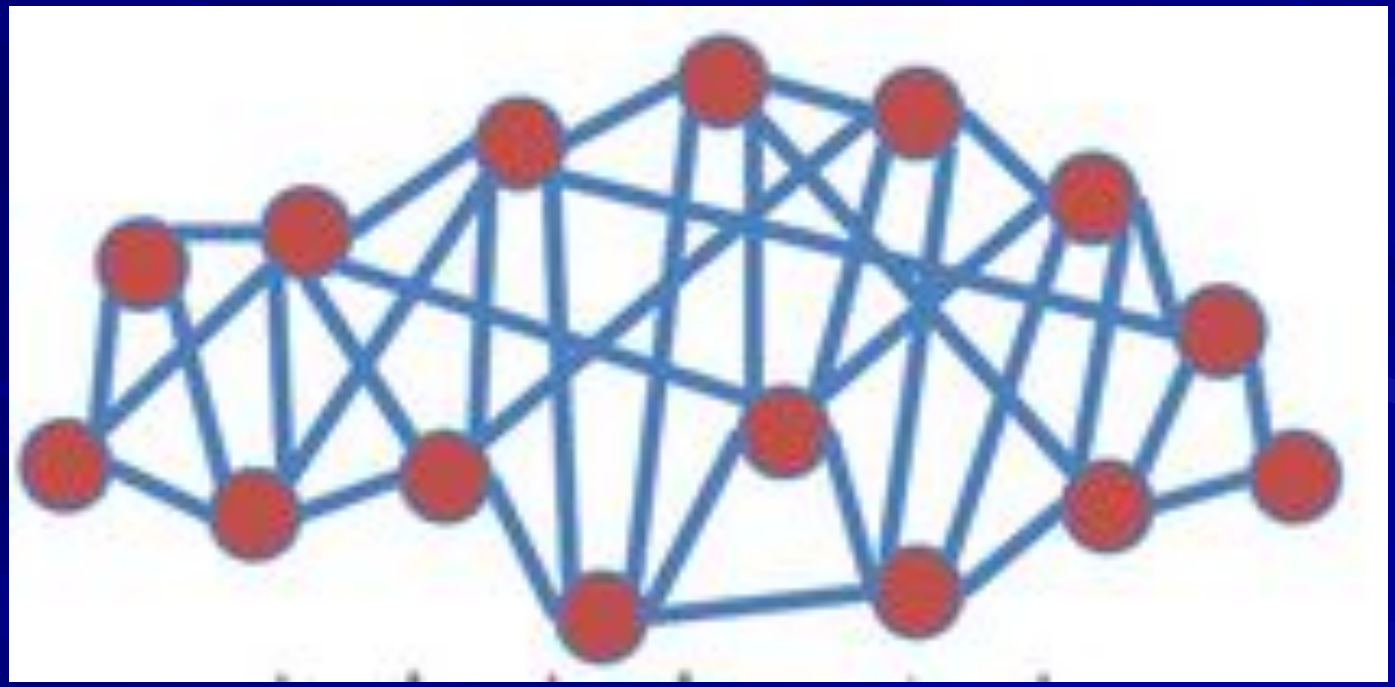
Neuropsychological assessment

Luria's theory

- Cognitive process is dynamic functional system.
- Functional system consist of interconnected subprocesses, or components

