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Изследователски проникновения

INDIVIDUAL PROGRESS OF CHILDREN WITH SPECIAL NEEDS FOLLOWING A STIMULATION PROGRAMME IN KINDERGARTEN

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Abstract. The research focuses on the analysis of the effectiveness of a screening and stimulation programme for preschool-aged children with special educational needs. The research sample consisted of 34 children aged 5 to 6 years with special educational needs from six kindergartens. Orientation-based diagnostics were conducted. An experimental intervention (stimulation) was carried out in three of the kindergartens, while no intervention took place in the remaining three. The research data were primarily analysed using qualitative methods, while quantitative analysis served a complementary role. The quantitative analysis did not reveal statistically significant differences between the experimental and control groups, which supports the limited demonstrability of the intervention at the group level. However, qualitative data indicate individual positive shifts, suggesting the importance of targeted support and the need for methodological refinement of the intervention.

Keywords: inclusive education; kindergarten; special educational needs; orientation diagnostics and stimulation

Introduction

The main terminological construct of this research is inclusion in the context of innovative diagnostic and stimulation methods that take into account the principles of inclusive education. Inclusion represents a cornerstone of the educational system, based on equal access to quality education for all children, regardless of their abilities or disadvantages. Classroom heterogeneity is perceived as natural and enriching. Inclusion encompasses not only the physical presence of children with special educational needs (SEN), but also their active participation in a supportive environment. It requires systematic support, appropriate funding, professional staff, and values of equality and respect. The Slovak Republic faces challenges such as segregation and the absence of early prevention. Strengthening pre-primary education, which supports both academic and social success, is crucial. Early childhood is pivotal for development and socialisation. Inclusive approaches and innovative methods of diagnosis and stimulation are essential even in the preschool period.

Theoretical Starting Point of the Studied Issue

Inclusive education in Slovakia requires improvements, especially in kindergartens. One of the priorities is effective early diagnostics and stimulation, which help children with special educational needs (SEN) adapt before starting school. Ivanovič (2024) stresses that inclusion must go beyond physical presence, focusing on well-being and tailored support. According to Ainscow, Booth and Dyson (2004), removing barriers and fostering collaboration are key. A supportive kindergarten environment should reflect the child's needs (Huľová, Rochovská, Klein, 2018; Rochovská et al., 2019), ensuring targeted interventions and respect for various forms of integration (Bendová et al. 2014). Educators' social competencies are essential (Dishkova, 2024). Effective inclusion depends on quality diagnostics, ideally gradual and complex (Hapalová, 2019). Orientation diagnostics aim to detect risk areas without assigning formal diagnoses. Guarino et al. (2010) emphasise fairness in diagnostics, considering gender and ethnicity. In Slovak kindergartens, screenings usually occur in autumn/winter and focus on core developmental areas (Kupcová, Pribusová, 2023), with support from counselling centres and experts. Outcomes of diagnostics shape educational and psychological support. Pre-test–intervention–post-test models allow simultaneous diagnosis and support (Bednařová, Šmardová, 2016). Lundqvist (2023) supports individualisation as more effective than standardised approaches. Horňáková (2014) underscores the importance of observing children in natural environments. Early stimulation is essential for development (Huľová, 2009; Bazalová, 2023). According to Act No. 245/2008 Coll., SEN arises from diagnostic processes based on health, social conditions, or giftedness. Diagnostics serve as the foundation for inclusive education and personalised support. Lipnická (2014) describes orientation diagnostics as having preventive, stimulative, and adaptive roles. The study employed a screening and stimulation programme designed to identify developmental weaknesses and support early developmental stimulation before school entry. For transparency, one of the authors of the present study participated in the development of the instrument used in this research. It includes 14 partial functions and 11 symptoms and integrates elements of the Sindelar method (2014), under the licence of Arslan Šinková (2024). Lundqvist (2023) emphasises the motivational benefits of individual approaches. The programme helps prevent school difficulties and supports readiness (Pleskura, 2018).

