Presentation date: July 2024, **Date of acceptance**: August, 2024 , **Publication date**: September, 2024

46

ASSESSMENT OF THE IMPACT OF SWIMMING CLASSES ON STUDENTS' PHYSICAL AND MENTAL HEALTH

EVALUACIÓN DEL IMPACTO DE LAS CLASES DE NATACIÓN EN LA SALUD FÍSICA Y MENTAL DE LOS ALUMNOS

Alexander Timushkin[1]
E-mail: timushkin-box@ramdler.ru
ORCID: https://orcid.org/0000-0003-1051-2790
Natalia Medvedeva[1]
E-mail: mednatalia2015@yandex.ru
ORCID: https://orcid.org/0000-0001-8417-8444
Andrey Popov[1]
E-mail: and26175475@yandex.ru
ORCID: https://orcid.org/0000-0003-1719-8722
Lyudmila Kashitsyna[1]
E-mail: kashizina@rambler.ru
ORCID: https://orcid.org/0000-0002-0320-6819
[1] Balashov Institute of Saratov State University, Russia.
*Corresponding autor

Suggested citation (APA, seventh ed.)

Timushkin, A., Medvedeva, N., Popov, A., & Kashitsyna, L. (2024). Assessment of the impact of swimming classes on students' physical and mental health. ***Revista Conrado, 20***(100), 408-412.

ABSTRACT

The purpose of the paper was to study the effect of swimming classes on the functional state of students' bodies at a pedagogical university. In the process of swimming classes, the student's body is subject to cross-adaptation in the form of the combined effects of physical exertion and physical factors of the aquatic environment. Adaptation to physical exercises performed in an aquatic environment will inevitably have an impact on the functional systems of the student's body. 42 students participated in the study. 60-minute classes in the pool were held twice a week for four months. To assess the effect of swimming lessons on students' bodies, a set of functional tests characterizing the state of the respiratory and cardiovascular systems was included in the study program. As a result of the performed work, a pronounced positive effect was observed in the dynamics of indicators of functional reserves of the respiratory and cardiovascular systems and an increase in the level of adaptive reserves that limit students' physical capabilities. The authors concluded that swimming classes contribute to improving the functional state of students' bodies. The greatest effect was manifested in the state of the respiratory and cardiovascular systems while stimulating resistance to hypoxia and increasing the body's resistance to adverse environmental factors.

Keywords:

Students, swimming, functional state, functional tests.

RESUMEN

El objetivo del artículo era estudiar el efecto de las clases de natación en el estado funcional del cuerpo de los estudiantes de una universidad pedagógica. En el proceso de las clases de natación, el cuerpo del estudiante está sometido a una adaptación cruzada en forma de efectos combinados del esfuerzo físico y los factores físicos del medio acuático. La adaptación a los ejercicios físicos realizados en el medio acuático repercutirá inevitablemente en los sistemas funcionales del organismo del alumno. En el estudio participaron 42 estudiantes. Se impartieron clases de 60 minutos en la piscina dos veces por semana durante cuatro meses. Para evaluar el efecto de las clases de natación en el organismo de los alumnos, se incluyó en el programa de estudio un conjunto de pruebas funcionales que caracterizaban el estado de los sistemas respiratorio y cardiovascular. Como resultado del trabajo realizado, se observó un pronunciado efecto positivo en la dinámica de los indicadores de las reservas funcionales de los sistemas respiratorio y cardiovascular y un aumento del nivel de las reservas adaptativas que limitan las capacidades físicas de los alumnos. Los autores concluyeron que las clases de natación contribuyen a mejorar el estado funcional del organismo de los alumnos. El mayor efecto se manifestó en el estado de los sistemas respiratorio y cardiovascular, al tiempo que estimuló la resistencia a la hipoxia y aumentó la resistencia del organismo a los factores ambientales adversos.

Palabras clave:

Estudiantes, natación, estado funcional, pruebas funcionales.