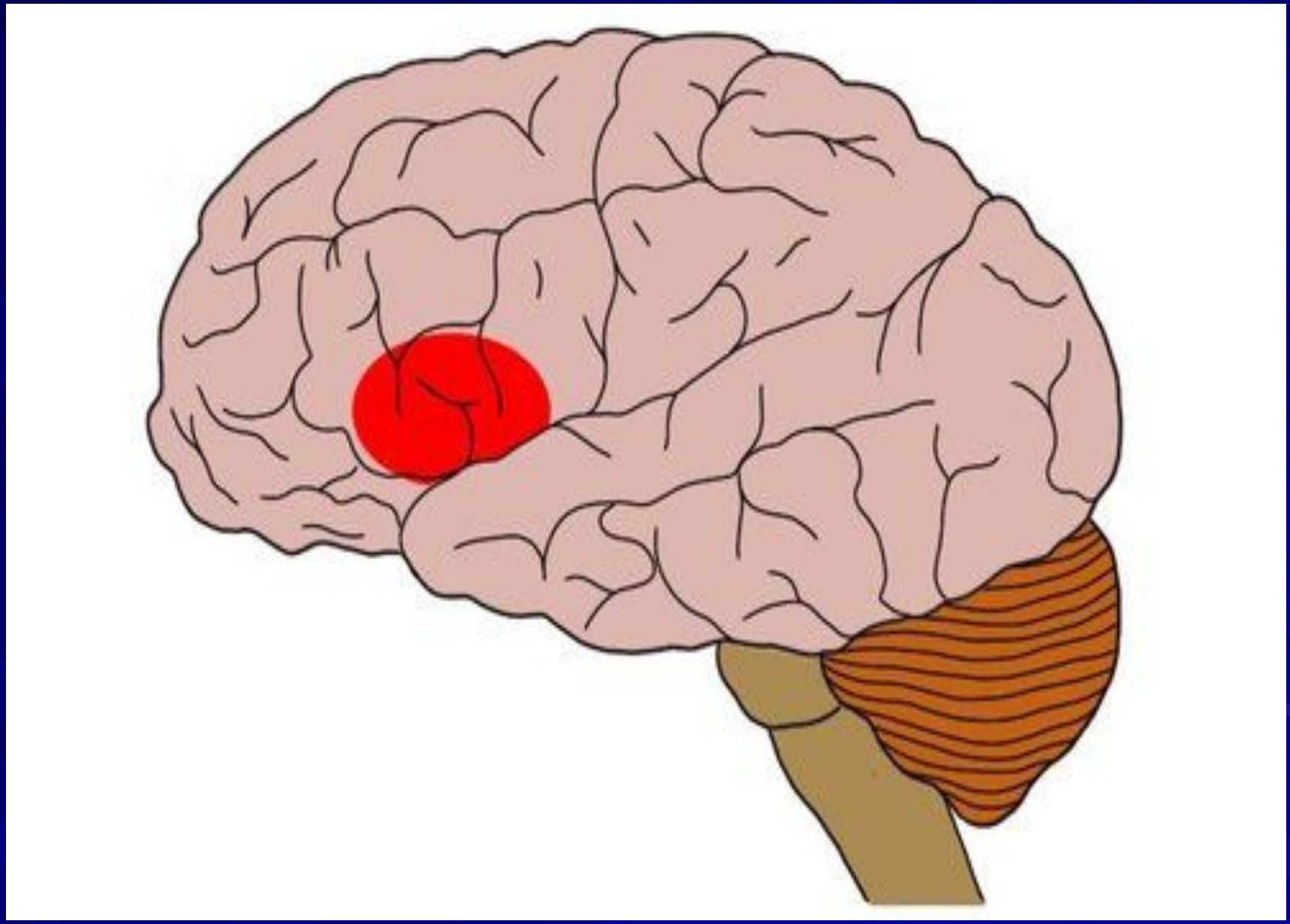


Functional system

Expressive language include at least the following components:

- inner speech
- producing a articulatory poses
- switching from one articulatory pose to another (oral articulatory motor series)
- kinesthetic feedback from articulatory movements
- auditory phonemic analysis of speech
- working memory

Broca's area



Phrenology

Franz Joseph Gall (1758-1828)

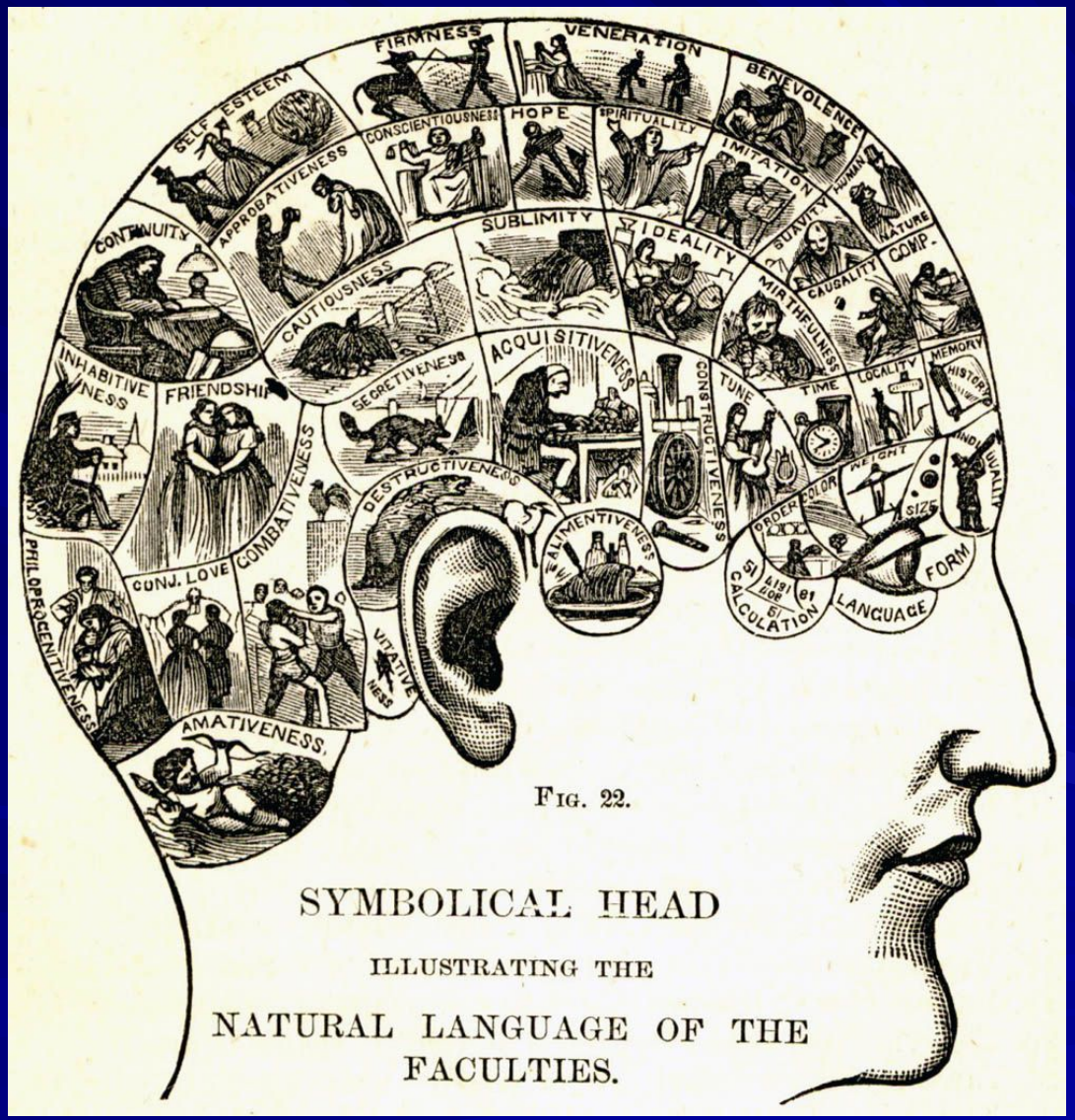
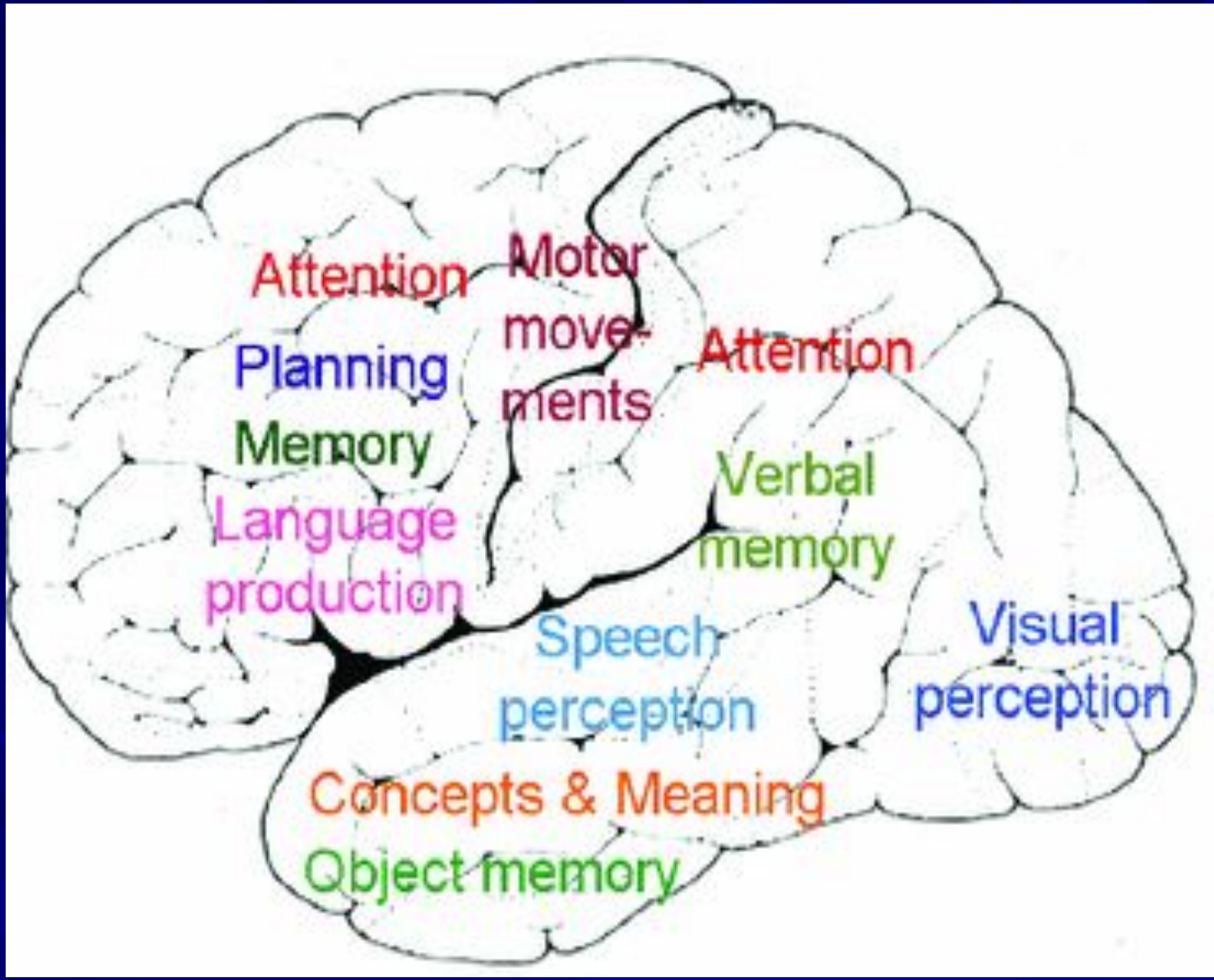


