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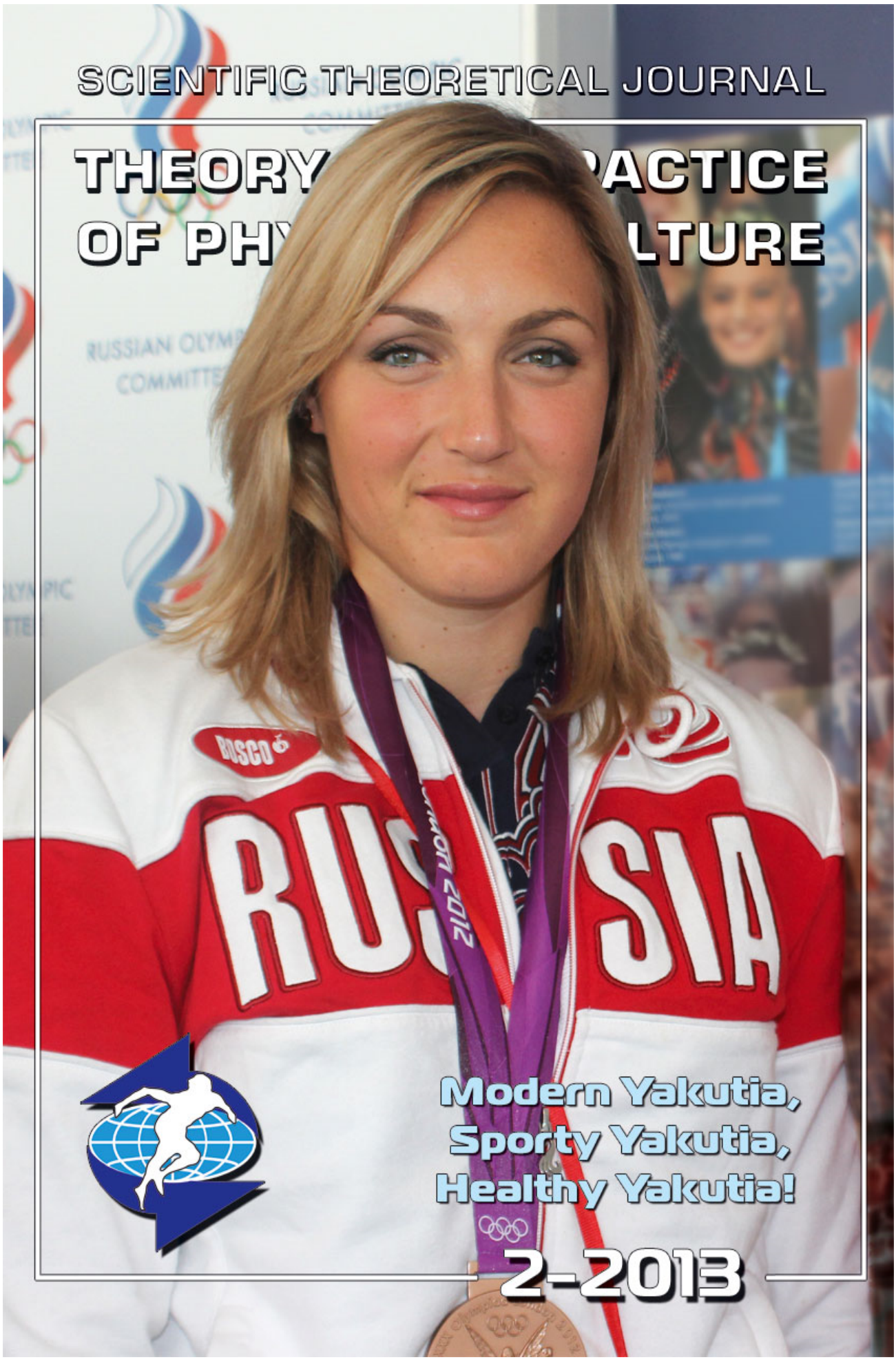

Modern Yakutia,
Sporty Yakutia,
Healthy Yakutia!