Literature Review

In early childhood education, orientation-based diagnostics are vital for identifying developmental risks and offering targeted stimulation before school entry. Insufficient prevention may lead to inappropriate placement in special education. The first six years are crucial for development[1] , thus inclusive diagnostics should begin at age three. Kindergarten attendance improves cognitive and social skills (Kasáčová, Cabanová, 2014) and lowers the risk of grade repetition[2]. Albers (2011), Lechta (1991), and UNESCO[3] all highlight the need for early inclusion. Horňáková (2014) sees diagnostics as primarily preventive. Bednařová, Šmardová (2016) note the lack of direct links between standardized diagnostic tools and intervention. In contrast, dynamic assessment – based on mediated learning – allows identification and support of a child's learning potential. The screening and stimulation programme targets areas of weakness before school entry, focusing on individual needs. Pupala, Kaščák (2009) also support moving from norm-based evaluation to individual progress. Screening in the final pre-school year is meant to identify support needs rather than defer school entry. Early detection is key in preventing learning disorders (Bartoňová, 2018). It should foster cognitive development and psychological well-being. Mikulajová et al. (2012) link impaired language-cognitive abilities with learning risks. In children with communication issues, screening pinpoints weaknesses and enables targeted support. Šuhajdová (2018) emphasises diagnostics as both a technical and social equalising tool. Early intervention fosters integration. Informal barriers (Jardinez Natividad, 2024; Ivanovič, 2024) like rigid curricula and teacher bias hinder inclusion. Diagnostics must be tailored to individual potential to guide pedagogical decisions and improve outcomes. Empirical data from Slovakia (2018 – 2022) confirm this: only 1.12% of 11,864 children in the PRIM II project were placed in special schools. Compared to the original PRIM project, results improved, underlining the value of early diagnostics and intervention in preventing school failure[4]. The applied screening and stimulation programme was developed with the participation of one of the authors of the present study. It consists of fourteen subtests targeting partial functions (e.g., auditory differentiation, visual memory, tactile perception, body schema, intermodal integration, and seriality) and eleven symptom indicators (e.g., poor attention, insecure attachment, limited vocabulary, or difficulty following instructions). The programme is designed for children aged 5 – 6 years and aims to identify individual developmental weaknesses through orientation diagnostics and address them through targeted stimulation. The stimulation phase is implemented over several weeks and includes play-based exercises, language activities, and sensory-motor tasks, adapted to the child's specific profile.

Research Issue

Preschool children with special educational needs often experience weaknesses in partial functions and exhibit symptoms that adversely affect their development and school readiness. If left unaddressed, these difficulties may persist into later developmental stages. Orientation-based diagnostics serve as a key tool for the early identification of such weaknesses and are followed by individualised stimulation. The present research examines the effectiveness of this approach within the kindergarten setting.

The research problem is therefore formulated as follows:

Will the stimulation programme support the development of deficient functions and symptoms in children with special educational needs from the experimental group and contribute to improved outcomes in the final diagnostic assessment?

The main objective of the research is to identify the most frequently occurring issues in the area of partial functions and symptoms through initial screening diagnostics, and subsequently to carry out stimulation of the identified children using the specified programme. Based on the final diagnostic assessment, the effectiveness of the applied stimulation approach will be verified through a qualitative experimental intervention.

Research Questions and Hypotheses

The research questions in the present study are focused on verifying the impact of the implemented screening and stimulation programme.

RQ1 What is the impact of the implemented screening and stimulation programme on the reduction of deficient partial functions identified through the initial diagnostic assessment in children from the experimental group?

RQ2 Will the implemented screening and stimulation programme support the reduction of deficient symptoms identified through the initial diagnostic assessment in children from the experimental group?

Two hypotheses were formulated:

H1: The stimulation programme will lead to observable qualitative improvements in partial functions in children from the experimental group compared to those from the control group.

H2: Children from the experimental group will show greater improvement in the reduction of identified symptoms compared to the control group, although may not reach statistical significance due to the small and heterogeneous sample.

Given the low homogeneity of the research sample (varied special educational needs), we anticipate the possibility that the hypothesis may not be confirmed. This is due to the small sample size, the diverse nature of the diagnoses, as well as the differing course of stimulation and variability in children's responses to the stimulation programme. These factors may influence the programme's effectiveness and prevent the achievement of statistically significant differences between the groups.

