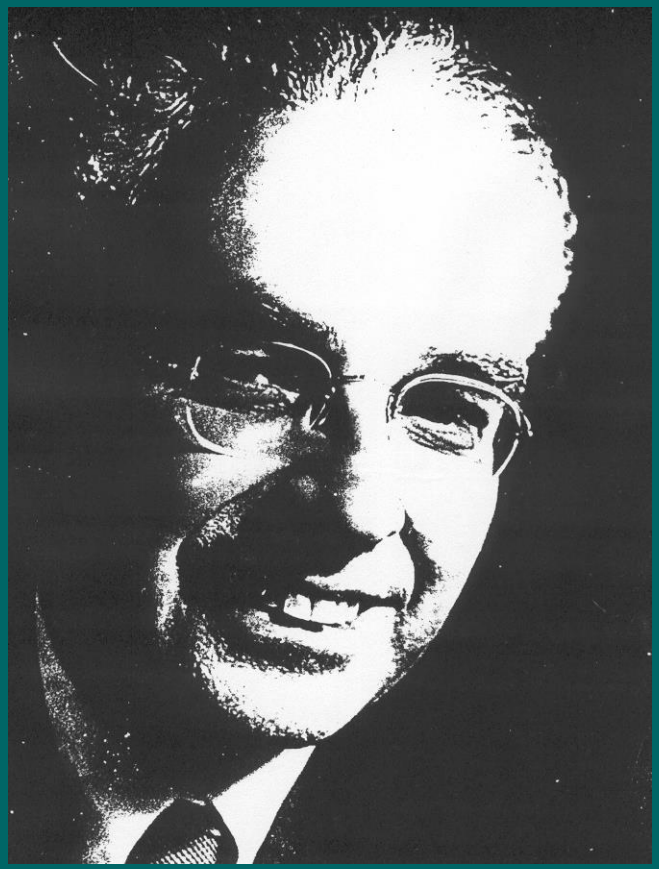
Vygotskian-Lurian Approach to Overcoming Learning Disabilities

Tatiana Akhutina

Moscow State University for Psychology and Education



A.R. Luria conducting neuropsychological assessment

Learning Disabilities

- Learning Disabilities are characterized by **partial underdevelopment** of child mental functions.
- Neuropsychological approach is highly appropriate for finding out strengths and weaknesses of a child.

Vygotsky-Luria principles
of human functioning and development

1. **Sociocultural Origin** of mental functions;

2. **System Structure** of mental functions;

3. **Dynamic Organization and Localization** of mental functions.

The **basic concept** of neuropsychology –

higher mental functions (HMFs)

was developed by Vygotsky.

HMFs "are complex, self-regulating processes, social by their origin, mediated by their structure and conscious, voluntary by their mode of functioning" (Luria, 1980).

HMFs are «social in their origin, systemic in their structure, dynamic in their development» (Luria, 1965).

Social genesis of HMFs

"Every function in child's cultural development appears on the stage twice, in two planes,

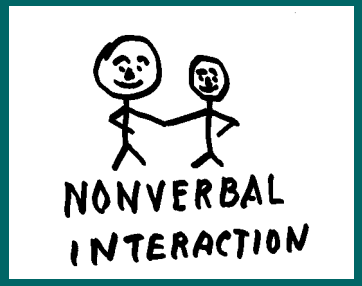
first - social, then – psychological;

first between people as an intermental category, then within a child as an intramental category" (Vygotsky, 1997b , v. 4, p. 106).

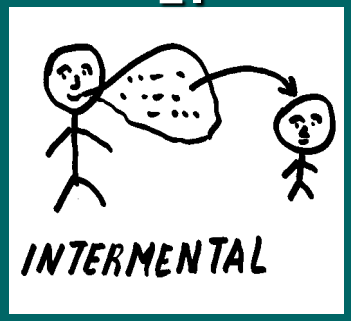
Transition from joint social functioning to individual's mental function is the process of internalization

Stages of Internalization

0.



1.



2.

3.

"First, an intermental stage:

you order, a child executes;

Then an extramental stage:

a child begins to speak to himself.

Then an intramental stage: *a child thinks and executes*

- two points of the brain, which are excited from the outside, have the tendency to work in a unified system and turn into an intracortical point." Vygotsky (1930/1997).

The idea of extracerebral organization of HMFs.

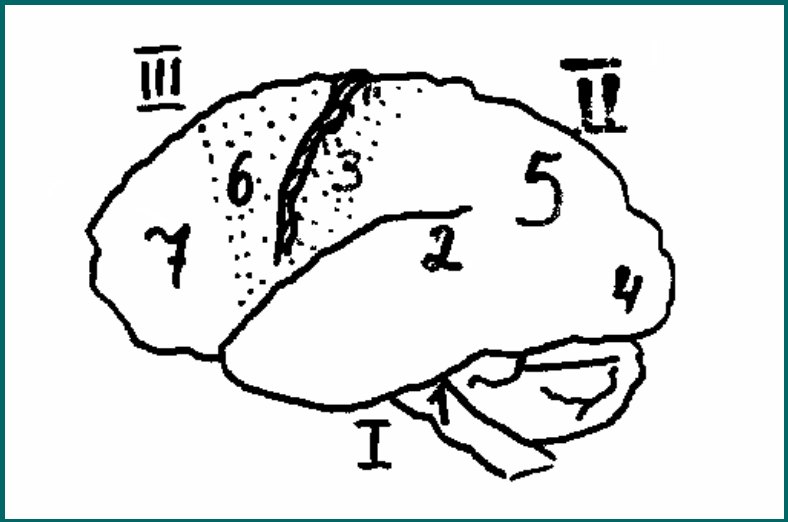
The steps of remediation work

System Structure **of HMFs**

HMF is a functional system consisting of **many components**, each one based on the performance of a special brain area and each playing its special role in the system.

Components of Writing in first-graders

1. Maintenance of the optimal level of activation
2. Audio-verbal information processing
3. Kinesthetic information processing
4. Visual information processing
5. Visual-spatial information processing
6. Motor programming of graphic movements
7. Executive functions



System Structure **of HMFs**

HMF is a functional system consisting of **many components**, each one based on the performance of a special brain area and each playing its special role in the system.

The underdevelopment of each of these components leads to desintegration of the entire functional system, however, in each case it is disturbed differently.

The Symptom Set consists of:

1. the **primary** defect - the primary impaired component ,
2. the **secondary** defects - the secondary systemic consequences of the primary defect ,
3. the **tertiary compensatory** reorganizations (positive adaptive and negative maladaptive).

In order to make a diagnosis, one has to **reveal the primary functional defect/s** underlying the whole symptom set.

Syndrome of executive functions defecits

The **primary** defect is underdevelopment of programming and control functions.

1. The manifestation of the **primary** defect :

disturbances in orientation within a task, planning, switching to other actions, inhibitory control.

2. The **secondary defects** are the problems with all gnostic (perception) and mnestic (memory) processes that require concentration of attention, checking and reviewing perceived information, active memorization.

3. The compensatory reorganization

- positive adaptive: the self-talk such as self-commands, self-discussions of the task (i.e., a transition from the intra-psychological level of a voluntary action to the extra-psychological level).
- negative maladaptive: adopting the role of a class clown (to attract attention, to withdraw from the situation of failure and to increase self-appraisal).

The Dynamic Organization and Localization

It takes place because of:

1. reorganization of functions in ontogenesis,
2. reorganization of a function in the process of automatization,
3. use of different strategies, e.g.,

   holistic* and *analytic strategies.

Reorganization of functions in ontogenesis

Reorganization of language/speech functions:

- Infants (10-18 months) demonstrate more delayed development of both language comprehension and production in cases of right hemisphere lesions.
- toddlers (19-31 months) show more delayed development of word production and near normal comprehension in cases of left temporal lobe lesions (Thal et al., 1991; Wulfeck et al., 1991; Stiles et al., 1998).
- in adults left hemisphere dominance for most language functions

- The first fact can be explained by use of the holistic strategy at the first steps of acquisition of any skills.
- Can we conclude that in two-year-old children language production is supported by brain structures of the left temporal lobe?
- No, it is a secondary defect of imperfect comprehension. The almost normal results in the comprehension tasks could be explained by a compensatory strategy of relying on different (not analytic phonological but global) features of words, processed by the intact right hemisphere (cf. Bates et al., 1997; Dick et al., 2005).

Reorganization of a function in the process of automatization

New action

- **Generalized activation**
- **Voluntary control of all operations**
- **Element-by-element planning**
- **High energy demands**

Automatized action

- Optimal activation
- **Voluntary control of main operations**
- **Large units planning**
- **Low energy demands**

Use of different strategies

- **holistic and analytic** strategies;
- **positive and negative** compensatory strategies

2 types of reaction to damage

- **plasticity** effect (M.Kennard, 1942)
- **“cascade” effect** (Vygotsky, 1934; Dobbing, 1968, 1975; Karmiloff-Smith, 2002):

In adults subordinate, **underlying operations suffer more**, but the defect is compensated by the **top** levels.

In children, by contrast, **overlying operations suffer more** - they are in the process of development and require the participation of the affected component.

For example, in the cases of underdevelopment of **visual perception** the acquisition of **vocabulary** and **language** as a whole is affected, which, in turn, causes problems in the development of **verbal thinking** and, at the same time, the delay in the development of **visual thinking.**

The plasticity effect, possibilities to compensate and cascade effects are voices in the drama of child development.

Implications of Vygotsky-Luria principles **for remediation methods**

1. Socio-cultural origin of mental functions ⟶

- Organization of the Interaction according to the rules of the **internalization** process;

2. System structure of mental functions ⟶

- Support of a **weak component**;

3. Dynamic Organization of mental functions ⟶

- Organization of the **optimal** functional system with **optimal emotional involvement**.

The Key Features of the Vygotsky-Luria neuropsychological approach to remediation

1. **Joint child-adult co-action**

   in the zone of proximal development (ZPD).

2. **Support of a weak component** of developing functions.

   The support is interactive.

3. **Providing motivation, emotional involvement** in co-actions

1. Joint child-adult co-action in the ZPD.
2. Support of a weak component of developing functions. The support is interactive.
3. Providing motivation

1. Organization of internalization

Joint co-action

→ **child's independent action**

Use of external support

→ **interiorized action**

Step-by-step

→ **fluent automatized action**

2. Support of weak components

The support is **interactive** –

each time it is a balance of the intention to give the **more complicated task** with **minimal help** and

to provide **sufficient support to avoid mistakes**.

The scaffolding is gradually withdrawn.

3. Emotional Involvement

Motivation makes a child **more active and more organized,**

and his/her **memory** of this event becomes deeper and facilitates the **transfer** of the learned action.

Why is our approach neuropsychological?

To reveal strong and weak components of the developing functions, we use **neuropsychological evaluation**:

1. Test assessment;
2. “Tracking” diagnostics:

   - Direct observation of behavior

   - Qualitative analysis of errors in child’s copy-books

The basic forms of learning difficulties

1. Deficits in executive functions, motor programming of graphic movements.
2. Deficits in audio-verbal functions and kinestetic control of articulations.
3. Deficits in visual-spatial and visual right-hemisphere functions.

Background: nonoptimal level of activation (low working capacity).

The basic forms of **writing** difficulties

- Regulatory dysgraphia,
- Phonological dysgraphia,
- Visual-spatial (surface) dysgraphia.

Typical errors in regulatory dysgraphia

1. Omission – *omision, omisn*
2. Perseveration – *perseveration*
3. Anticipation of the following letter – *with all children → will all children*
4. Contamination – *bunch of flowers → oflowers*
5. Errors of language analysis (no capital letters)
6. Orthographic (spelling) mistakes in spite of the knowledge of the rules.

Phonological Dysgraphia

The reason for errors - difficulties of selection.

