Training basketball players technology of of student teams of the humanitarian profile higher education institutions

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

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Abstract

At the current stage, the importance of training basketball players during their studies at higher education institutions is growing. After all, it is precisely at the age of 18-25 years, which coincides with the age of studying at the university, that the highest rate of increase in sports achievements of basketball players is observed. But combining sports training with professional development, which requires studying at a university, has difficulties. It is difficult for the coach to take into account the psychological and psychophysiological characteristics of the students of the basketball team. Such features include the properties of the nervous system, its mobility, lability, strength, endurance, as well as the type of thinking based on the predominance of the right or left hemisphere of the brain, that is, imaginative (artistic) or logical (mental).

Purpose: to develop and experimentally justify the methodology of training basketball teams of humanitarian higher educational institutions, taking into account the psychophysiological capabilities of the players.

Material and methods

23 students - players of the national basketball team H.S. Skovoroda Kharkiv National Pedagogical University. Athletes were divided into 2 groups, control (n=12) and experimental (n=11). In the experimental group, a specially developed technology for training basketball players was used, taking into account the peculiarities of the nervous system and the type of thinking of students of humanitarian universities, that is, high mobility and lability and low endurance of the nervous system with a predominance of the artistic type of thinking. The technology included exercises for the development of speed qualities in combination with informational means of influencing the perception of technical and tactical elements in basketball. Research methods: analysis of modern literature, methods of determining the physical and technical level of athletes, methods of determining the level of attention, methods of determining the ability to concentrate and switch attention, methods of statistical analysis.

Results

In the study, based on the results of the literature analysis, the psychophysiological features of students of humanitarian universities were determined. These features consist in the predominance of mobility and lability of the nervous system over endurance. On the basis of these data, a method of training basketball teams of humanitarian higher educational institutions was developed.

Special informational methods of influence on the perception of basketball players of humanitarian higher educational institutions of the elements of basketball technique and tactics have been developed. These methods correspond to the imaginative, artistic type of thinking of students of humanitarian universities and the peculiarities of their nervous system - high mobility and lability in combination with a low level of endurance development.

Conclusions

The method of training basketball players of student teams, based on the psychophysiological characteristics of students of humanitarian universities, is effective for improving the level of special physical fitness of players, as well as the technical and tactical skills of basketball students of humanitarian universities.

Keywords

basketball, team, students, humanitarian profile, information influence
Анотація

Валентин Козін, Віталій Матлаєв. Методика підготовки баскетболістів студентських команд закладів вищої освіти гуманітарного профілю

Обґрунтування і мета
На сучасному етапі зростає значення підготовки баскетболістів в період навчання у закладах вищої освіти. Адже саме у віці 18-25 років, якій співпадає з віком навчання в університеті, спостерігається найвищий темп підвищення спортивних досягнень баскетболістів. Але поєднання спортивних тренувань з професійним вдосконаленням, яке вимагає навчання в університеті, має труднощі. Тренеру важко врахувати психологічні і психофізіологічні особливості студентів баскетбольної команди. До таких особливостей належать властивості нервої системи, її рухливість, фізичні здібності, витривалість, а також — тип мислення за переважанням правої чи лівої півкулі мозку, то бі - образний (художній) чи логічний (розумовий).

Мета: розробити та експериментально обґрунтувати методику підготовки баскетбольних команд гуманітарних вищих навчальних закладів з урахуванням психофізіологічних можливостей гравців.

Матеріал і методи
В дослідженні взяли участь 23 студента — гравця збірної команди з баскетболу Харківського національного педагогічного університету імені Г.С. Сковороди. Атлети були розподілені на 2 групи, контрольну (n=12) та експериментальну (n=11). В експериментальній групі застосовувалась спеціально розроблена технологія підготовки баскетболістів з урахуванням особливостей нервої системи і типу мислення студентів гуманітарних університетів, тобто — високих рухливості і лабільністі та низької витривалості нервої системи з переважанням художнього типу мислення. Технологія включала вправи на розвиток швидкісних якостей у поєднанні з інформаційними засобами впливу на сприйняття техніко-тактичних елементів в баскетболі. Методи дослідження: аналіз сучасної літератури, методи визначення фізичного та технічного рівня спортсменів, методи визначення рівня уваги, методи визначення здатності до концентрації та переключення уваги, методи статистичного аналізу.