FIG. 22.

SYMBOLICAL HEAD

ILLUSTRATING THE

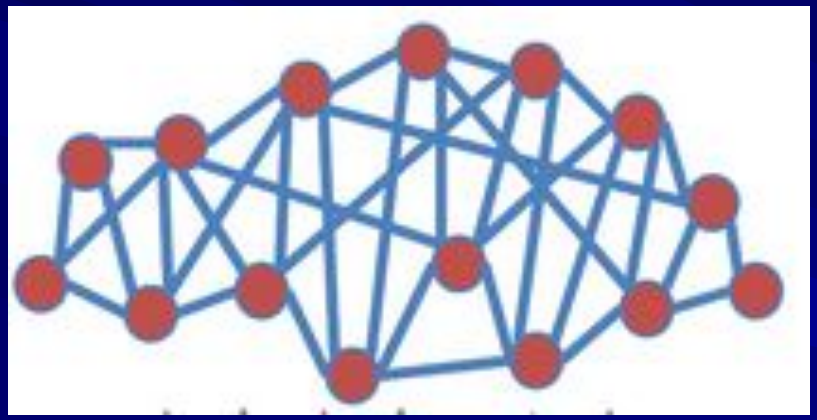
NATURAL LANGUAGE OF THE FACULTIES.


Attention
Motor move-ments
Attention
Planning
Memory
Verbal memory
Language production
Speech perception
Visual perception
Concepts & Meaning
Object memory

Luria's theory

Physiological process
(neuronal activity)

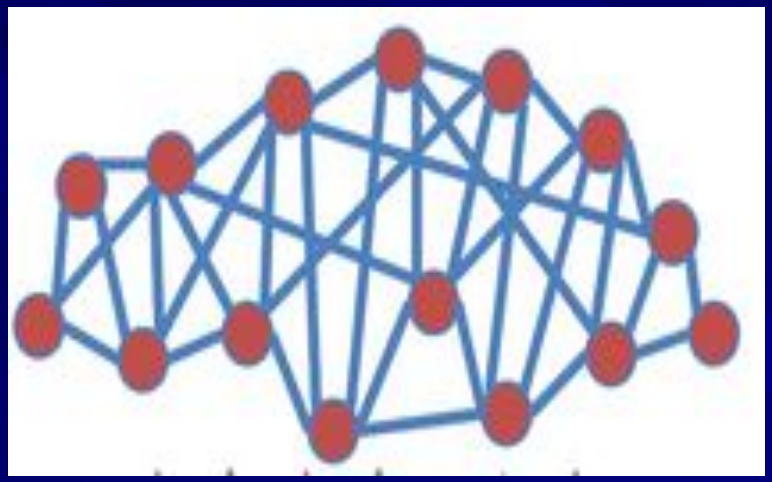
Mental process



The components of the functional systems reflect the activity of specific brain regions.