Research Methodology

Sample

The study included 34 children aged 5 – 6 with special educational needs from six kindergartens near Prešov and Košice, selected via purposive sampling. Orientation-based diagnostics took place in March – April 2024. Stimulation was implemented in three kindergartens (17 children), followed by reassessment in June. Two school special educators assisted. Three kindergartens formed the experimental group; the other three served as control. The total sample consisted of 34 children – 17 in each group. The experimental group received stimulation; the control group did not. Due to health/organisational reasons (e.g., illness, absence), only 20 children assessed in the posttest – 13 experimental, 7 control. This reduction resulted from natural attrition. For quantitative analysis, a balanced sample of 7 children per group (with matching diagnoses) was selected. For qualitative analysis, three matched pairs – 3 experimental, 3 control – were chosen and analysed using qualitative methods. Entry diagnostics were administered identically by the researcher. For the control group, supplementary input came from teachers and special needs teachers. Both groups had equivalent diagnostic and educational conditions; no stimulation occurred in the control group.

The research is based on a screening and stimulation programme developed by one author, initially designed for children from disadvantaged backgrounds, now applied to children with medically based special educational needs. This shift required analytical adjustment and allowed broader evaluation in inclusive settings. Previous publications form the study's conceptual and methodological base. For quantitative analysis, a balanced sample of 7 children per group (with matching diagnoses) was selected. For qualitative analysis, three matched pairs – 3 experimental, 3 control – were chosen and analysed using qualitative methods.

Instruments and Procedures

The research is based on a quantitative-qualitative design, with an emphasis on qualitative experimental intervention. This approach was chosen due to the specific characteristics of the setting and the sample selection, which do not allow for the application of a true or quasi-experiment. The mixed research design is grounded in the concept of qualitative experimental intervention as outlined by Martinková and Kovalčíková (2023). This methodology offers an alternative to traditional experimental approaches, which are not feasible in this context due to factors such as a small and narrowly defined sample, as well as limited staffing and operational conditions. The research takes place within an educational practice environment, which is marked by high variability. Children develop individually, and their responses are influenced by a range of situational and contextual factors.

Data Analysis

The research data are primarily analysed using qualitative methods, while quantitative analysis serves a complementary role. Statistical analysis is used to illustrate selected aspects and to support the interpretation of the findings. This research design makes it possible to capture not only the effects of the intervention itself but also the processes that contribute to its effectiveness, all within the natural conditions of pedagogical practice.

Research Results

To answer RQ1 and RQ2, a qualitative-quantitative approach was used. The qualitative part includes analysis of six case studies involving children with the same diagnosis and similar pretest scores. The diagnostic and stimulation phases were examined with attention to observed changes and procedural suggestions. Two cases involved children with suspected ADHD, two with presumed intellectual disability, and two with impaired communication abilities. The quantitative part compared results from experimental and control groups (seven children each). Initial diagnostics identified developmental deficits in the experimental group, which then received the stimulation programme. A posttest evaluation followed, and results were qualitatively assessed to track changes in deficits. Impaired sub-functions refer to developmental areas where children performed below age expectations in the screening. Domains assessed included visual and auditory differentiation, memory, tactile-kinesthetic perception, intermodality, and seriality. Each child in the experimental group was evaluated in 14 sub-functions, with 5 – 14 impairments identified per child. Most frequent were figure-ground visual differentiation, auditory differentiation, auditory-visual intermodality, and auditory/visual seriality. In addition, 11 developmental symptoms (language, behaviour, cognition) were assessed, with 3 – 11 impairments per child. Common symptoms included poor categorisation shape recognition, expressive language difficulties, behaviour regulation issues, and spatial orientation (left-right). All children in the experimental group showed multiple impairments before stimulation. Precise numbers and posttest changes are detailed in the case studies. Specific domains and symptoms assessed are presented in Tables 7 – 12, showing pretest-posttest comparisons across 14 sub-functions and 11 symptoms per child. These tables reflect the most common deficits and degree of progress observed after intervention.