Результати
За результатами аналізу літератури визначено психофізіологічні особливості студентів університетів гуманітарного профілю. Ці особливості полягають у переважанні рухливості і лабільністі нервої системи над витривалістю. На основі цих даних розроблено методику підготовки баскетбольних команд гуманітарних вищих навчальних закладів. Розроблено специфічні інформаційні методи впливу на сприйняття баскетболістами гуманітарних вищих навчальних закладів елементи техніки і тактики баскетболу. Ці методи відповідають образному, художньому типу мислення студентів університетів гуманітарного профілю та особливостям їх нервої системи — високих рухливості і лабільністі у поєднанні з невисоким рівнем розвитку витривалості.

Висновки
Методика підготовки баскетболістів студентських команд, заснована на психофізіологічних особливостях студентів університетів гуманітарного профілю є ефективною для поліпшення рівня спеціальної фізичної підготовленості гравців, а також — техніко-тактичної майстерності студентів-баскетболістів гуманітарних університетів.

Ключові слова
баскетбол, команда, студенти, гуманітарний профіль, інформаційний вплив
Introduction

At the current stage, the importance of training basketball players during their studies at higher education institutions is growing [1–4]. After all, it is precisely at the age of 18-25 years, which coincides with the age of studying at the university, that the highest rate of increase in sports achievements of basketball players is observed [5–8]. But combining sports training with professional development, which requires studying at a university, has difficulties. First of all, these difficulties are related to the organization of the training process [9, 10]. The composition of the student team is constantly changing, as athletes who graduate from the university drop out of the team, and students entering the first year join the team. Secondly, the difficulty of organizing the training process in the student team is also related to the fact that it is difficult for the coach to take into account the psychological and psychophysiological characteristics of the students of the basketball team [9–12]. Such features include the properties of the nervous system, its mobility, lability, strength, endurance, as well as the type of thinking based on the predominance of the right or left hemisphere of the brain, that is, imaginative (artistic) or logical (mental) [9, 10].

A number of authors also indicate the presence of specific features in the processes of higher nervous activity in students of "humanities" and "naturalists": humanitarian professions require greater development of an artistic type of thinking, and technical professions require greater development of a logical type of thinking. Modern authors distinguish several interdependent types of thinking, properties of the nervous system and inclination to humanitarian or technical activities [13–16].

Humanitarians are characterized by a combination of mobility and lability of the nervous system. This forms the natural basis of the "artistic" type of thinking. Naturalists are characterized by the combination of endurance and inertia of the nervous system, which distinguishes the "mental" type. This means that melancholics have higher coefficients of verbal intelligence and gravitate towards the "mental" type of thinking. Compared with melancholics, phlegmatic, sanguine and choleric people "gravitate" towards the "artistic" type [17–19].

However, the issue of accounting for the peculiarities of the type and peculiarities of thinking when building the educational and training process of basketball in humanities universities was not considered in the scientific studies available at the moment [20–23]. The issue of accounting for the individual characteristics of student basketball players during the preparation of student basketball teams was also not considered. Therefore, the development of these provisions requires experimental studies and theoretical justifications.

Purpose: to develop and experimentally justify the methodology of training basketball teams of humanitarian higher educational institutions, taking into account the psychophysiological capabilities of the players.

Material and Methods

Participants

23 students - players of the national basketball team of H.S. Skvoroda Kharkiv National Pedagogical University. Athletes were divided into 2 groups, control (n=12) and experimental (n=11). In the experimental group, a specially developed technology for training basketball players was used, taking into account the peculiarities of the nervous system and the type of thinking of students of humanitarian universities, that is, high mobility and lability and low endurance of the nervous system with a predominance of the artistic type of thinking. The technology included exercises for the development of speed qualities in combination with informational means of influencing the perception of technical and tactical elements in basketball.

The experiment to identify the impact of the developed methodology on the level of sportsmanship was conducted from September 2022 to April 2023.

Method of analysis of literary sources

A number of authors indicate the presence of specific features in the processes of higher
nervous activity in students of "humanities" and "naturalists": humanitarian professions require greater development of an artistic type of thinking, and technical professions require greater development of a logical type of thinking. However, the issue of accounting for the peculiarities of the type and peculiarities of thinking when building the educational and training process for basketball in humanities universities was not considered in the currently available scientific research. The issue of accounting for the individual characteristics of student basketball players during the preparation of student basketball teams was also not considered. Therefore, the development of these provisions requires experimental studies and theoretical justifications.

The method of determining the game efficiency of basketball players

The level of game efficiency was determined according to the standard methods described in the works of Kozina, et. all [1–4, 9, 10].

Methods of determining the level of physical and technical readiness

The level of physical and technical readiness was determined by the tests described in the works of Kozina, et. all [1–4, 9, 10].

Intervention technology

Based on the results of the factor analysis of the structure of the readiness of basketball students of humanitarian universities and the generalization of literature data [9, 10, 13, 14], a training methodology for athletes, players of the humanitarian university basketball team was developed, which formed the basis of a formative pedagogical experiment.

