

ФИЗИЧЕСКАЯ КУЛЬТУРА И ПРОФЕССИОНАЛЬНАЯ ФИЗИЧЕСКАЯ ПОДГОТОВКА / PHYSICAL CULTURE AND PROFESSIONAL PHYSICAL TRAINING

DOI: <https://doi.org/10.23670/IRJ.2023.132.32>

CIRCULAR GYM TRAINING – AN EFFECTIVE METHOD FOR BASIC MOTOR SKILLS' DEVELOPMENT OF UNIVERSITY STUDENTS

Research article

Fedyakin A.A.^{1,*}, Kortava Z.G.², Fedyakina L.K.³, Zaplatina N.Y.⁴

² ORCID : 0000-0003-4384-7642;

³ ORCID : 0000-0001-5557-208X;

⁴ ORCID : 0000-0002-5130-4106;

^{1,2,3,4} Sochi State University, Sochi, Russian Federation

* Corresponding author (faart[at]mail.ru)

Abstract

Aim of the study: to show the effectiveness of doing strength exercises using the circular training method, during the scheduled physical education university lessons.

Methods. 1st and 2nd year Sochi State University students of the main study group (n=49) participated in the study. A major part of each lesson took place in the gym. The students were doing strength exercises on the machines in the quasi-isotonic mode using the circular training method twice a week. The main methods were: visually checking the amplitude of each movement, muscular sensations of the students. The heart rate was measured with the Sport Testers POLAR RS-400 during the strength exercises and during the recovery. The results were analyzed in the computer program SPSS Statistics v22.0. Statistical significance of the results was determined using the non-parametric Wilcoxon test.

Results. Doing strength exercises in the quasi-isotonic mode using the circular training method and doing general developing exercises for the main muscle groups in the aerobic mode improve the basic motor skills. Doing strength exercises in the quasi-isotonic mode using the circular training method has a more prominent training effect ($p < 0,05$) than doing general developing exercises for the main muscle groups in the aerobic mode. The students' aerobic and strength endurance, speed, strength and coordination have improved.

Conclusion. The circular training method helps to develop the basic motor skills during the scheduled lessons. The circular training method and the quasi-isotonic mode of doing strength exercises improve the effectiveness of the physical education lessons.

Keywords: circular training method, students, strength exercises, quasi-isotonic mode, machines.

КРУГОВАЯ ТРЕНИРОВКА В ТРЕНАЖЕРНОМ ЗАЛЕ КАК ЭФФЕКТИВНЫЙ МЕТОД РАЗВИТИЯ ОСНОВНЫХ ДВИГАТЕЛЬНЫХ СПОСОБНОСТЕЙ СТУДЕНТОВ ВУЗА

Научная статья

Федякин А.А.^{1,*}, Кортава Ж.Г.², Федякина Л.К.³, Заплата Н.Ю.⁴

² ORCID : 0000-0003-4384-7642;

³ ORCID : 0000-0001-5557-208X;

⁴ ORCID : 0000-0002-5130-4106;

^{1,2,3,4} Сочинский государственный университет, Сочи, Российская Федерация

* Корреспондирующий автор (faart[at]mail.ru)

Аннотация

Цель исследования. Обосновать эффективность выполнения силовых упражнений методом круговой тренировки во время академических занятий физической культурой студентами вуза.

Организация и методы. В исследованиях участвовали студенты первого и второго курсов Сочинского государственного университета основной учебной группы (n=49). Занятия проходили два раза в неделю. Основную часть занятия студенты занимались в тренажерном зале. Они выполняли силовые упражнения на тренажерах, используя метод круговой тренировки, в квазиизотоническом режиме. В качестве основных методических приемов использовались зрительные ориентиры для определения амплитуды выполнения каждого упражнения; мышечные ощущения студентов при выполнении упражнений. Во время выполнения силовых упражнений и в период отдыха регистрировалась частота сердечных сокращений при помощи спорт-тестеров POLAR RS-400. Данные, полученные в ходе исследования, обрабатывались в программе SPSS Statistics v22.0. Для оценки статистической значимости различий результатов использовался непараметрический критерий Вилкоксона.

