action of motor regulation, including processes of motor activity coordination. However, according to researchers [38, 39], the use of complexes of special coordination exercises in sports training of teenage girls allows not only to prevent deterioration in motor coordination, but also to significantly improve their motor abilities.

If we talk separately about the period from 14 to 15, and especially about the period from 15 to 16, then there is a further improvement in the level of development of the coordination abilities of young female volleyball players. Similar conclusions were drawn [40], which speak of a further significant improvement in coordination abilities in the postpubertal period. According to experts, however, this can only be achieved through the use of a targeted coordination exercise program. Because after 15 years the natural development of most coordinative abilities ends and reaches its maximum. As a result, based on the data presented, it can be argued that after 16 years and later there is another possibility to improve the coordination abilities of young female volleyball players. In particular, if special means and methods of increased coordination complexity are used for this purpose.

An indicative planning of coordination training is presented in the works Lyakh et al. [8]. According to the authors, in order to successfully plan the process of coordination training of young athletes, it is necessary to know the coordination skills that are significant for a particular sport and to select training means for their development. In addition, according to their beliefs, it is necessary to provide exercises for the combined development of significant coordination abilities, as well as speed, strength, endurance, etc. It is important to consider sensitive development phases of coordination abilities.

Based on these recommendations, we conducted a trainer survey.

This survey allowed us to select, differentiate, and group the coordination training means, taking into account their coordination complexity and training potential. The results of the expert assessment confirmed the need to use a wide range of basic coordination exercises at the age of 10–

12 years. These are, in particular, outdoor games, relay races, acrobatics and athletics exercises. This approach makes it possible to create a broad coordination basis for further technical and tactical improvements. In addition, at the age of 15–17 years, coordination training is mainly carried out in combination with technical and tactical training and fitness training [41, 42].

Thus, the results obtained by us allow us to trace the dynamics of the development of coordination abilities of young female volleyball players in the age aspect. The identified periods of greatest increase in certain types of coordination abilities will allow to properly and timely form training effects for maximum progress. A certain percentage of coordination training means in the long-term education and training process, taking into account their coordination complexity and training effect, will help to avoid mistakes in planning this activity. In addition, further research is needed to identify the dynamics of coordination abilities development, taking into account the sex characteristics of those involved. It seems that the time has come to pay more attention to improving the means and methods for controlling the coordination readiness of young volleyball players in order to make the educational and training process more controllable.

## Conclusions

1. Identifying age-related features of the development of coordination abilities makes it possible to implement the principle of unity of biological development and means, methods, forms of pedagogical and training action. Only knowledge of ontogeny periods enables rational management of the process of long-term athletic improvement. The effect of selectively targeted influence on different aspects of motor function is directly related to the period over which they are improved.

1. Analysis of the dynamics of development of coordination abilities of young volleyball players aged from 10 to 17 shows two periods of natural increases in results. The first period is the age from 10 to 12. Favorable social, psycho-intellectual, anatomical-physiological and motor conditions for the rapid development and training of coordination abilities are currently emerging. After that, from 12 to 13, and in some tests from 13 to 14, there is a stabilization and partial decrease in the results conditioned by puberty. At the age of 14 to 16, further improvement in motor coordination indicators continues.
2. When planning coordination training, it is advisable to take into account not only age, gender, but also individual peculiarities of the development of certain coordination abilities of young athletes. It is also important to normalize the training loads according to the degree of

coordination complexity. At the age of 10 to 12, coordination training takes place using a variety of basic coordination exercises. At the age of 13 to 14, many introductory and preparatory exercises are carried out to create a correct

understanding of the elements of volleyball playing technique. At the age of 15 to 17, the coordination training takes place mainly in combination with technical, tactical and fitness training.