Luria's theory

Psychological process



Neuropsychological factors

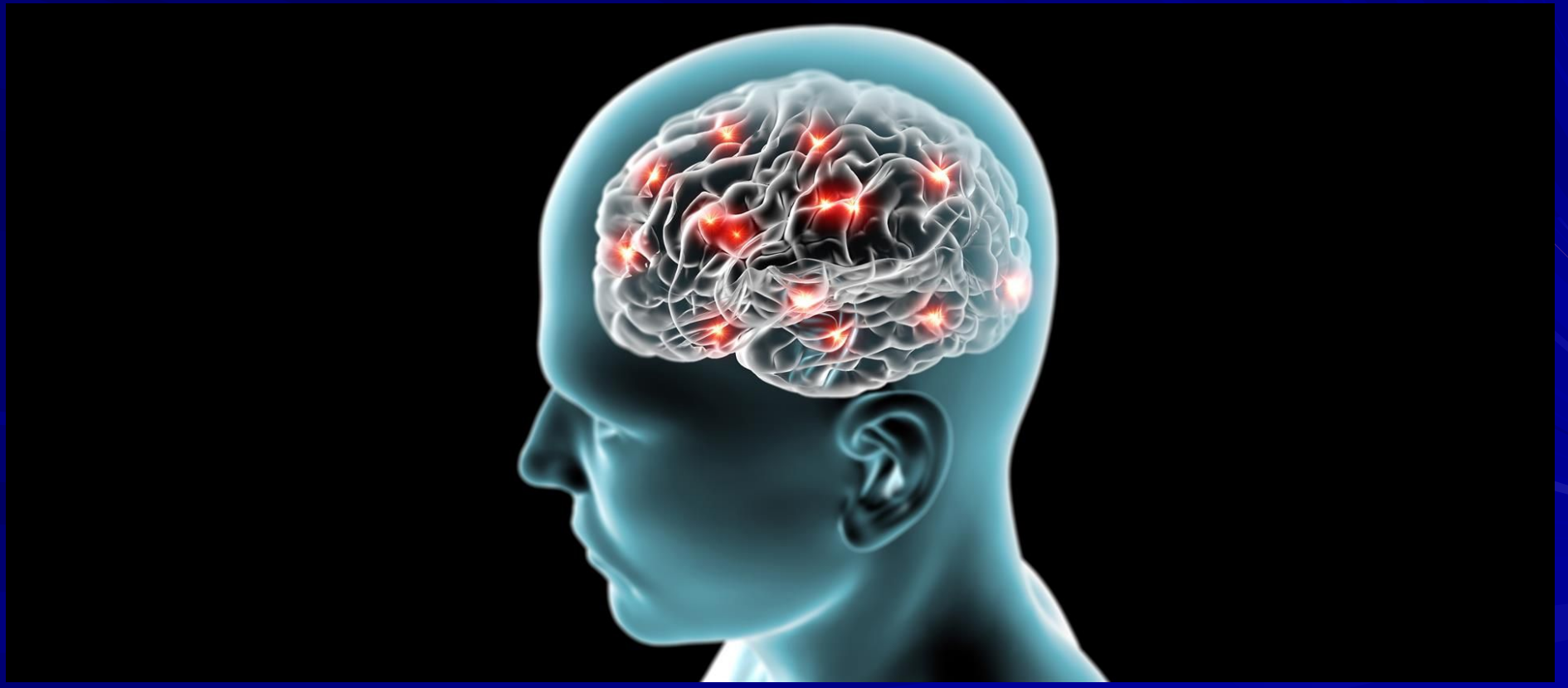
(Specific brain Mechanisms)

Physiological process

Neuropsychological factor is a specific brain mechanism that contribute to a specific component of functional system