Результаты. Выполнение силовых упражнений методом круговой тренировки в квазиизотоническом режиме и общеразвивающих упражнений на основные мышечные группы в аэробном режиме улучшает основные двигательные способности студентов. Выполнение силовых упражнений методом круговой тренировки в квазиизотоническом режиме характеризуется более выраженным тренировочным эффектом ($p < 0,05$), чем выполнение общеразвивающих упражнений на основные мышечные группы в аэробном режиме. Улучшились показатели аэробной и силовой выносливости, скоростно-силовых и координационных способностей студентов.

Выводы. Метод круговой тренировки помогает развитию основных двигательных способностей студентов во время академических занятий физической культурой в вузе. Метод круговой тренировки и квазиизотонический режим

выполнения силовых упражнений повышают эффективность академических занятий физической культурой студентов вуза.

Ключевые слова: метод круговой тренировки, студенты, силовые упражнения, квазиизотонический режим, тренажеры.

Introduction

The students' basic motor skills are deteriorating as noted in the works of Russian [3], [7], [9], [17] and international [1], [12], [18], [22] scholars. The authors equate this with the amount of the students' physical activity [6], [10], [20]. The amount of the physical activity during the scheduled lessons is regulated by the Federal State Educational Standard. Thus, improving the effectiveness of the physical education methods during the scheduled university lessons is a relevant issue.

Strength exercises have a positive effect on the human body as shown in the studies [2], [5], [11]. Pourrazi H. and Ebrahimi M. note [21] that doing strength exercises with low (50%) and middle (75%) intensity has the same training effect on the human body.

Data shows the effectiveness of doing strength exercises to failure with 60% intensity [14]. The effectiveness of the physical education tools is defined by the students' physical fitness [8], this fact influences the lessons' organization. Thus, further study and specification are needed on the issues of determining the optimal intensity of the exercises during lessons, determining the most effective order of doing the exercises, the features of group training, etc.

Aim of the study: to show the effectiveness of doing strength exercises using the circular training method during the scheduled physical education university lessons.

Methods

1st and 2nd year Sochi State University students of the main study group (n=49) participated in the study. The average age of the participants was 18,1±1,9 years, the average weight – 73,3±2,1 kg, the average height – 176,3±3,4 cm. The study procedure complied with the Ethical Committee standards. The entry criterion for participating in the study – voluntary informed consent of the students. The participants of the experimental study were randomly divided into two groups: control and experimental. In the beginning of each lesson, both groups did a standard warm-up: 18 minutes of the step aerobics and slow running, 8 minutes of stretching and 8–10 minutes of the special running exercises. During the main part of each lesson, the students of the control group did the general developing exercises for the main muscle groups in the aerobic mode for 40 minutes.

The students of the experimental group did the strength exercises on the machines in the quasi-isotonic mode using the circular training method for 40 minutes. The weight amount was selected so that each student would do the exercises to failure. Each exercise was being done for 35–45 seconds with three minutes of rest.

The students were training twice a week for two academic hours according to the schedule. The experiment lasted for 18 weeks. Basic motor skills of the participants were tested in the beginning and in the end of the experiment. The heart rate was measured with the Sport Testers POLAR RS-400 during the general developing exercises, the strength exercises and during the recovery. Aerobic endurance of the students was determined from the sit test. Speed and strength were determined from the upward jumps. Coordination was determined from the shuttle run. Back muscles' strength endurance was determined from the duration the participants could keep their torso horizontally while lying on the Roman chair with their hands behind the head. Abdominal muscles' strength endurance was determined from the students' maximum number of incline bench sit-ups with their hands behind the head. The results of the study were analyzed in the computer program SPSS Statistics v22.0. Statistical significance of the results was determined using the non-parametric Wilcoxon test [19].