The developed methodology assumes that the educational and training process in the basketball teams of humanitarian universities is based on the awareness of the players. This awareness, as a rule, is activated through the artistic thinking of humanities university students, which is confirmed by literary sources and the results of the analysis of the structure of readiness. This opinion is based on the theory of I.P. Pavlov [9, 10] about the existence of different types of thinking in people and on the data of modern scientists, who showed that artistic thinking is more common among students of humanitarian specialties.

In addition to literary data, the basis of the development methodology is data on the factor structure of thinking of basketball students of humanitarian universities. Elements of interpretation, in particular the concept of attention, occupy an important place in the revealed structure of readiness. On the basis of these provisions, methods were developed to activate imaginative and artistic thinking when teaching basketball techniques and tactics, as well as when conducting spontaneous and ideomotor training.

In addition to indicators characterizing attention, key indicators of players' speed and strength capabilities, as well as a high level of fatigue, were found in the structure of the readiness of basketball players of the humanitarian university [1–4, 9, 10]. These provisions determined the main provisions of the developed methodology for training basketball teams of humanitarian universities.

Thus, on the basis of literary data and data obtained as a result of our own research, we determined the methodological features of the training of humanities university students in basketball. These features are expressed in the following key provisions in educational and training sessions.

- When structuring the educational and training process - based on the data of the factor analysis, rely on the main qualities in the general structure of preparedness and the individual structure of preparedness of the players. This approach involves the performance of individual tasks that require activation of the athlete's consciousness;

- when adjusting the load - use of a subjectively recognized scale of load intensity;

- Visual guides, educational cartoons, and video tapes with various technical techniques recorded by professional basketball players were widely used when teaching technical and tactical techniques. Visual aids were issued to each student and could be studied in detail for an unlimited period of time. Educational animations were played on computers and mobile phones;

- To develop the feeling of the ball and the so-called "softness of the hands",...
exercises for juggling the ball and exercises for "virtuoso possession" were performed, as well as homework for manipulating the ball or a soft bag with sand. When performing these tasks, attention was focused on observing the necessary effort and biomechanical details of the exercises;

- Exercises aimed at developing and improving the sense of time, for example, hitting a ball for 30 seconds. In addition, some methods are aimed at developing specific sensations that develop in basketball players who are already at a fairly high technical level, that is, the feeling of the ball, court, opponent, etc.

Visual guides, educational cartoons, and video tapes with various technical techniques recorded by professional basketball players were widely used when teaching technical and tactical techniques. Visual guides were published every student and could be studied in detail for an unlimited period of time. Educational animations were played on computers and mobile phones;

To create printed manuals, the method of video recording of qualified basketball players demonstrating technical techniques was used, with further processing of the obtained data on a computer. The video material was shot by a video camera and transferred to a computer using a TV tuner. The video material was divided into frames using the Adobe Premier program. Adobe Photoshop was then used to select the desired frames and remove the background. The background has been removed to ensure contrast and visual recognition of technical elements. The video game created in this way was printed and distributed to each student for independent study. Below are examples of videograms and drawings created in this way (Fig. 1-4).

Fig. 1. An example of a visual aid for illustrating the technique of holding the ball in one hand

Fig. 2. An example of a visual aid for illustrating a one-handed pass from below, which was studied to expand the technical arsenal of players and develop a sense of the ball
Statistical analysis

For the statistical processing of the research results, the analysis of samples for the normality of the distribution was used. The results of testing samples for normality of distribution showed that they all obey the law of normal distribution (p>0.05). Therefore, we used parametric methods of data processing, namely - Student's t test. The "SPSS" program was used in the statistical processing of the research results.

Results

The study convincingly demonstrated the effectiveness of the use of a complex method of training basketball teams in humanitarian higher educational institutions. This can be seen from the results of the comparative analysis of the test indicators of the control and experimental groups before and after the experiment. Let us now consider the influence of the experimental methodology on the indicators of special and technical physical fitness, game performance and the development of psychophysiological abilities.
The control and experimental groups did not differ statistically in pre-experimental indicators of special and technical training (Table 1). When comparing the average values of the test indicators of the control and experimental groups, the Student's independent sampling criterion was used. Statistical processing of the data showed that the t values calculated for all the analyzed indicators of the special and technical preparedness of basketball players of the humanitarian university were lower than the critical value of t (p>0.05), which proves the absence of a statistically significant difference between the control and experimental groups before the start of the experiment (Table 1).

