Improvement of the physical preparedness of athletes in breaking at the age of 13-15 years using the functional simulator “alpha-gravity”

Sergey Humenyuk[1]
Vladimir Konovalov[2]
Vladislav Zamaziy[1]

[1]*Kharkiv State Academy of Physical Culture, Kharkiv, Ukraine*
[2]*Kharkiv National Medical University, Kharkiv, Ukraine*

Abstract

Purpose: to experimentally substantiate the improvement of the physical preparedness of breakdancers at the age of 13-15 years using the functional simulator «Alpha Gravity».

Material & Methods: theoretical analysis and generalization of scientific and methodological literature, pedagogical observation, pedagogical testing, pedagogical experiment, methods of mathematical statistics. The study involved 22 breakdancers aged 13-15 years, from the reserve of the national team of Ukraine. Two groups were formed from the study participants: the control group (CG) - 11 athletes and the main group (MG) – 11 athletes, in the educational process of which the means of the functional simulator «Alpha Gravity» were included.

Results: a positive effect of the application of a set of exercises using the «Alpha Gravity» functional simulator in the training process of breakdancers aged 13-15 years was revealed. The greatest increase in indicators of physical fitness of the athletes of the main group was found in the tests: T1 «Bend forward from a sitting position, legs together (cm)»; T2 «Push-ups» (number of times min^{-1})”; T5 «Holding the torso in the prone position, (s)»; T6 «Plank, (s)». In other tests, there is also a positive trend in the growth of indicators.

Conclusions: statistically significant positive changes in the level of physical preparedness of breakdancers at the age of 13-15 years of the main group (MG, n=11) were established under the influence of the developed training methodology using the means of the functional simulator «Alpha Gravity».

Анотація

Сергій Гуменюк, Володимир Коновалов, Владислав Замазій. Вдосконалення фізичної підготовленості спортсменів з брейкінгу віком 13-15 років засобами функціонального тренажеру «альфа-гравіті». Мета: експериментально обґрунтувати вдосконалення фізичної підготовленості спортсменів з брейкінгу віком 13-15 років засобами функціонального тренажеру «Альфа-гравіті». **Матеріал і методи:** теоретичний аналіз і узагальнення науково-методичної літератури, педагогічне спостереження, педагогічне тестування, педагогічний експеримент, методи математичної статистики. У дослідженні взяли участь 22 спортсмена з брейкінгу віком 13-15 років, зі складу резерву збірної команди України. З учасників дослідження було сформовано дві групи: контрольну групу (КГ) - 11 спортсменів та основну групу (ОГ) - 11 спортсменів, до навчально-тренувального процесу якої було включено засоби функціонального тренажеру «Альфа-гравіті». **Результати:** виявлено позитивний вплив застосування у навчально-тренувальному процесі спортсменів з брейкінгу віком 13-15 років комплексу вправ з використанням функціонального тренажеру «Альфа-гравіті». Найбільший приріст показників фізичної підготовленості спортсменів основної групи виявлено у тестах: Т1 «Нахил вперед з положення сидячи ноги разом, (см)»; Т2 «Згинання та розгинання рук в упорі лежачи (к-ть разів·$хв^{-1}$)»; Т5 «Утримання тулубу в положенні лежачи на животі, (с)»; Т6 «Планка, (с)». В інших тестах також простежується позитивна динаміка зростання показників. Висновки: встановлено статистично значущі позитивні зміни

Original Paper

DOI: 10.15391/snsv.2022-1.004
Received: 17.02.2022;
Published: 31.03.2022

Citation:

Humenyuk, S., Konovalov, V. & Zamaziy, V. (2022). Improvement of the physical preparedness of athletes in breaking at the age of 13-15 years using the functional simulator “alpha-gravity”. *Slobozhanskyi Herald of Science and Sport*, 26(1), 20-26. doi: 10.15391/snsv.2022-1.004

Corresponding author:

Sergey Humenyuk
Kharkiv State Academy of Physical Culture, Kharkiv, Ukraine
ORCID: 0000-0003-2694-1071
e-mail: raoidstk@gmail.com