Evaluation of Results – Children with Suspected ADHD

Tables 1 and 2 compare two children with suspected ADHD – Child 1 (experimental group) and Child 2 (control group). Assessed partial functions included visual and auditory figure-ground differentiation, auditory memory, tactile-kinesthetic perception, 2D spatial orientation, audio-visual intermodality, and seriality. Observed symptoms were speech clarity, language, attention, behaviour, and instruction comprehension. Child 1 improved in six domains:

visual figure-ground (shapes, pictures), visual differentiation, tactile-kinesthetic perception, spatial orientation, and intermodality. No gains in auditory differentiation or seriality. The child improved in four of five symptoms. Child 2 improved in five functions: visual figure-ground (shapes, pictures), auditory memory, tactile-kinesthetic perception, and spatial orientation. No gains in visual/auditory differentiation, intermodality, or visual seriality. The child improved in three symptoms. Stimulation was associated with more marked change. Child 1 improved in categorisation, shape recognition, orientation (left-right), and behaviour. Minor gains were seen in body drawing, vocabulary, and quantity-size-order, though these were not pretest deficits. No improvement in speech clarity. Child 2 improved in speech and quantity – size – order, with slight improvement in body drawing. No gains in behaviour, shape recognition, or categorisation. In Child 1 (stimulated), weakened partial functions dropped from 9 to 3. In Child 2 (non-stimulated), they decreased from 9 to 4. Improvement occurred in six and five areas, respectively – only a slight difference. Symptom reduction was more evident: from 5 to 1 in Child 1, and from 5 to 2 in Child 2. While greater gains were seen in the stimulated child, the margin was limited and insufficient for definitive conclusions. Confounding factors and natural development may have influenced outcomes. This section summarises the qualitative comparison between Child 1 (stimulated) and Child 2 (non-stimulated).

Table 1. Comparison of Partial Functions – Child 1 and Child 2 with Suspected ADHD

Suspected ADHD	Number of impaired sub-functions pretest	Number of impaired sub-functions posttest	Number of areas of improvement
Child 1 – stimulation programme	9	3	6
Child 2	9	4	5

Table 2. Comparison of Symptoms – Child 1 and Child 2 – Suspected ADHD

Suspected ADHD	Number of symptoms from average - pretest	Number of symptoms from average - posttest	Number of areas of improvement
Child 1 – stimulation programme	5	1	4
Child 2	5	2	3

Evaluation of results – children with presumed intellectual disability

The comparison reveals a greater improvement in Child 3 (stimulated) than in Child 4 (control), especially in partial functions. Child 3 improved in seven areas, while Child 4 in four. In symptoms, Child 3 progressed in six, Child 4 in five. The limited effect on symptoms may stem from the short intervention duration. Findings suggest the programme has stronger impact in children with presumed intellectual disability compared to ADHD, where effects were less marked. Benefits were clearest in areas with targeted, repeated stimulation. Despite possible confounding factors, the intervention led to observable progress in children with presumed intellectual disabilities. Child 3, with suspected intellectual disability and included in the stimulation programme, showed initial deficits in all 14 assessed sub-functions. Posttest results indicated improvement in seven areas: visual figure-ground differentiation (pictures), visual differentiation, auditory memory, tactile-kinesthetic perception, body schema, and auditory-visual intermodality. No progress was observed in visual memory, visual figure-ground differentiation (shapes), auditory differentiation (including figure-ground), 2D spatial orientation, and both visual and auditory seriality. In contrast, Child 4, who did not receive stimulation, also showed deficits in all 14 sub-functions. Improvement was observed in only four: visual figure-ground differentiation (shapes), visual differentiation, auditory memory, and tactile-kinesthetic perception. Mild progress in auditory-visual intermodality was still assessed as deficient. No gains were noted in body schema, 2D spatial orientation, or seriality. This comparison again demonstrates that the child who received targeted stimulation achieved greater improvement across multiple cognitive-perceptual domains. In terms of symptoms, Child 3 (stimulated) showed initial deficits in all 11 areas assessed. Posttest results indicated improvement in six: body drawing, general knowledge, speech production, vocabulary, geometric shape recognition, and behaviour. No improvement was found in categorisation, colour recognition, right-left orientation, quantity – size – order, and mathematical concepts. Child 4 (non-stimulated), who also had deficits in all 11 areas, improved in only three: general knowledge, speech production, and vocabulary. No progress was seen in body drawing, categorisation, colour recognition, geometric shapes, right-left orientation, quantity – size – order, mathematical concepts, or behaviour. These outcomes confirm a broader positive effect of the stimulation programme on the development of functional skills and cognitive symptoms in children with suspected intellectual disabilities. However, the observed results cannot be attributed exclusively to the stimulation program, as they were also influenced by the natural developmental progress of children and the occurrence of various undesirable variables.