A comparison of the average values of the test indicators before and after the experiment shows that almost all indicators of the special physical and technical preparedness of the athletes of the experimental group improved significantly, while the test indicators of the control group improved not as clearly and not as much as in the experimental group (Table 2, Fig. 5).

In the 6-m running test, the experimental group improved its result by 0.06 s, and the control group - by 0.03 s as a result of the experiment. The increase of this indicator in both control and experimental groups is statistically unreliable (p>0.05). Both the control and experimental groups were unlikely to improve their performance in the 6-m run because the training experiment was conducted for insufficient time to reliably improve this measure.

However, the results of running 6 m have a tendency to improve, and this tendency is more pronounced in the experimental group than in the control group (Table 2). Thus, the time spent on running the 6 m segment shows an unreliable decrease in both the control and experimental groups, but only a tendency to decrease this indicator, which is more pronounced in the experimental group.

In the control group, only indicators of high-speed technique, throwing a stuffed ball from the place, speed of movement in defense, accuracy of free throws and throws from medium distance improved significantly (Table 3.2). At the same time, the increase of these indicators, expressed as a percentage, in the experimental group was higher than in the control group (Table 2, Fig. 5).

The result of the “run 2*28 m” test in the experimental group was 9.69 s before the experiment, and 9.01 s after the experiment. The indicator of running ability on the “2*28 m” segment in the experimental group improved by 0.68 s or by 7.01% with a probability of p<0.05 (Table 3.2). In the control group, the time spent running the “2*28 m” segment changed from 9.58 s before the experiment to 9.31 s after the experiment, which is not statistically significant (p>0.05) (Table 2).

The result of the standing long jump test in the control group before the experiment was 55.5 cm, and after the experiment - 56.8 cm. This change is not statistically significant (p>0.05) (Table 2). At the same time, in the experimental group, the “long jump” test was 57.1 cm before the experiment and 58.75 cm after the experiment. The improvement of this indicator due to the use of experimental methods was 1.65 cm or 2.22%, which is reliable at p < 0.05 (Table 2).

The changes due to the application of the experimental methodology were more pronounced in the test of speed-power readiness, or “running jump”, which characterizes the most typical combination of speed and explosiveness in the basketball game. The result of the “running jump” in the experimental group before the test was 66.5 cm, while the result after the test was 73.25 cm. The increase in this test was 6.75 cm or 10.15%. This change is statistically significant at the p<0.01 level (Table 2). In the control group, the result of the standing long jump test changed from 69.17 cm to 71.83 cm. This change is not significant (p>0.05) (Table 2).

The results of the “speed jumping” test in the experimental group increased from 31.3 jumps in 20 s to 35.5 jumps in 20 s, which is an increase of 13.4% from the initial level and can be p<0.01 (Table 2). In the control group, the increase in indicators in this test is unreliable: the result before the experiment was 32.13 jumps in 20s, and after the experiment - 33.33 jumps in 20s (p>0.05) (Table 2).

The results of the “speed technique” test changed significantly with p<0.05 in both the experimental and control groups (Table 2). In the experimental group, the duration of this test decreased from 12.87 s before the test to 12.04
s after the test, that is, by 0.83 s (2.74%). In the control group, performance of the “speed technique” test improved from 12.52 s to 12.08 s, the increase in results was 2.45%, which is significant at the p<0.05 level, but slightly worse than in the experimental group (Table 2).

In the experimental group, the indicator in the test “throwing a stuffed ball” also significantly improved as a result of the application of the developed experimental technique. The results showed that the shot put from the place belonging to the experimental group improved by 0.89 m (from 15.16 m to 16.05 m, 5.87% of the initial level). This change is significant at p<0.05 (Table 2). In the control group, there is also a significant increase in the results of the test “throwing a stuffed ball from a place”: from 15.52 m to 15.96 m. The result in this test in the control group improved by 0.44 m or by 2.83% <0.05, which, however, is lower than the improvement of this indicator in the experimental group (Table 2).

Similar results were obtained in the “throwing a stuffed ball from a run-up” test: in the experimental group, the increase in the result was 2.12% p<0.05 (Table 3.2), and in the control group the increase in the result was 0.84%, which is statistically not likely (p>0.05) (Table 2).

The results of the “time of defensive movements” test in the experimental group improved from 23.52 seconds to 23.05 seconds, that is, by 2.0%, which is statistically significant at p < 0.05 (Table 2). In the control group, the improvement of this indicator was 0.46% (from 23.41 to 23.05 seconds), which is also statistically significant at p<0.05 (table 2), but is smaller than in the experimental group (Table 2). Shot accuracy at medium distances in the experimental group was 45.23% before and 60.15% after the experiment, which is reliable with a probability of p<0.01 (Table 2). Similar changes were detected in the control group, but less pronounced than in the experimental group, although more reliable. In the control group before the experiment, the accuracy of throws from medium distances was 44.33%, while after the experiment - 51.77% (p<0.01) (Table 2).