Vladimir Konovalov
ORCID: 0000-0002-4493-3350

Vladislav Zamaziy
ORCID: 0000-0002-1984-5869

Key words:

fbreaking
physical preparedness
functional trainer
alpha gravity

Ключові слова:

брейкінг
фізична підготовленість
функціональний тренажер
альфа-гравіті

рівня фізичної підготовленості спортсменів з брейкінгу віком 13-15 років основної групи (ОГ, n=11) під впливом розробленої методики тренувань з використанням засобів функціонального тренажеру «Альфа-гравіті».

Introduction

Today, experts in the field of physical culture and sports state the growth of the attractiveness of practicing technical and aesthetic sports. Usually, the group of "technical and aesthetic" sports includes sports acrobatics, artistic gymnastics, artistic swimming, aesthetic gymnastics, rhythmic gymnastics, and figure skating. These sports are characterized by the presence of a technical and artistic component in the performance of competitive programs, as well as a peculiar approach to assessing the performance skills of athletes, depending on the aesthetics, complexity, accuracy of the performed motor actions (Platonov, 2004; Hrytsyshyn (Dzhala) & Zanevs'kyy, 2007; Medvedyeva, 2008; Bernads'ka, 2013; Kaluzhna, 2015).

Classes in dance types of physical activity have a positive effect on the motivation for classes, as well as indicators of physical condition and personality traits, provide ample opportunities for the realization of creative potential (Shynkaruk, 2003; Rovnyy & Romanenko, 2016; Humenyuk, 2018; Kyzim et. al., 2018; Kolnohuzenko, 2018).

Today, traditionally, dance sports include sports aerobics, cheerleading, sports (ballroom) dancing, acrobatic rock and roll and, more recently, breaking.

Breaking was the first of the dance sports, according to the decision of the International Olympic Committee, was included in the program of the Olympic Games, which will be held in Paris (France) in 2024.

As in any other sport, the basis of successful competitive activity in breaking is the proper level of physical preparedness of athletes (Shkrebtiy, 2005; Sergienko, 2010; Baranov, 2012; Yeshpanova, 2017). But breaking experts note that today there is no scientific and methodological literature covering the issues of training athletes in breaking. Due to the fact that the national team of Ukraine in breaking, which is currently undergoing the stage of formation, will take part in the Olympic Games in Paris, there is a manifested scientific and applied problem, on the one hand, in the absence of a sufficient amount of scientific and methodological materials on the training of breakdancers, on the other hand, it is necessary to develop a structured system for the practical training of breakdancers, which will ensure a corresponding increase in sportsmanship and the achievement of high sports results in a short time.

Connection of research with scientific programs, plans, topics. The study was carried out in accordance with the initiative topic of the scientific research of the Department of Gymnastics, Dance Sports and Choreography of the KhSAPC: "Theoretical and methodological foundations for the development of backbone components of physical culture (sport, fitness and recreation) for 2020-2025 state registration number 0120U01215".

Purpose of the study: to experimentally substantiate the improvement of the physical preparedness of breakdancers at the age of 13-15 years using the functional simulator «Alpha Gravity».

Research task: to characterize the construction of the training process and increase the physical preparedness of athletes using the functional simulator «Alpha Gravity».

Material and Methods of the research

Participants

The study involved 11 breakdancers aged 13-15 years in the control group (CG) and 11 breakdancers aged 13-15 years in the main group (MG). All participants and their parents were informed of the nature of the study and gave informed consent to participate and process the data.

Methods

In the course of the study, a set of research methods was used to solve the set purpose: theoretical analysis of scientific and methodological literature, pedagogical observation, pedagogical testing, pedagogical experiment, methods of mathematical statistics.

