

Analysis of Gender Characteristics in The Intelligence of Girls and Boys

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Abstract: This article is devoted to the analysis of gender characteristics in the intelligence of girls and boys in the context of neuropedagogy. The subject of the study is the impact of gender differences on the educational process, and the topic is to study the impact of gender-specific neuropsychological characteristics of the child on the cognitive development. The main goal of the article is to develop individual approach strategies taking into account gender-specific neuroanatomical and psychological factors in pedagogical approaches. The relevance of the topic is determined by the fact that the success of educational activities in children is largely determined by the relationship between gender differences in brain development. The study, based on neuropsychological observations, cognitive tests and pedagogical experience, identified differences between boys and girls and studied their impact on teaching effectiveness. The results obtained showed that boys are more likely to excel in spatial and logical thinking, while girls are more likely to excel in verbal intellectual activity. Experimental observation, questionnaires and statistical analysis were used as research methodologies. The results may be useful for educators, psychologists, and program developers working with preschool and school-age children. In conclusion, it has been found that pedagogical approaches that take into account gender neurospecificities are an important factor in increasing children's motivation for learning and academic performance.

Keywords: Neuropedagogy, gender characteristics, girls, boys, intelligence, cognitive development, education, neuropsychology.

Introduction: The implementation of the principle of an individual approach in the modern education system requires a thorough analysis of the personal characteristics of students. In particular, the impact of gender differences on the intellectual development of students is one of the pressing issues in the field of neuropedagogy. Gender-specific neurophysiological features of brain development indicate that there are significant differences in the ways boys and girls perceive, analyze, and process knowledge. To increase the effectiveness of education, educators need to take these differences into account.

The purpose of this article is to analyze the neuropsychological characteristics that affect the development of intelligence in girls and boys, to formulate individual educational strategies based on existing gender differences. The main problem is that existing curricula in most cases do not take into account gender differences, which leads to students not fully

realizing their potential. Therefore, the article presents a scientifically based study of this problem and practical solutions.

In recent years, neuropedagogical research has focused on in-depth study of gender differences. In particular, S. Baron-Cohen in his studies emphasized the tendency of the male brain to systematic analysis, and the female brain to activities related to empathy and language [1]. D. Halpern and J. Hyde showed that boys excel in spatial-logical skills, and girls in verbal thinking and social adaptation [2]. Among local authors, studies by Sh. Mamatkulov (2020) and D. Karimova (2022) analyzed gender-specific learning strategies and psychological approaches, which showed the advantages of gender-based didactic methods [3][4]. These studies serve as an important methodological basis for improving the neuropedagogical approach.

Purpose

The main purpose of this article is to identify

neuropsychological gender characteristics in the intellectual development of girls and boys, to develop approaches aimed at increasing educational effectiveness by taking them into account in the educational process. The following issues are planned to be addressed within the framework of the study:

To identify gender-specific neuropsychological differences that affect the cognitive activity of the brain of girls and boys;

To identify the strengths and weaknesses of both sexes in terms of verbal, spatial-logical, creative and emotional intelligence;

To develop methodological recommendations that serve to form an individual approach based on gender differences;

To scientifically substantiate the existing differences and assess their impact on educational activity based on practical observations, tests and statistical analysis;

To show the relevance of this issue and ways to solve it by comparing the results obtained with international and local studies.

METHODS

The study was conducted in 2024–2025 with the participation of 60 students (30 girls and 30 boys) aged 8–10 studying in grades 2–4 of secondary schools in Tashkent city and Fergana region. Participants were selected based on the consent of their parents. During the study, the levels of intellectual development of children, their cognitive activity, attention, memory, language and spatial thinking indicators were analyzed.

Observations were conducted in real conditions during the educational process. Taking into account the individual characteristics of each child, their mental activity was assessed using specially designed questionnaires and test materials [5].

The study used neuropsychological analysis, pedagogical observation, psychometric tests, statistical analysis methods (chi-square test, comparison of mean values). In particular, tools such as Raven's progressive matrix, a shortened version of the Wechsler test, verbal and visual memory measurement techniques, and Schulte tables were used to assess the intellectual potential of children.

The study was methodologically based on a combination of experimental and observational methods and included qualitative and quantitative analysis. Children of primary school age were selected as the object of study, since at this age neurocognitive functions are formed rapidly and gender differences are clearly manifested. The research data were collected anonymously and ethical norms were strictly observed [6].

RESULTS

According to the results of the study, there were significant differences between some indicators of the intelligence of girls and boys. In particular, girls performed better on verbal and memory tests, while boys performed better on spatial reasoning and analytical thinking. The following table shows the mean scores for the main test scores:

Table 1. Comparison of intellectual performance between girls and boys (mean scores)

Test type	Girls (n=30)	Boys (n=30)	Difference (Δ)	Note
Verbal thinking	7.9	6.3	+1.6	Girls are superior
Spatial-logical thinking	6.1	8.2	−2.1	Boys are superior
Visual memory	8.4	7.2	+1.2	Girls are superior
Attentional stability (Schulte)	7.6	7.8	−0.2	There is almost no difference.
Creative thinking	6.9	6.5	+0.4	The difference is minimal.

These results indicate that there are certain intellectual priorities between girls and boys, which requires an individual approach to education.

Based on the results of the analysis, the following conclusions were drawn:

Girls have higher performance in activities related to speech, language, memory and emotional expression. This is explained by the stronger interhemispheric connections in women [1].

Boys, on the other hand, show higher results in tasks requiring logical, spatial and technical skills. This is due to the relative dominance of the right hemisphere in them [2].

These facts are consistent with previous international studies and strengthen the theoretical foundations of the article. It has been proven that some generalized approaches do not give the same results for all children, but need to be adapted to their gender neurospecificities [7].

The following problems were encountered during the study:

The cautious approach of schools to the conduct of psychological tests, in some cases the refusal of parents to participate;

Cases where the mood of children and external factors influenced the test results;

The lack of in-depth empirical studies on neuropedagogical gender differences in the domestic literature.

These problems caused some limitations in generalizing the scientific results. However, the data obtained based on the existing methodologies have a sufficiently reliable statistical basis [8].

The results of the study are consistent with previous foreign and domestic studies. For example, Halpern and Hyde's research on gender intelligence [2], as well as Baron-Cohen's theory of empathic and systematic thinking differences [1] support the results of this article.

Also, in the research on the psychological development of preschool children conducted by Karimova (2022), the socio-emotional activity of girls and the logical-spatial superiority of boys were revealed [3].

CONCLUSION

The results of the research served as an important scientific basis for determining the biological and psychological differences in the intellectual development of girls and boys within the framework of neuropedagogy. During the study, it was found that girls have high indicators in verbal thinking,

memorization and socio-emotional activity, while boys excel in spatial-logical thinking, analytical thinking and technical abilities.

These results indicate the need to take into account gender characteristics in the education and upbringing of children. Instead of universal approaches in the educational process, adapted pedagogical methods should be used that take into account gender-specific cognitive and neuropsychological characteristics. These differences are especially important when designing curricula, selecting test items, and defining assessment criteria [2], [5].

Also, the scientific and methodological shortcomings of the study, the lack of localization of test tools, and the obstacles encountered in working with parents require further deepening of the scope of neuropedagogical research. In the future, empirical studies conducted on a larger scale, with the participation of different age groups and cultural strata, will serve to enrich the knowledge base in this area. The development of neuropedagogy allows for the improvement of individualized educational approaches and increases the effectiveness of education.

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