Typical errors:

1. Phonemic substitution of consonants (voiced – unvoiced: d-t, v-f, b-p)
2. Articulatory substitution of sounds similar in the place or manner of articulation (p-t, b-d)

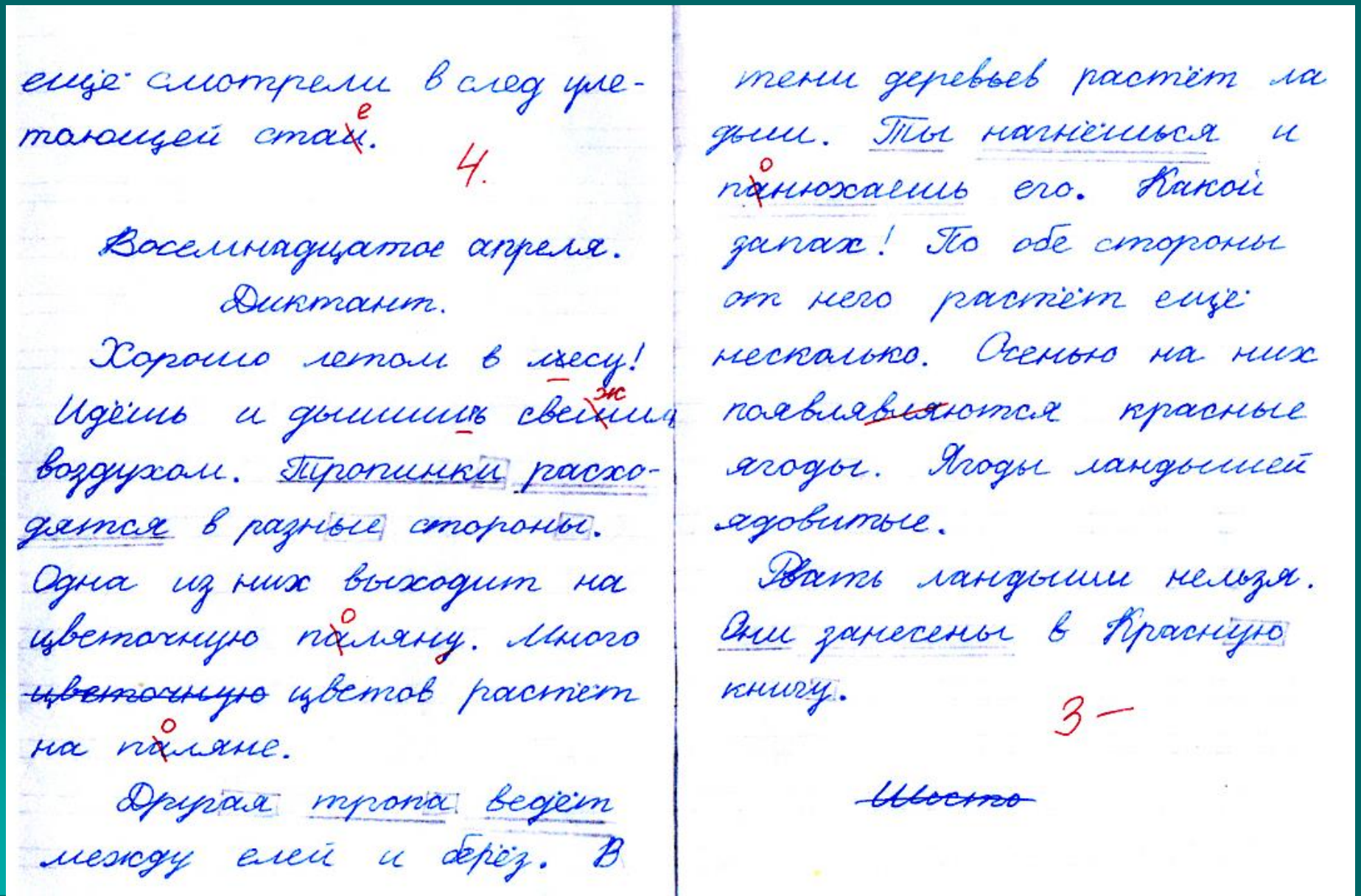
Visual-spatial (Surface) Dysgraphia

1. Difficulty to find the correct position on the paper to start writing and to keep the line.
2. Fluctuations in the slope and height of the letters.
3. Separate writing of letters.
4. Substitution of visually similar letters or handwritten and block letters.

Visual-spatial (Surface) Dysgraphia

5. “Mirror” writing of letters and digits.
6. Errors in writing ideograms (“*Mascow*”).
7. Omission and substitution of **vowels.**
8. Tendency to **phonetic** (transcription) writing (*money → muny).*
9. Wrong order of letters.
10. Writing of different words in one word.

Regulatory dysgraphia



ещё смотрели в след улетающей стаи.

4.

Восемнадцатое апреля.

Диктант.

Хорошо летом в лесу! Идёшь и дышишь свежим воздухом. Тропинки расходятся в разные стороны. Одна из них выходит на цветочную поляну. Много цветов растёт на поляне.

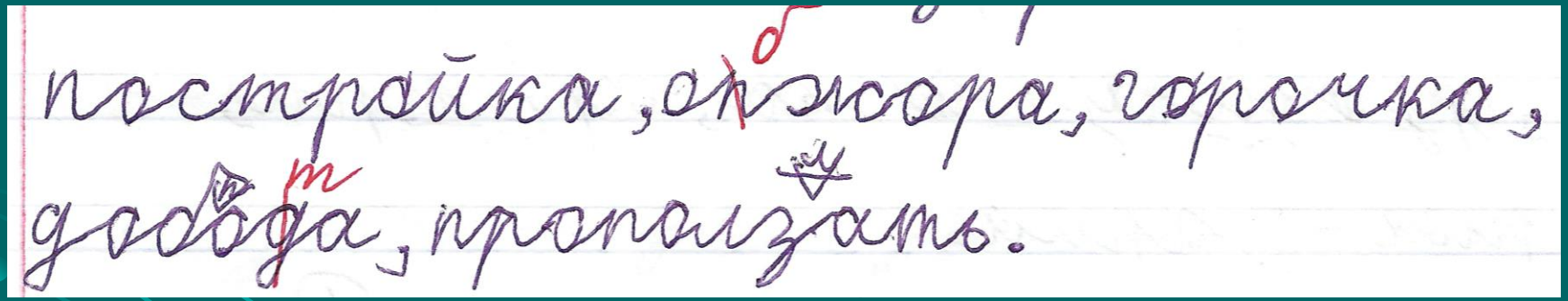
Другая тропа ведёт между елей и берёз. В тени деревьев растёт ландыш. Ты нагнёшься и понюхаешь его. Какой запах! По обе стороны от него растёт ещё несколько. Осенью на них появляются красные ягоды. Ягоды ландышей ядовитые.

Рвать ландыши нельзя. Они занесены в Красную книгу.

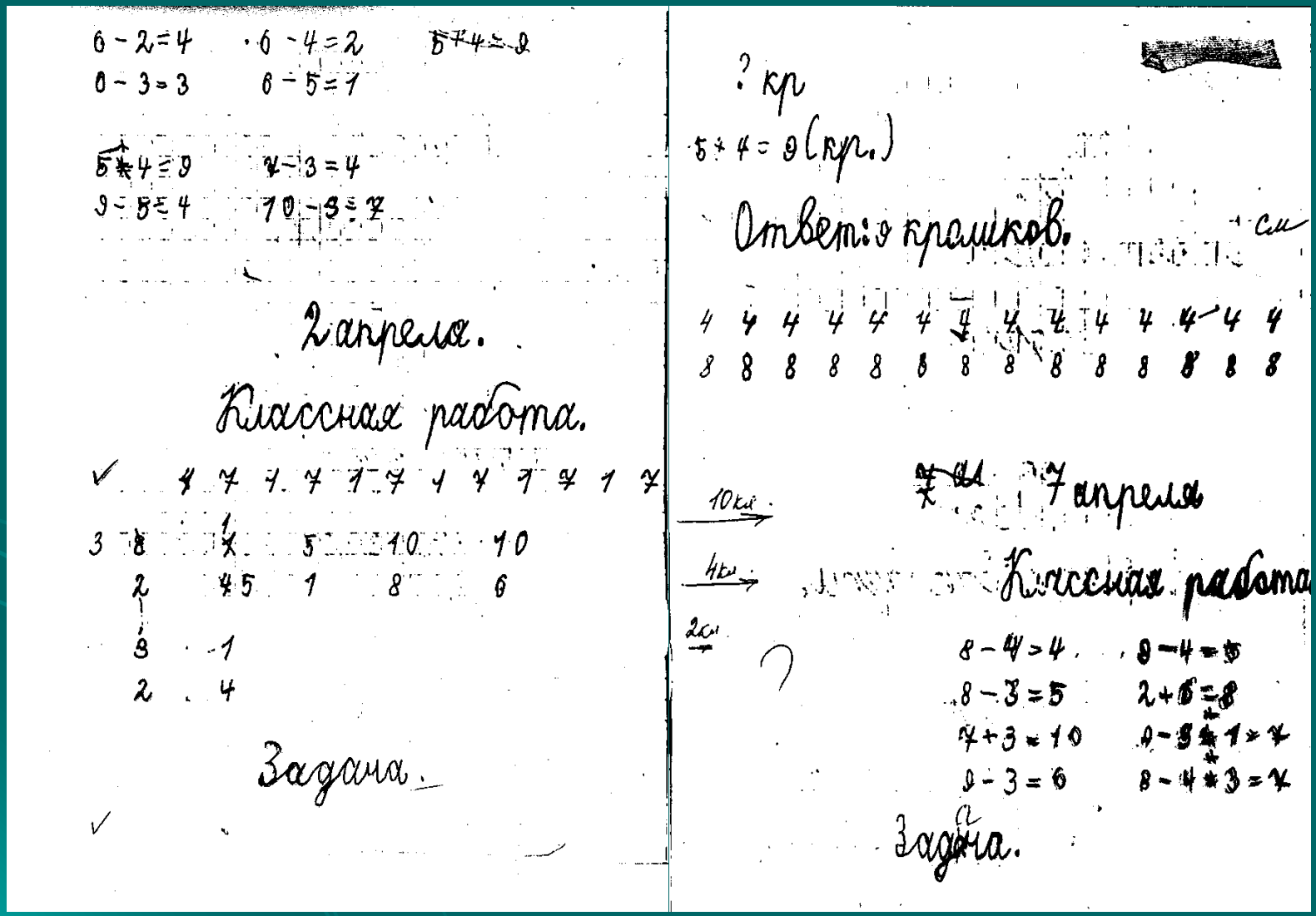
3 –

~~Вместо~~

Phonological dysgraphia



Visual-spatial (surface) dysgraphia



6 - 2 = 4 6 - 4 = 2 5 * 4 = 9
6 - 3 = 3 6 - 5 = 1

5 * 4 = 9 4 - 3 = 4
9 - 5 = 4 10 - 3 = 7

2 апреля.

Классная работа.

Задача.

? кр

5 * 4 = 9 (кр.)

Ответ: 9 крашков.

4 4 4 4 4 4 4 4 4 4 4 4 4 4
8 8 8 8 8 8 8 8 8 8 8 8 8 8

10 кг

4 кг

2 кг

7 апреля

Классная работа

8 - 4 = 4 9 - 4 = 5
8 - 3 = 5 2 + 6 = 8
7 + 3 = 10 9 - 3 * 1 = 7
9 - 3 = 6 8 - 4 * 3 = 7

Задача.

7 д.

х = 3 (д.)

Ответ: 3 девочки.

29 апреля.

Классная работа.

12 13 15 17 18

Задача.

7 п.

8 − 3 = 5 (п.)

Ответ: 5 пластинок.

3 = 7

3 = 13

2 + 8 = 10 8 + 6 = 14

8 + 2 = 10 4 + 6 = 10

8 − 7 = 1

8 − 8 = 0

5 мая.

Классная работа.

7 11 12 15 16 18 20

15 16 18

Задача

10 + 6 = 16 (кн.)