Results and discussion

There were no statistically significant differences ($p>0,05$) in the basic motor skills level between the two groups after the tests in the beginning of the experiment (Table 1).

Table 1 - Initial basic motor skills level of the students

DOI: <https://doi.org/10.23670/IRJ.2023.132.32.1>

Tests	Control group (n=25)	Experimental group (n=24)	P
Sit test, units	13,3±4,92	13,4±5,01	$p>0,05$
Upward jump height, cm	27,7±4,57	27,4±4,24	$p>0,05$
Shuttle run 3x10 m, sec	7,51±0,50	7,52±0,48	$p>0,05$
Back muscles' strength endurance, sec	89,8±31,4	90,8±32,9	$p>0,05$
Abdominal muscles' strength endurance, times	18±4,1	17±4,3	$p>0,05$

Note: $M \pm SD$

Initial students' aerobic endurance level was below average, coordination was average. Strength, speed, back and abdominal muscles' endurance of the students were poor. The results show the necessity to improve the basic motor skills during the scheduled physical education lessons. The heart rate was monitored during the lessons [16]. The figure shows the combined heart rate values during the main part of the lessons of the control and experimental groups.

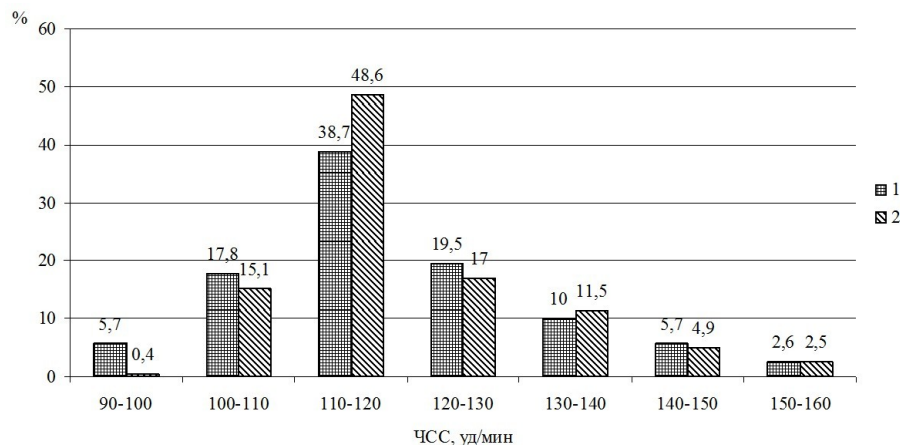


Figure 1 - Combined heart rate values of the control (1) and the experimental (2) group
DOI: <https://doi.org/10.23670/IRJ.2023.132.32.2>

The results show that there are no statistically significant differences between the maximum heart rate values of the control group (156 BPM) and the experimental group (155 BPM) and between the average heart rate of the groups (118 and 119 BPM accordingly). The heart rate becomes maximum by the end of the exercise or right after the exercise. Further heart rate changes are explained by the actions during the rest period (rotating, changing body positions, etc.). The main heart rate differences between the groups were in the 9.9% longer duration of the 110-120 BPM and in the 5.3% shorter duration of the 90-100 BPM in the experimental group. Aforementioned heart rate values correspond to the recommended ones and to the recommended recovery mode between the exercises [15]. It can be concluded that doing general developing exercises for the main muscle groups and doing strength exercises using the circular training method have the same circulatory system's adaptive response (Fig.). This is true providing there is enough rest time between sets. Reducing that time can influence the gym lesson's training effect on the student's body.

During the experiment, there have been statistically significant ($p < 0,05$) positive changes in both groups (Table 2).