Procedure

To assess the level of physical fitness of athletes in breaking, 8 tests were selected: "Push-ups", "Lifting the body from a supine position", "Holding the torso in the prone position" to assess the strength abilities of athletes; the "Plank" test was chosen to assess static strength; to assess flexibility – tests "Split (right, left, split)" and the test "Bend forward from a sitting position, legs together"; to assess the speed-strength abilities – the test "Standing long jump"; "Romberg" test was used to assess coordination abilities (ability to maintain balance).

In the training process of the athletes of the main group (MG, n=11), a set of exercises was included using the means of the functional simulator " Alpha Gravity".

"Alpha Gravity" is a functional simulator, which is a suspension system in which athletes are horizontally suspended using special attachments for arms and legs (Alabin. & Skripko, 1974). Training sessions with the inclusion in the training process of the means of the functional simulator " Alpha Gravity" were held 3 times a week. The duration of the complex is 20-25 minutes. The complex developed by us included the following exercises:

Exercise 1. Hanging face up (basic position), arms and legs are fixed in slings (unloading the pelvis). The duration of the exercise is 20 s.

Exercise 2. Pull-ups with a wide grip (legs suspended in slings). Number of repetitions – 12.

Exercise 3. Bringing the pelvis up with the touch of the heels. Number of repetitions – 8.

Exercise 4. Bringing the pelvis and pulling up with a wide grip while fixing the knees and elbows in the central zone (navel area) for 5-8 seconds. Number of repetitions – 8.

Exercise 5. From the basic position twist to the right, then pull up face down (exit to the "second floor"), after reaching the end point, the body is bent and unbent (10 times) face down. Repeat on the other side. Number of repetitions – 1.

Exercise 6. From the basic position, turn the shoulder girdle back to form an arc in the spine and perform oscillatory movements to unload the pelvic region.

Exercise 7. Access to the "high level" with a change in support on the knees and ankles.

The athletes of the control group (CG, n=11) had the training process according to the traditional method of training athletes in breaking.

Statistical analysis

Statistical analysis of the results obtained was carried out using descriptive statistics indicators using licensed Excel spreadsheet packages and a set of built-in functions.

Results of the research

Indicators of the level of physical preparedness of breakdancers 13-15 years old of the main and control groups at the initial and final stages of the study are presented in Tables 1-2.

As a result of the analysis of statistical indicators of the level of physical preparedness of athletes from the MG and CG, carried out at the beginning of the study, the unreliability of the differences in the results obtained in 7 tests (from tp=0,1 до tp=1,68 at tgr=2,2). Thus, we state the acceptable difference in the initial level of physical fitness of athletes of both groups. In the test "Splits (right/left/splits), (cm)" at the beginning of our study, the performance of athletes from the main group (n=11) significantly exceeded the performance of athletes from the control group (n=11).

As a result of the analysis of the data obtained at the final stages of the study, we note that the greatest increase in the physical preparedness indicators of the MG athletes was found in the tests: T1 "Bend forward from a sitting position, legs together (cm)"; test T2 «Push-ups (number of times min^{-1})»; test T5 «Holding the torso in the prone position, (s)»; test T6 «Plank, (s)». In our opinion, this may indicate that with the help of the «Alpha Gravity» functional simulator, muscles, ligaments and tendons in the back and waist are strengthened, and in breaking these areas bear the main load when performing basic elements and their variations. It is also important to note that the indicators of the T1 test "Bend forward from a sitting position, legs together, (cm)" indicate that the «Alpha Gravity» simulator significantly contributes not only to increasing the level of strength indicators, but also has a positive effect on the level of flexibility, which, in turn, contributes to the implementation of breaking elements with greater amplitude and dynamics, as well as a high rate of flexibility reduces the risk of injury and reduces the recovery time after training and competitive loads. In other tests, there is also a positive trend in the growth of indicators. In the T4 test "Romberg test" and the T7 test "Splits", positive changes did not reach statistically significant values, which may be the result of the fact that the complex developed by us did not include specialized exercises aimed at improving flexibility and vestibular stability.