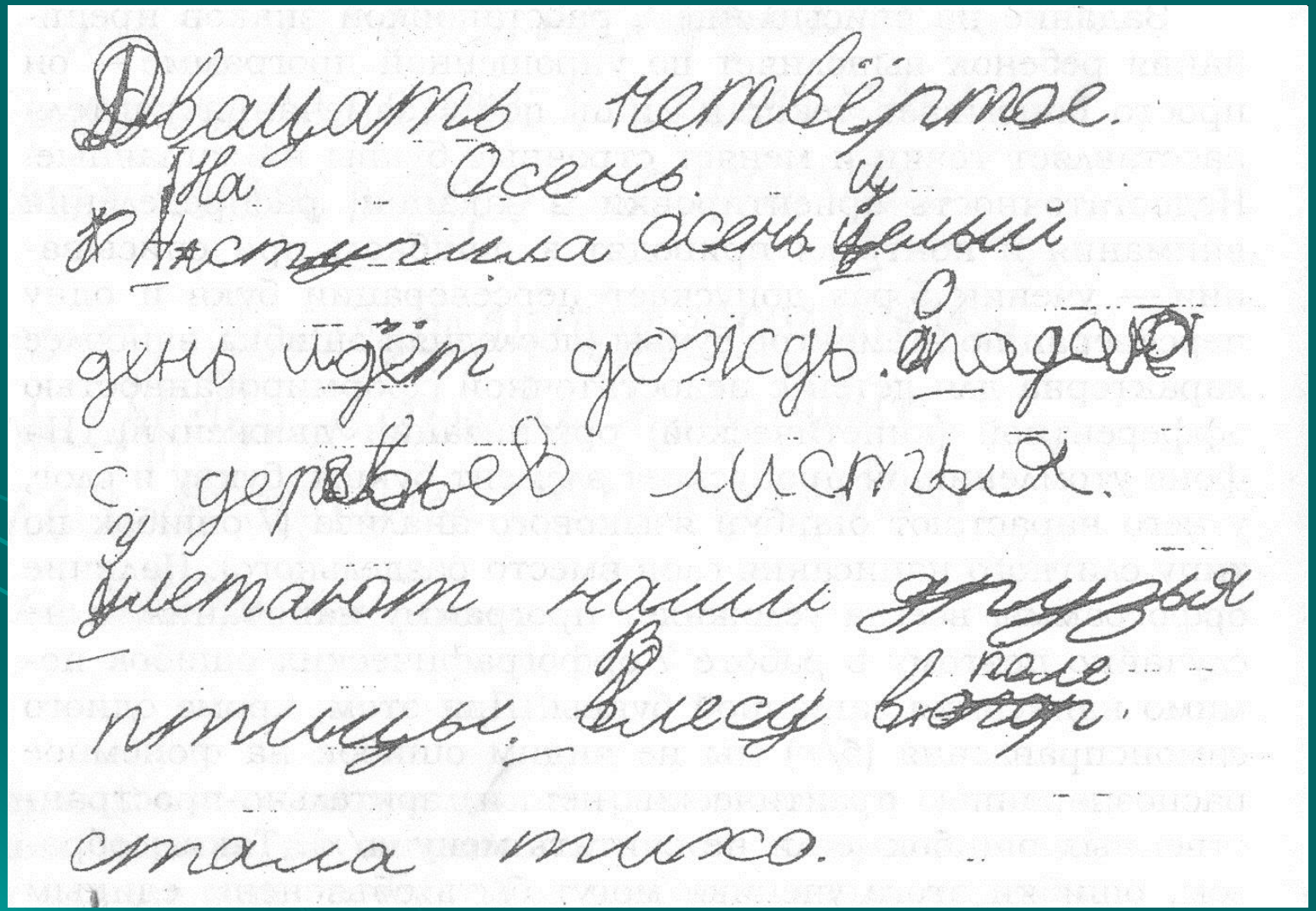
Ответ: 16 тетрадок.

Задача.

7 + 5 + 3 = 15 (с.)

Ответ: 15 банок.

Writing in case of deficits in activation, executive, and visual-spatial functions



Distribution of specific mistakes in basic types of dysgraphia
(Ахутина, Корнеев, Воронова и др., 2007)

Types of mistakes	Regulat.	Phonolog.	Vis.-spat.
Regulatory mistakes	50,0	30,7	20
Capital letters	13,2	0	14,4
Omission of words	11,8	24,3	8,7
Omissions and substitutions of consonants	7,4	17,8	5,8
Omission and substitution of vowels	10,3	8,0	17,3
Visual-spatial distortions	7,4	17,8	31,8

Why do we see all kinds of mistakes in any form of dysgraphia?

- The weakness of any component in the functional system of writing **delays the process of its automatization**, that is why
- the process of writing remains effortful and energy demanding and that is why
- there are no enough resources for any component of functional system (cp. Waber, 2010).
- But a weak component suffers most of all.

The “dysexecutive” syndrome

- These children have difficulty initiating tasks.
- Their orienting activity is chaotic and incomplete.
- Their plans are simplified and unstable.
- They fail to inhibit inappropriate answers

“sliding” to the more simplistic version of the task completion.

- They often fail to carry the task through to the end.

The “dysexecutive” syndrome

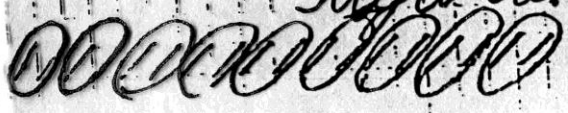
- They repeat the parts of the program or the whole program.
- They are impulsive and get easily distracted by outside stimuli.
- They do not compare results with the model of task performance or the plan.
- They find it difficult to switch from one task to the other, stop one activity, and move to a different activity that they consider a chore.

Задача № 21.

12 : 4 = 3 (б.)

Ответ: всего 3 букета.

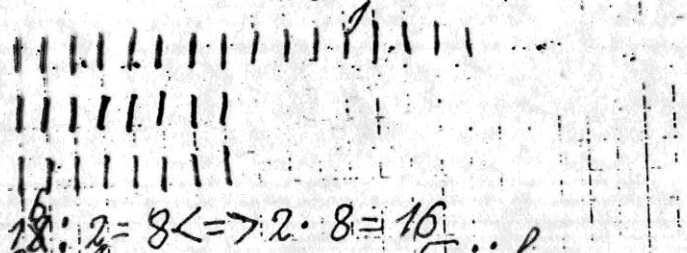
Задача.



18 : 2 = 9 <=> 2 · 9 = 18

Ответ: 9 детей.

Задача № 27.



18 : 2 = 8 <=> 2 · 8 = 16

Ответ: по 8 грёбен.

□ + 6 = 9 | □ - 8 = 9 | 10 + □ = 18

9 - 6 = 4 | 9 + 8 = 17 | 18 - 10 = 8

4 + 6 = 9 | 17 - 8 = 9 | 10 + 8 = 18

The syndrome approach in remediationn

Work with the weak component occurs not only within the frames of the isolated function – for example, writing –

but also with **all** the verbal and nonverbal functions that involve this component.

These functions do not suffer equally – each of them goes through its own path of probabilistic self-organized development.

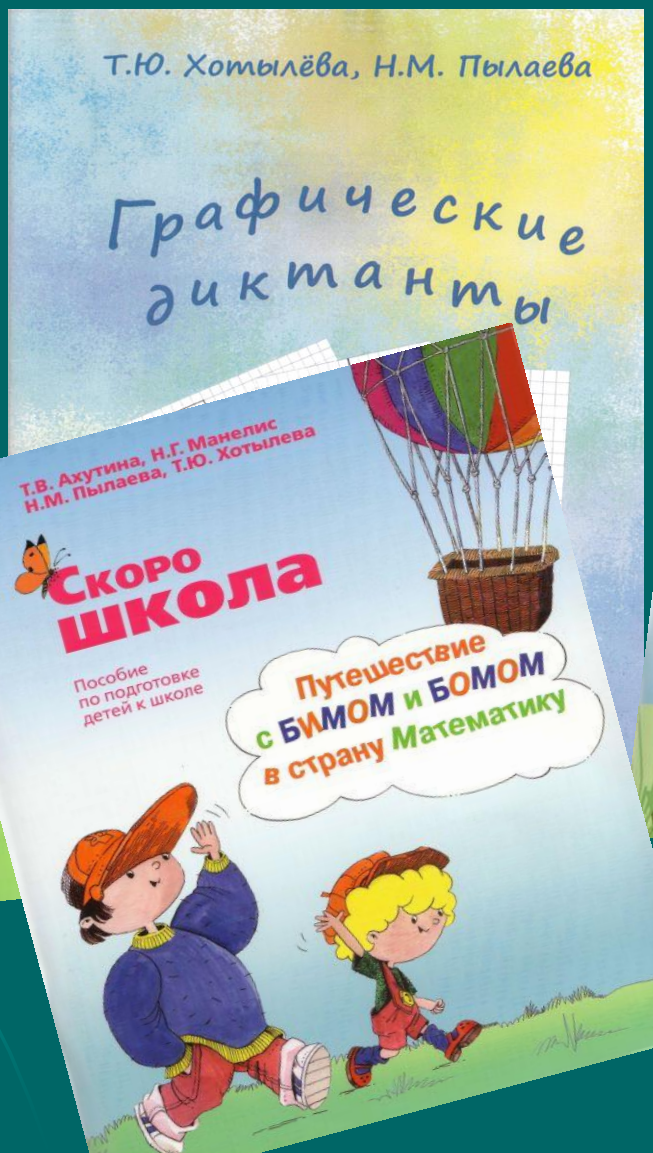
Remediation of executive functions

Remediation

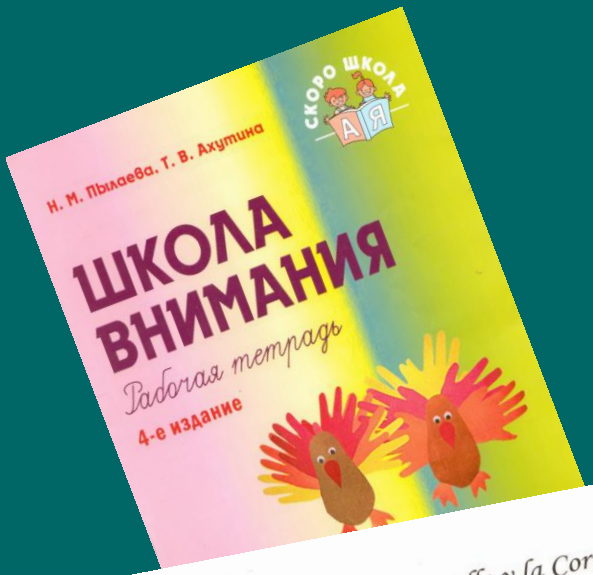
"…the objectification of a disturbed function, i.e. bringing it outside and changing it into external activity, is one of the basic roads in the compensation of disorders."

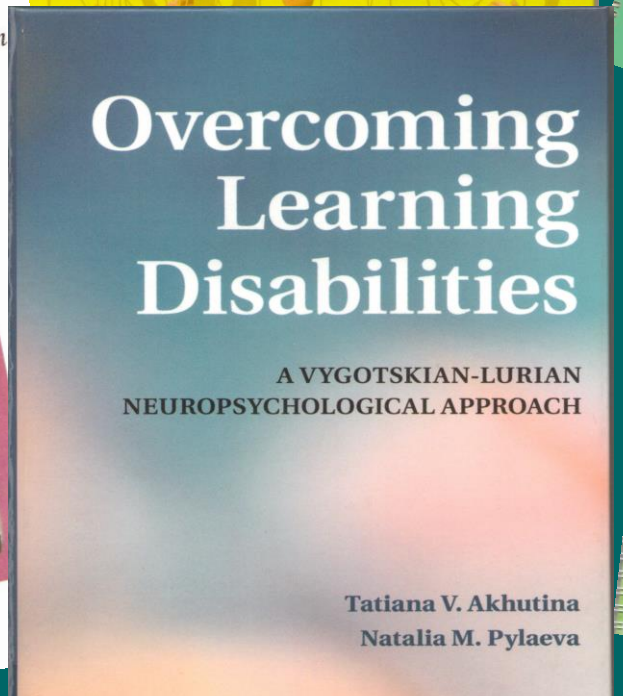
L. Vygotsky. Psychology and Theory of Localization of Psychological Functions (1934)

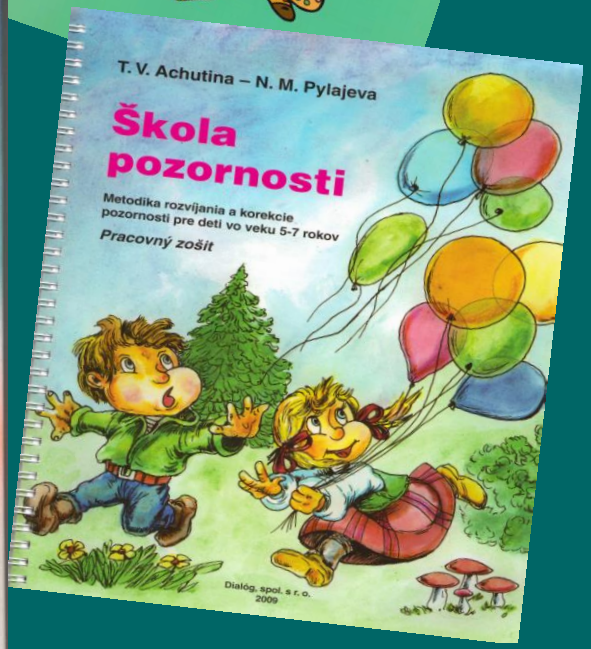
Our didactic materials for remediation of **executive** functions



Akhutina & Pylaeva books







The “School of Attention” Method for the Remediation of Executive Functions in 5-7 year old children

(Akhutina, Pylaeva, 1995; Пылаева, Ахутина,1997; Akhutina, Pilayeva, 2004; 2009)

Rationale of choosing materials

The numerical sequence (1, 2, 3...):

