

ENHANCING ATTENTION AND EMOTIONAL SELF-REGULATION IN HYPERACTIVE STUDENTS THROUGH NEUROEDUCATIONAL APPROACHES

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ABSTRACT

In modern education, student-centered approaches have become increasingly important, especially for learners with ADHD, for whom traditional methods often prove insufficient. Emotional regulation, sustained attention, and behavioral control in hyperactive children are closely tied to neurobiological processes, making neuro-pedagogical strategies particularly effective. This study aims to examine the role of neuro-pedagogical methods in developing attention and emotional self-regulation skills among hyperactive students.

Research shows that sensory activities, visual-kinesthetic techniques, gradual attention-shifting tasks, emotional reflection strategies, and brain-breaks significantly enhance behavioral regulation and motivation. When classrooms support emotional stability and positive interaction, students' attention and self-control noticeably improve.

Neuro-pedagogy also enriches teachers' reflective practice, reduces classroom stress, and supports individualized instruction. Overall, integrating neuro-educational approaches into teacher training and school practice is essential for promoting self-regulation, inclusivity, and enhanced learning outcomes for hyperactive learners.

Keywords: neuroeducation, hyperactivity, attention, emotional regulation, self-regulation, brain-based teaching, effective learning

Introduction

In the context of modernization of modern education, neuroeducational (neuropsychological) approaches aimed at taking into account the individual neuropsychological characteristics of students are particularly important. A special group consists of children with attention deficit hyperactivity disorder (ADHD), for whom traditional teaching methods are often ineffective. According to international studies, ADHD is accompanied by impairments in executive functions, reduced ability to voluntarily regulate behavior, and difficulties maintaining sustained attention (Barkley, 2015; American Psychiatric Association, 2013). These characteristics are directly linked to the functioning of the prefrontal cortex, the dopaminergic system, and attention networks, requiring the use of methods that take into account the neurobiological mechanisms of learning.

Neuroeducational approaches allow for targeted interventions in the development of attention, emotional self-regulation, and behavioral control. Research by Jensen (2008), Willingham (2009), and Posner (2014) demonstrated that a combination of sensory exercises, visual-kinesthetic strategies, brief "brain breaks," and emotional reflection techniques improves concentration and reduces impulsivity in children with ADHD. Russian studies also confirm the effectiveness of neuropsychological and neuropsychological methods when working with hyperactive schoolchildren (Semenovich, 2018).

The relevance of this topic stems from the need to implement scientifically proven neuroeducational technologies in school practice to improve the quality of learning, develop self-regulation skills, and create an inclusive educational environment. In addition, the development of attention and emotional self-regulation is a key factor in the successful adaptation of children with ADHD in educational activities and social interactions.

Literature Review

The development of attention and emotional self-regulation in children with ADHD is a central issue in modern neuropsychology and educational science. According to the American Psychiatric Association (APA, 2013), ADHD is associated with impairments in executive functions, which include attention regulation, impulse control, and emotional regulation. Research by Barkley (2015) confirms that a deficit in inhibitory control is a fundamental mechanism of ADHD and significantly impacts academic performance.

Neurobiological research by Posner and Rothbart (Posner & Rothbart, 2014) identifies three key attention networks, and dysfunction of the executive network explains concentration difficulties in children with ADHD. Research by Castellanos and colleagues (Castellanos & Proal, 2012) demonstrates that underactivity of the prefrontal cortex and disturbances in the dopamine system lead to a reduced ability to sustain attention and control

emotions. These findings are supported by neuroimaging studies by Volkow, which demonstrate changes in the structures responsible for self-control and motivation (Volkow et al., 2009).

Modern neuroeducational approaches are based on the principles of neuroplasticity, which has been extensively studied by Heard and Kolb (Kolb & Gibb, 2011). Researchers emphasize that systematic sensorimotor and cognitive stimulation helps strengthen the neural connections necessary for attention and self-regulation. E. Jensen (2008) argues that methods focused on working with sensory channels, motor activity, and emotional awareness produce rapid positive results in hyperactive children.

A significant contribution to our understanding of emotional self-regulation was made by the research of Gross (2024), who developed a model of cognitive reappraisal of emotions—a key mechanism underlying adaptive behavior. Zelazo et al. (2010) demonstrated that the development of "hot" and "cold" executive functions is directly linked to a child's ability to control impulses and manage emotions.