The effectiveness of free throws in the experimental group increased from 57.25% before the experiment to 67.5% after the experiment, which was statistically significant at p<0.01 (Table 2). In the control group, the efficiency of free throws was 56.33% before the experiment and 61.67% after it. This change is significant at the p<0.05 level. In other words, the increase in the effectiveness of free throws in the experimental group is statistically significant compared to the control group (Table 2).

In addition to a comparative analysis of the levels of special physical and technical preparation of basketball students of humanities universities before and after the application of the developed experimental methodology, a comparative analysis of the dynamics of game efficiency was also conducted. The dynamics was determined by a formula that allows you to generalize the effectiveness of various actions in attack and defense.

According to the results of the t-test with independent samples, the control and experimental groups before the experiment did not differ significantly (p=0.345) in terms of game efficiency. However, after the experiment, the difference between the groups became significant (p<0.001) according to the results of the t-test with independent samples.

Before the experiment, the average value of the game efficiency index in the experimental group was 16.84 points. After the experiment, the average value of the game efficiency index in the experimental group was 22.31 points. This change is reliable at the highest level of significance (p<0.001).

In the control group, such changes in game efficiency are practically not presented. So, before the experiment, the average value of the game efficiency index in the control group was 17.49 points. After the experiment, the average group value of the game efficiency index in the control group was equal to 17.22 points. This change was not significant (p=0.45).
Table 1
Indicators of special physical preparedness of basketball players of the control and experimental groups before the experiment (n=11 in the experimental group, n=12 in the control group)

<table>
<thead>
<tr>
<th>№</th>
<th>Name of the test</th>
<th>Group</th>
<th>M±σ</th>
<th>t</th>
<th>p</th>
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<tbody>
<tr>
<td>1</td>
<td>Running 6m (s)</td>
<td>Control</td>
<td>1,19±0,02</td>
<td>0,21</td>
<td>&gt;0,05</td>
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<td></td>
<td></td>
<td>Experimental</td>
<td>1,21±0,01</td>
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<tr>
<td>2</td>
<td>Running 2*28 m (s)</td>
<td>Control</td>
<td>9,53±0,08</td>
<td>0,06</td>
<td>&gt;0,05</td>
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<tr>
<td></td>
<td></td>
<td>Experimental</td>
<td>9,69±0,07</td>
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<tr>
<td>3</td>
<td>Standing jump (cm)</td>
<td>Control</td>
<td>55,5±3,33</td>
<td>0,23</td>
<td>&gt;0,05</td>
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<tr>
<td></td>
<td></td>
<td>Experimental</td>
<td>57,1±2,38</td>
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<tr>
<td>4</td>
<td>Running jump (cm)</td>
<td>Control</td>
<td>69,17±5,15</td>
<td>0,87</td>
<td>&gt;0,05</td>
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<tr>
<td></td>
<td></td>
<td>Experimental</td>
<td>66,5±9,14</td>
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Table 3
Indicators of special physical fitness of basketball players of the control and experimental groups before and after the experiment (reliable values of the Student’s t-test are highlighted) (n=11 in the experimental group, n=12 in the control group)