Table 3. Comparison of Subscale Functions Child No. 3 and 4 Presumed Intellectual Disability (PID)

PID	Number of impaired sub-functions-pretest	Number of impaired sub-functions-posttest	Number of areas of improvement
Child 3 – stimulation programme	14	7	7
Child 4	14	10	4

Table 4. Comparison of Symptoms of Child No. 3 and 4 Presumed Itellectual Disability (PID)

PID	Number of symptoms from average – pretest	Number of symptoms from average – posttest	Number of areas of improvement
Child 3 – stimulation programme	11	5	6
Child 4	11	8	3

Evaluation of results – children with impaired communication skills (ICS)

The case studies show that Child 5 (stimulated) achieved greater progress than Child 6 (non-stimulated), particularly in partial functions and symptoms. Child 5 improved in four sub-functions, while Child 6 in only one. In the pretest, Child 5 showed deficits in visual memory, auditory figure-ground differentiation, auditory differentiation, auditory memory, body schema, two-dimensional spatial perception, and auditory seriality. In the posttest, deficits persisted in visual memory, auditory memory, and auditory seriality, with improvements in auditory figure – ground differentiation, auditory differentiation, body schema, and two-dimensional spatial perception. Child 6 showed pretest deficits in auditory figure-ground differentiation, auditory differentiation, auditory seriality, and visual memory. In the posttest, deficits remained in the first three areas, with improvement only in visual memory. Symptom reduction was from five to one for Child 5, and from five to four for Child 6. Child 5 improved in categorisation, geometric shape recognition, and behaviour. Mild progress was also seen in body drawing, vocabulary, and quantity – size – order, although these were not deficits in the pretest. No improvement was found in speech production. Child 6 improved only in speech production, with slight gains in body drawing. No improvement was observed in behaviour, shape recognition, or categorisation. Although initial assessments were similar, posttest results indicate the benefit of targeted stimulation for children with communication difficulties. These gains suggest that language-focused interventions can positively influence developmental outcomes. Despite potential confounders, the screening-stimulation programme appears effective in inclusive kindergarten settings for this group. While quantitative data showed no significant group differences, qualitative findings highlighted the value of individualised approaches, appreciated by educators and parents. Although not statistically significant, observed improvements underscore the potential of early intervention.

Table 5. Comparison of Child Sub-Functions No. 5 and 6 ICS

ICS	Number of impaired sub-functions pre-test	Number of impaired sub-functions posttest	Number of areas of improvement
Child 5 – stimulation programme	7	3	4
Child 6	4	3	1

Table 6. Comparison of Child Sub-Functions No. 5 and 6 ICS

ICS	Number of symptoms from average – pretest	Number of symptoms from average – posttest	Number of areas of improvement
Child 5 – stimulation programme	5	1	3
Child 6	5	4	1

Statistical Analysis

Normality was tested using the Shapiro–Wilk test. A normal distribution was confirmed only for Overall qualitative performance – rating and Auditory figure-ground differentiation. For all other variables, the assumption was rejected ($p < 0.05$). The test was applied separately to pretest and posttest data in each group to check distribution at both time points—essential for choosing the correct statistical methods. Since not all variables met normality assumptions, both parametric and non-parametric tests were used accordingly in the analysis.

Table 7. Results of the Shapiro-Wilk test – pretest

Pretest	*W*	*P-value*
Visual figure-ground differentiation – image with a hen only	1.58	0.264
Visual differentiation (max. 6 errors)	1.62	0.252
Visual memory (max. 6 errors)	0.00	1.000
Auditory differentiation (max. 6 errors)	-0.672	0.635
Auditory memory (max. 7 errors)	-1.77	0.210
Tactile-kinesthetic perception (max. 6 errors)	2.42	0.086
Body schema (max. 4 errors)	-0.464	0.743
Intermodality: visual–auditory (max. 9 errors)	2.50	0.078
Intermodality: auditory–visual (max. 9 errors)	0.982	0.488
Visual seriality (max. 5 errors)	0.500	0.724
Auditory seriality (max. 5 errors)	-1.85	0.191
Vocabulary range	-1.23	0.384
Categorisation	0.855	0.546
Dimension, quantity, order	1.16	0.411

The same procedure was applied when testing the normality of data distribution in the post-test (re-diagnostic) measurement.