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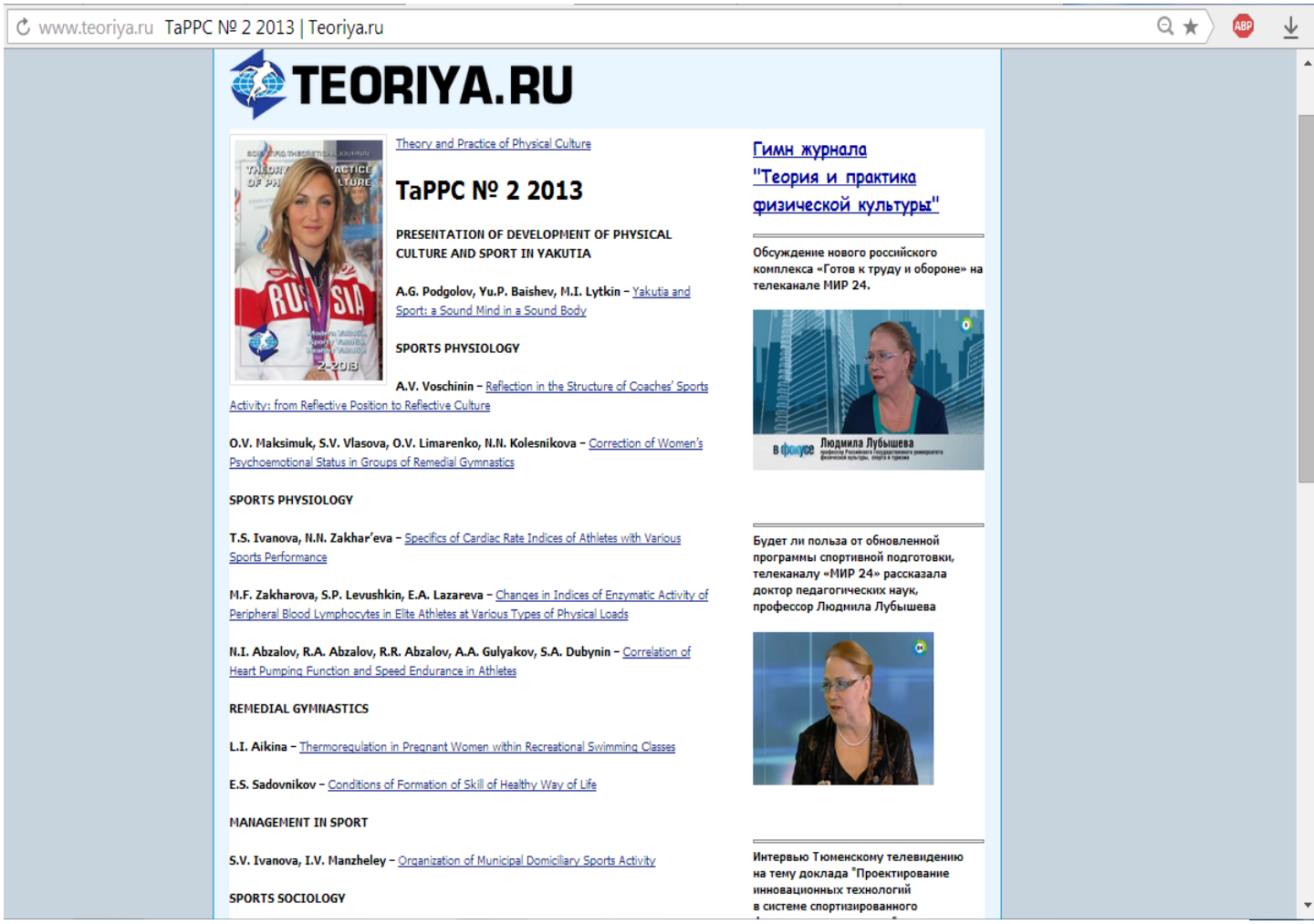

CORRELATION OF HEART PUMPING FUNCITON AND SPEED ENDURANCE IN ATHLETES

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Key words: speed of movement, speed endurance, heart rate, test tasks, students, athletes.

Introduction. The peculiarities of manifestation of the physical quality of speed attract the attention of a lot of researchers [1-5, 8, 10-13]. Speed is understood as a set of body functional features defining speed characteristics and time of motor reaction. Nowadays due to the rise of sports results, the role of ensuring of the speed of movements is increasing. Therefore speed endurance is even more important, since the ability of the body to keep the high rate of movement for it is characterized by the maximum body reaction and primarily by the reaction of cardiac function indices. The body works mainly in the anaerobic conditions while performing speed exercises, resulting in the oxygen debt provoking decreased metabolism, body energy and heart functional indices. Speed endurance is known as an essential factor of efficiency in all sports. Speed exercise performance indices have considerably increased in the modern sport and keeping up of the high rate depends on speed endurance. Speed and speed endurance are hard to estimate among young athletes due to the different level of their motor fitness by the moment of

measurements [6, 9]. Therefore it is extremely important to standardize the initial physical status of the subjects. This research is dedicated to the study of the rules of manifestation of speed and specifically speed endurance.