The dynamics of physical preparedness characteristics of athletes of the main group (MG, n=11) is presented in Table 3

The increase in the indicators of physical preparedness of breakdancers at the age of 13-15 years of the main group (MG) in the performance of the battery of tests is:

- test T1 «Bend forward from a sitting position, legs together, (cm)» - increase 147,8% (t_p = 2,44; p < 0,05);
- test T2 «Push-ups (number of times min^{-1})» - increase 35% (t_p=3,11; p < 0,05);
- test T3 «Lifting the body from a supine position (number of times min^{-1})» - increase 16,7% (t_p = 2,28; p < 0,05);
- test T4 «Romberg test (on the right/left), (s)» - increase 35% (t_p = 1,04; p > 0,05) / increase 62,9% (t_p = 2,25; p < 0,05);
- test T5 «Holding the torso in the prone position, (s)» - increase 100% (t_p = 4,64; p < 0,001);
- test T6 «Plank, (s)» - increase 140,8 % (t_p = 2,79; p < 0,05);
- test T7 «Split (right/left/split) (cm)» - increase 33,2% (t_p=1,18; p > 0,05)/increase 35,5% (t_p = 1,10; p > 0,05) /

Table 1

Indicators of the level of physical preparedness of breakdancers at the age of 13-15 at the beginning of the study (n=22)

Test №	Tests	Maingroup (*n*=11) $\bar{X}\pm m$	Controlgroup (*n*=11) $\bar{X}\pm m$	t_p	P
T1	«Bend forward from a sitting position, legs together, (cm)»	4,18±2,31	2,18±1,42	0,74	p>0,05
T2	«Push-ups (number of times min^{-1})»	40,81±3,58	40,27±3,5	0,1	p>0,05
T3	«Lifting the body from a supine position (number of times min^{-1})»	44,18±2,33	38,45±2,83	1,56	p>0,05
T4	«Romberg test (on the right/left), (s)»	6,0±1,01 4,54±0,72	5,0±0,63 4,36±0,72	0,83 0,18	p>0,05 p>0,05
T5	«Holding the torso in the prone position, (s)»	127,27±10,23	113,45±11,77	0,88	p>0,05
T6	«Plank (s)»	159,54±28,57	119,72±14,27	1,24	p>0,05
T7	«Split (right/left/split) (cm)»	15,36±3,53 14,91±3,83 16,77±3,93	28,63±3,12 28,27±2,93 24,72±2,6	2,82 2,77 1,68	p<0,05 p<0,05 p>0,05
T8	«Standing long jump (cm)»	175,90±6,3	168,90±3,03	1,0	p>0,05

Table 2

Indicators of the level of physical preparedness of breakdancers at the age of 13-15 years at the final stages of the study (n=22)

Test №	Tests	Maingroup (*n*=11)	Controlgroup (*n*=11)	tp	p
		$\bar{X}$±m			
T1	«Bend forward from a sitting position, legs together, (cm)»	10,36±1,05	2,36±1,36	4,67	p<0,001
T2	«Push-ups (number of times min^{-1}) »	55,18±2,92	41,09±3,44	3,12	p<0,01
T3	«Lifting the body from a supine position (number of times min^{-1}) »	51,54±2,23	38,27±3,02	3,54	p<0,01
T4	«Romberg test (on the right/left), (s)»	8,1±1,75 7,4±1,09	4,9±0,5 4,81±0,8	1,75 1,92	p>0,05 p>0,05
T5	«Holding the torso in the prone position, (s)»	254,63±25,41	120,36±11,72	4,79	p<0,001
T6	«Plank (s)»	384,3±75,11	124,09±13,64	3,41	p<0,01
T7	«Split (right/left/split) (cm)»	10,27±2,5 9,63±2,87 13,54±3,75	27,09±4,0 28,18±2,91 24,63±2,64	3,56 4,54 2,42	p<0,01 p<0,01 p<0,05
T8	«Standing long jump (cm)»	190,54±8,63	167,18±4,34	2,42	p<0,05

Table 3

Dynamics of indicators of physical preparedness of breakdancers of the main group (n =11)