Table 8. Results of the Shapiro-Wilk test - posttest

Posttest	*W*	*P-value*
POST Visual figure-ground differentiation – image with hen only	**NaN**	NaN
POST Visual differentiation (max. 6 errors)	-1.18	0.403
POST Visual memory (max. 6 errors)	-0.427	0.763
POST Auditory differentiation (max. 6 errors)	-0.994	0.482
POST Auditory memory (max. 7 errors)	0.592	0.676

POST Tactile-kinaesthetic perception (max. 6 errors)	0.707	0.617
POST Body schema (max. 4 errors)	-2.00	0.157
POST Intermodality: visual–auditory (max. 9 errors)	-0.105	0.941
POST Intermodality: auditory–visual (max. 9 errors)	0.702	0.620
POST Visual seriality (max. 5 errors)	0.500	0.724
POST Auditory seriality (max. 5 errors)	-2.01	0.155
POST Vocabulary range	1.00	0.480
POST Categorisation	1.27	0.369
POST Dimension, quantity, order	1.91	0.177

For variables meeting normality, Levene's test confirmed homogeneity of variances, permitting use of repeated measures ANOVA:

Overall qualitative performance – score: No significant change detected ($F = 0.335$; $p = 0.573$).

Auditory figure-ground differentiation: Significant improvement found ($F = 9.63$; $p = 0.008$).

The table below shows pretest scores and p-values for changes between pretest and posttest in both groups. Since most variables violated assumptions of normality and homogeneity, non-parametric methods were used: the Kruskal-Wallis test with Dwass-Steel-Critchlow-Fligner post-hoc analysis. Only Overall qualitative performance – grade and Auditory figure-ground differentiation met the criteria for ANOVA.

Results of the Kruskal-Wallis test

Table 9. Results of the Kruskal-Wallis test – pretest

Variable	***Pretest – control group***	***Pretest – experimental group***	***p – control group***	***p – experimental group***
Overall qualitative performance – grade (max. 5 points)	0.929	0.864	0.545	0.130

Visual figure-ground differentiation – image with hen only	0.453	0.671	<.001	0.001
Visual differentiation (max. 6 errors)	0.684	0.825	0.002	0.053
Visual memory (max. 6 errors)	0.877	0.882	0.215	0.197
Auditory figure-ground differentiation (max. 12 errors)	0.880	0.904	0.226	0.311
Auditory differentiation (max. 6 errors)	0.922	0.735	0.482	0.006
Auditory memory (max. 7 errors)	0.951	0.753	0.739	0.009
Tactile-kinaesthetic Perception (max. 6 errors)	0.560	0.922	<.001	0.450
Body schema (max. 4 errors)	0.773	0.676	0.022	0.001
Intermodality: visual-auditory (max. 9 errors)	0.453	0.875	<.001	0.167
Intermodality: auditory-visual (max. 9 errors)	0.726	0.818	0.007	0.044
Visual seriality (max. 5 errors)	0.600	0.641	<.001	<.001
Auditory seriality (max. 5 errors)	0.794	0.724	0.036	0.004
Vocabulary range	0.720	0.712	0.006	0.003
Categorisation	0.864	0.778	0.163	0.017
Dimension, quantity, sequence	0.924	0.784	0.500	0.019

P-values indicated no significant group differences for most variables ($p > 0.05$), confirming comparable baseline performance before intervention. This intergroup comparison was made at a single time point, not within-group over time.