The purpose of the study was to examine the indices of speed endurance and heart rate of athletes involved in different sports.

Materials and methods. The studies were conducted in the laboratory of exercise physiology at the department of theory of physical culture with 1-3-year students of the Institute of physical culture, sport and rehabilitation medicine of Kazan Federal University. 107 students under study were divided into two groups: experimental, made of mainly 1-3-year students (57 persons) from team sports, and control one of students not practicing sports with physical activity limited to practical university classes (50 persons) The setup specially designed in our laboratory was used to estimate the qualities of speed and speed endurance [13].
The equipment was presented by a setup to estimate speed endurance, lap top with a video camera, metronome, stopwatch, electrodes and tonometer.
The setup is mounted on a cabinet 50-60 cm high. Lap top with a video camera on is placed on the table in front of the setup on the same level to record performed exercise and then makes delayed calculations of the number of movements made by a subject within 10 sec. A student sits on a chair in front of the setup, puts his hand on its bottom panel with his palm inward, fingers straight and together. After the command «Ready», ..Go!» he performs the maximum number of touches of the top and the bottom panels of the setup with his right hand for 10 seconds. This result was taken as 100% with 75% defined based on this index. Each student performed the exercise in accordance with the specified number of repetitions up to the moment when he got out of the tempo. This point was assumed as starting fatigue i.e. the time of speed endurance. The rate of the test task performance was set by a metronome. The exercise duration (t) fixed was assumed an indicator of speed endurance while exercising with maximum frequency.
Results and discussion. Physical exercises applied in sports to develop physical qualities are performed at 75% of the maximum, particularly weightlifters use 75% of the maximum weight to train strength indices and do maximum number of reps. This is the principle we used while estimating speed endurance.
Table 1. Time indices while performing a special exercise for speed endurance at 75% of the maximum (t, sec)

Subjects	Number of subjects, n	t, sec
Students involved in team sports	57	35,00+2,5
Students not involved in sports	50	27,00+1,9*

*- All the data between the groups meet the standards of reliability

As shown in Table 1, the time of performance of the subjected test task of touching the top and the bottom panels of the setup varies. The best time at the rate of 75% of the maximum for the students involved in team sports (football, volleyball, basketball) was 35,00±2,5 sec. The time indices of the students from the second group were 27,00±1,9 sec. The time difference between their indices is statistically accurate ($p<0,005$).
The next indices we determined were the ones of speed endurance using our test task of performance of 75% of the maximum number of repetitions.

Table 2. Frequency indices of touches of the setup panels at different workout rates (number of repetitions)

*- All the data between the groups meet the standards of reliability

As shown in Table 2, the maximum number of repetitions of the task for 10 seconds was 46,5±1,16 reps for the students involved in team sports (football, volleyball, basketball) and 41,5±1,17 reps for the ones not involved in sports. The statistically reliable difference between the maximum number of repetitions of the test task by students from the two groups was equal to 6 ($p<0,005$)
Thus, speed endurance of team athletes is higher than that of students not engaged in regular sports, proving the training potential of speed endurance. But the rates of increase of speed qualities are known to diminish distantly at this age.
Herewith, the subjects had their heart rate measured during the test task: pre exercise, for 10 sec after the exercise and at 75% of the maximum number of repetitions.

Table 3. Heart rate while performing a test task

Subjects	Number of subjects, n	Pre-exercise HR	HR after maximum number of reps	HR after reps at 75% of max.

Subjects	Number of subjects, n	Number of repetitions for 10 sec (max)	Number of repetitions at 75% of max.
Students involved in team sports	57	46,5+1,16	35,2+0,86
Students not involved in sports	50	41,5+1,17*	31,3+0,81*

Students involved in team sports	57	67,5 + 1,16	71,4 + 5,08	72,3 + 1,48
Students not involved in sports	50	71,5 + 1,43*	77,4 + 5,82*	76,5 + 1,33*