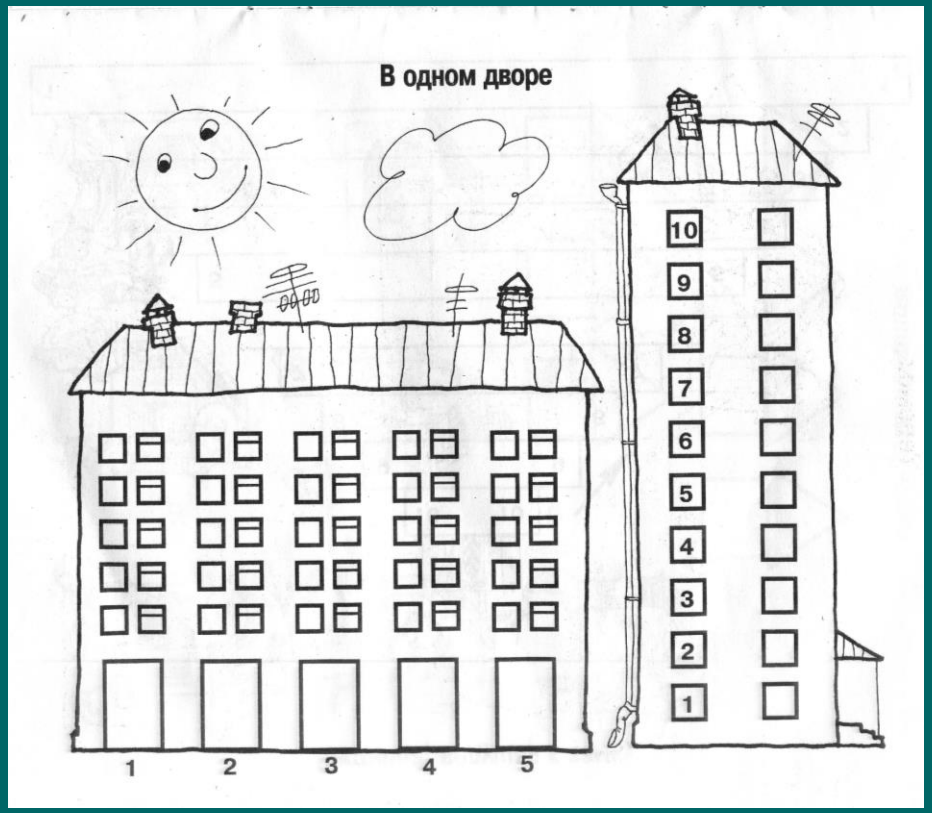
- is important for schooling,
- could easily be calibrated to set the compexity of programming and control functions,
- children of this age like “school” games.

The “School of Attention” Method

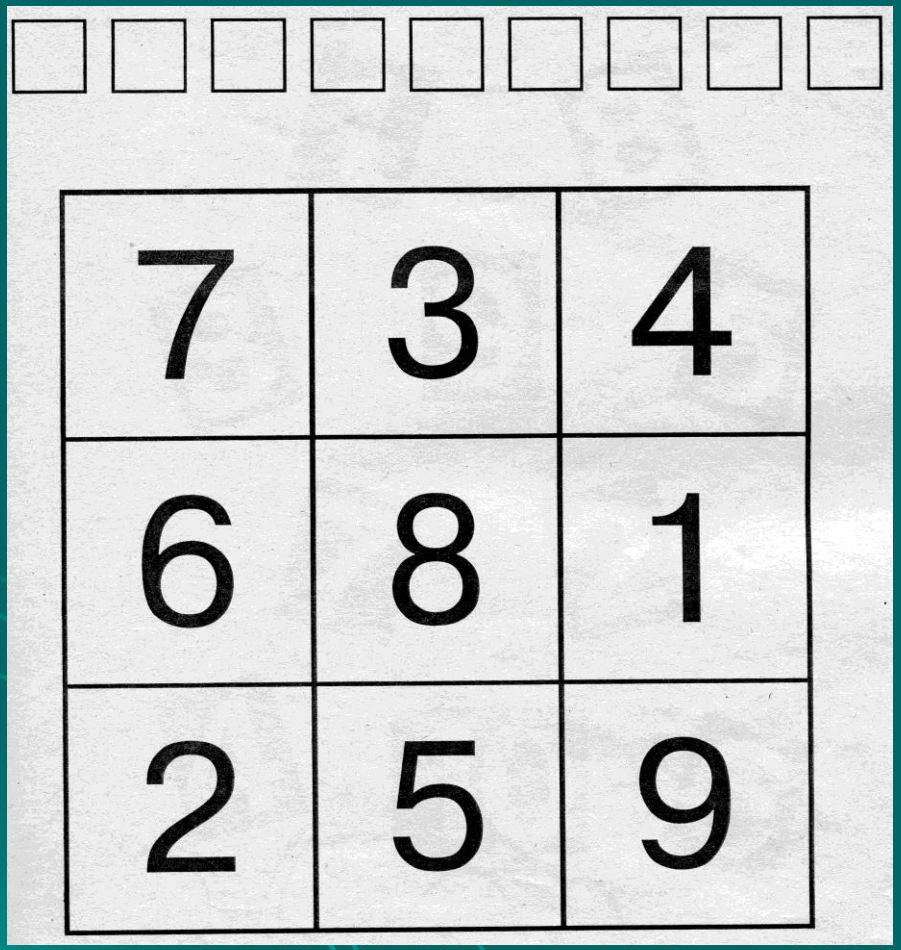
This method consists of 50 tasks divided into 5 circles:

1. Numerical row in familiar situations
2. Numerical row in direct order
3. Quantitative sequence in direct order
4. Numerical row in reverse order
5. Parallel rows