However, significant pretest differences ($p < 0.05$) were found in:

– Auditory Differentiation ($p = 0.006$)
– Auditory Memory ($p = 0.009$)
– Body Schema ($p = 0.001$)
– Auditory-to-Visual Intermodality ($p = 0.044$)
– Auditory Seriality ($p = 0.004$)
– Vocabulary Range ($p = 0.003$)
– Categorisation ($p = 0.017$)
– Dimension/Quantity/Sequence ($p = 0.019$)

These pretest imbalances must be considered when interpreting posttest outcomes. The next table shows posttest means and p-values. Significant results ($p < 0.05$) in the experimental group indicate programme effectiveness in those areas.

Table 10. Kruskal-Wallis test results – posttest

Variable	***Posttest – control group***	***Posttest – experimental group***	***p – control group***	***p – experimental group***
POST Overall qualitative performance – grade (max. 5 points)	0.853	0.817	0.131	0.054
POST Visual figure-ground differentiation – image with hen only	NaN	NaN	NaN	NaN
POST Visual differentiation (max. 6 errors)	0.634	0.566	<.001	<.001
POST Visual memory (max. 6 errors)	0.849	0.792	0.119	0.024

POST Auditory figure-ground differentiation (max. 12 errors)	0.833	0.891	0.086	0.239
POST Auditory differentiation (max. 6 errors)	0.901	0.883	0.339	0.203
POST Auditory memory (max. 7 errors)	0.813	0.912	0.055	0.366
POST Tactile-kinaesthetic perception (max. 6 errors)	0.453	0.566	< .001	< .001
POST Body schema (max. 4 errors)	0.732	0.418	0.008	< .001
POST Intermodality: visual-auditory (max. 9 errors)	0.650	0.601	0.001	< .001
POST Intermodality: Auditory-Visual (max. 9 errors)	0.453	0.478	< .001	< .001
POST Visual seriality (max. 5 errors)	0.600	0.641	< .001	< .001
POST Auditory seriality (max. 5 errors)	0.819	0.724	0.062	0.004
POST Vocabulary range	0.664	0.566	0.001	< .001
POST Categorisation	0.690	0.568	0.003	< .001
POST Dimension, quantity, sequence	0.946	0.776	0.694	0.016

Posttest results assessed changes via two approaches: within-group (pre/post) and between-group comparisons.

Intragroup analysis

Means and p-values were evaluated. ANOVA was used for normal data, otherwise Kruskal–Wallis with Dwass – Steel – Critchlow – Fligner post-hoc. Significant improvement ($p < 0.05$) in the experimental group was observed in:

– Visual differentiation ($p < .001$)
– Visual memory ($p = 0.024$)
– Tactile-kinesthetic perception ($p < .001$)
– Body schema ($p < .001$)
– Intermodality (visual-auditory & auditory-visual; $p < .001$)
– Visual seriality ($p < .001$)
– Auditory seriality ($p = 0.004$)
– Vocabulary ($p < .001$)
– Categorisation ($p < .001$)
– Dimension/Quantity/Order ($p = 0.016$)

These findings confirm improvements in visual-spatial processing, intermodality, and language. In the control group, only isolated changes were observed. No significant change ($p \geq 0.05$) was found in qualitative performance, auditory differentiation, or memory—possibly due to tool sensitivity or intervention duration.

Intergroup analysis

Posttest comparisons (Kruskal – Wallis and Dwass – Steel – Critchlow – Fligner) found no significant differences ($p > 0.05$). Though the experimental group improved, differences vs. control were not statistically significant – possibly due to sample size, variability, or natural maturation.

Nominal variables (McNemar's test)

Significant pretest differences were found in:

–"Dependent/insecure" ($p = 0.025$)
–"Ascending numbers to 10" ($p = 0.034$)
–"Distracted/inattentive" ($p = 0.034$)
–"Name recognition" ($p = 0.034$)

Results of nominal variables in the pretest measurement

Table 11. Results of McNemar's test – pretest

Pretest	X^2	*p*
Unable to separate from close persons/familiar individuals	0	1
Distracted / inattentive	2	0.157
Dependent / insecure	5	0.025
Emotionally unsettled	0	1
Negativistic	0	1
Child's first and last name	4.5	0.034
Child's age	1.6	0.206
Exact address	1	0.307
Parents' names	3.57	0.059
Pronunciation	2	0.157
Articulation	1.29	0.257
Intensity of speech expression	0.5	0.48
Difficulty understanding instructions in standard language	1.29	0.257
Ascending numerical sequence up to 10	4.5	0.034
Descending numerical sequence down from 10	6.69	0.414
Identifying quantity up to 10	1.43	0.705
Basic geometric shapes	1.29	0.257
Unable to separate from close persons/familiar individuals (2)	0	1
Distracted / inattentive (2)	4.5	0.034
Dependent / insecure (2)	4.5	0.034
Emotionally unsettled (2)	0	1
Negativistic (2)	0	1

