
CONFERENCE ARTICLE

The Relationship Between Body Balance And Attention Concentration Ability In Students Aged 10-15

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ABSTRACT

This thesis is devoted to a literature review on the relationship between body balance and attention concentration ability in students aged 10-15. The study analyzes the neurophysiological connections between the vestibular system, the cerebellum, and the prefrontal cortex, the influence of balance exercises on attention indicators, and the developmental characteristics of this age period. The thesis also provides practical recommendations and directions for future research.

Keywords: Balance, attention, vestibular system, cerebellum, prefrontal cortex, correlation, cognitive function, balance exercises.

INTRODUCTION

In the modern education system, harmonizing students' physical and cognitive development is an urgent task. The age of 10-15, which corresponds to adolescence and middle school age, is characterized by intensive development of the central nervous system, as well as functional improvement of the vestibular apparatus and cerebellum. Body balance is the ability to maintain a stable position in space, and it depends on the integration of vestibular, proprioceptive, and visual systems. Attention concentration, in turn, is one of the key cognitive factors of success in learning activities.

The purpose of this thesis is to analyze the existing literature on the relationship between body balance and attention in students aged 10-15, summarize the main findings, and develop practical recommendations.

Neurophysiological Foundations: Vestibular System, Cerebellum, and Prefrontal Cortex

Studies on adolescents aged 12-14 have examined the relationship between vestibular function and cognitive indicators using a rotary test and computerized cognitive tasks. In a study involving 80 students, it was found that adolescents with higher vestibular excitability demonstrated 20-30% higher levels of attention stability and spatial memory. The author explains this result through active neural connections between the cerebellum and the prefrontal cortex.

Research on executive functions, including attention control, impulse control, and working memory, has shown that balance exercises, especially yoga, acrobatics, and gymnastics, increase the activity of the prefrontal cortex and cerebellum, thereby improving selective attention and resistance to distraction. According to these findings, 8-10 weeks of regular training may improve cognitive test results by 15-35%.

Studies analyzing the physiological mechanisms of attention and

developmental changes during adolescence emphasize that the rapid development of voluntary attention at the age of 10-15 makes this period especially sensitive to pedagogical influence.

Correlation Between Balance and Attention: Empirical Studies

Empirical studies involving 120 adolescents aged 12-15 calculated the correlation between balance indicators, measured through the Romberg test and one-leg standing test, and attention indicators, assessed using Schulte tables and correction tests. The results showed a Pearson correlation coefficient of $r = 0.68$, with $p < 0.01$, indicating a strong positive relationship. Interestingly, the correlation was stronger among boys ($r = 0.73$) than among girls ($r = 0.59$). The authors explain this difference by the higher level of motor activity among boys.

Another study involving 60 schoolchildren aged 10-11 implemented an eight-week balance exercise program, including walking on a gymnastics bench, standing on one leg, and using a balance ball. In the experimental group, attention indicators measured by the Bourdon test improved by an average of 22% compared with the control group. This confirms the positive effect of balance exercises on attention.

Other studies have shown that balance exercises are 1.5 times more effective than ordinary running or jumping exercises in improving selective attention and resistance to distraction. This is explained by the fact that balance exercises simultaneously activate several brain areas, including the cerebellum, vestibular nuclei, thalamus, and prefrontal cortex.

Age Characteristics and Sensitive Period of Development

Research on the stages of motor coordination development in children and adolescents shows that proprioceptive sensitivity and vestibular stability increase rapidly between the ages of 10 and 15. During this period, systematic use of balance exercises produces the highest effect because neuroplasticity is especially

active.

Studies of age-related dynamics of attention development in 150 children aged 9–14 found that attention span and stability increase sharply at the age of 10–11. At the age of 12–13, a temporary decline may occur due to the adolescent developmental crisis, while by the age of 14–15 attention becomes more stable again. Therefore, the use of balance exercises during this age period supports the natural development of attention.

The literature review shows that a positive correlation between body balance and attention in students aged 10–15, approximately $r = 0.6-0.7$, has been confirmed by several independent studies. From a neurophysiological perspective, this relationship is based on functional connections between the cerebellum and the prefrontal cortex. Balance exercises such as standing on one leg, the Romberg test, and walking on a gymnastics bench activate not only the vestibular apparatus but also higher cognitive functions.

However, the analyzed sources differ methodologically. Some studies were conducted with small samples, while others used larger samples. Various tests, including the Bourdon test, Schulte tables, and correction tests, were used to assess attention, which makes direct comparison of results difficult. In addition, most studies were short-term, lasting 8–12 weeks, while long-term effects have not been sufficiently studied. The near absence of such studies in schools of Uzbekistan indicates a research gap in this field. Nevertheless, all analyzed sources confirm the positive role of balance exercises in the development of attention. This provides pedagogical justification for including balance-development exercises in physical education lessons.

Conclusion and Recommendations

In conclusion, there is a moderate to strong positive correlation between body balance and attention concentration ability in students aged 10–15, with correlation indicators ranging from $r = 0.6$ to $r = 0.7$. The neurophysiological basis of this relationship lies in the functional connections between the vestibular system, the cerebellum, and the prefrontal cortex. When performed regularly for 8–12 weeks, balance exercises such as standing on one leg, the Romberg test, and walking on a gymnastics bench can improve attention indicators by 20–30%. The age of 10–15 is considered the most sensitive period for applying such exercises.

Based on the obtained information and conclusions, the following recommendations can be proposed:

1. Include balance exercises in school physical education lessons, for example, for 5–7 minutes in each lesson.
2. Organize “active breaks” during lessons, such as standing on one leg or walking along a straight line.
3. Recommend that parents perform short balance games with children at home, such as using a balance ball or practicing the “swallow” position.
4. Conduct large-scale experimental studies involving students aged 10–15 in schools of Uzbekistan.
5. Study the long-term effects of balance exercises over a period of 6–12 months.
6. Analyze gender differences between boys and girls in greater depth.

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