Table 2 - Final basic motor skills level of the students

DOI: <https://doi.org/10.23670/IRJ.2023.132.32.3>

Tests	Control group (n=25)	Experimental group (n=24)	P
Sit test, units	10,0±3,89	8,4±2,21	$p < 0,05$
Upward jump height, cm	29,4±4,12	31,9±3,32	$p < 0,05$
Shuttle run 3x10 m, sec	7,31±0,39	7,19±0,33	$p > 0,05$
Back muscles' strength endurance, sec	112,1±19,2	129,4±17,1	$p < 0,05$
Abdominal muscles' strength endurance, times	19±3,3	24±3,2	$p < 0,05$

Note: $M \pm SD$

Aerobic endurance of the students by the end of the experiment became average. Strength, speed, coordination, back and abdominal muscles' endurance of the students became significantly better. Basic motor skills' development of the experimental group of the students became significantly ($p < 0,05$) higher than that of the control group of the students. Doing strength exercises in the quasi-isotonic mode using the circular training method has a more prominent training effect than doing general developing exercises in the aerobic mode.

The noted tendencies apparently are explained by the mode of muscle contractions. During the strength exercises in the quasi-isotonic mode muscles are not relaxing which reduces the blood flow to the working muscle. This is a hypoxic training, which has a positive effect [13].

Conclusion

Doing strength exercises in the quasi-isotonic mode using the circular training method has a prominent training effect, which is explained by the mode of muscle contractions. The heart rate values during the different modes of the exercises were the same. Thus, doing strength exercises in the quasi-isotonic mode using the circular training method increases the effectiveness of the scheduled university lessons.

Конфликт интересов

Не указан.

Рецензия

Сообщество рецензентов Международного научно-исследовательского журнала

DOI: <https://doi.org/10.23670/IRJ.2023.132.32.4>

Conflict of Interest

None declared.