Test №	Tests	$\bar{X}$±m		t_p	P
		at the beginning of the study	at the end of the study		
T1	«Bend forward from a sitting position, legs together, (cm)»	4,18±2,31	10,36±1,05	2,44	p<0,05
T2	«Push-ups (number of times min^{-1})»	40,81±3,58	55,18±2,92	3,11	p<0,05
T3	«Lifting the body from a supine position (number of times min^{-1})»	44,18±2,33	51,54±2,23	2,28	p<0,05
T4	«Romberg test (on the right/left), (s)»	6,0±1,01 4,54±0,72	8,1±1,75 7,4±1,09	1,04 2,2	p>0,05 p<0,05
T5	«Holding the torso in the prone position, (s)»	127,27±10,23	254,63±25,41	4,64	p<0,001
T6	«Plank (s)»	159,54±28,57	384,3±75,11	2,79	p<0,05
T7	«Split (right/left/split) (cm)»	15,36±3.53 14,91±3,83 16,77±3,93	10,27±2,5 9,63±2,87 13,54±3,75	1,18 1,10 0,59	p>0,05 p>0,05 p>0,05
T8	«Standing long jump (cm)»	175,90±6,3	190,54±8,63	1,37	p>0,05

Table 4

Dynamics of indicators of physical preparedness of breakdancers of the control group (n=11)

Test №	Tests	$\bar{X}\pm m$		t_p	P
		at the beginning of the study	at the end of the study		
T1	«Bend forward from a sitting position, legs together, (cm)»	2,18±1,42	2,36±1,36	0,09	p>0,05
T2	«Push-ups (number of times min^{-1})»	40,27±3,5	41,09±3,44	0,16	p>0,05
T3	«Lifting the body from a supine position (number of times min^{-1})»	38,45±2,83	38,27±3,02	0,04	p>0,05
T4	«Romberg test (on the right/left), (s)»	5,0±0,63 4,36±0,72	4,9±0,5 4,81±0,8	0,12 0,42	p>0,05 p>0,05
T5	«Holding the torso in the prone position, (s)»	113,45±11,77	120,36±11,72	0,41	p>0,05
T6	«Plank (s)»	119,72±14,27	124,09±13,64	0,22	p>0,05
T7	«Split (right/left/split) (cm)»	28,63±3,12 28,27±2,93 24,72±2,6	27,09±4,0 28,18±2,91 24,63±2,64	0,30 0.02 0,02	p>0,05 p>0,05 p>0,05
T8	«Standing long jump (cm)»	168,90±3,03	167,18±4,34	0,32	p>0,05

increase 19,3% (t_p = 0,59; p > 0,05);

- test T8 «Standing long jump (cm)» - increase 8,3% (t_p = 1,37; p > 0,05).

As a result of the analysis of indicators in the performance of a battery of tests to assess the level of physical preparedness of breakdancers at the age of 13-15 years at the initial and final stages of the study, we state a trend of positive growth in strength indicators (dynamic and static strength), which indicates the effectiveness and significant effect of the application functional simulator "Alpha-gravity" in the educational process of athletes of the main group (MG).

To compare the results of athletes in both study groups, we also determined the dynamics of the physical preparedness indicators of breakdancers of the control group. The results are presented in Table 4.

Based on the indicators of the control group at the initial and final stages of the study, we state that in the control group there were positive changes in most tests (except for the T8 test «Standing long jump (cm), test T3 "Lifting the body from a supine position (number of times/min)" and test T4 "Romberg test (on the right), (s)", where there is a minimal decrease in performance). The decrease in indicators is insignificant, which may indicate that training according to the traditional method of the training process of athletes in breaking does not give the training effect that is observed in the main group with the integration of the means of the "Alfa Gravity" functional simulator into the training process.

The dynamics of the indicators of the main and control groups in the performance of the battery of tests for assessing the physical preparedness of athletes aged 13-15 years of the main and control groups is shown in the Figure 1.