<table>
<thead>
<tr>
<th>№</th>
<th>Name of the test / Group</th>
<th>M±σ before the experiment</th>
<th>M±σ after the experiment</th>
<th>Change absolute</th>
<th>Change %</th>
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<th>p</th>
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<tbody>
<tr>
<td>1</td>
<td>Running 6m (s)</td>
<td>1,19±0,02</td>
<td>1,16±0,08</td>
<td>-0,03</td>
<td>-2,5</td>
<td>0,21</td>
<td>&gt;0,05</td>
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<tr>
<td>2</td>
<td>Running 2*28 m (s)</td>
<td>9,53±0,08</td>
<td>9,31±0,37</td>
<td>-0,22</td>
<td>-2,3</td>
<td>1,06</td>
<td>&gt;0,05</td>
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<td>3</td>
<td>Standing jump (cm)</td>
<td>55,5±3,33</td>
<td>56,83±3,43</td>
<td>1,23</td>
<td>2,22</td>
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<tr>
<td>4</td>
<td>Running jump (cm)</td>
<td>69,17±5,15</td>
<td>71,83±4,91</td>
<td>2,66</td>
<td>3,84</td>
<td>1,87</td>
<td>&gt;0,05</td>
</tr>
<tr>
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<td></td>
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<td></td>
</tr>
<tr>
<td>5</td>
<td>Speed hopping (number of times)</td>
<td>32,13±3,88</td>
<td>33,33±4,91</td>
<td>1,2</td>
<td>3,73</td>
<td>0,96</td>
<td>&gt;0,05</td>
</tr>
<tr>
<td></td>
<td>High-speed technology (c)</td>
<td>Control</td>
<td>12.52±0.89</td>
<td>12.08±0.51</td>
<td>-0.44</td>
<td>-3.51</td>
<td>2.45</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Experimental</td>
<td>12.87±0.48</td>
<td>12.04±0.51</td>
<td>-0.83</td>
<td>-6.49</td>
<td>2.74</td>
</tr>
<tr>
<td>7</td>
<td>Throwing a stuffed ball from the run (m)</td>
<td>Control</td>
<td>17.27±1.42</td>
<td>17.42±1.26</td>
<td>0.15</td>
<td>0.8</td>
<td>0.84</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Experimental</td>
<td>17.33±1.09</td>
<td>17.98±0.34</td>
<td>0.65</td>
<td>3.75</td>
<td>2.12</td>
</tr>
<tr>
<td>8</td>
<td>Throwing a stuffed ball from a place (m)</td>
<td>Control</td>
<td>15.52±0.88</td>
<td>15.96±1.09</td>
<td>0.44</td>
<td>2.83</td>
<td>2.63</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Experimental</td>
<td>15.16±1.01</td>
<td>16.05±0.71</td>
<td>0.89</td>
<td>5.87</td>
<td>2.97</td>
</tr>
<tr>
<td>9</td>
<td>Time of defensive movements (s)</td>
<td>Control</td>
<td>23.41±1.29</td>
<td>23.3±1.23</td>
<td>-0.11</td>
<td>-0.46</td>
<td>2.16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Experimental</td>
<td>23.52±0.36</td>
<td>23.05±1.4</td>
<td>-0.47</td>
<td>-2.0</td>
<td>3.87</td>
</tr>
<tr>
<td>10</td>
<td>% of shots hit from medium distance</td>
<td>Control</td>
<td>44.33±18.81</td>
<td>51.77±15.27</td>
<td>7.44</td>
<td>16.78</td>
<td>4.63</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Experimental</td>
<td>45.23±5.47</td>
<td>60.15±9.3</td>
<td>14.92</td>
<td>32.99</td>
<td>5.92</td>
</tr>
<tr>
<td>11</td>
<td>% of free throws</td>
<td>Control</td>
<td>56.33±8.76</td>
<td>61.67±9.3</td>
<td>5.34</td>
<td>9.48</td>
<td>3.55</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Experimental</td>
<td>57.25±8.53</td>
<td>67.5±8.66</td>
<td>10.25</td>
<td>17.9</td>
<td>4.47</td>
</tr>
<tr>
<td>12</td>
<td>Speed Endurance. Sum of 3 attempts (s)</td>
<td>Control</td>
<td>82.8±5.94</td>
<td>82.62±4.7</td>
<td>-0.18</td>
<td>-0.21</td>
<td>1.64</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Experimental</td>
<td>83.52±4.36</td>
<td>82.0±2.8</td>
<td>-1.52</td>
<td>-1.81</td>
<td>2.76</td>
</tr>
</tbody>
</table>

Fig. 5. Change in the results of testing basketball players in the control and experimental groups (%): 1 – run 6m (s); 2 – running 2x28 m (s); 3 – standing jump (cm); 4 – running jump (cm); 5 – high-speed jumping (number of times); 6 – high-speed equipment (c); 7 – throwing a stuffed ball from a run-up (m); 8 - throwing. embankment free kick (m); 9 – time of defensive movements (s); 10 – % of hits from mid-range shots; 11 – % of free throw hits; 12 – speed endurance, sum of 3 attempts (s)
However, the results of running 6 m have a tendency to improve, and this tendency is more pronounced in the experimental group than in the control group (Table 2). Thus, the time spent on running the 6 m segment shows an unreliable decrease in both the control and experimental groups, but only a tendency to decrease this indicator, which is more pronounced in the experimental group.

In the control group, only indicators of high-speed technique, throwing a stuffed ball from the place, speed of movement in defense, accuracy of free throws and throws from medium distance improved significantly (Table 3.2). At the same time, the increase of these indicators, expressed as a percentage, in the experimental group was higher than in the control group (Table 2, Fig. 5).

The result of the "run 2*28 m" test in the experimental group was 9.69 s before the experiment, and 9.01 s after the experiment. The indicator of running ability on the "2*28 m" segment in the experimental group improved by 0.68 s or by 7.01% with a probability of p<0.05 (Table 3.2). In the control group, the time spent running the "2*28 m" segment changed from 9.58 s before the experiment to 9.31 s after the experiment, which is not statistically significant (p>0.05) (Table 2).