INTRODUCTION

Students' physical education involves the formation of a versatile personality and abilities for the targeted use of various means of physical culture, sports, and outdoor hiking to preserve and strengthen health, psychophysical training, and self-preparation for future professional activity. The formation of motivation for physical education in a modern educational institution should be based on the creation of prerequisites for the integrated development of intellectual and creative abilities using physical culture. The "Spartian technology of physical and spiritual health improvement of children and youth" by V.I. Stolyarov is promising in this field (Stolyarov & Firsin, 2011). The implementation of this project in universities involves the participation of students in creative, intellectual, and sports competitions.

Participation in sports competitions implies special training. Such training itself, according to several researchers (Bulgakova, 2001; Chernyaev, 2003; Timushkin et al., 2004; Lubysheva, 2013), has a positive effect on the physical abilities and functional systems of the participants. Swimming classes, as noted by several authors (Bazylyuk et al., 2010; Ganchar, 2012; Ganchar & Garkusha, 2012; Khorkova & Adilev, 2016), contribute to improving the functional capabilities of the respiratory and cardiovascular systems, increasing resistance to adverse environmental factors. This information served as a prerequisite for studying the influence of swimming classes conducted in preparation for the Olympic test on the functional health state of university students.

Originating in Ancient Greece and revived by P. de Coubertin, the Olympic idea presupposes a close harmony of the physical and spiritual aspects. This idea is reflected in the works of later researchers, Russian (Balsevich, 1997; Timushkin et al., 2004; Stolyarov & Firsin, 2011; Firsin & Maskayeva, 2014) and others (Paleologos, 1985; Nikolaou, 1986; Rachev, 1986; Lipiec, 1999). The famous German philosopher and Olympic Champion H. Lenk has repeatedly written about the need for an active lifestyle, activity, and creativity as necessary components of human life (Lenk, 1985, 2007). Spartian Games initiated by Stolyarov fully reproduce the ideas of the Olympic movement (Stolyarov & Firsin, 2011; Firsin & Maskayeva, 2014).

These games involve the inclusion of not only various competitions and contests, but also non-competitive games where not an individual comes to the fore, but a team united by one goal and solving the same tasks. Similar competitions are held in the USA, Japan, Canada, Germany, and other countries (Orlick, 1978; Tembeck, 1979; Fluegelman, 1981; Funke, 1989; LeFevre, 2002). To stimulate the humanistic component of sports and physical education, it is necessary to combine them with other cultural activities.

Currently, experts from many countries continue attempts to expand the integration of sports and arts and the development of new forms of youth education (Tembeck, 1979; Rachev, 1986; Kim, 1988; Pawelke, 1995; LeFevre, 2002; Stolyarov & Firsin, 2011; Firsin & Maskayeva, 2014). However, participation in the physical education part of the Spartian games (Spartian agons, tests) involves some physical training. Such training contributes to the improvement of physical qualities and functional systems of the body (Chernyaev, 2003).

One of the most valuable types of physical exercises for solving these problems is swimming (Bulgakova, 2001; Bazylyuk et al., 2010; Ganchar, 2012; Ganchar, Garkusha, 2012). Swimming classes not only contribute to the improvement of the functional systems of the body and the acquisition of applied skills necessary for life, but also allow the participants to correct some defects in physical development and stimulate the education of moral and volitional qualities like perseverance, determination, courage, and mutual assistance (Bulgakova, 2001; Ganchar & Garkusha, 2012; Drogomeretsky et al., 2013; Khorkova & Adilev, 2016).

Purpose of the study. To evaluate the effect of swimming lessons on the functional state of the students of a pedagogical university.

MATERIALS AND METHODS

42 students took part in the study, including 21 females aged 17 to 19 years and 21 males aged 17 to 25 years. Informed consent was obtained from each subject to participate in the study following the approved protocol and the ethical principles of the Helsinki Declaration of the World Medical Association.

The initial testing was conducted in February and the final one in June. The studies were conducted under standard conditions. In a state of relative muscular rest, according to generally accepted methods, we measured the participants' height and weight, vital capacity (VC) by spirometry, heart rate (HR), blood pressure (BP), and timed inspiratory capacity (TIC). As a stress test, the students performed a squat test (20 squats in 30 s) with HR measurement in the first 15 s of recovery. The percentage of increase in HR after squats was determined compared with the HR before the exercise.