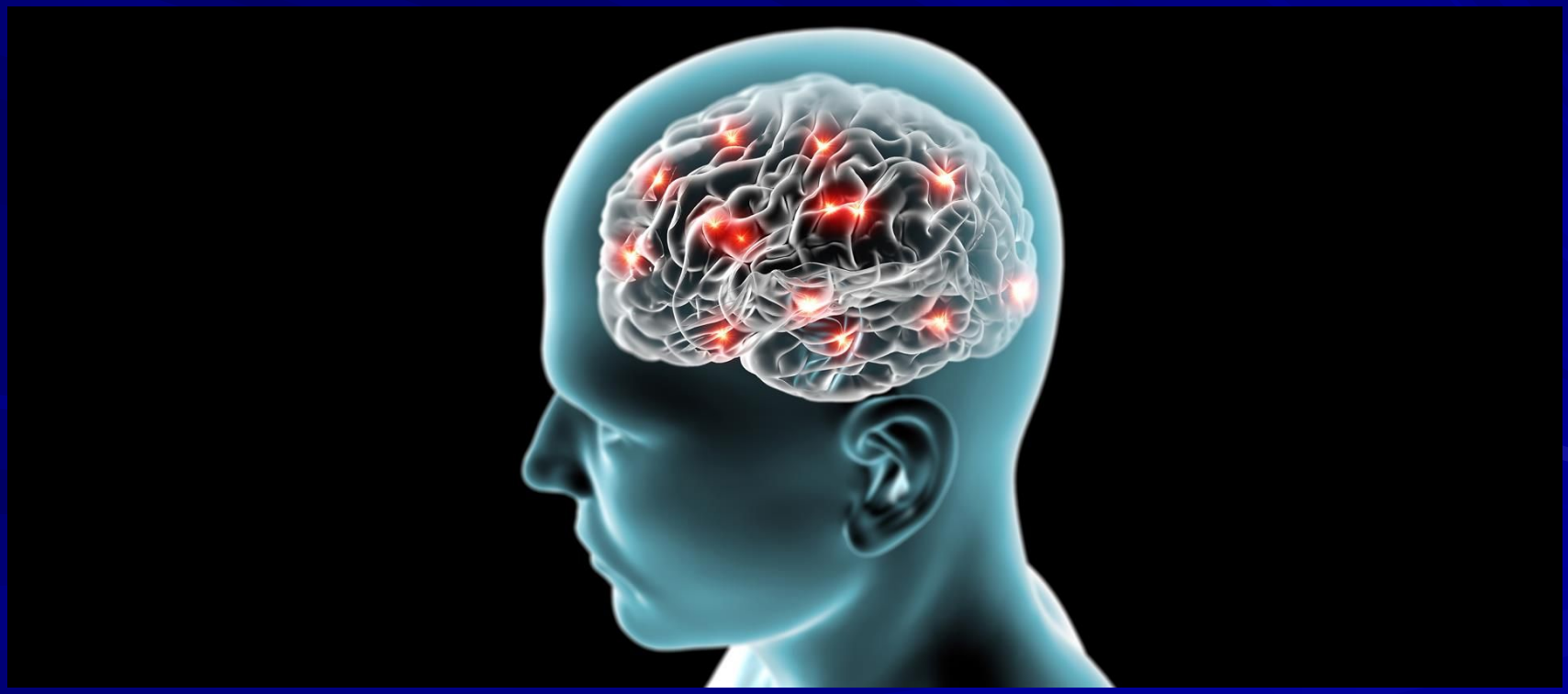
The basic concept of Luria's theory

The brain is "a functional mosaic” of specific neuropsychological factors



The basic concept of Luria's theory

Various combinations of specific neuropsychological factors provide the neural basis of cognitive processes



Dysgraphia

deficiency in the ability to write

Component of functional system	Symptoms	The role in writing	Brain area	Brain mechanism
Visual image of letter	Substitutions of visually similar letters	Visual analysis of details in letters	Visual cortex	Visual information processing
Visuospatial image of letter				

Dysgraphia

Component of the Functional System

1. Visual image of letter

q g

Dysgraphia

Symptoms and compensations

Substitutions of visually similar letters

quick – guick

Compensation

the use of kinaesthetic analysis of graphic movements

Dysgraphia

The role in writing

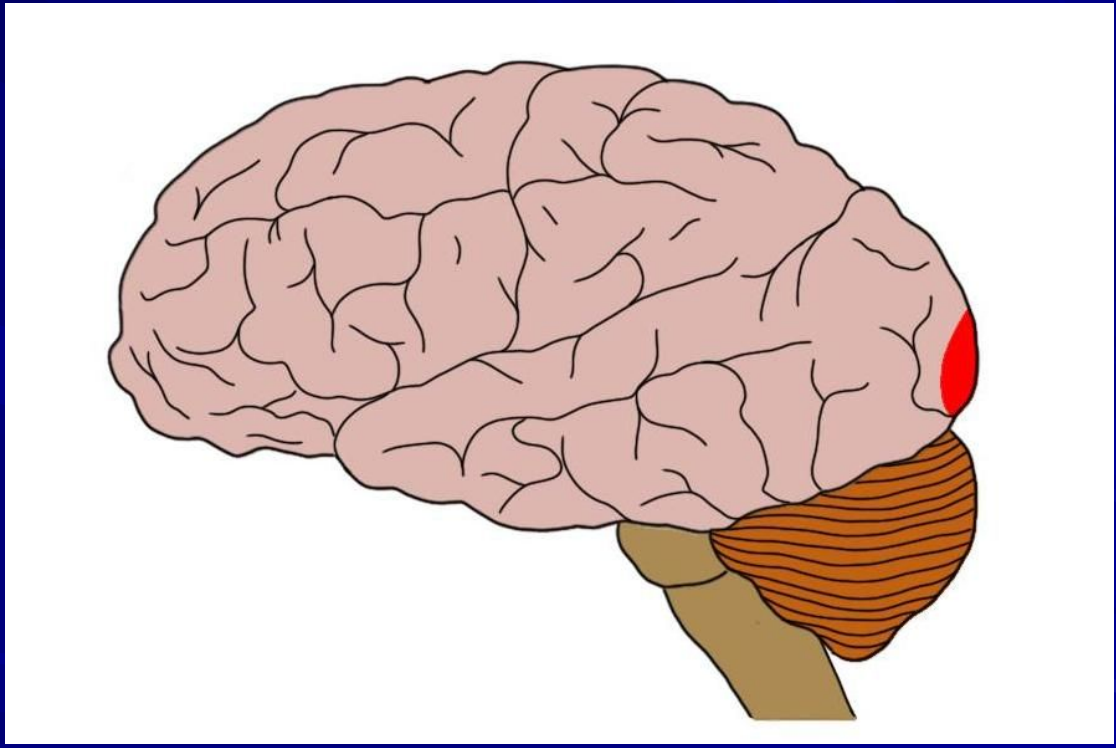
Visual analysis of details in letters

Brain area

Visual cortex (occipital lobe)