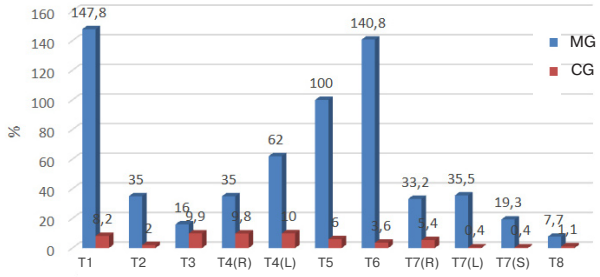

Figure 1. Changes in the indicators of physical preparedness of breakdancers in the main (MG) and control groups (CG)

T1 - Bend forward from a sitting position, legs together (cm);
T2 - Push-ups (number of times min^{-1});

T3 - Lifting the body from a supine position (number of times min^{-1});
T4 - Romberg test (on the right) (s);
T4 - Romberg test (on the left) (s);
T5 - Holding the torso in the prone position (s);
T6 - Plank (s);
T7 - Right split (cm);
T7- Left split (cm);
T7 - Split (cm);
T8- Standing long jump (cm).

In the T1 test "Bend forward from a sitting position, legs together, (cm)", the increase in the indicators of the main group is 147,8%, and in the control group only 8,2%; in the T2 test "Push-ups, (number of times min^{-1})" indicators in the main group increased by 35%, in the control group by 2%; in the test "T6 Plank, (s)" in the main group of growth 140,8%, in the control – 3,6%; in the T5 test "Holding the torso in the prone position (s)" in the main group - 100%, in the control group - 6%; in the T7 test "Splits (right /left/splits) (cm)" in the main 33,2%, 35,5%, 19,3%, in the control 5,4%, 0,4%, 0,4%.

Discussion

An analysis of the special literature shows that specialists using the "Alpha Gravity" simulator in their professional activities, among its advantages, note that muscles and ligaments become stronger, stretch and relax under the weight of the body, joints are strengthened and their mobility increases, the spine is stretched, vertebrae fall into place, innervation and blood circulation are restored, psycho-emotional blocks are removed. (Rovnyy & Romanenko, 2016).

Conclusions

1. Based on these characteristics of the functional simulator "Alpha Gravity" and its use in the educational and training process of the main group, it made it possible to combine the advantages of strength training, stretching, Pilates, yoga, which had a positive effect on the level of physical preparedness of breakdancers aged 15 years. Evidence of the effectiveness of the developed methodology is statistically significant changes in the level of physical fitness in athletes of the main group.
2. Using the obtained indicators, the developed set of exercises, which gave a positive result, we can integrate into the general training course for breakdancers, and continue to improve the existing developments and develop new exercises that will improve sportsmanship.

Author Contributions
Sergey Humenyuk: data collection, input, statistics; Vladimir Konovalov: data interpretation, manuscript preparation, literature search analysis.; Vladislav Zamaziy: design, research planning, fundraising.

Funding
This article didn't receive financial support from the state, public or commercial organizations.

Conflicts of Interest
The authors declare no conflict of interest.

Acknowledgements
Thanks to the Head of the Department of Gymnastics, Dance Sports and Choreography of KhSAPC, Honored Coach of Ukraine Petro Kyzim for methodological assistance, critical remarks and meaningful discussion.

References

Alabin, V. G. & Skripko, A. D. (1974). Trenazhery i trenirovochnyye ustroystva v fizicheskoy kul'ture i sporte. Minsk, 174.

Baranov, V. I. (2012), Metodika razvitiya fizicheskikh kachestv i svoystv lichnosti molodezhi 16-18 let sredstvami breykinga : dissertatsiya kandidata pedagogicheskikh nauk. Khabarovsk, 155.

Bernads'ka, D. P. (2013). Suchasna khoreohrafiya v konteksti syntezu mystetstv. Aktual'ni pytannya humanitarnykh nauk. Kyyiv, 7, 78 – 86.

Gluzman, L. S. (1990). Trenazhory v ozdorovitel'noy fizicheskoy trenirovke. Kiyev, 158.