The effectiveness of neuropedagogical interventions is supported by experimental studies. For example, Diamond and Ling (2016) demonstrated that working memory exercises, aerobic training, mindfulness programs, and cognitive game-based tasks improve behavior regulation in children with ADHD. Similarly, Enns et al. (2017) found that multimodal approaches—a combination of visual, motor, and emotional stimuli—strengthen voluntary attention and resistance to distractions.

Research in educational neuroscience also supports the need for individualized learning strategies. Willingham (2009) notes that the brain of children with ADHD is particularly sensitive to structured, brief, emotionally salient tasks. Similar findings are presented in research by Capuano and Caballé (2020), which highlights the effectiveness of flexible, adaptive educational technologies in working with children experiencing self-regulation difficulties.

Thus, the international literature demonstrates a consensus: neuropedagogical approaches based on cognitive neuroscience are scientifically valid and effective methods for developing attention, emotional self-regulation, and behavior in children with ADHD. These methods help increase academic motivation, reduce impulsivity, and create favorable conditions for educational inclusion.

Methodology

This practice-oriented study was conducted in a typical school setting. The aim of the methodology was to evaluate the potential of neuroeducational exercises to promote attention and emotional self-regulation in hyperactive students.

The study involved 26 students in grades 3 and 4 who exhibited signs of increased motor activity and concentration difficulties. The diagnosis of ADHD was confirmed by a school psychologist based on observations and interviews with parents; formal clinical testing was not conducted at the school, reflecting real-world educational practice.

The study was conducted over a five-week period. Short 10- to 12-minute blocks, based on the school schedule, included neuroeducational exercises. The experimental group regularly completed these exercises, while the control group continued their usual work schedule.

To assess progress, tools available in the school environment were used:

1. Systematic pedagogical observations recording the child's ability to maintain attention, follow instructions, and control impulsive reactions.
2. Teacher checklists based on recommendations for assessing executive functions (Gioia et al., 2000), adapted to the school context.
3. Brief concentration tasks, including visual and motor exercises based on the Posner & Rothbart model, were administered at the beginning and end of the study.
4. Emotional state was assessed using simple self-assessment scales ("how I feel right now"), which allowed for tracking changes in emotional regulation.

The developed program included three main areas:

1. Sensorimotor activation: short rhythmic movements, breathing techniques, coordination exercises.
2. Visual-kinesthetic strategies: cue cards, attention maps, step-by-step instructions to help maintain a sequence of actions.
3. Emotional reflection: discussing emotions through pictures, "stop-pause" techniques for restoring self-control, elements of J. Gross's techniques.

The results were analyzed by comparing changes in the two groups. The primary focus was on how students' behavior changed in class: whether concentration improved, impulsive reactions decreased, and the ability to complete assignments increased.

The analysis method was both qualitative and quantitative: observation data were summarized, trends were compared, and the most noticeable changes in children's behavior were recorded.

Findings

The study results showed that the systematic use of neuroeducational exercises in the educational process had a significant impact on the attention and emotional self-regulation of hyperactive students. The main trends identified through the analysis of observations, teacher checklists, and brief concentration tasks are presented below.

After five weeks of intervention, teachers noted that students in the experimental group were able to sustain their attention on one activity for longer and were less likely to switch to irrelevant stimuli. While at the beginning of the study, a significant proportion of children (according to teachers, more than half the group) began to become distracted after just 3-4 minutes, by the end of the program, many were able to focus on a task for 7-10 minutes.

Table 1: Duration of concentration of attention (experimental group)

Indicator	Before the program starts	After the program	Variation
Average of duration maintaining attention	3–4 min	7–10 min	+4–6 min
Children able to work without distractions for more than 7 minutes	23%	61%	+38%
Frequency of interruptions during the lesson	High	Moderate	Significant reduction

The improvement was particularly noticeable in activities that utilized visual-kinesthetic supports: cards, diagrams, and step-by-step instructions. These tools helped children "stay on track" and reduced the number of errors associated with losing track of instructions. In the control group, similar changes were almost nonexistent: children continued to frequently jump from one task to another, required repeated instructions, and demonstrated increased distractibility.