Brain mechanism

Visual information processing



Dysgraphia

Component of the Functional System

2. Visuospatial image of letter

b d q

Dysgraphia

Symptoms

Mirror writing

dog bog

Dysgraphia

The role in writing

Visual analysis of letters which have only visuospatial differences

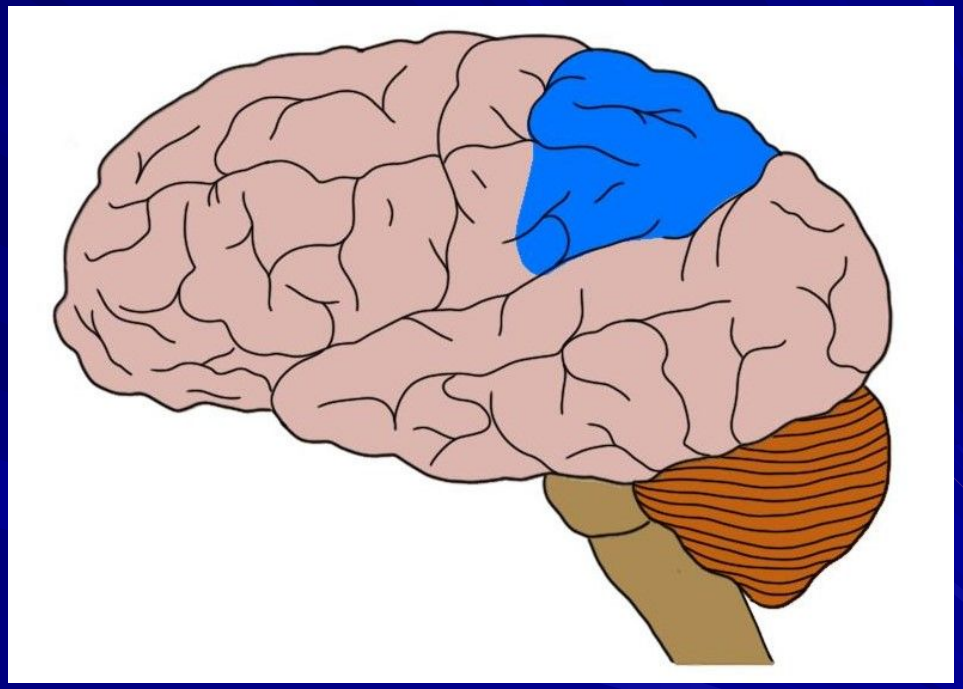
Brain area

Posterior-parietal associative cortex

(parietal lobe)

Brain mechanism

Visuospatial information processing



Dysgraphia

Component of the Functional System

3. Motor component

Afferent part

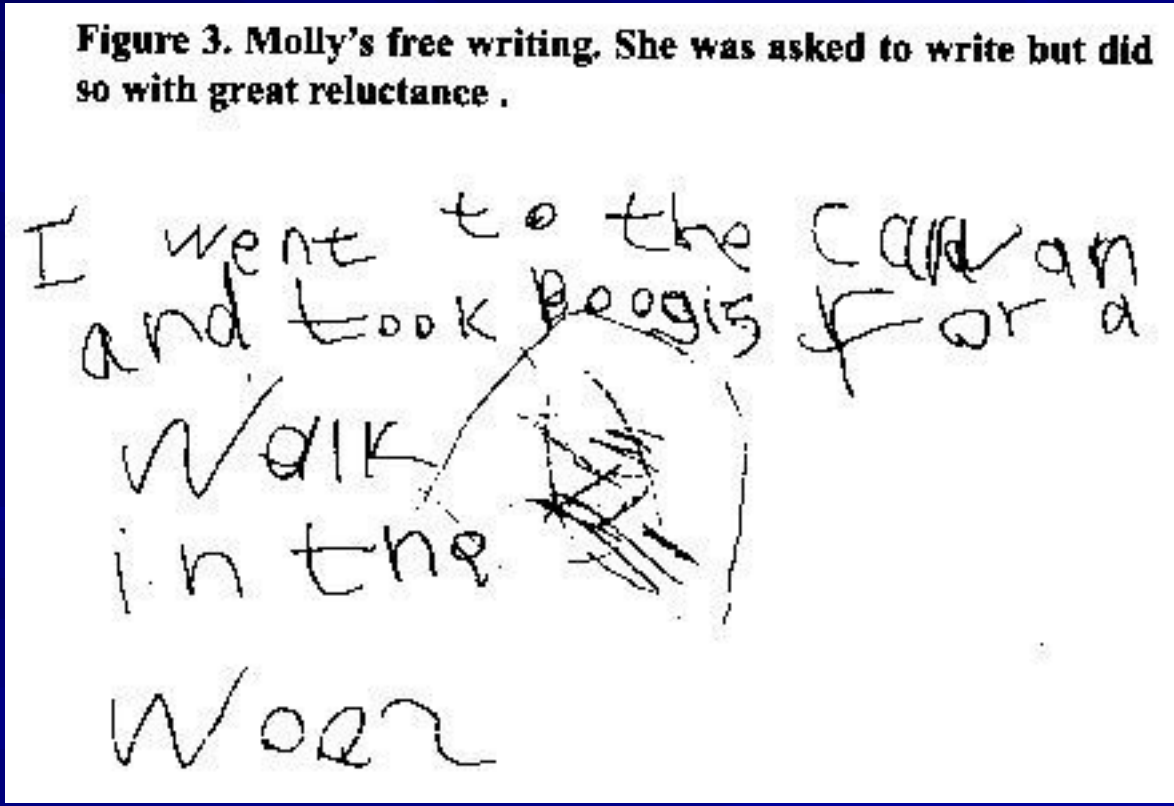
Efferent part

Dysgraphia

Afferent part

Symptoms and compensations

Clumsy writing



Dysgraphia

Afferent part

Symptoms and compensations

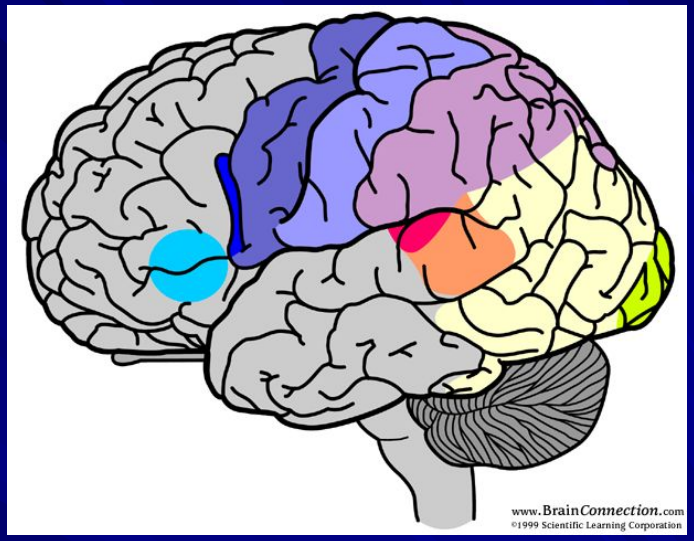
Compensation

big letters

Dysgraphia

The role in writing

Kinaesthetic analysis of graphic movements (motor schema corresponding to the image of the letter).

