The effect of football practice duration on improving the balancing skills of football players with hearing impairments

UDC 796.332

Dr. Hab., Professor **F.I. Sobyanin**[1]
Dr. Biol., Professor **S.Yu. Zavalishina**[2]
PhD, Associate Professor **E.S. Kachenkova**[3]
PhD, Associate Professor **S.N. Bobkova**[3]
[1]Belgorod State National Research University, Belgorod
[2]Russian State Social University, Moscow
[3]Moscow City University, Moscow

Corresponding author: svetlanazsyu@mail.ru

Received by the editorial office on 12.01.2025

Abstract

Objective of the study. The present study is aimed at determining the possibilities of maintaining balance in people with hearing impairments who practice in the specialized football section.

Methods and structure of the study. As part of the study, a group of 36 hard-of-hearing second-year university students who regularly attend adaptive soccer training sessions were monitored. Distribution by length of service: 12 people – one year, 10 people – two years and 14 people – three years. The control group consisted of 12 somatically healthy, hard-of-hearing second-year students who did not exercise. The ability to maintain balance was assessed using the Stabilan 01-2 device before and after physical exertion. Statistical data processing was carried out using the Student's t-test.

Results and conclusions. The results showed that hearing-impaired young men playing football had a reduced ability to maintain balance as fatigue set in. The level of development of this indicator in hearing-impaired athletes increased with an increase in their training experience. The best results were recorded in football players with three years of experience, which is explained by the higher level of fitness of their muscular and vestibular systems.

Keywords: *hearing disorders, specialized football, hard of hearing students, adaptive football, ability to maintain balance, training experience.*

Introduction. Regular sports activity activates all life phenomena in the trainees [1]. Systematic physical activity increases the level of biosynthetic and regulatory processes in the body of athletes, primarily in the cardiorespiratory system and in striated muscles [2]. Sports training develops the vestibular apparatus especially strongly [3]. As a result, the trainees experience somatic strengthening and increase stability in space [4].

A sufficiently long physical strengthening of any kind increases the body's oxygen needs and creates a certain oxygen debt in its tissues with the development of certain metabolic changes [5]. Under these conditions, even experienced athletes experience a short-term decrease in statokinetic stability in conditions of fatigue during exercise [6]. However, the relationship of leg muscle fatigue to balance in hearing-impaired adaptive soccer players cannot be considered studied.

Objective of the study. The present study is aimed at determining the possibilities of maintaining balance in people with hearing impairments who practice in the specialized football section.

Methods and structure of the study. The results of observation of 36 hearing–impaired young men (19.7±0.65 years old) who were enrolled in full–time studies in the second year of university with experience in adaptive football were taken into account: 12 people – at least one year, 10 people - at least two years and 14 people - at least three years. In the study, the control group consisted of a sample of 12 hearing-impaired young men with an average age of 19.2±0.82 years, who had never been involved in sports and were enrolled in full-time studies in their second year of university.

The development of the ability to maintain balance was monitored using a stabilographic device "Stabi-

lan 01-2" (manufactured by the Russian company "Rhythm"). It was used to remove the indicators initially and at the end of the test load. The subjects participated for 52 seconds in performing the Romberg test with their eyes open. Later, they performed 50 full squats from a standing position. Before and after physical exertion, the subjects' stabilographic parameters were monitored.

The effect of an episode of muscle activity on the ability to maintain balance was assessed by a number of indicators: the average rate of change of the center of pressure (VCR, mm/s); the rate of dynamics of the surface of the statokinesiogram (VS, mm^2/s); the maximum distance of indicators on the frontal plane (QX, mm); the maximum distance of indicators on the sagittal plane (QY, mm); the quality of the equilibrium function (CFR, %); the surface of the confidence ellipse on the statokinesiogram (SELLS, mm2). The mathematical processing of the data consisted in calculating the Student's t- test.

Results and conclusions. The control indicators differed from those of football players due to their poor development of the ability to maintain balance (see the table). The muscular load activates the internal organs and increases blood flow in the working organs. This alters a person's ability to maintain balance. With the development of muscle fatigue in hearing-impaired football players, the stabilographic characteristics changed.

The more athletic experience the hearing-impaired had, the better their stabilogram scores were. Against the background of physical fatigue, all categories of football players showed varying degrees of severity in the dynamics of the recorded indicators. Their improvement occurred as their athletic experience and experience in performing athletic movements increased. Thus, those who had been training for at least three years had the greatest harmony in the development of the muscular system and the greatest development of the vegetative support of the body.