## References

- Schnabel G. Motor coordination the fundamental process of motor activity. In: Carbonaro G. (Ed.), *Motor coordination in sport and exercise*. Bologna: University of Bologna; 2001. P. 89–106.
- Starosta W. The concept of modern training in sport. *Studies in Physical Culture & Tourism*, 2006;13(2).
- Šimonek J. Coordination Abilities in Volleyball. Warsaw, Poland: De Gruyter Open Poland; 2014. <https://doi.org/10.2478/9783110370317>
- Rathod VV, Rai A. Coordinative abilities of female volleyball players at different levels of achievement. *International Journal of Yogic, Human Movement and Sports Sciences* 2017; 2(2): 150–152.
- Bernstein N. *The coordination and regulation of movements*: Oxford Pergamon; 1967.
- Issurin V. *Athletic Talent: Identification and Development*: Ultimate Athlete Concepts; 2017.
- Hirtz P, Starosta W. Sensitive and critical periods of motor coordination development and its relation to motor learning. *Journal of Human Kinetics*. 2002;7:19–28.
- Lyakh V, Sadowski J, Witkowski Z. Development of coordination motor abilities (CMA) in the system of long-term preparation of athletes. *Polish Journal of Sport and Tourism*. 2011;18(3):187. <https://doi.org/10.2478/v10197-011-0014-6>
- Lyakh V, Jaworski J, Wiczorek T. Genetic endowment of coordination motor abilities a review of family and twin research. *Journal of Human Kinetics*. 2007;17:25.
- Vishnyakov A. Coordination training of young taekwondo players, taking into account the peculiarities of their age development. *Theory And Practice of Physical Culture*. 2012(12):6–9.
- Šimonek J, Horička P, Hianik J. Differences in pre-planned agility and reactive agility performance in sport games. *Acta Gymnica*. 2016;46(2):68–73. <https://doi.org/10.5507/ag.2016.006>
- Ljach W, Witkowski Z. Development and training of coordination skills in 11-to 19-year-old soccer players. *Human physiology*. 2010;36(1):64–71. <https://doi.org/10.1134/S0362119710010081>
- Yin X, Zhu R, Shi X, Cai G, Jing C, Pan Q, et al. The effect of rhythm training on the motor coordination abilities of 8–12-year-old freestyle swimmers. *PeerJ*. 2023;11:e15667. <https://doi.org/10.7717/peerj.15667>
- Peker AT, Vural M. Comparison of Some Coordinative Abilities in Terms of Team and Individual Sports. *Journal of Education and Training Studies*. 2019;7(8):67–72. <https://doi.org/10.11114/jets.v7i8.4333>
- Dubey S, Choudhary PK. Comparative analysis on selected coordinative abilities among female team sports players. *Int J Phys Educ Sports Health* 2023;10(1):07–11. <https://doi.org/10.22271/kheljournal.2023.v10.i1a.2745>
- Platonov V, Nikitenko A. Agility and coordination testing in hand-to-hand combat sports. *Polish Journal of Sport and Tourism*, 2019;26(2):7–13. <https://doi.org/10.2478/pjst-2019-0008>
- Morrow Jr J, Jackson A, Disch J, Mood D. Measurement and evaluation in human performance. 3rd edition. USA: Human Kinetics; 2005.
- Nimphius S, Callaghan SJ, Bezodis NE, Lockie RG. Change of direction and agility tests: Challenging our current measures of performance. *Strength & Conditioning Journal*. 2018;40(1):26–38. <https://doi.org/10.1519/SSC.0000000000000309>
- Levesque R. SPSS programming and data management. A guide for SPSS and SAS Users; 2007.
- Trajković N, Pajek M, Sporiš G, Petrinović L, Bogataj Š. Reducing aggression and improving physical fitness in adolescents through an after-school volleyball program. *Frontiers in Psychology*, 2020;11:2081. <https://doi.org/10.3389/fpsyg.2020.02081>
- Bompa T. *Total Training for Young Champions*: Human Kinetics; 2000.
- Zatsiorsky VM, Kraemer WJ, Fry AC. *Science and practice of strength training*. Human Kinetics; 2020.
- Śliwa M, Sadowski J, Buszta M. Relative Age Effect and Talent Identification in Youth Volleyball Players from the Polish Volleyball Federation Sports School. *Polish Journal of Sport and Tourism*. 2021;28(4):21–5. <https://doi.org/10.2478/pjst-2021-0022>
- Sheppard JM, Young WB. Agility literature review: Classifications, training and testing. *Journal of Sports Sciences*, 2006;24(9):919–32. <https://doi.org/10.1080/02640410500457109>
- Petrariu I, Leuciuc FV. Selection Process for Romanian Children in Handball Based on Coordinative Abilities: A Questionnaire Survey. *International Journal of Environmental Research and Public Health*, 2022;19(6):3672. <https://doi.org/10.3390/ijerph19063672>
- Muratova G. Methodology of selection and use of mobile games as a means of connected formation of technical skills and development of physical qualities of volleyball players. *Galaxy International Interdisciplinary Research Journal*, 2022;10(12):992–3.
- Koryahin V, Blavt O. Study of the Technical Training System of Young Athletes. *Physical Education Theory and Methodology*, 2019;19(2), 64–68. <https://doi.org/10.17309/tmfv.2019.2.02>
- Uslu S, Causevic D, Abazovic E, Mahmutovic I, Mahmutovic I, Riza B. The relationship between motor skills and technical skills specific to volleyball