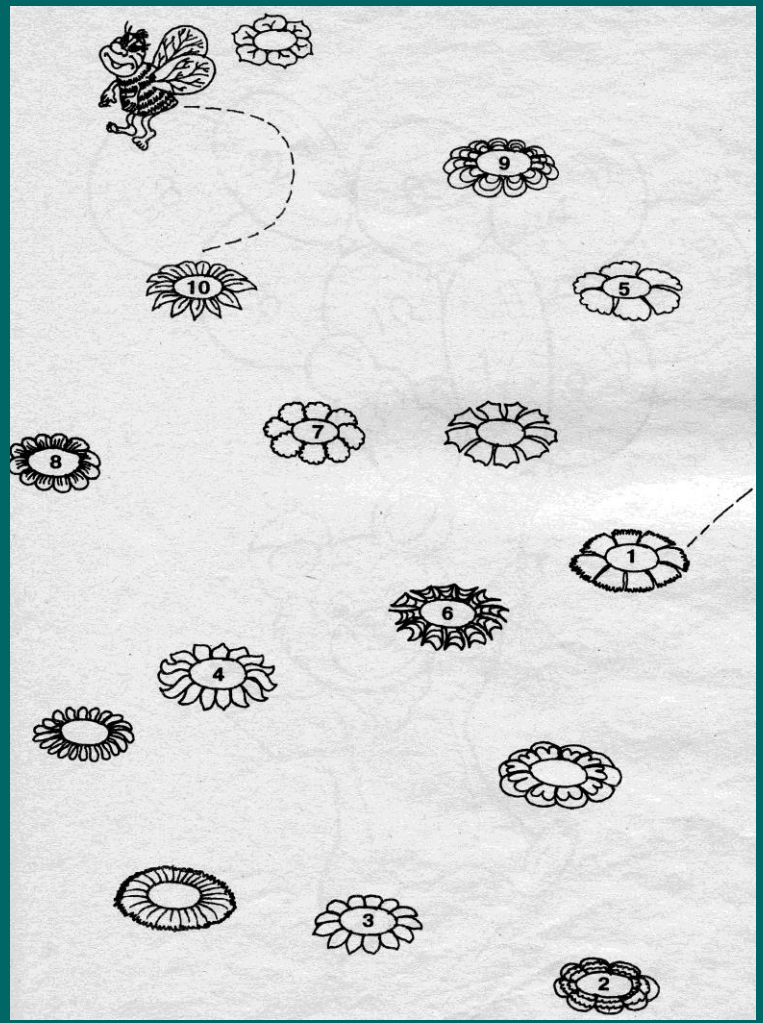
1. Numerical row in familiar situations



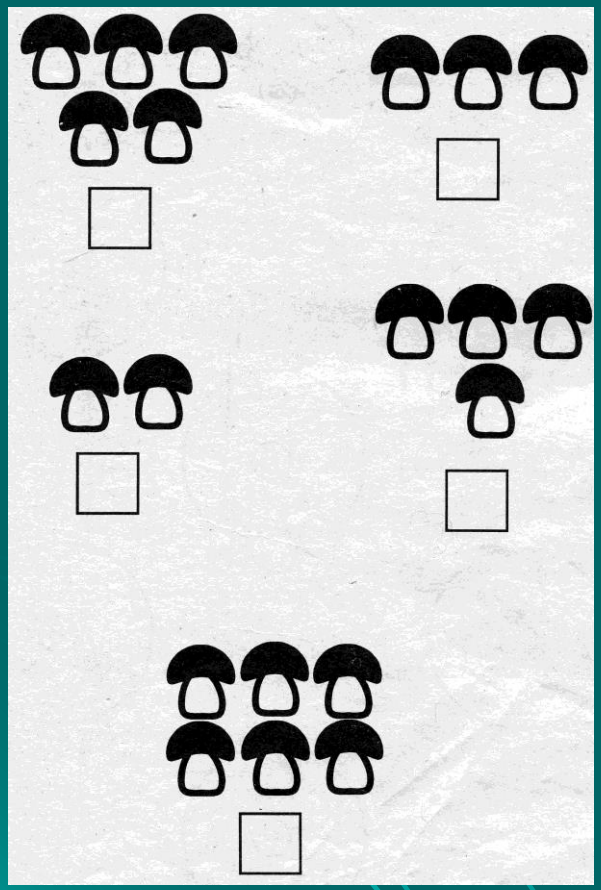
2. Numerical row in direct order

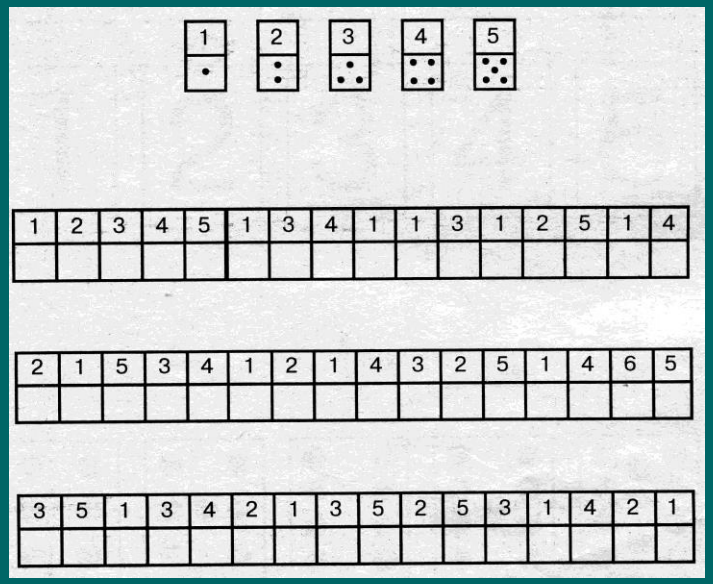


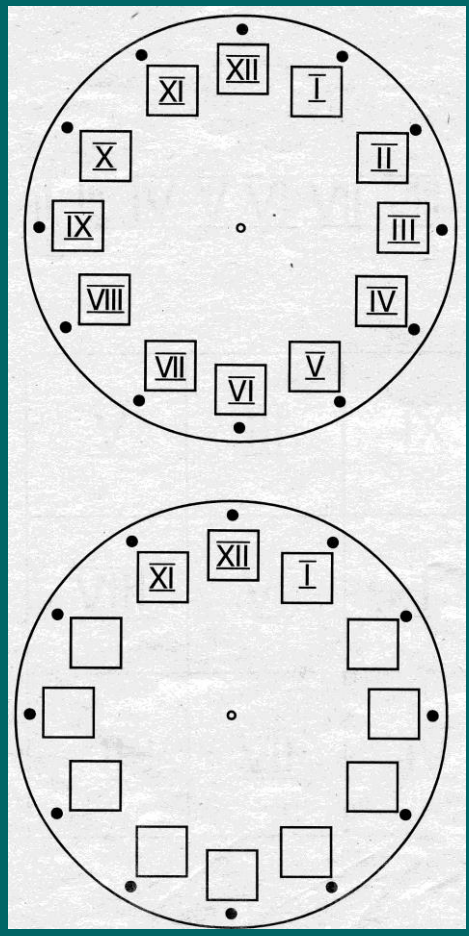
7	3	4
6	8	1
2	5	9



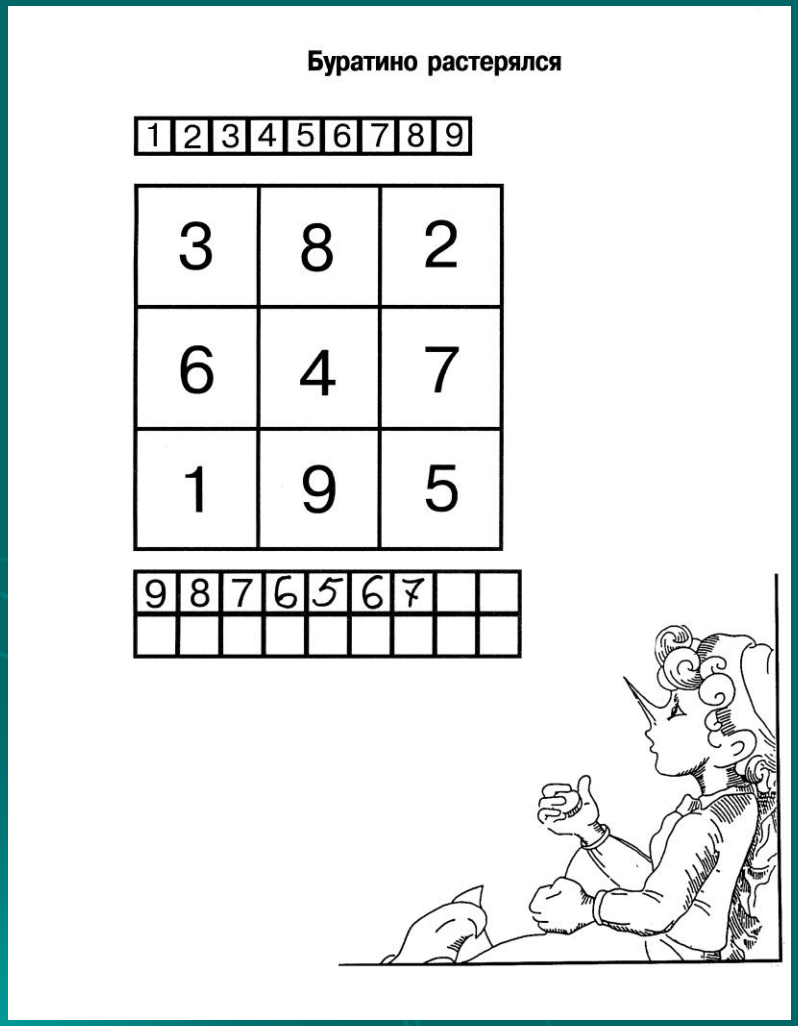
3. Quantitative sequence in direct order

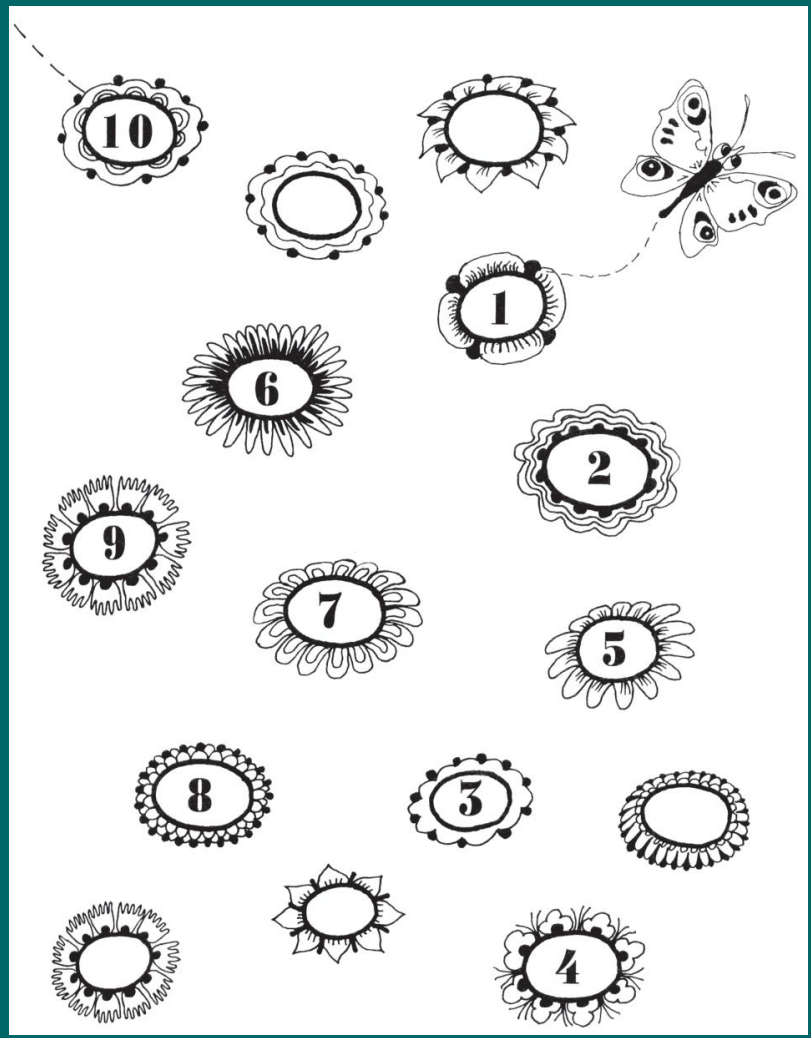




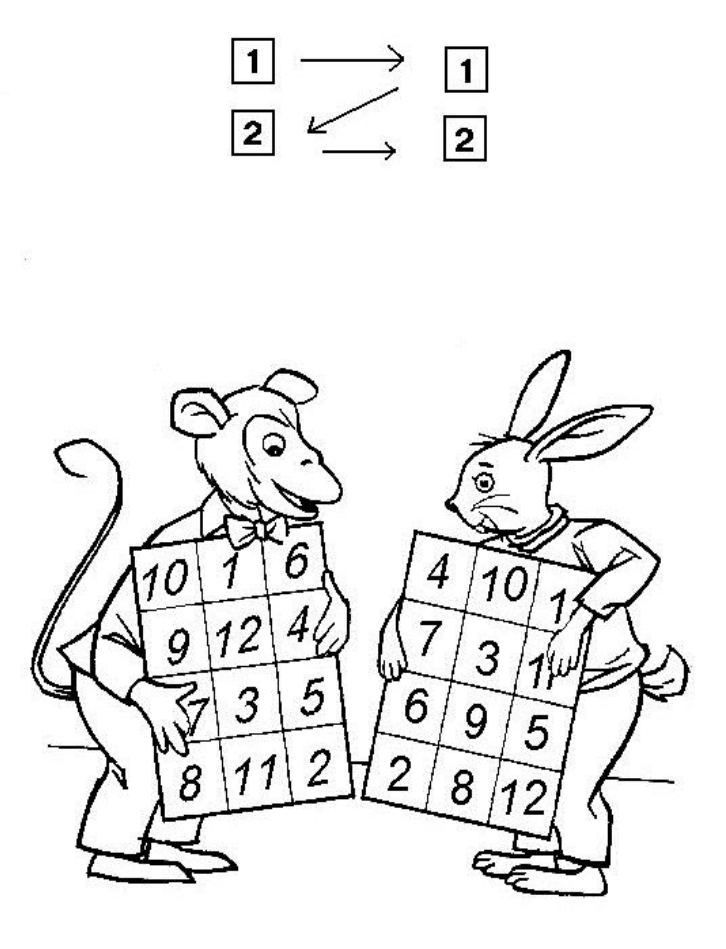


4. Numerical row in reverse order





5. Parallel rows



10	7	**1**	4
1	**10**	5	**3**
5	**7**	8	**9**
3	6	**4**	2
8	**2**	9	**6**

Subject

N. was a first grade student, 8 years old, bilingual.

She entered our school for remedial-developmental education one ear later than her classmates because her parents were immigrants.

In age about 2.8 years she had a neuro-infection of unknown origin.

The social situation of her development was unusual. Her parents with high education were attentive to their daughter, but she had no contacts with children.

Psychological observations

The girl is shy. In the situation of evaluation she was so afraid to make a mistake that she answered with big pauses and hesitations. It was seen in Kogan test (inserting figures in the cells of the table sorting them by matching two of their characteristics: shape and color) and verbal tests (e.g. telling a story based on the series of pictures). It was necessary constantly to stimulate and encourage her.

The knowledge about environment was selective.

Her Russian is good, but she knows only 4 letters

Neuropsychological assessment

Go-no-go test (choice reactions) was made slowly, with impulsive errors in switching.

Fluency tests: 12 (in 2 min), 2 and 4 words.

“Odd one out” was made only with expanded stimulating help.

Telling a story based on the series of pictures: very short sentences, enumerations of details.

Neuropsychological assessment

Palm-First-Edge Test: slowly, errors in switching from one program to the other;

Reciprocal Coordination: difficulties in initiating the task; single errors in right hand;

Graphomotor Sequences Test  slow, element-by-element;

Reproduction of Rhythms (after verbal instruction) slowness, perseverations.

Neuropsychological assessment

In all auditory, kinesthetic, visual and visual-spatial tasks difficulties in initiating a task, in orienting activity, perseverations and slowness.

E.g.    
in 110”, 57”, 280” and 225”.

The girl is easily tired.

Learning skills

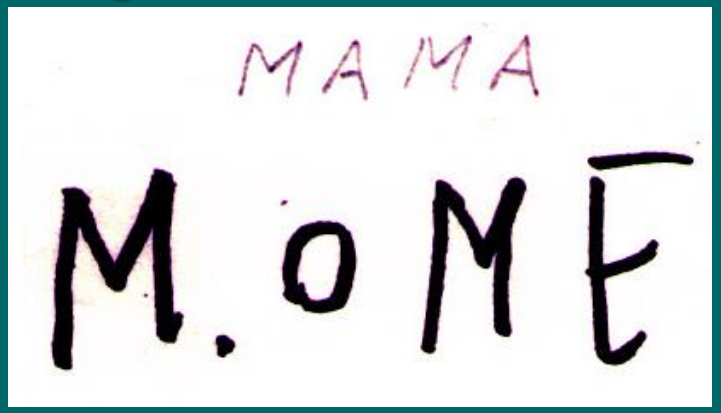
The girl never visited any kindergarten.

She could not read at all.

She wrote MAMA as MOME

she could not write

any other word.



She could count in direct and reverse order till/from 10. She knew numerals.

3+2 counted adding numbers by one.

Conclusion of neuropsychological and pedagogical evaluation

The girl is in a high risk of learning disabilities.

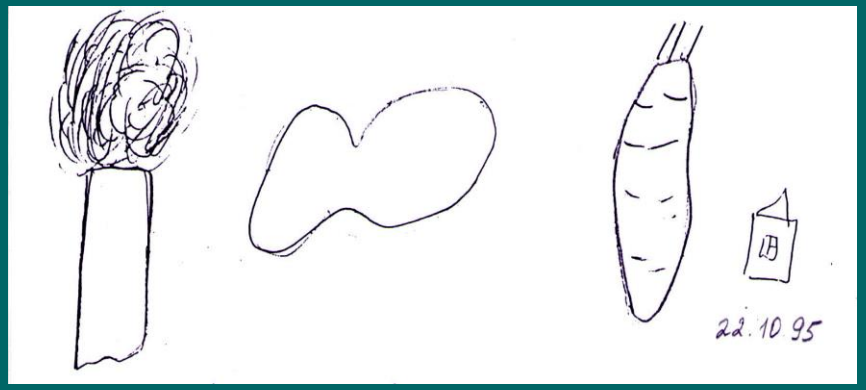
The difficulties in school can be connected with delay in development of the executive functions and serial organization of movements and actions.