Review

International Research Journal Reviewers Community

DOI: <https://doi.org/10.23670/IRJ.2023.132.32.4>

Список литературы на английском языке / References in English

1. Chedova T.I. Realization of Educational Module “Physical Culture” on the Example of Classical University. / T.I. Chedova, G.A. Gavronina // *Sports Science Bulletin*. — 2018. — 6. — p. 52-61.
2. Chesno A.V. Influence of Various Directions of Fitness on Physical Condition of Students. / A.V. Chesno, L.A. Kekova, O.P. Vatrak et al. // *Scientific Notes of the University named after P.F. Lesgaft*. — 2020. — Vol. 180. — 2. — p. 457-461. — DOI: [10.34835/issn.2308-1961.2020.2](https://doi.org/10.34835/issn.2308-1961.2020.2)
3. Davydov O.Yu. Influence of Athletic Gymnastics Classes on General Physical Fitness of University Students. / O.Yu. Davydov // *Scientific Notes of the University named after P.F. Lesgaft*. — 2011. — Vol. 81. — 11. — p. 48-52.
4. Fagaras S. The Level of Physical Activity of University Students. / S. Fagaras, L. Radu, G. Vanvu // *Procedia – Social and Behavioral Sciences*. — 2015. — 197. — p. 1454–1457. — DOI: [10.1016/j.sbspro.2015.07.094](https://doi.org/10.1016/j.sbspro.2015.07.094)
5. Gorelov A.A. To the Question of Necessity in Development of System Mechanisms for Providing the Student Youth with Optimal Motion Conditions. / A.A. Gorelov, V.I. Lyakh, O.G. Rumba // *Scientific Notes of the University named after P.F. Lesgaft*. — 2010. — Vol. 67. — 9. — p. 29-34.
6. Grjibovski A.M. Choosing a Statistical Test for Hypothesis Testing. / A.M. Grjibovski // *Human Ecology*. — 2008. — 11. — p. 48-57.
7. Kholodov J.K. Theory and Methods of Physical Education and Sports / J.K. Kholodov, V.S. Kuznetsov. — Moscow: Akademiya, 2004.
8. Khomiakov G.K. Index of Efficiency of Blood Circulation as a Method of Control for Optimization of Physical Load. / G.K. Khomiakov // *Scientific Notes of the University named after P.F. Lesgaft*. — 2017. — Vol. 147. — 5. — p. 182-184.
9. Kuvaldina E.V. Specialty of Influence Reglamented Physical Education Lessons on Students Organisms. / E.V. Kuvaldina // *Scientific Notes of the University named after P.F. Lesgaft*. — 2015. — Vol. 124. — 5. — p. 104-106.
10. Kuzmina O.I. Modern Technologies of Pedagogical Impact and New Types of Motor Activity in Student Health Protection. / O.I. Kuzmina, V.Y. Lebedinskiy, O.A. Shvachun // *Theory and Practice of Physical Education*. — 2020. — 1. — p. 14–17.
11. Lipošek S. Physical Activity of University Students and its Relation to Physical Fitness and Academic Success. / S. Lipošek, J. Planinšec, B. Leskošek et al. // *Annales Kinesiologiae*. — 2019. — Vol. 9. — 2. — p. 89–104. — DOI: [10.35469/ak.2018.171](https://doi.org/10.35469/ak.2018.171)
12. Loginov S. Students’ Physical Activity in Surgut and Karaganda: a comparative analysis. / S. Loginov, A. Nikolaev, N. Smagulov et al. // *Theory and Practice of Physical Education*. — 2019. — 7. — p. 90–92.
13. Myakichenko E.B. Healthy Training According to Izoton System / E.B. Myakichenko, V.N. Seluianov — Moscow: SportAkademPress, 2001. — 68 p.
14. Pourrazi H. Comparison of Two Different Resistance Training Intensities on Metabolic Syndrome Risk Factors in Obese Women. / H. Pourrazi, M. Ebrahimi // *International Journal of Applied Exercise Physiology*. — 2019. — Vol. 8. — 1. — p. 74-83.
15. Samsonova A.V. Research Review of Blood Flow Restriction Training (KAATSU TRAINING). / A.V. Samsonova, E.L. Tokmakova, G.P. Vinogradov // *Physical Education and Sport*. — 2007. — Vol. 63. — 3. — p. 89-93.
16. Seluianov V.N. Healthy Physical Education Technology / V.N. Seluianov — Moscow: SportAkademPress, 2001. — 172 p.
17. Vasitsky V.A. Health and Fitness Indicators of Kazakhstani Students (through the example of creative professions of the Kazakh National Academy of Arts named after T.K. Zhurgenov). / V.A. Vasitsky, G.V. Kovalenko // *Sports Science Bulletin*. — 2018. — 2. — p. 42-46.
18. Vinogradov G.P. *Athletism: Theory and Methods, Technology of Sports Training* / G.P. Vinogradov, I.G. Vinogradov — Moscow: Sport, 2017. — 406 p.
19. Vorona V. The Level of Physical Condition of Students of Different Faculties of Pedagogical University. / V. Vorona, N. Kylik, V. Lytvynenko et al. // *International Journal of Applied Exercise Physiology*. — 2019. — Vol. 8. — 3. — p. 153-158. — DOI: [10.26655/IJAEP.2019.9.19](https://doi.org/10.26655/IJAEP.2019.9.19)
20. Zhalbe M.G. Efficiency of Using Training Modules for Development of Professionally Significant Motor Abilities among Students – Electrical Energy Industry Specialists. / M.G. Zhalbe, L.G. Pashchenko // *Scientific Notes of the University named after P.F. Lesgaft*. — 2017. — Vol. 151. — 9. — p. 92-96.

21. Zsolt Szakály Z. Physique, Body Composition and Motor Performances in Hungarian Students. / Z. Zsolt Szakály, F. Ihász, C. Konczos et al. // *Scientific Notes of the University named after P.F. Lesgaft*. — 2016. — Vol. 133. — 3. — p. 267-274.
22. Zvyagintsev M.V. Analysis of the Physical Fitness of First-Year Students of Novokuznetsk Branch-institute of Kemerovo State University. / M.V. Zvyagintsev, T.V. Karpova, N.G. Zauer // *Scientific Notes of the University named after P.F. Lesgaft*. — 2020. — Vol. 179. — 1. — p. 143-147. — DOI: 10.34835/issn.2308-1961.2020.1.p143-148