- in adolescent volleyball players. *International Journal of Life Science and Pharma Research*, 2022;11:285–295.
29. Aoki MS, Arruda AF, Freitas CG, Miloski B, Marcelino PR, Drago G, et al. Monitoring training loads, mood states, and jump performance over two periodized training mesocycles in elite young volleyball players. *International Journal of Sports Science & Coaching*. 2017;12(1):130–7. <https://doi.org/10.1177/1747954116684394>
  30. Hidalgo YQ, Sánchez JIR, Callejas TW, Sabates HRR. Psychological actions for tactical thinking development on solving tasks in school volleyball. *International Research Journal of Management, IT and Social Sciences*, 2019;6(6):128–34. <https://doi.org/10.21744/irjmis.v6n6.784>
  31. Koopmann T, Faber I, Baker J, Schorer J. Assessing technical skills in talented youth athletes: a systematic review. *Sports Medicine*, 2020;50(9):1593–611. <https://doi.org/10.1007/s40279-020-01299-4>
  32. Platonov VN. *Motor qualities and physical training of athletes*. Kyiv: Olympic literature; 2017. (In Russian).
  33. Latorre Román PÁ, Villar Macias FJ, García Pinillos F. Effects of a contrast training programme on jumping, sprinting and agility performance of prepubertal basketball players. *Journal of Sports Sciences*, 2018;36(7):802–8. <https://doi.org/10.1080/02640414.2017.1340662>
  34. Szabo DA, Neagu N, Sopa IS. Research regarding the development and evaluation of agility (balance, coordination and speed) in children aged 9-10 years. *Health, Sports & Rehabilitation Medicine*, 2020;21(2). <https://doi.org/10.26659/pm3.2020.21.1.33>
  35. Özgül F, Atan T, Kangalgil M. Comparison of the command and inclusion styles of physical education lessons to teach volleyball in middle school. *Physical Educator*. 2019;76(1):182–96. <https://doi.org/10.18666/TPE-2019-V76-I1-8481>
  36. Latino F, Cataldi S, Fischetti F. Effects of a coordinative ability training program on adolescents' cognitive functioning. *Frontiers in Psychology*. 2021;12:620440. <https://doi.org/10.3389/fpsyg.2021.620440>
  37. Islam RW. A Model of Volleyball Smash Skills Exercise Model for High School Beginners Athletes. *ACTIVE: Journal of Physical Education, Sport, Health and Recreation*. 2019;8(3):134–8.
  38. Ivashchenko O. Research program: Modeling of motor abilities development and teaching of schoolchildren. *Physical Education Theory and Methodology*. 2020;20(1):32–41. <https://doi.org/10.17309/tmfv.2020.1.05>
  39. Lyakh V. Differences in the level of development and proficiency in coordination motor abilities among female and male athletes of selected combat sports. *Journal of Kinesiology and Exercise Sciences*, 2021;31(96):11–23. <https://doi.org/10.5604/01.3001.0015.7373>
  40. Raczek J, Mynarski W. *Coordination motor abilities of children and young people: internal structure and variability*. Katowice: AWF Katowice; 2012.
  41. Padrón-Cabo A, Rey E, Kalén A, Costa PB. Effects of training with an agility ladder on sprint, agility, and dribbling performance in youth soccer players. *Journal of human kinetic.*, 2020;73(1):219–28. <https://doi.org/10.2478/hukin-2019-0146>
  42. Araújo R, Hastie P, Lohse KR, Bessa C, Mesquita I. The long-term development of volleyball game play performance using Sport Education and the Step-Game-Approach model. *European Physical Education Review*, 2019;25(2):311–26. <https://doi.org/10.1177/1356336X17730307>