The result of the standing long jump test in the control group before the experiment was 55.5 cm, and after the experiment - 56.8 cm. This change is not statistically significant (p>0.05) (Table 2). At the same time, in the experimental group, the "long jump" test was 57.1 cm before the experiment and 58.75 cm after the experiment. The improvement of this indicator due to the use of experimental methods was 1.65 cm or 2.22%, which is reliable at p < 0.05 (Table 2).

The changes due to the application of the experimental methodology were more pronounced in the test of speed-power readiness, or "running jump", which characterizes the most typical combination of speed and explosiveness in the basketball game. The result of the "running jump" in the experimental group before the test was 66.5 cm, while the result after the test was 73.25 cm. The increase in this test was 6.75 cm or 10.15%. This change is statistically significant at the p<0.01 level (Table 2). In the control group, the result of the standing long jump test changed from 69.17 cm to 71.83 cm. This change is not significant (p>0.05) (Table 2).

The results of the "speed jumping" test in the experimental group increased from 31.3 jumps in 20 s to 35.5 jumps in 20 s, which is an increase of 13.4% from the initial level and can be p<0.01 (Table 2). In the control group, the increase in indicators in this test is unreliable: the result before the experiment was 32.13 jumps in 20s, and after the experiment - 33.33 jumps in 20s (p>0.05) (Table 2).

The results of the "speed technique" test changed significantly with p<0.05 in both the experimental and control groups (Table 2). In the experimental group, the duration of this test decreased from 12.87 s before the test to 12.04 s after the test, that is, by 0.83 s (2.74%). In the control group, performance of the "speed technique" test improved from 12.52 s to 12.08 s, the increase in results was 2.45%, which is significant at the p<0.05 level, but slightly worse than in the experimental group (table 2).

In the experimental group, the indicator in the test "throwing a stuffed ball" also significantly improved as a result of the application of the developed experimental technique. The results showed that the shot put from the place belonging to the experimental group improved by 0.89 m (from 15.16 m to 16.05 m, 5.87% of the initial level). This change is significant at p<0.05 (Table 2). In the control group, there is also a significant increase in the results of the test "throwing a stuffed ball from a place": from 15.52 m to 15.96 m. The result in this test in the control group improved by 0.44 m or by 2.83% <0.05, which, however, is lower than the improvement of this indicator in the experimental group (Table 2).

Similar results were obtained in the "throwing a stuffed ball from a run-up" test: in the experimental group, the increase in the result was 2.12% p<0.05 (Table 3.2), and in the control group the increase in the result was 0.84%, which is statistically not likely (p>0.05) (Table 2).

The results of the "time of defensive movements" test in the experimental group improved from 23.52 seconds to 23.05 seconds, that is, by 2.0%, which is statistically significant at p < 0.05 (Table 2). In the control group, the improvement of this indicator was 0.46% (from 23.41 to 23.05 seconds), which is also statistically significant at p<0.05 (table 2),
but is smaller than in the experimental group (table 2). Shot accuracy at medium distances in the experimental group was 45.23% before and 60.15% after the experiment, which is reliable with a probability of p<0.01 (Table 2). Similar changes were detected in the control group, but less pronounced than in the experimental group, although more reliable. In the control group before the experiment, the accuracy of throws from medium distances was 44.33%, while after the experiment - 51.77% (p<0.01) (Table 2).

The effectiveness of free throws in the experimental group increased from 57.25% before the experiment to 67.5% after the experiment, which was statistically significant at p<0.01 (Table 2). In the control group, the efficiency of free throws was 56.33% before the experiment and 61.67% after it. This change is significant at the p<0.05 level. In other words, the increase in the effectiveness of free throws in the experimental group is statistically significant compared to the control group (Table 2).

In addition to a comparative analysis of the levels of special physical and technical preparation of basketball students of humanities universities before and after the application of the developed experimental methodology, a comparative analysis of the dynamics of game efficiency was also conducted. The dynamics was determined by a formula that allows you to generalize the effectiveness of various actions in attack and defense.

According to the results of the t-test with independent samples, the control and experimental groups before the experiment did not differ significantly (p=0.345) in terms of game efficiency. However, after the experiment, the difference between the groups became significant (p<0.001) according to the results of the t-test with independent samples.

Before the experiment, the average value of the game efficiency index in the experimental group was 16.84 points. After the experiment, the average value of the game efficiency index in the experimental group was 22.31 points. This change is reliable at the highest level of significance (p<0.001).