The obtained initial data were used to calculate five indicators (indices) according to the generally accepted methodology (Gorelov et al., 2021):

1. Quetelet mass-and-height index (QI, determination of compliance with the normal body weight);
2. Robinson Index (RI, assessment of the regulation of the cardiovascular system);
3. Skibinskaya Index (SI, assessment of the functional capabilities of the respiratory system, blood circulation, and the body's resistance to hypoxia);
4. Squat test (%HR, assessment of the level of adaptive reserves of the cardiovascular system, which limits the physical capabilities of the student);
5. Adaptive potential (AP, assessment of the functional capabilities of the body as a whole).

The mathematical processing of the material was carried out using Student's t-test. The statistical significance was assumed at the level of $p \leq 0.05$. Calculations were performed using the Statistica 10.0 software package.

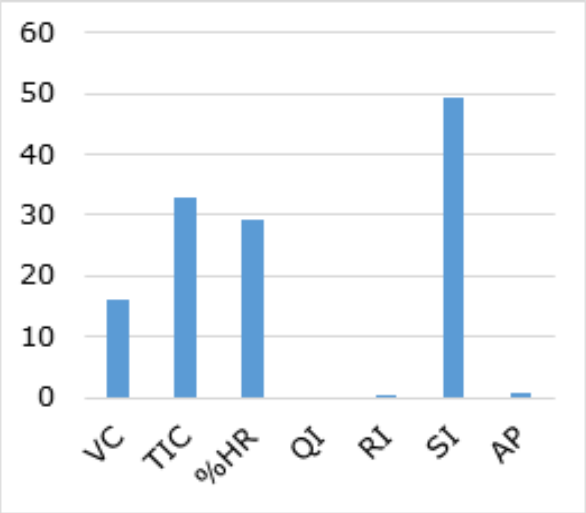
Swimming curriculum. 60-minute classes in the pool were held twice a week for four months. In total, 34 classes were held.

1. Floating workout (1 hour).
2. Legwork training for front crawl. Leg movement coordination with breathing (2 hours).
3. Arm drills for front crawl. Arm movement coordination with breathing (2 hours).
4. Front crawl technique improvement (3 hours).
5. Open turn for front crawl (1 hour).
6. Training for start from the starting block (1 hour).
7. Front crawl technique improvement. Strength training in front crawl (2 hours).
8. Front crawl technique improvement. Speed and endurance development in front crawl (2 hours).
9. Front crawl technique improvement. Initial training in back crawl swimming techniques (2 hours).
10. Front crawl technique improvement. Legwork training for back crawl (2 hours).
11. Front crawl technique improvement. Arm drills for back crawl (2 hours).
12. Front crawl technique improvement. Coordination of arms and legs movement for back crawl (2 hours).
13. Front and back crawl technique improvement (4 hours).
14. Front and back crawl technique improvement. Water start training (2 hours).
15. Turn drills for the back crawl. Front and back crawl technique improvement (2 hours).
16. Front and back crawl technique improvement. Endurance training (4 hours).

RESULTS AND DISCUSSION

The analysis of the results of the conducted research showed that the work carried out in the swimming pool had a positive effect on the functional systems of the female students. The most pronounced positive effect was determined in the SI indicators. The initial results of this indicator had increased by 49.4% ($P<0.01$), which indicates an increase in the functional reserves of the respiratory and cardiovascular systems (Figure 1).

Figure 1. Changes in functional indicators after swimming lessons in the female students (%).