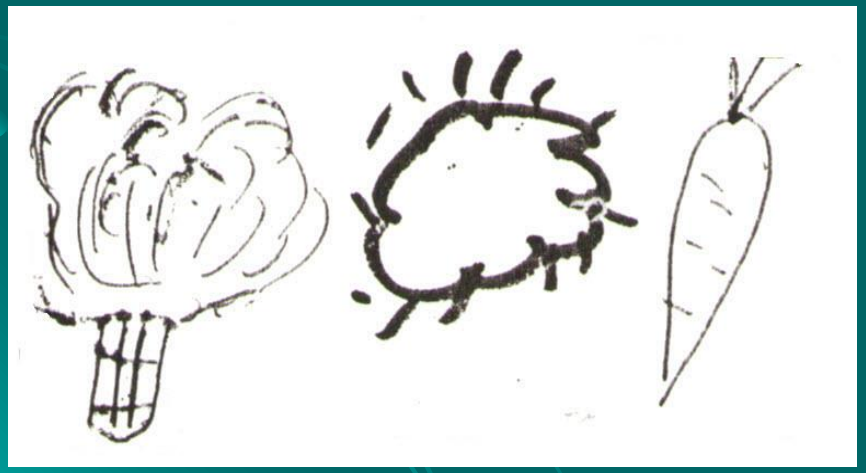
Observations during first weeks in school

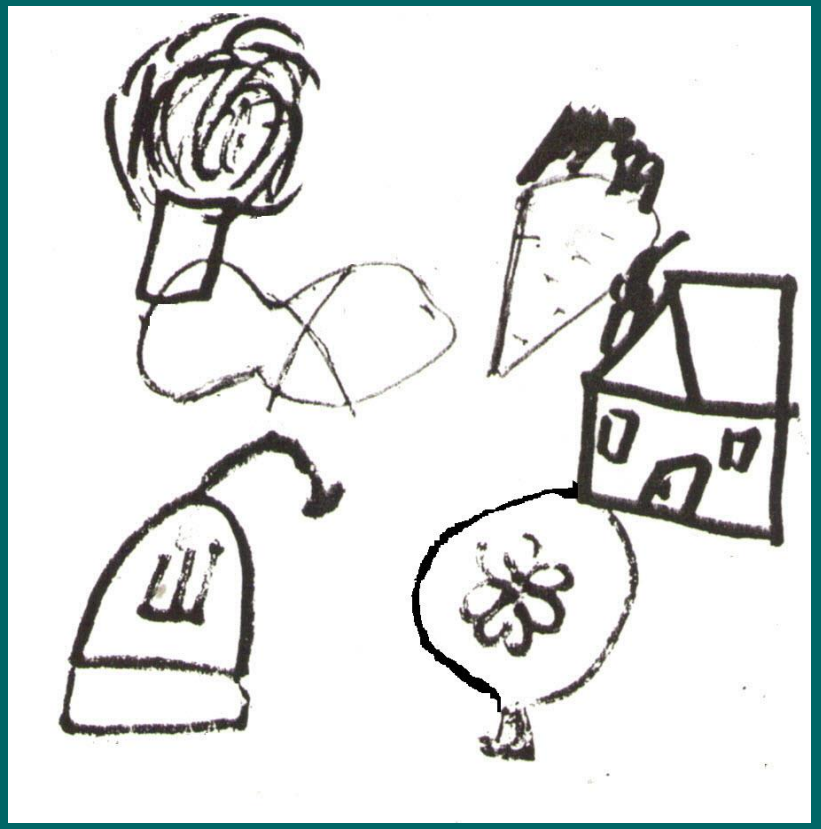
N. observes the school rules. During class lessons she is inactive, still afraid to answer questions.

During recess periods she tried to play with other children, but it is difficult for her to involve the other children in play. She has no adequate skills. For example, she addressed one girl with question: “Do you mind to play with me?’

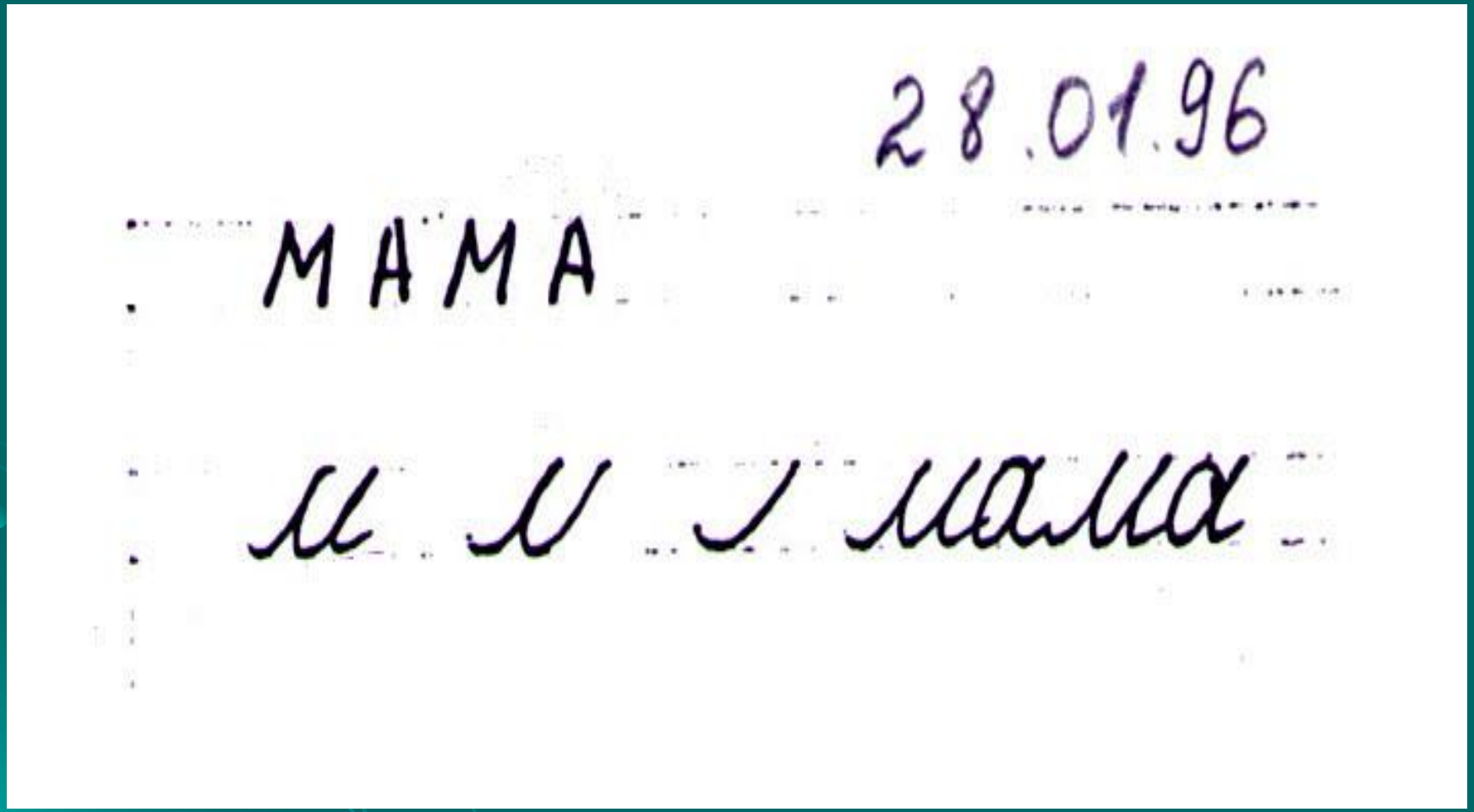
Two “Make a riddle” tasks (22.10.95, 3.11.95) and “Draw words with consonants as a first sound” (16.11.95)



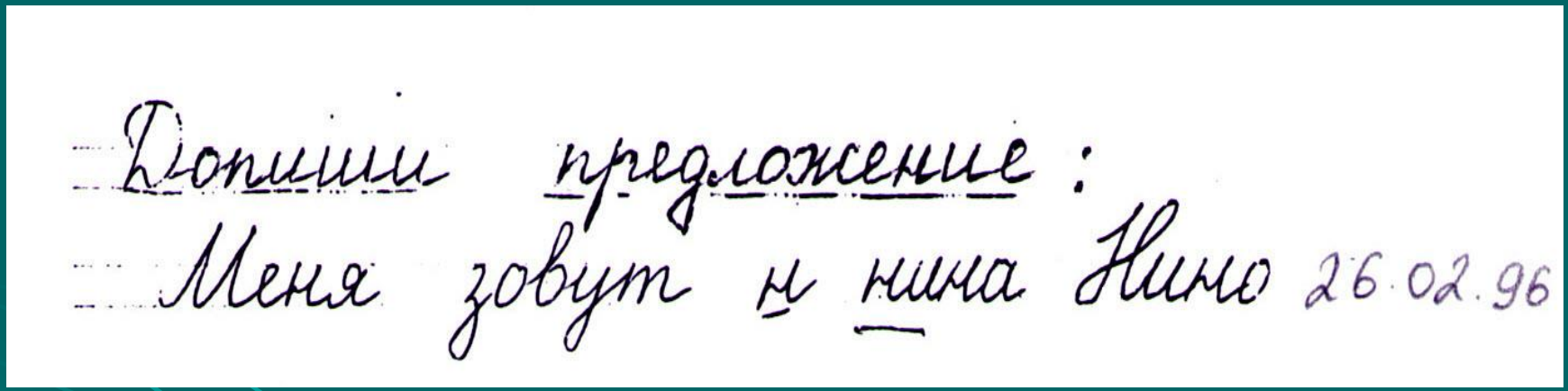




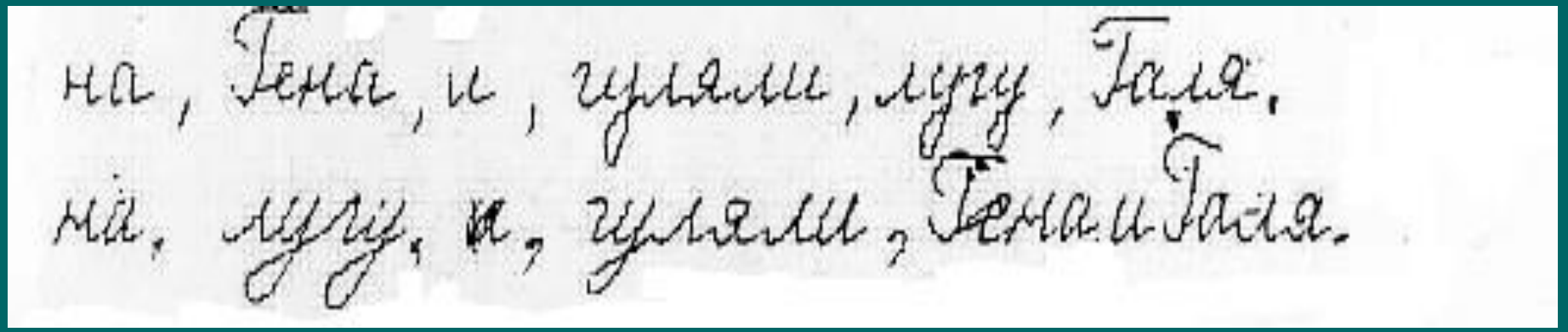
Task: to copy MAMA (28.01.96)



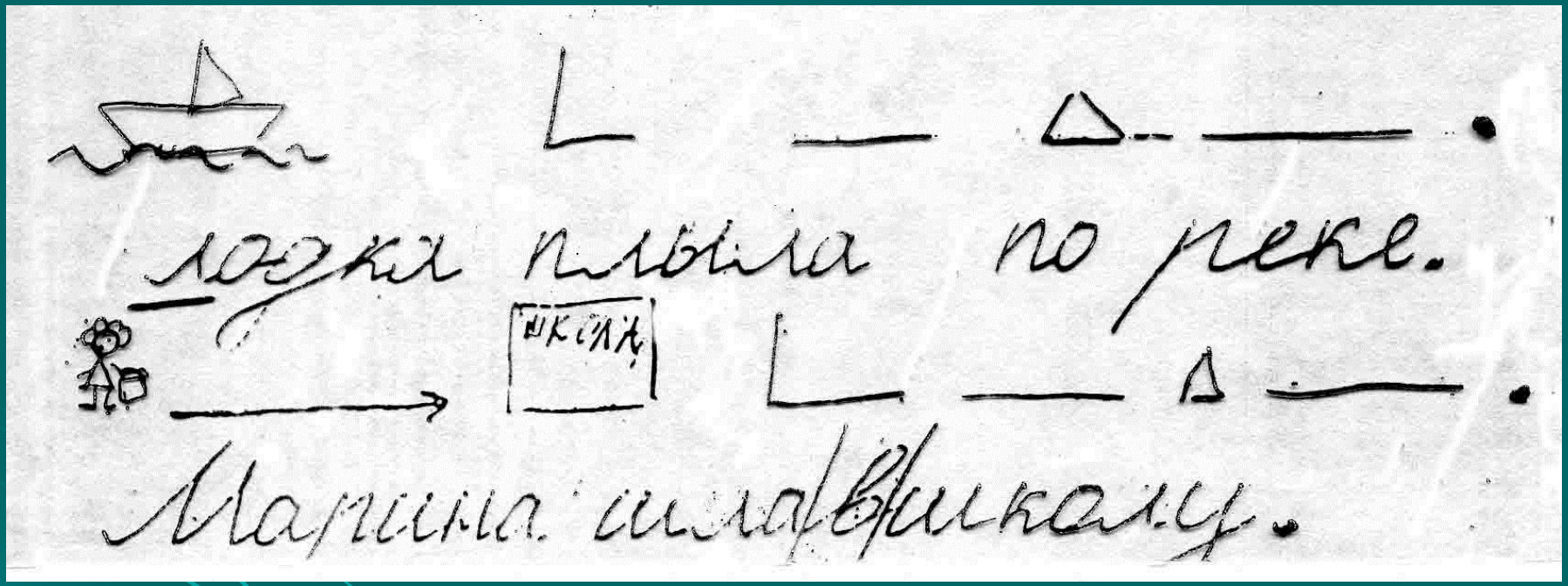
Task: [Finish the sentence: My name is …] (26.02.96)