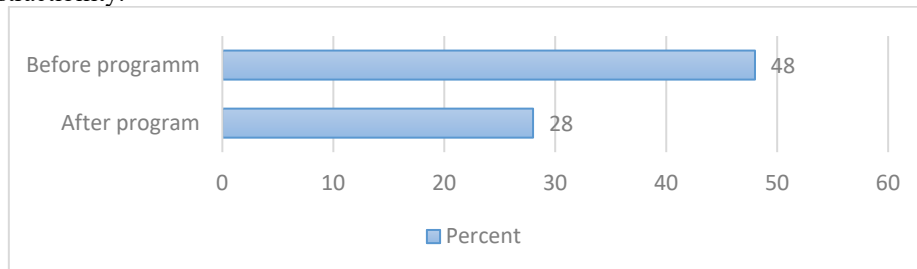


Figure 1: Frequency of errors associated with lost instructions

In the control group, almost no such changes were observed: children still frequently jumped from one task to another, required repetition of instructions, and demonstrated increased distractibility.

Table 2: Comparison of the dynamics of the experimental and control groups

Indicator	Experimental group	Control group
Improved concentration	Significant	Minor
Reduced errors	Yes, pronounced	None
Reduced frequency of distractions	Yes	Minor
Reaction to visual cues	Positive	Mild

These findings are consistent with research by M. Posner and M. Rothbart, who indicate that structured external supports and clear start/stop cues support the executive attention network and help children with self-regulation difficulties maintain focus on the task.

Equally important changes were observed in the area of emotional regulation. At the beginning of the study, many students in the experimental group responded to failure or teacher criticism with outbursts of irritation, tears, or refusal to continue participating in the task. By the end of the program, such reactions became less frequent and their intensity decreased.

Teachers noted that as the program progressed, students in the experimental group responded more calmly to

mistakes, showed fewer outbursts of anger or frustration, and more frequently used the suggested strategies (stop-pause, breathing exercises, and naming emotions).

Table 3: Emotional Self-Regulation Indicators

Indicator	Before the program	After the program	Variation
Tantrums and crying	Frequent (50–55%)	Rare (20–25%)	-30%
Reaction to teacher's comments	Sharp/impulsive	Calmer	Improvement
Ability to use the “stop-pause” method	Low	Average/high	Positive Dynamics
Asking for help instead of refusing to complete a task	18%	47%	+29%

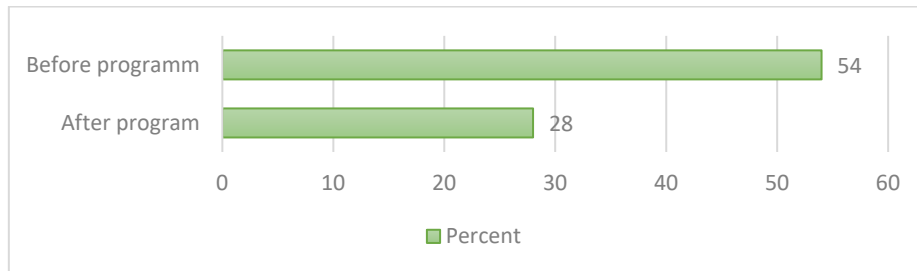


Figure 2: Reduction in emotional outbursts (%)

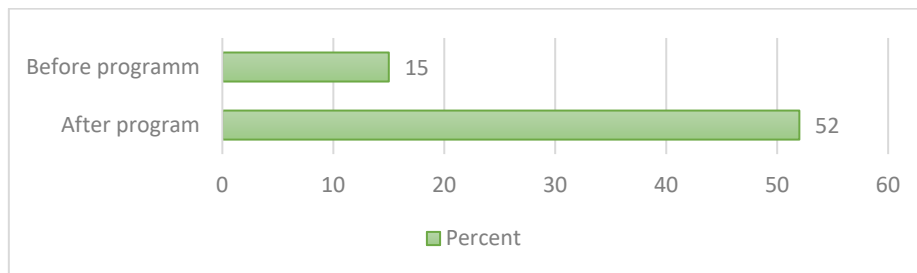


Figure 3: Use of self-regulation techniques (stop-pause, breathing) (%)

These results are fully consistent with Gross's model of emotional regulation, which emphasizes that the ability to stop and become aware of one's state is a key skill for adaptive behavior. Regular use of short “stop-pauses”, breathing exercises, and discussion of emotions in simple categories (“angry”, “hurt”, “happy”) helped the children gradually become aware of their states and choose more adaptive responses. Teachers noted that children began asking for help more often, rather than engaging in rebellious or demonstrative behavior.

These results align well with J. Gross's emotional regulation model, which posits that teaching children skills in recognizing and reappraising emotions promotes more controlled and less impulsive behavior in important situations.