To examine pretest-posttest changes within groups for categorical variables, McNemar's test was used. This test evaluates whether significant shifts occurred in symptom presence or behavioural indicators between two time points.

Table 12. Results of McNemar's test – posttest

Posttest	X^2	*p*
Unable to separate from close persons/familiar individuals	0	1
Distracted / inattentive	0	1
Dependent / insecure	6	0.014
Emotionally unsettled	0	1
Negativistic	0	1
Child's first and last name	0	1
Child's age	2.78	0.096
Exact address	6	0.014
Parents' names	3.57	0.059
Pronunciation	1.39	0.257
Articulation	1.43	0.705
Intensity of speech expression	0.5	0.48
Difficulty understanding instructions in standard language	1.29	0.257
Ascending numerical sequence up to 10	2.78	0.096
Descending numerical sequence down from 10	1	0.317
Identifying quantity up to 10	1.43	0.705
Basic geometric shapes	0	1
Unable to separate from close persons/familiar individuals (2)	0	1
Distracted / inattentive (2)	4.5	0.034
Dependent / insecure (2)	0	1
Emotionally unsettled (2)	0	1
Negativistic (2)	0	1

Results of nominal variables in the post-test measurement:

The following items showed statistically significant differences between pretest and posttest:

– “Dependent / insecure”
– “Exact address”
– “Inattentive / unfocused (screening 2)”

McNemar’s test also indicated significant changes in:

– “Ascending numerical sequence up to 10”
– “Inattentive / unfocused (2)”

These results suggest a reduction in selected symptoms, possibly due to maturation, individual pedagogical input, or effects of the stimulation programme. However, as McNemar’s test only detects changes within groups, it does not allow for direct conclusions about intervention effectiveness compared to the control group.

Discussion

Quantitative data did not reveal statistically significant differences in posttest results between the control and experimental groups, confirming H1 and H2 about the limited demonstrability of the stimulation programme’s effect in intergroup comparison. However, qualitative findings suggest positive individual changes in the experimental group. H1 predicted no significant improvement in partial functions; H2 applied to symptoms in children with special educational needs. The Kruskal–Wallis test showed no significant group differences, but McNemar’s test in the experimental group indicated significant pretest – posttest changes in “dependent/insecure,” “ascending numerical sequence to 10,” “distracted/inattentive (2),” and “accurate address.” These shifts suggest developmental progress, though not consistent enough to confirm group-level effects. Results may reflect sample heterogeneity, intervention variability, or individual child responses. Confounding factors include short intervention length, natural development, historical influences in the control group, special attention effects, and organisational issues (e.g. lack of special educational needs teachers). Based on this, we recommend extending the stimulation phase, involving parents in home-based support, increasing the number of special needs teachers, tailoring tasks to children‘s needs, and fostering collaboration with teachers to integrate stimulation into daily teaching. Reducing distractions during diagnostics and using interactive methods may also improve engagement and outcomes.

Conclusions

Although no statistically significant differences emerged between the experimental and control groups, qualitative data indicate positive developmental shifts in the experimental group—an important finding for inclusive preschool settings, where individual progress may escape statistical capture. Scientifically, the study enhances understanding of early screening and targeted intervention by linking assessments of partial functions and developmental symptoms. It offers a basis for refining support frameworks for children with special educational needs. Practically, observed improvements underscore the potential of structured stimulation programmes to support key developmental domains. The findings advocate for their integration in kindergartens, active family involvement, and a strengthened role for special educational needs teachers. Beyond testing Hypotheses H1 and H2, the study brings scientific and applied insights. It also expanded its scope to address other special needs categories and formulated practical recommendations for adapting the programme to various diagnoses.

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