Stabilographic parameters under conditions of performing the Romberg test in hearing-impaired football players (M±m)

Stabilographic characteristics	Without power load				Under power load			
	Control, n=12	Three years of experience, n=14	Two years of experience, n=10	Experience is one year, n=21	Control, n=12	Three years of experience, n=24	Two years of experience, n=18	Experience is one year, n=22
S_{ELLS}, $мм^2$	94,8±6,52	71,0±4,22**++	79,6±3,95**+	85,0±4,72*	114,2±7,53	56,8±2,33	72,4±8,15**++	93,4±3,85**
КФР, %	82,6±3,94	92,5±1,12	89,4±0,93*+	86,9±0,98	-7,23±1,47	-3,10±0,91**++	-4,25±0,76**++	-5,42±0,85**
Q_X, мм	2,39±0,56	2,02±0,38*+	2,14±0,44*+	2,26±0,29	1,32±0,36	0,91±0,47*+	1,00±0,51*+	1,22±0,58
Q_Y, мм	3,43±0,71	2,95±0,25*+	3,06±0,38*+	3,25±0,19	1,91±0,68	1,40±0,51**+	1,52±0,49**+	1,66±0,54*
V_{CP}, мм/с	7,56±1,32	5,42±0,72**++	6,15±0,89**++	6,85±0,96*	7,68±1,25	3,21±0,86**++	4,16±0,94**++	5,63±1,10**
V_S, $мм^2/с$	9,42±1,75	7,29±0,93**+	7,98±1,01**+	8,91±1,26*	7,42±1,44	4,36±0,87**++	5,49±0,95**++	6,62±1,16**

*Note: differences in the control parameters and the level of performance of athletes with different experience before and after the load * $p<0.05$, ** $p<0.01$; the significance of differences in the parameters of football players with one year of experience with football players with two and three years of experience before and after the load + – $p<0.05$, ++–$p<0.01$.*

In this regard, hard-of-hearing football players with one year of experience may develop the greatest fatigue of the muscles and the autonomic system out of all the athletes observed. This situation leads to a marked increase in the fluctuation of the center of pressure with a weakening of the ability to maintain body balance.

In the control group, the growth of stablographic parameters after muscle exertion and against the background of muscle fatigue turned out to be even more pronounced than in those engaged in sports for one year. This indicated that the control group experienced more severe fatigue in the structures of their autonomic nervous system and a more pronounced increase in their musculoskeletal system and lactate in their blood. Against this background, the physically inactive experienced a more pronounced deterioration in the stability of their bodies in space.

Regular physical activity contributes to the development of the function of maintaining balance. Against the background of the onset of physical fatigue, including during exercise. This function is starting to weaken. The work traces the development of the ability to maintain body balance in hearing-impaired football players with different training periods. As it increased, they showed an increase in their stability under conditions of test physical activity. It is clear that football loads associated with great physical activity improve the ability of the hearing-impaired to maintain body balance.

References

1. Varfolomeev D.L., Mahov A.S., Medvedev I.N. Temperament yunoshej, regulyarno zanimayushchihsya futbolom i sportivnoj hodboj. Teoriya i praktika fizicheskoy kultury. 2024. No. 3. P. 74.
2. Mahov A.S., Medvedev I.N. Funkcionalnye izmeneniya v organizme yunoshej s sensonevralnoj tugouhostyu v rezultate regulyarnyh futbolnyh trenirovok. Teoriya i praktika fizicheskoy kultury. 2022. No. 5. P. 48.
3. Mahov A.S., Medvedev I.N. A.S. Rol trenera v podbore uprazhnenij dlya sportsmenov-invalidov s uchetom ih fiziologicheskih osobennostej. Teoriya i praktika fizicheskoy kultury. 2019. No. 8. P. 62.
4. Mahov A.S., Medvedev I.N. Fiziologicheskie osobennosti yunyh futbolistov, polgoda nazad prekrativshih trenirovki. Teoriya i praktika fizicheskoy kultury. 2019. No. 1. P. 25.
5. Nazarenko A.S., Chinkin A.S. Vliyanie vestibulyarnogo razdrazheniya na statokineticheskuyu ustojchivost sportsmenov razlichnyh specializacij. Nauka i sport: sovremennye tendencii. 2015. T.7. No. 2(7). P. 78-85.
6. Medvedev I.N., Gusev A.V., Malyshev A.V., Mikhailova O.D., Garina E.V., Petina E.Sh., Tagirova N.Dz. Influence of the Experience of Health-Improving Jogging on the Level of Functional Activity of Platelets in Men of the Second Mature Age. Systematic Reviews in Pharmacy. 2020. No. 11(8). pp. 432-438.