Допиши предложение:
Меня зовут и нина Нино 26.02.96

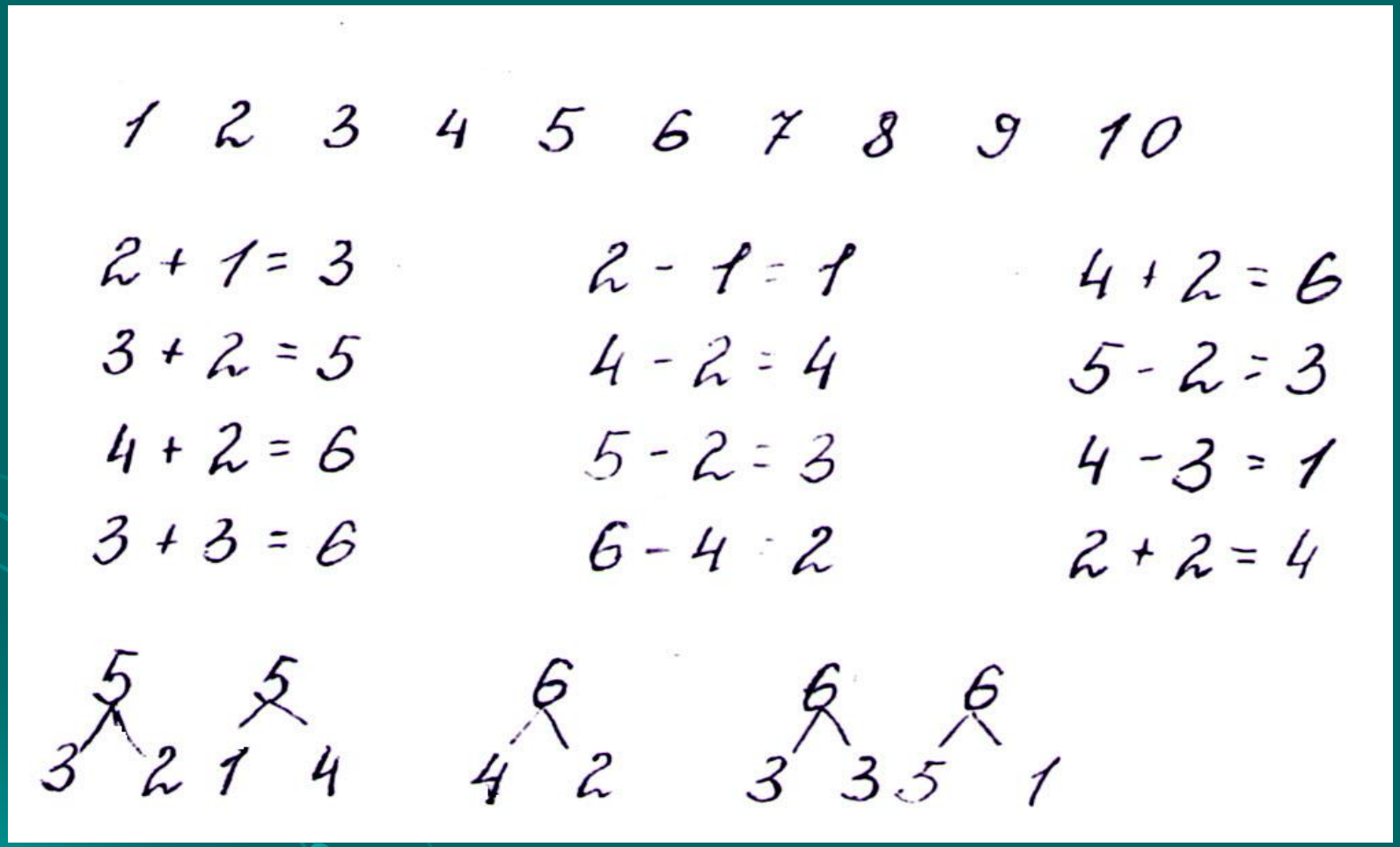
Task “Make a sentence out of words” (20.03.95)



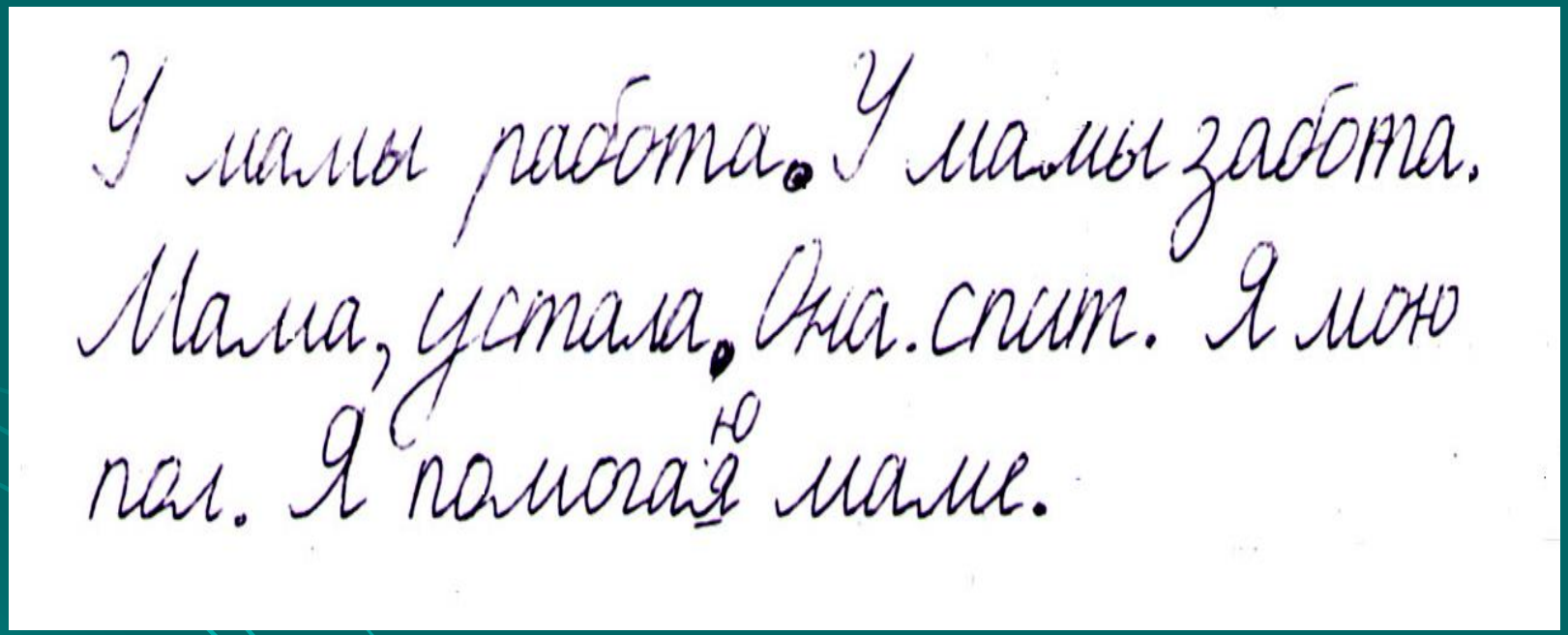
Task: Write a sentence according the scheme (18.04.96)



Control work in mathematics (05.96)



Control copying of printed text (05.96)



Comparison of neuropsychological assessment data (05.95; 09.95; 05.96)

Go-no-go test

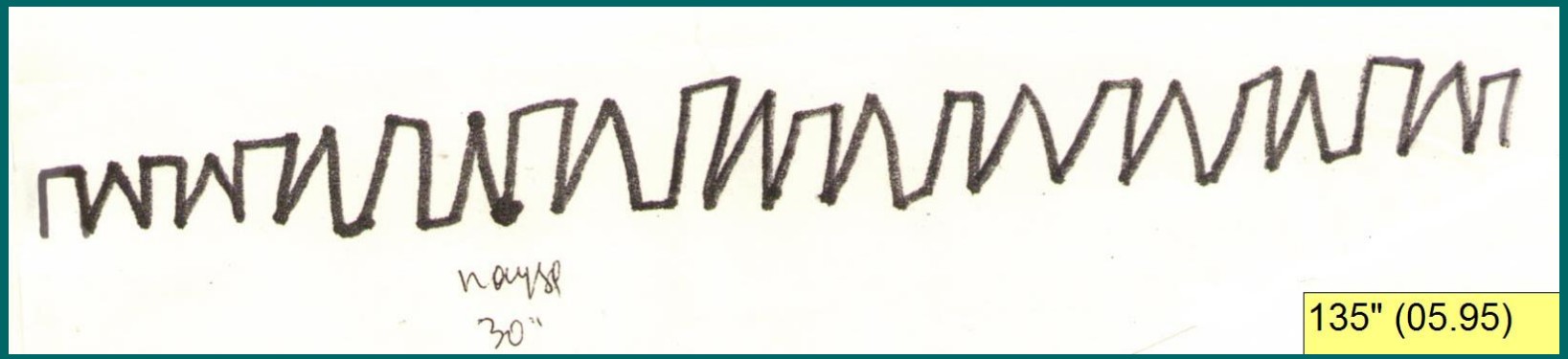
05.95;	09.95;	05.96
Slowness,	Slowness	+

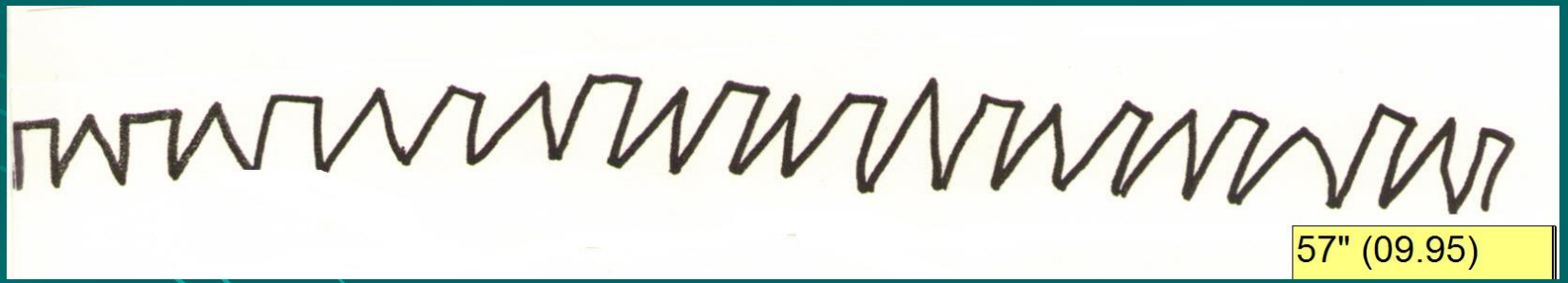
- single impulsive errors in switching from one program to another

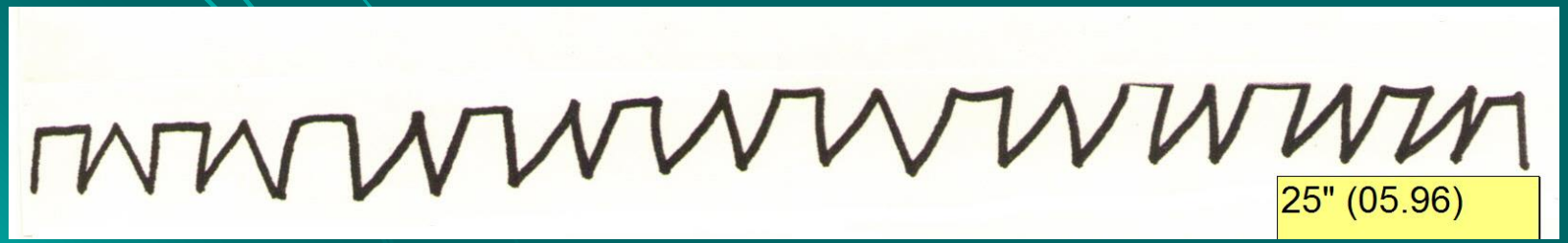
Fluency tests

05.95;	09.95;	05.96
Free associat.		
1 min – 0	16	25
2 min - 12		
Names of actions		
2	13	14
Names of plants		
4	5	12

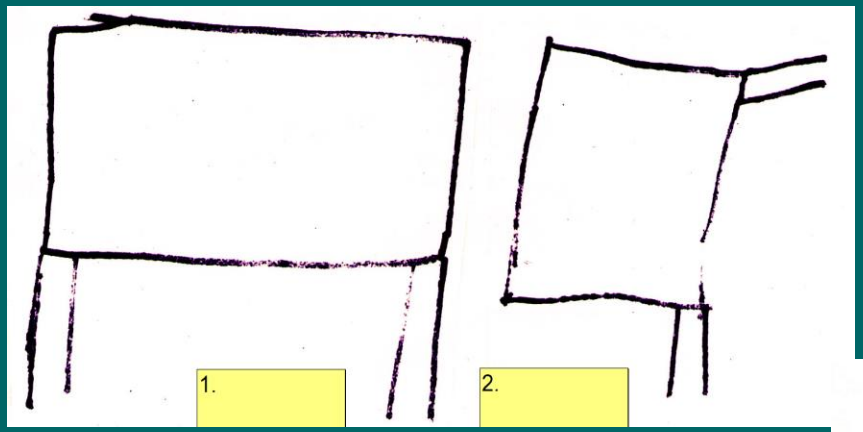
Cp. Graphomotor Sequences Test data (05.95; 09.95; 05.96)