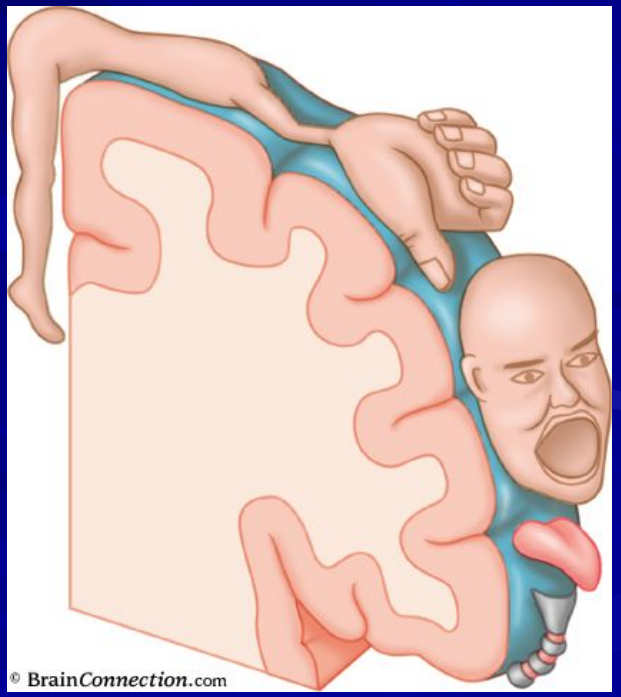


Brain area

Somatosensory cortex (hand/wrist area)

Brain mechanism

Kinaesthetic information Processing



Dysgraphia

Component of the Functional System

Motor component

Efferent part

Dysgraphia

Efferent part

Symptoms and compensations

Perseverations of elements in letters or letter

Velvet - Wellvet

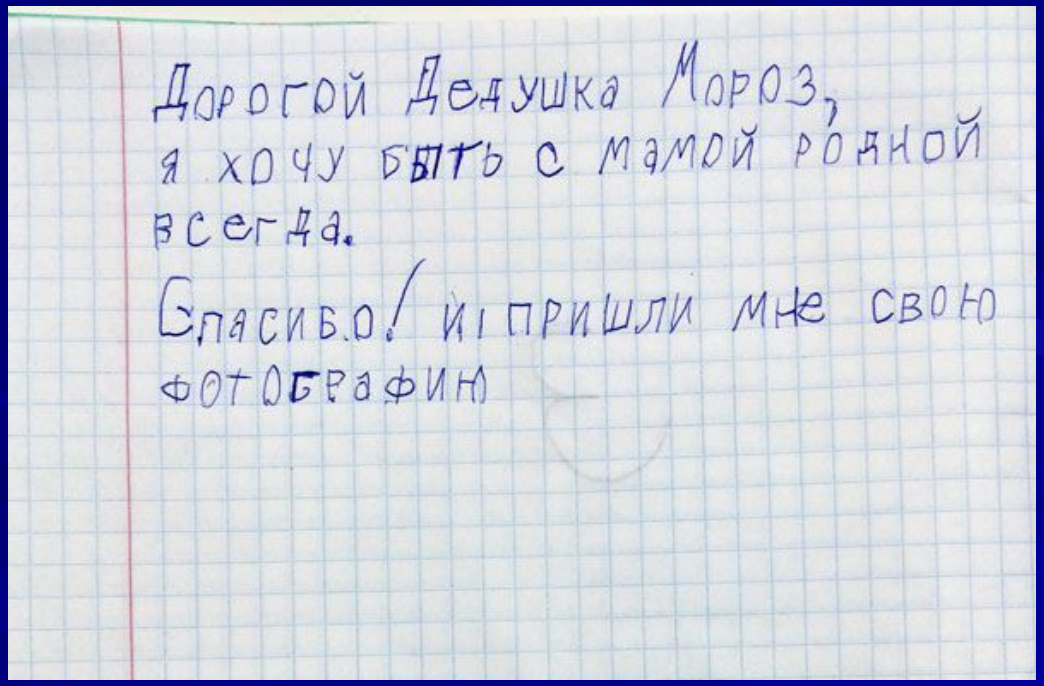
Dysgraphia

Efferent part

Symptoms and compensations

Compensation

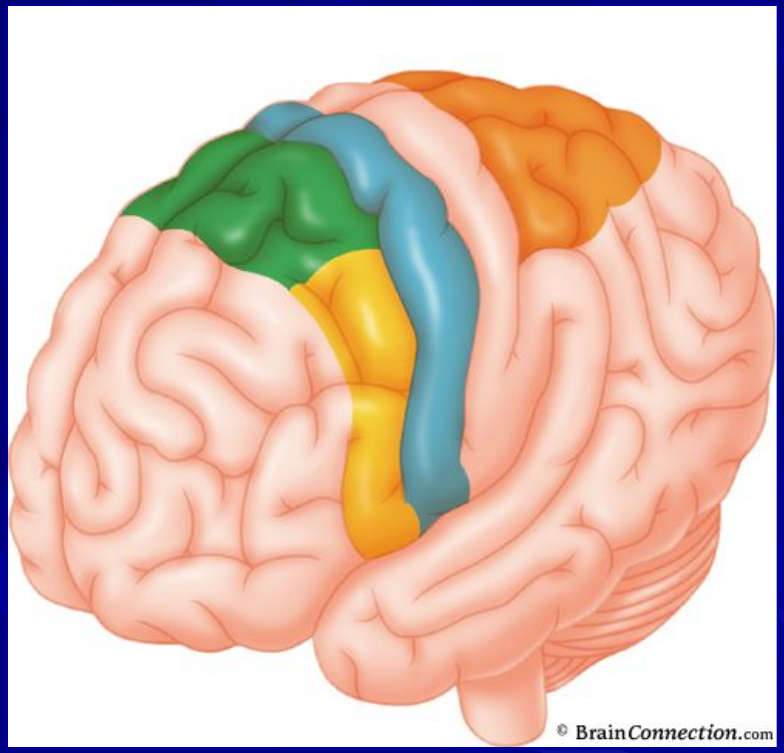
writing in printed letters



Dysgraphia

The role in writing

- Kinetic (sequential) organization of movements in writing
- Easiness of switching from one element of letter to another, from one letter to another.