Source: Prepared by authors

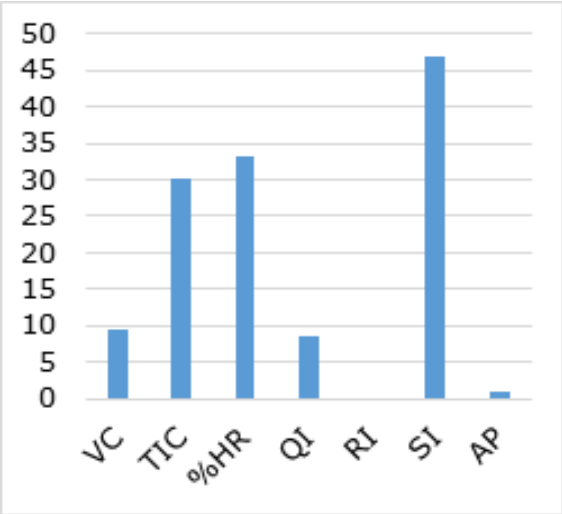
A similar trend was noted in the TIC indicator. The initial values during this test were exceeded by 33.0% ($P<0.01$), which implies an increase in the body's resistance to mixed hypoxia and hypercapnia and an improvement in the state of the body's oxygen-supplying systems when holding breath during inspiration.

The improvement in the state of the respiratory system is also confirmed by the VC indicators, which had increased by 16.0% at the final stage of the experimental study ($P<0.01$). The improvement in the ability of the cardiovascular system to recover after performing a controlled activity confirms the increase in HR after performing 20 squats in 30 s. This indicator had improved by 29.2% ($P<0.01$), decreasing from 54.7% in the initial examination to 38.7% in the final one, which indicates an increase in the adaptive reserves of the cardiovascular system, which limits the physical capabilities of female students.

No statistically significant changes were observed in the dynamics of other indicators of the athletes' functional state.

The results of the studies in the male students showed similar dynamics (Figure 2).

Figure 2. Changes in functional indicators after swimming lessons in the male students (%).



Source: Prepared by authors

The most pronounced improvement was noted in SI indicators, exceeding the baseline data by 46.8% (P<0.01). TIC time had increased by 30.2% (P<0.01) (from 42.0±17.2 s to 54.7±9.3 s). The VC indicators had improved by 9.4% (P<0.01). The percentage of HR increase after performing 20 squats in 30 s at the final stage of the examination decreased by 33.1% (P<0.01) and amounted to 37.8±13.2% versus 56.5±16.1% at baseline. No statistically significant changes were observed in the dynamics of other indicators of the functional systems of the body, like in the female group.

CONCLUSIONS

The four-month training in the swimming pool conducted to prepare for the Olympic test significantly improved the functional state of the students. To a greater extent, this was manifested in the dynamics of indicators of the respiratory system but pronounced positive changes were also observed in the activity of the cardiovascular system. These changes made it possible to increase the level of adaptive reserves of the respiratory and cardiovascular systems, stimulate the body's resistance to hypoxia conditions, and activate the body's ability to adequately respond to a complex of adverse environmental factors.

The study was conducted at the Balashov Institute (Branch) of the Saratov National Research State University named after N.G. Chernyshevsky with the participation of students. We would like to express our gratitude to the management, faculty, and students of the Balashov Institute (Branch) of the Saratov National Research State University named after N.G. Chernyshevsky.

This work was supported by a grant from the Balashov Institute (Branch) of the Saratov National Research State University named after N.G. Chernyshevsky.

REFERENCES

Balsevich, V.K. (1997). Humanistic vector of sports of higher achievements. In, V.V. Kuzin (Ed.), Sports, spiritual values, culture. Issue 3. Prospects and ways to increase the humanistic value of modern sports and the Olympic movement: A collection of articles. (pp. 287-291). SpArt RGAFK.

Bazylyuk, T.A., Kozina, J.L., Beznes, E.E., & Koverya, V.N. (2010). The use of aqua fitness of a gaming orientation in the physical education of female students. Physical Education of Students, 6, 8-12.

Bulgakova, N.J. (Ed.). (2001). Swimming: Studies. Manual. Physical culture and sport.

Chernyaev, V.V. (2003). Designing and constructing the humanities-oriented content of physical education in higher education: Theory and methodology. Moscow-Lipetsk.

Drogomeretsky, V.V., Kondakov, V.L., & Gorelov, A.A. (2013). The use of recreational swimming for the purpose of correcting disorders of the articular ligamentous apparatus of students. Physical Education of Students, 5, 46-54.