**Information about the authors:**

**Roman Boichuk;** (Corresponding author); <https://orcid.org/0000-0001-7377-6211>; [roman-boychuk@ukr.net](mailto:roman-boychuk@ukr.net); Department of Physical Education and Sports, Ivano-Frankivsk National Technical University of Oil and Gas; Ivano-Frankivsk, Ukraine.

**Sergii Iermakov;** <https://orcid.org/0000-0002-5039-4517>; [sportart@gmail.com](mailto:sportart@gmail.com); Department of Methodologies of Cross-Cultural Practices, Kharkiv State Academy of Design and Arts; Kharkiv, Ukraine.

**Mykola Nosko;** <http://orcid.org/0000-0001-9903-9164>; [mykola.nosko@gmail.com](mailto:mykola.nosko@gmail.com); Department of Pedagogy, Psychology and Methods of Physical Education, T.H. Shevchenko National University “Chernihiv Colehium”; Chernihiv, Ukraine.

**Yuliya Nosko;** <http://0000-0003-1077-8206>; [ulianosko5@gmail.com](mailto:ulianosko5@gmail.com); Department of Preschool and Primary Education, T.H. Shevchenko National University “Chernihiv Colehium”; Chernihiv, Ukraine.

**Sergii Harkusha;** <https://orcid.org/0000-0002-7120-1446>; [biomex@ukr.net](mailto:biomex@ukr.net); Department of Pedagogy, Psychology and Methods of Physical Education, T.H. Shevchenko National University “Chernihiv Colehium”; Chernihiv, Ukraine.

**Zhanna Grashchenkova;** <https://orcid.org/0000-0002-9372-9890>; [zhannet444margo@gmail.com](mailto:zhannet444margo@gmail.com); Department of Olympic and Professional Sports, Kharkiv State Academy of Physical Culture; Kharkiv, Ukraine.

**Mariya Troyanovska;** <https://orcid.org/0000-0002-7676-8468>; [masha.troyanovskaya@gmail.com](mailto:masha.troyanovskaya@gmail.com); Department of Pedagogy, Psychology and Methods of Physical Education, T.H. Shevchenko National University “Chernihiv Colehium”; Chernihiv, Ukraine.

---

Cite this article as:

Boichuk R, Iermakov S, Nosko M, Nosko Y, Harkusha S, Grashchenkova Z, Troyanovska M. Features of planning training loads of coordinating orientation in young female volleyball players aged 10-17, taking into account their age development. *Pedagogy of Physical Culture and Sports*, 2023;27(5):419–428.  
<https://doi.org/10.15561/26649837.2023.0509>

---

This is an Open Access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited (<http://creativecommons.org/licenses/by/4.0/deed.en>).

Received: 29.08.2023

Accepted: 20.10.2023; Published: 30.10.2023