*- All the data between the groups meet the standards of reliability

As shown in Table 3 heart rate indices of students involved in team sports are much lower at rest than of the ones not engaged in regular sports, testifying to the lower functional lability of their heart rate while performing standard muscular load than of the ones not involved in sports.
Conclusion. Our studies dedicated to allocation of speed endurance using the technique and the setup designed in the Laboratory of Physiology of physical exercises in the Institute of Physical Culture, Sports and Rehabilitation Medicine of Kazan Federal University are original and performed for the first time. It is of primary importance when estimating sports prospects for selection of those who starts practicing exercises for speed endurance. Proceeding from our studies, speed endurance of the students engaged in team sports is much higher than that of the students not doing sports regularly. We believe the main reason is that team sports (football, basketball, volleyball) are classified as speed and strength exercises assisting in development of speed endurance. The task of our study was to establish the relationship between the speed endurance characteristics and cardiac performance. The higher speed endurance indices of the subjects were proved to stipulate for the lower cardiac response proving the feedback of these indices.

References

1. Abzalov, N.I. The features of heart rate, blood stroke volume and cardiac output in ontogenesis / N.I. Abzalov, R.A. Abzalov // Teoriya i praktika fizicheskoy kultury. – 2009. – № 10. – P. 17–19. (In Russian)
2. Abzalov, R.A. The features of noncardiac regulation of heart functions in transition periods from physiological rest to muscular loads / R.A. Abzalov, R.R. Abzalov // Teoriya i praktika fizicheskoy kultury. – 1998. – № 3. – P. 14–16. (In Russian)

3. Abzalov, R.A. Change in the indices of heart pumping function in athletes and non-athletes while performing graduated muscular loads / R.A. Abzalov, R.R. Nigmatulina // Teoriya i praktika fizicheskoy kultury. – 1999. – № 8. – P. 24–26, 39–40. (In Russian)
4. Balsevich, V.K. Development of agility and coordination in children aged 4-6 / V.K. Balsevich, M.N. Koroleva, L.T. Mayorova //Teoriya i praktika fizicheskoy kultury. – 1986. – № 10. – P. 21–24. (In Russian)
5. Vanyushin, Yu.S. Physiology of exercise: study guide for students of faculties of physical culture of pedagogical institutes / Yu.S. Vanyushin. – Kazan: Publ. h-se of TSHPU, 2007. – 180 P. (In Russian)
6. Varakin, A.P. Research methods of agility and accuracy of attacking actions in fencers and pentathletes / A.P. Varakin // Teoriya i praktika fizicheskoy kultury. – 1983. – № 3. – P. 7–9. (In Russian)
7. Vorob'ev, A.N. Weightlifting: textbook for institutes of physical culture. – 4th ed., rev., ext. – Moscow: Fizkultura i sport. – 1988. – 238 P. (In Russian)
8. Zheleznyak, Y.D. The basics of methodological activity in physical culture and sport: study guide for students of higher educ. institutions / Y.D. Zheleznyak. – 4th ed., ster. – Moscow: Academia, 2008. – 272 P. (In Russian)
9. Koryagina, Yu.V. The features of time motor characteristics in the ones engaged in different sports / Yu.V. Koryagina, V.V. Verner // Teoriya i praktika fizicheskoy kultury. – 2004. – № 12. – P. 37–38. (In Russian)
10. Lubysheva, L.I. Sociology of physical culture and sport: study guide for students of higher educ. institutions / L.I. Lubysheva. – 3rd ed., rev. and comp. – Moscow: Academia, 2010. – 272 P. (In Russian)
11. Lyakh, V.I. Motor abilities / V.I. Lyakh / Fizicheskaya kultura v shkole. – Moscow: Fizkultura i sport. – 2006. – № 2. – P. 12–13. (In Russian)
12. Fomin, N.A. Human physiology: study guide for students of faculties of physical culture of higher educ. institutions. – 2-nd ed., rev./ N.A. Fomin. – Moscow: Prosveschenie, 2002. – 351 P. (In Russian)
13. Khuramshin, I.G. Heart pumping function in athletes while performing physical exercises for agility / I.G. Khuramshin, R.A. Abzalov, N.I. Abzalov, R.R. Nabiullin, A.Z. Khuramshina // Teoriya i praktika fizicheskoy kultury. – 2012. – № 6. – P. 43–52. (In Russian)

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The study was carried out with 1-3-year students of the Institute of physical culture, sports and rehabilitation medicine to define speed and speed endurance, as well as heart rate indices using the technique and setup designed in the Laboratory of Physiology of physical exercises. It was found that speed endurance of students involved in team sports is higher than that of the students not engaged in

regular sports activities. The higher speed endurance indices of the subjects were proved to stipulate for the lower cardiac response proving the feedback of these indices.

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