One of the important practical results of the study was a change in the overall “background” of classroom behavior in the experimental group. According to teachers, the following occurred:

- the number of spontaneous outbursts from their seats decreased;
- children stood up less often without permission;
- it became easier to complete tasks, even if they were challenging.

Positive changes were evident not only in emotions and attention, but also in overall academic behavior.

Table 4: Behavioral Changes

Indicator	Before the program	After the program	Variation
Standing up without permission	High Frequency	Significant reduction	Improvement
Number of comments per lesson	6–8	2–3	–50–60%
Completing a task	32%	58%	+26%
Following instructions the first time	27%	49%	+22%

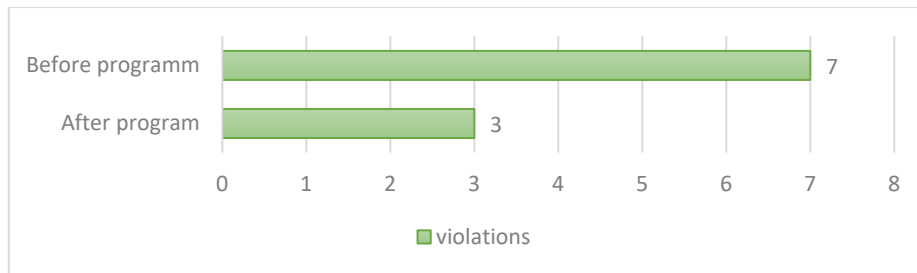


Figure 4: Number of disciplinary violations per lesson

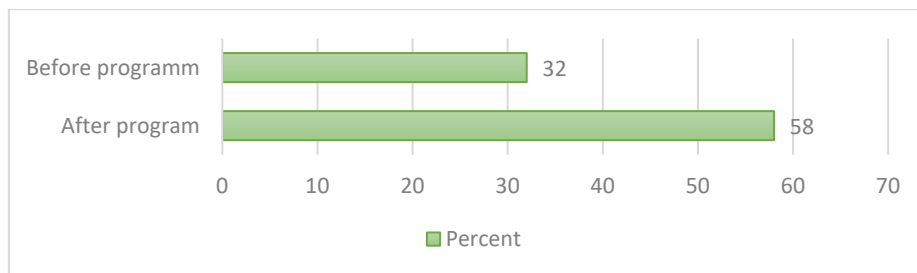


Figure 5: Task Completion Rate (%)

Teachers emphasized that children became more engaged in the lesson, were less tired, and the overall pace of the class improved.

Furthermore, it became noticeable that students showed greater interest in activities that actively involved movement, visual aids, and game elements. This confirms the findings of D. Willingham and E. Jensen that children with concentration difficulties engage in activities more readily when they have a clear structure, emotional meaning, and allow for moderate physical activity.

In the control group, students were still more likely to be tired by the end of the lesson, showed signs of overload and irritation, and required more individual reminders from the teacher to return to the task.

The feedback from the teachers participating in the study is of particular interest. Many noted that they initially viewed the neuroeducational exercises as an “additional burden” on an already busy curriculum. However, as the program progressed, it became clear that short sensorimotor blocks and "brain breaks" did not waste time, but, on the contrary, helped organize the lesson more effectively.

Teachers noted the following effects:

- a decrease in the overall level of tension in the classroom;
- improved communication with hyperactive students;
- a calmer response from children to comments and corrections;
- a greater sense of control over the learning process.

Thus, the neuropedagogical approach proved beneficial not only for children but also for the teachers themselves, enhancing their reflectiveness and sense of professional competence when working with challenging classes.

Comparison of Results with Scientific Literature

Comparing the obtained data with the results of international studies, several similarities can be noted. First, it confirms the idea that regular but short exercises aimed at training attention, working memory, and emotional awareness can lead to significant changes in the behavior of children with ADHD (Diamond & Ling, 2016; Barkley, 2015). Second, our study data are consistent with the "brain-based learning" approach proposed by E. Jensen, according to which the combination of movement, visual support, and emotional engagement makes learning more accessible for children with attention deficit. Third, the observed improvement in emotional self-regulation resonates with the work of P. Zelazo and J. Gross, who emphasize the key role of executive functions and cognitive reappraisal strategies in the development of voluntary behavior.