In the control group, such changes in game efficiency are practically not presented. So, before the experiment, the average value of the game efficiency index in the control group was 17.49 points. After the experiment, the average group value of the game efficiency index in the control group was equal to 17.22 points. This change was not significant (p=0.45).

Discussion

The purpose of the research was achieved, as the feasibility of using a special technology developed for the training of basketball players of humanitarian universities was substantiated. The technology included special means of influencing the conscious perception of technical and tactical elements through the use of information technologies in the form of visual devices, films and cartoons. Emphasis on the use of visualization technologies was associated with the predominance of imaginative thinking among students of liberal arts universities. It should also be noted the expediency of using exercises aimed at developing athletes' speed. The use of high-speed exercises was based on the premise of the predominance of mobility and lability of the nervous system with insufficient development of the endurance of the nervous system. The obtained data confirmed the expediency of building a training process in accordance with the properties of the athletes' nervous system.

The results of tests for special physical fitness and technical-tactical skills in the experimental group were more significantly improved compared to the control group. The above-mentioned tests mainly reflect the level of development of speed, speed-power abilities and technical preparation. It is natural that the use of experimental methods led to improved results in these tests. This is explained by the fact that the developed technique was aimed primarily at the development of speed and speed-power qualities, according to the data of the factor analysis of the complex index of readiness of basketball players of the humanitarian university [1–4].

However, the developed methodology also assumed that the performance of humanitarian university basketball players can be improved by gradually increasing the frequency of performing a set of exercises aimed at developing speed and speed-power qualities. At the same time, once a week, cross-training was conducted with the players,
aimed at increasing general endurance, which made it possible to improve the most problematic elements of the complex structure of the preparation of basketball players of the humanitarian university [1–4, 9, 10].

The degree of influence of the developed technique on the indicator of special endurance can be determined by the results of the "speed endurance" test. In the experimental group, this indicator increased from 83.52 s to 82.0 s, significantly at p<0.05 (Table 2). In the control group, an increase in the performance of this test is unlikely (p>0.05) (Table 2). The developed technique was aimed primarily at the development of speed and speed-strength qualities, and the development of endurance was realized to a greater extent as its aerobic-anaerobic component, that is, speed-strength endurance. However, the results of a special endurance test showed that the developed method was effective for developing the working capacity of students of humanitarian universities, which confirms its effectiveness as a special method of training basketball teams of humanitarian universities [20–23].

So, summarizing the results of the impact of the developed methodology on the indicators of special and technical preparation of basketball players of humanities universities, we can say that the rates of improvement of indicators of special preparation of basketball players of the experimental group increased by 1.81-32.99% (Table 2, Fig. 5), then as in the control group, this increase was from 0.21 to 16.78% (Table 2, Fig. 5).

It can be concluded that the complex method of training basketball teams of humanitarian higher educational institutions, applied in the educational and training process of basketball players of the experimental group, contributed to the increase of almost all indicators of special tests of physical fitness. The greatest increase in indicators was observed in "quick jumps" (increase of 13.4% and t-criterion of 4.54, which is higher than other indicators) (Table 2, Fig. 5), "jumps from a run" (increase of 10.15), "throws of a stuffed ball" (increase from 5.7 to 9.7), "speed of movement in defense" (increase in "efficiency of free throws" and "efficiency of shots from medium distance" (increase was 17.9 and 32, 99, respectively) (Table 2, Fig. 5). In addition, after the experiment, almost all indicators showed significant differences between the control and experimental groups.

Based on the above, it can be noted that in order to improve the quality of training of basketball players of humanitarian universities, it is possible to recommend a technology that relies on the psychophysiological characteristics of students studying in the humanitarian field. These features include the mobility of the nervous system and the predominance of visual perception. That is why exercises and technologies that correspond to these qualities of students should be used: speed exercises and visualization technologies of technical and tactical elements.

Conclusions

In the study, based on the results of the literature analysis, the psychophysiological features of students of humanitarian universities were determined. These features consist in the predominance of mobility and lability of the nervous system over endurance. On the basis of these data, a method of training basketball teams of humanitarian higher educational institutions was developed.

Special informational methods of influence on the perception of basketball players of humanitarian higher educational institutions of the elements of basketball technique and tactics have been developed. These methods correspond to the imaginative, artistic type of thinking of students of humanitarian universities and the peculiarities of their nervous system - high mobility and lability in combination with a low level of endurance development.

The method of training basketball players of student teams, based on the psychophysiological characteristics of students of humanitarian universities, is effective for improving the level of special physical fitness of players, as well as the technical and tactical skills of basketball students of humanitarian universities.

Conflict of interest

The author declares no conflict of interest.
References


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