Normative scales for assessing static equilibrium in junior schoolchildren

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Abstract

Objective of the study was to develop normative scales for assessing static balance in younger schoolchildren.

Methods and structure of the study. The scientific work was carried out on the basis of school 1476 in Moscow, in which 570 elementary school students took part. A comprehensive assessment of the physical development of children of primary school age was carried out. For static balance of junior schoolchildren, a complicated non-instrumental Romberg test was used. The use of the Romberg test is based on the assessment of vertical stability and stability of a person's posture, which involves identifying the degree of contribution of different sensory systems. Maintaining a stable posture is ensured by: vision, vestibular apparatus, proprioception. In the Romberg test, performed in a calm state on a stationary support, provided there are no disorders of the vestibular apparatus, the activity of the visual system and proprioception is assessed to a greater extent. In the practice of physical education and sports, the Romberg test is also quite often used for comprehensive testing of schoolchildren.

Results and conclusions. Centile scales have been developed to evaluate the Romberg test on one leg with open and closed eyes; visual control has a significant impact on primary school students when performing a test exercise for static balance. The experiment revealed the dominance of the right leg relative to the left.

Keywords: *Romberg test, static balance, centile scales, children of primary school age.*

Introduction. The Romberg test is a universal diagnostic exercise used in medicine to identify dysfunctions of the vestibular apparatus and cerebellum, and in physical education and sports activities to assess static balance. Stability and steadiness of the vertical posture are provided by three main components: the visual sensory system, the vestibular apparatus, and proprioceptive sensitivity. The Romberg test, depending on the complexity and method of its implementation, allows for varying degrees of quantitative assessment of the stability of the vertical posture and the contribution of certain sensory systems to maintaining it. The visual component is involved in ensuring the vertical posture at all levels of complexity of the Romberg test. Evaluation of its contribution allows for determining important aspects, such as a person's "sensory profile" – the degree of dominance of vision or proprioception in organizing a person's movement and posture. Vision, in particular, determines the involvement of conscious control and perception of the position of one's own body in space when organizing movement and posture [2, 4, 5]. Balance develops based on the improvement of reflex mechanisms in the process of maturation of the vestibular analyzer. The sensitive period of balance development is the age of 7-12 years, respectively, it is important to control and identify violations in this age period. By the age of 13-14, the indicators of body stability reach the value characteristic of an adult [1]. As a result of the analysis of the literature, it was revealed that most of the normative values for the studied samples are not oriented towards children, which does not allow for a quantitative and qualitative assessment of the physical condition of primary school children.

Objective of the study was to develop standard scales for the Romberg test indicator and to assess the level of static balance in primary school children.

Centile scales for assessing the Romberg test on one leg with open and closed eyes for students in grades 1-4 (seconds)

Eye position	Leg	Very low	Low	Below the average	Average	Above average	High	Very high
1-2 grades								
Open	Right	2	2-5	5-7	**7-15**	15-20	20-25	25
	Left	1	1	1-3	**3-4,2**	4,2-4,3	4,3- 5,2	5,3
Closed	Right	1	1-3	3-6	**7-10**	11-15	15-18	18
	Left	1	1	1-2,5	**2,5-3**	3-4,2	4,2-5,2	5,3
3-4 grades								
Open	Right	5	5-10	10-15	**15-20**	20-25	25-30	30
	Left	1	1	1-2	**2-4,5**	4,5-8	8-9	9
Closed	Right	3	3-6	7-9	**9-12**	12-15	15-20	20
	Left	1	1	1	**1-4**	4-7	7,1-8	8

Methods and structure of the study. The research work was carried out on the basis of school 1476 in Moscow, in which 570 primary school students took part. A comprehensive assessment of the physical development of primary school children was carried out. For the static balance of primary school children, a complicated non-instrumental Romberg test was used. However, there are no standard scales for an objective quantitative and qualitative assessment of primary school children using the Romberg test. Centile scales include a quantitative assessment and the corresponding qualitative values: «very high», «very low», «high», «low», «average», «below average», «above average» [3].

Results of the study and discussion. Centile scales for the age sample of primary school students were determined (see table). Each age is represented by a sample of 100 people, since no reliable differences in indicators between classes were found - combined scales are presented.

As a result of the testing, taking into account the developed standard scales, it was found that among schoolchildren in grades 1-2 in a position with open eyes: «very low» – 3% of schoolchildren: right – 2 sec, left – 1 s; «very high» – 3% of schoolchildren: right 25 sec, left – 5,3 sec; «low» – 7% of schoolchildren: right 2-5 sec, left – 1 sec; «high» – 7% of schoolchildren: right 20-25 sec, left 4,3-5,3 sec; «below average» – 15% of schoolchildren: right 5-7 sec, left 1-3 sec; «above average» – 15% of schoolchildren: right 15-20 sec, left 4,2-4,3 sec; «average» – 50% of schoolchildren: right 7-15 sec, left 3-4,15 sec. In the position with eyes closed: «very low» – 3% of schoolchildren: right – 5 sec, left – 1 sec; «very high» – 3% of schoolchildren: right 30 sec, left –9 sec; "low" – 7% of schoolchildren: right 1–3 sec, left – 1 sec; «high» – 7% of schoolchildren: right 16-18 sec, left 4,3-5.2 sec; «below average» – 15% of schoolchildren: right 3-6 sec, left 1-2,5 sec; «above average» – 15% of schoolchildren: right 11-25 sec, left 4,2-4,3 sec; «average» – 50% of schoolchildren: right 7-10 sec, left 2,5-3 sec. It was found that for schoolchildren of grades 1-2 the influence of the visual analyzer was significant and the indicators obtained when performing the test with closed eyes were significantly lower than with open eyes. Schoolchildren showed a pronounced asymmetry of stability on the right leg.

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With eyes closed: «very low» - 3% of schoolchildren: right - 3 sec, left -1 sec; «very high» - 3% of schoolchildren: right 20 sec, left -8 sec; «low» - 7% of schoolchildren: right 3-6 sec, left -1 sec; «high» - 7% of schoolchildren: right 15-20 sec, left 7.1 - 8 sec; «below average» - 15% of schoolchildren: right 7-9 sec, left 1-2 sec; «above average» - 15% of schoolchildren: right 12-15 sec, left 4-7 sec; «average» - 50% of schoolchildren: right 9-12 sec, left 1-4 sec.

Relative to schoolchildren in grades 1-2, students in grades 3-4 have increased performance indicators

for the Romberg test on the right leg. Relative to asymmetry, the indicators are higher, which emphasizes the clear dominance of the right leg. Performing a complicated Romberg test does not cause difficulties for primary school students in the position of «standing on the right leg with open eyes», however, with age, the difference in results increases towards a significant dominance of the right leg.

Conclusions. Centile scales have been developed to evaluate the Romberg test on one leg with open and closed eyes; visual control has a significant effect on primary school students when performing a test exercise for static balance. The experiment revealed the dominance of the right leg relative to the left.

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