Hrytsyshyn (Dzhala), T. R., & Zanevs'kyy, I. P. (2007). Kvalimetrychna systema u sportyvnykh tantsyakh na etapi poperedn'oyi bazovoyi pidhotovky Slobozhans'kyy naukovo-sportyvnyy visnyk, 11, 63-69.

Humenyuk, S. V. (2018). Osoblyvosti funktsional'noho treninhu i yoho vplyv na vzayemozv'yazky pokaznykiv spetsial'noyi fizychnoyi pidhotovlenosti sport·smeniv katehoriyi «yuvenaly» z akrobatychnoho rok-n-rolu. Naukovyy chasopys NPU imeni M.P. Drahomanova. Seriya 15.naukovo-pedahohichni problemy fizychnoyi kul'tury,10 (104) 18, 20-28.

Isayev, A. (2017). Praktika breyk-dansa. Kazhdyy dostigayet takikh rezul'tatov, kotorykh on sam reshil dostich'! Moskva, 80.

Istoriya breykinga URL:https://vk.com/topic-12545059_21877197

Kaluzhna, O. M. (2015). Udoskonalennya fizychnoyi pidhotovky sport·smeniv na etapi poperedn'oyi bazovoyi pidhotovky u sportyvnykh tantsyakh: avtoref. dys. ... kand. nauk z fiz. vykhovannya i sportu: 24.00.01. Kyev, 20.

Kolnohuzenko, B. M. (2018). Khoreohrafichna kompozytsiya: metod. posib. z kursu «Mystetstvo baletmeystera». Kharkiv, 208.

Kyzim, P., Humenyuk, S., & Batyeyeva, N. (2018). Udoskonalennya spetsial'noyi fizychnoyi pidhotovlenosti sport·smeniv katehoriyi «Yuvenaly» z akrobatychnoho rok-n-rolu z vykorystannyam zasobiv funktsional'noho treninhu. Slobozhans'kyy

naukovo-sportyvnyy visnyk, 4, 47–52.

Medvedyeva, I. M. (2008). Teoretyko-metodychni zasady pidhotovky fakhivtsiv z skladnokoordynatsiynykh vydiv sportu: monohrafiya. Kyyiv, 381.

Petr Kyzim, Serhiy Humeniuk, Nataliya Batieieva (2018). Influence of modern choreography means the level of technical preparedness of athletes from acrobatic rock'n'roll at the stage of preliminary basic training. Slobozhanskyi herald of science and sport, 3 (65), 32-39.

Petr Kyzim, Serhiy Humeniuk, Nataliya Batieieva (2018). The influence of specific physical fitness of athletes on the biomechanical characteristics of performing basic exercises in acrobatic rock'n'roll. Slobozhanskyi herald of science and sport, 1 (63), 32-38.

Platonov, V. N. (2004). Sistema podgotovki sportsmenov v olimpiyskom sporte. Obshchaya teoriya i yeye prakticheskiye prilozheniya. Kiyev, 804.

Rovnyy, A. S., Romanenko, V. V. (2016). Model'nyye kharakteristiki sensomotornykh reaktsiy i spetsificheskikh vospriyatiy yedinobortsev vysokoy kvalifikatsii. Kdinoborstva, 54-57.

Sergienko, L. P. (2010). Sports metrology: theory and practical aspects. Kyiv, 776.

Shkrebtiy, Yu. M. (2005). Upravlinnya trenuval'nymy i zmahal'nymy navantazhennyamy sport·smeniv vysokoho klasu. Kyyiv, 257.

Shynkaruk, O. A. (2003). Oriyentatsiya trenuval'noho protsesu vidpovidno do indyvidual'nykh osoblyvostey sport·smeniv. Aktual'ni problemy fizychnoyi kul'tury i sportu, 46-52.

Yeshpanova, G. T. (2017). Ispol'zovaniye trenazherov v lechebnoy fizicheskoy kul'ture dlya reabilitatsii sportsmenov. Molodoy uchenyy. Moskva, 6 (140). 217.