Firsin, S.A., & Maskayeva, T.Yu. (2014). Spartian games in the humanistic system of education of students: A textbook. MIIT.

Fluegelman, A. (1981). More new games! and playful ideas from the New Games Foundation. Dolphin Books.

Funke, J. (1989). Bewegungskunst – Ein wiederentdecktes Thema Menschlicher Bewegung. In, K. Diertrich, & K. Heinemann (Eds.). Der nichtsportliche Sport. (pp. 72-83). Hofmann.

Ganchar, A.I. (2012). Dynamics of indicators of swimming and physical activity the preparedness of cadets of the marine profile in the process of physical education and sports, taking into account gender differences. Physical Education of Students, 4, 37-41.

Ganchar, A.I., & Garkusha, S.V. (2012). Theoretical and methodological aspects of the formation of swimming skills among different groups of the population in the process of physical education and sports, taking into account gender differences of students. Physical Education of Students, 3, 24-28. https://www.semanticscholar.org/paper/THEORETICAL-METHODICAL-ASPECTS-OF-FORMING-SKILLS-OF-Hanchar-Garkusha/caeb78d4946ede784863e35f163596cea75b7486

Gorelov, A.A., Rumba, O.G., Kondakov, V., & Kopeikin, E.N. (2021). Theoretical foundations of physical culture: A textbook for universities. Yurayt Publishing House.

Khorkova, A.S., & Adilev, V.O. (2016). Some physiological changes in the body during swimming and its health-improving value. Bulletin of the Yugra State University, 1(40), 209-212. https://journals.eco-vector.com/byusu/article/view/7384/5937

Kim, Y.-H. (1988). A case study on curriculum integration art, music, and physical education for the first and second graders. (Paper). New horizons of human movement: Abstracts, 1988 Seoul Olympic Scientific Congress. (pp. 238-239). Olympic Scientific Congress Organizing Committee. Seoul, Korea.

LeFevre, D.N. (2002). ***Best new games. Champaign***. Human Kinetics.

Lenk, H. (1985). Genuinely personal achievement, sport, educational program and beyond. ***International Journal of Physical Education, 22***, 9-17.

Lenk, H. (2007). An anthropology of the Olympic athlete towards a modernised philosophy of the Olympic Games and Athletes. ***Journal of Olympic History, 15***(1), 39-47. https://www.iosrjournals.org/iosr-jhss/papers/Vol.%2024%20Issue9/Series-8/C2409081321.pdf

Lipiec, J. (1999). ***Filozofia olimpizmu***. Polskie Wydawnictwo Sportowe SPRINT.

Lubysheva, L.I. (2013). ***The concept of the formation of human physical culture***. GTSOLIFK.

Nikolaou, L.W. (1986). The Olympic spirit in ancient Greece and in modern society. In International Olympic Academy. Report of the 25th Session. (pp. 45-49). The Olympic Studies Centre.

Orlick, T. (1978). The cooperative sport & games book: Challenge without competition. Pantheon Books.

Paleologos, C. (1985). Heracles, the ideal Olympic personality. In International Olympic Academy. Report of the twenty-second Session. (pp. 52-56). The Olympic Studies Centre.

Pawelke, R. (1995). ***Neue Sportkultur. Neue Wege in Sport, Spiel, Tanz und Theater***. Von der Alternativen Bewegungskultur zur Neuen Sportkultur. AOL-Verlag.

Rachev, K. (1986). Integration process on training in physical education with other spheres on spiritual culture. (Paper). ***III and IV Session at the BOA 1985-1986***. Sofia, National Olympic Academy.

Stolyarov, V.I., & Firsin, S.A. (2011). ***Spartian games in the humanistic system of education and leisure of students: A textbook for teachers and leisure organizers of student youth***. Publishing Center Nauka LLC.

Tembeck, Sh. (1979). ***New games***. Ahorn Verlage.

Timushkin, A.V., Chesnokov, N.N., & Chernov, S.S. (2004). ***Physical culture and health: A textbook***. Sport Akadem Press.