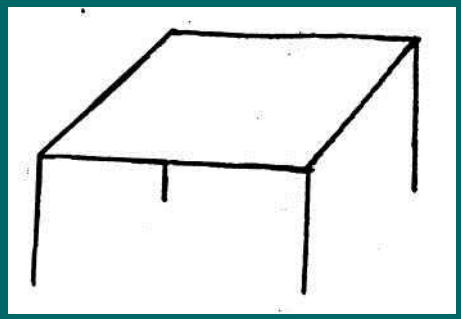




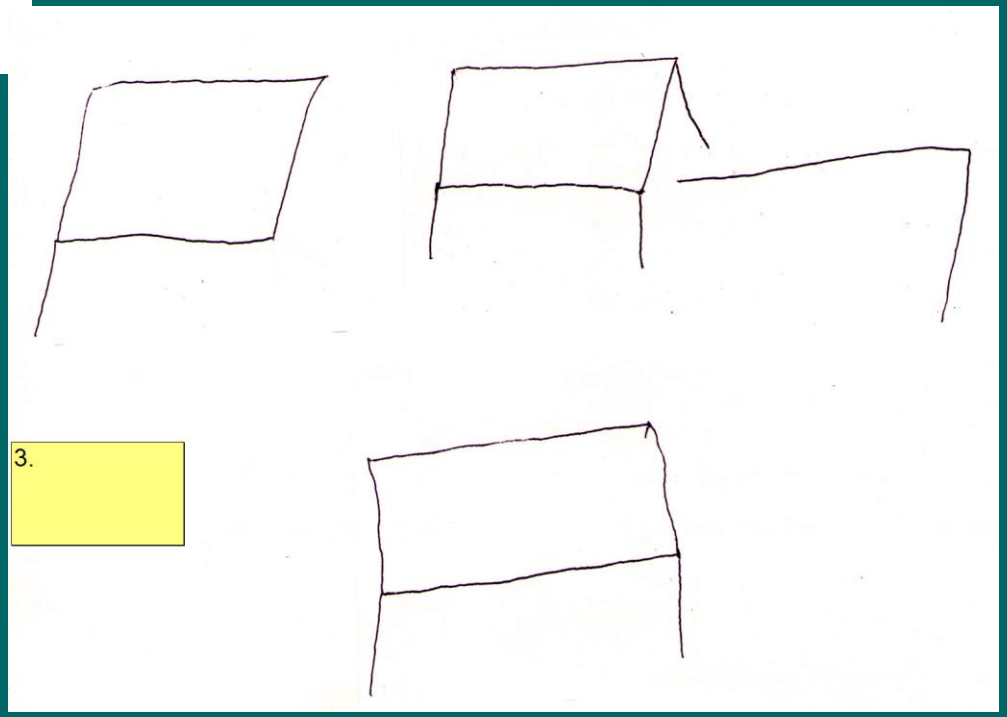


Drawing and copying a table (05.95)

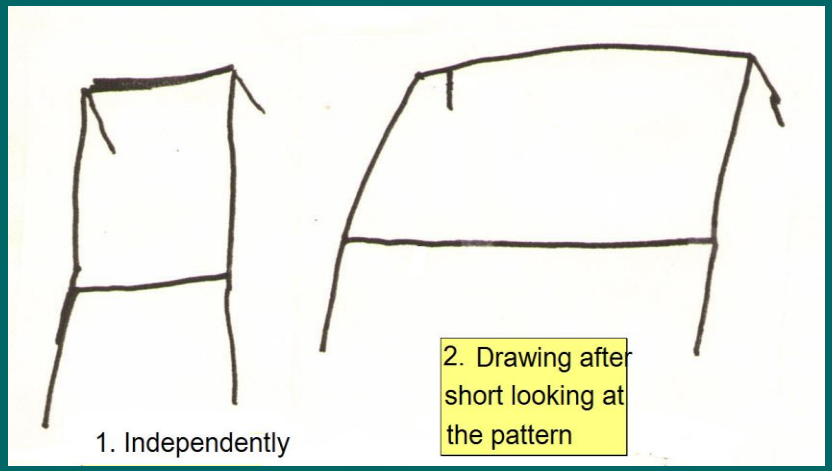


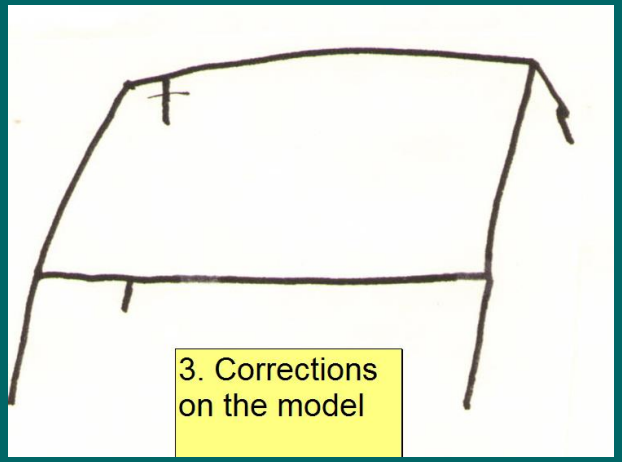


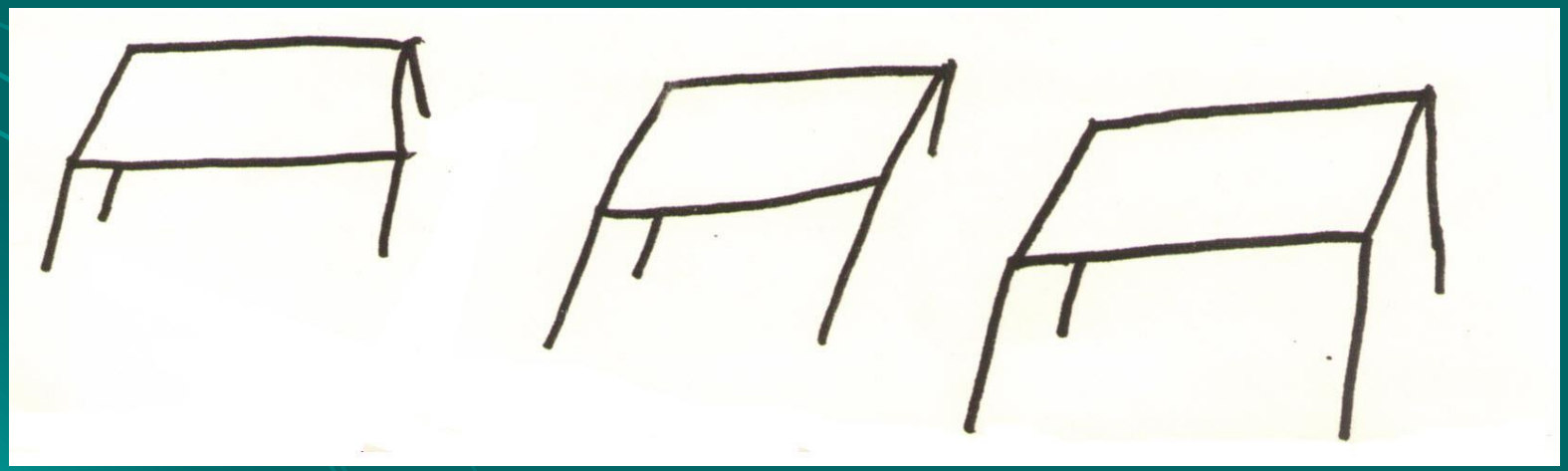
1. Independent Drawing
2. Drawing after short presentation of the model
3. Copying



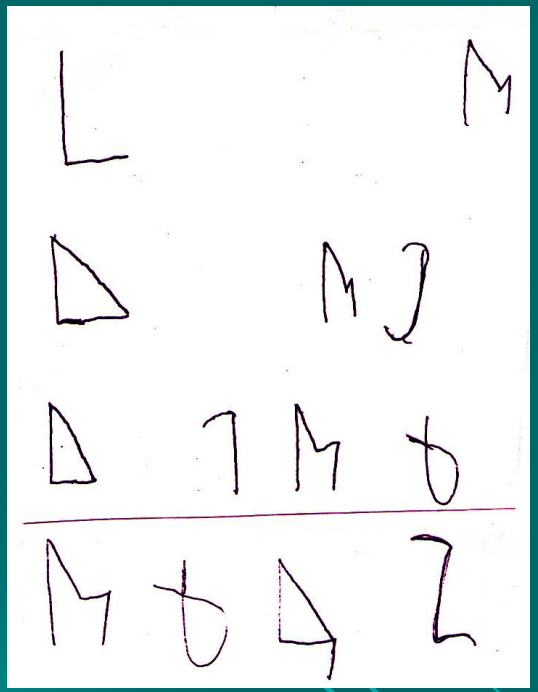
Drawing and copying a table(09.95; 05.96)

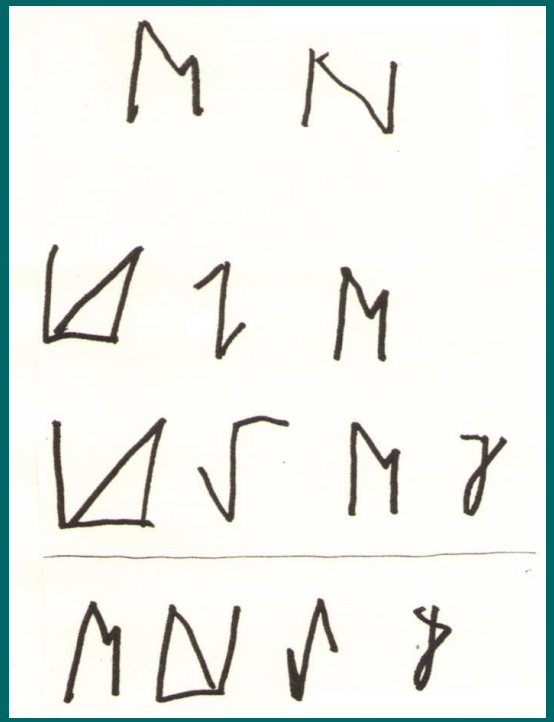


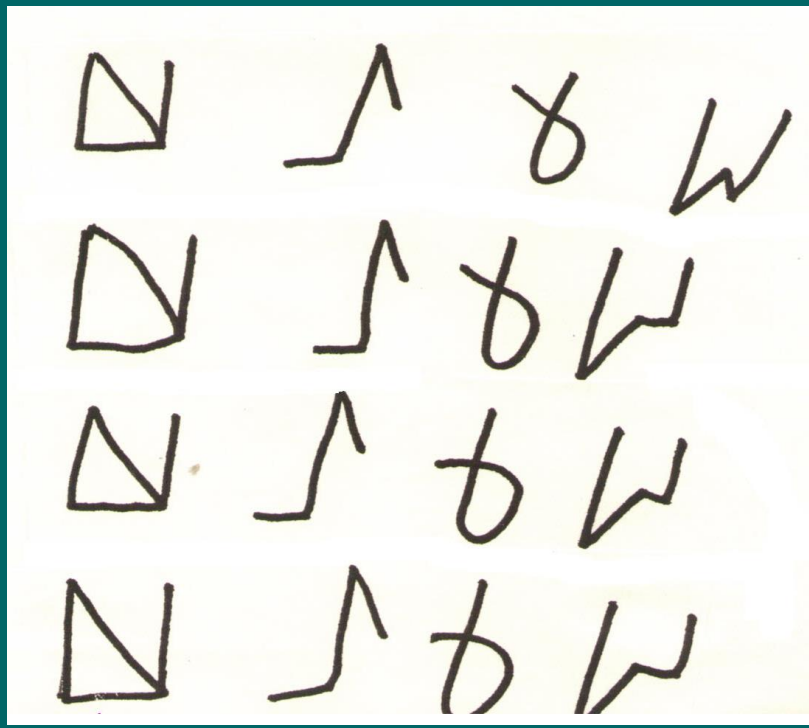




Visual-spatial memory (05.95; 09.95; 05.96)







Instead of conclusions

After finishing the first grade N. moved to an ordinary school and made progress in it.

However she continued to have problems starting a new kind of activity - she had to struggle but her struggle was successful.

Our work – to our teacher A.R. Luria