Table 5: Comparative dynamics of two groups

Indicator	Experimental Group	Control group
Improved concentration	Pronounced	Virtually absent
Reduced distractions	Significant	Minor

Reduced emotional outbursts	Yes	None
Improved behavior in class	Steady	Weak
Engagement in the learning process	Increased	No change
Use of self-regulation strategies	Regular	

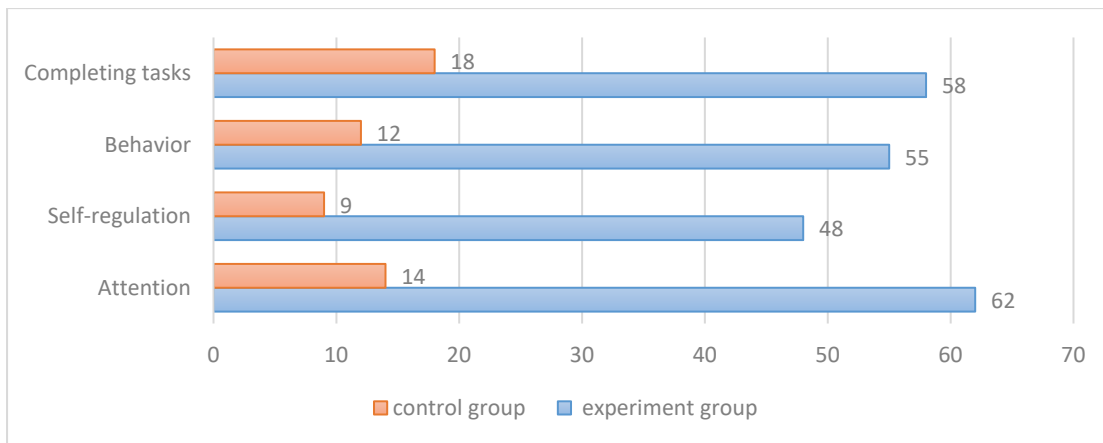


Figure 6: Total improvement in key parameters (%)

However, the limitations of the study should also be acknowledged. The small sample size, lack of standardized clinical tests, and relatively short observation period preclude generalizations for all categories of children with ADHD. However, the data obtained demonstrate a consistent positive trend and demonstrate that even in a regular school setting, it is possible to implement simple neuroeducational practices that can truly facilitate the learning process for hyperactive children.

Overall, the study results allow us to draw several important practical conclusions:

- Neuroeducational exercises integrated into the structure of a regular lesson help improve concentration and reduce impulsive behavior in hyperactive students.
- Developing emotional self-regulation is possible not only through specialized remedial programs but also through everyday teaching practice, if the teacher consciously uses elements of emotional reflection and "stop-pause."
- Teachers mastering neuropedagogical approaches report not only changes in children's behavior but also a reduction in their own stress, making this approach an important resource for preventing professional burnout.

Thus, the results and their discussion confirm the feasibility of further implementation of neuroeducational strategies in school practice and the need to include such approaches in teacher training programs.

CONCLUSIONS

The study demonstrated that the use of neuroeducational approaches in working with hyperactive students can be an effective tool for developing attention and emotional self-regulation in a regular school setting. Over five weeks of systematically using sensorimotor exercises, visual-kinesthetic supports, short "brain breaks," and emotional reflection techniques, children in the experimental group showed significant positive dynamics across key parameters of academic behavior.

The findings indicate a significant increase in the duration of voluntary attention, a decrease in the frequency of distractions, and a reduction in the number of errors associated with missing the instruction. Concurrently, an improvement in emotional stability was observed: children responded more calmly to criticism, demonstrated fewer outbursts of anger, and more frequently used self-regulation strategies. These changes are consistent with the findings of international studies emphasizing the role of sensorimotor activation, visual structures, and emotional awareness in executive function.

An equally important result was the strengthening of academic discipline: children began to get up less often, completed assignments more often, and their overall behavior in class became more organized. Teachers noted a reduction in stress when interacting with hyperactive children and an increase in the effectiveness of lessons, highlighting the value of neuropedagogical practices not only for students but also for educators.

Despite the limited sample size and relatively short observation period, the study results highlight the practical significance of incorporating neuroeducational methods into the educational process. The simplicity and accessibility of the proposed exercises allow them to be easily integrated into the structure of a regular lesson without significant changes to the curriculum.

Thus, the neuropedagogical approach can be considered a promising approach to improving the quality of education for children with ADHD and developing key self-regulation skills necessary for successful school adaptation and subsequent personal development. Future studies should be expanded, increasing the duration and sample size, and testing the effectiveness of various combinations of neuropedagogical techniques.

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