Brain area

Premotor cortex (Supplementary motor cortex - SMA)

Brain mechanism

Kinetic mechanism

Dysgraphia

Component of the Functional System

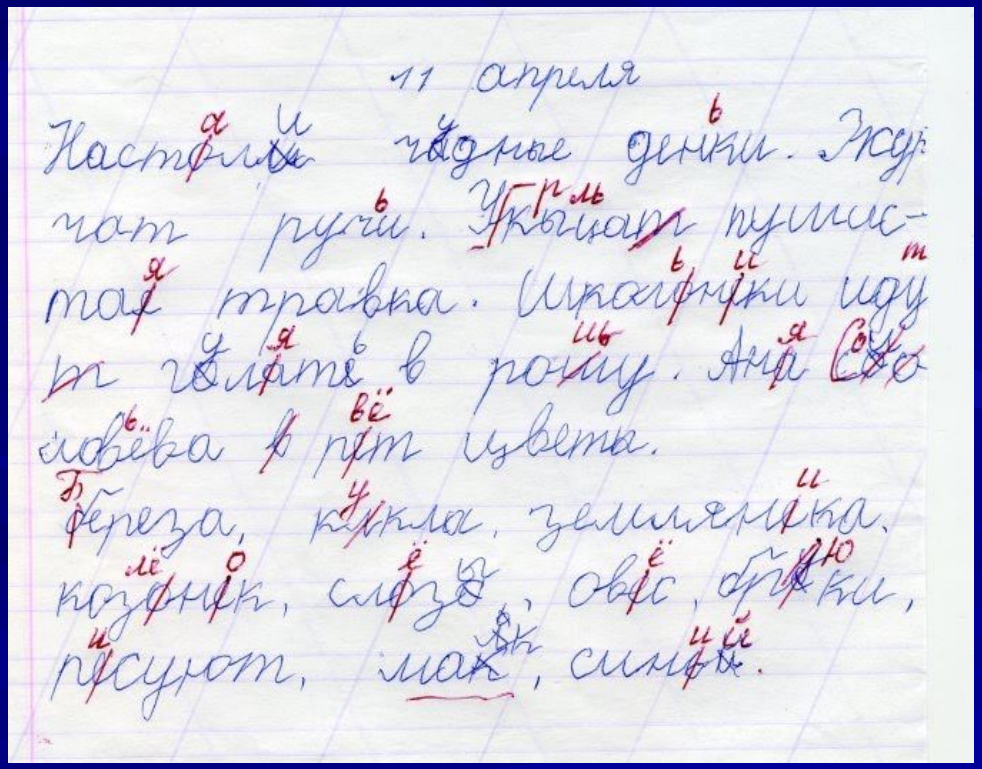
4. Control of writing

Dysgraphia

Symptoms

- Lack of capitalization and punctuation

- Grammar mistakes



Dysgraphia

The role in writing

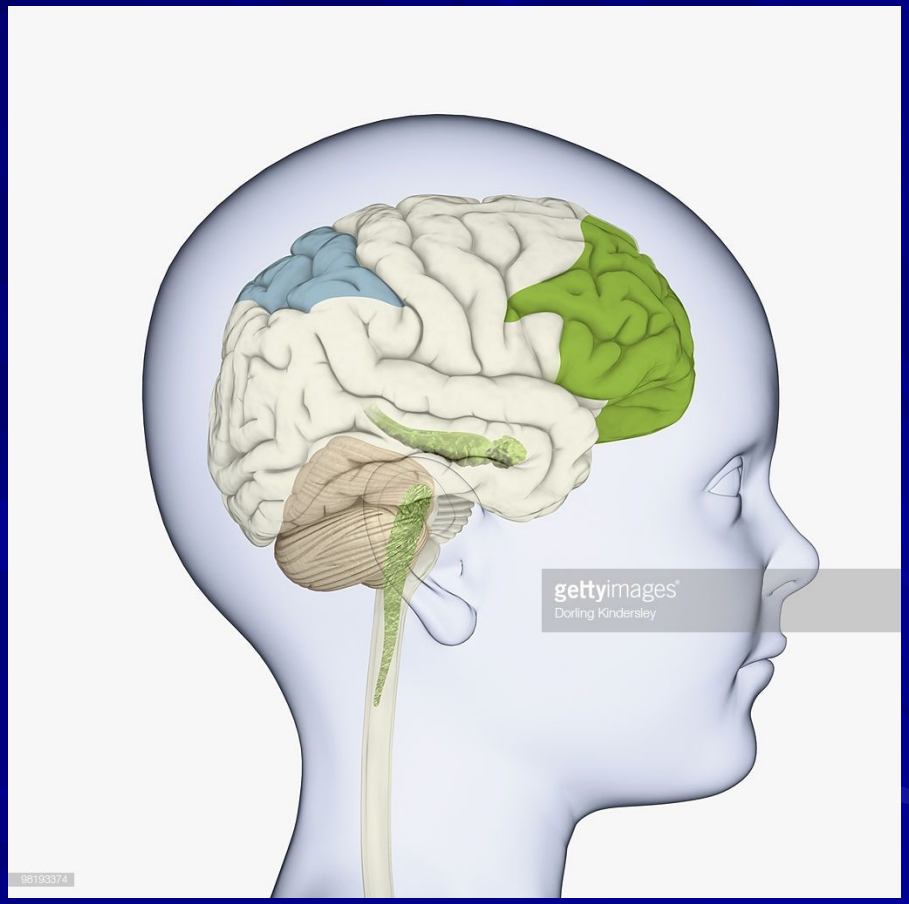
- Planning, initiation and control in writing
- Control in using punctuation and orthography rules.

Brain area

Prefrontal cortex

Brain mechanism

Executive abilities



Dysgraphia

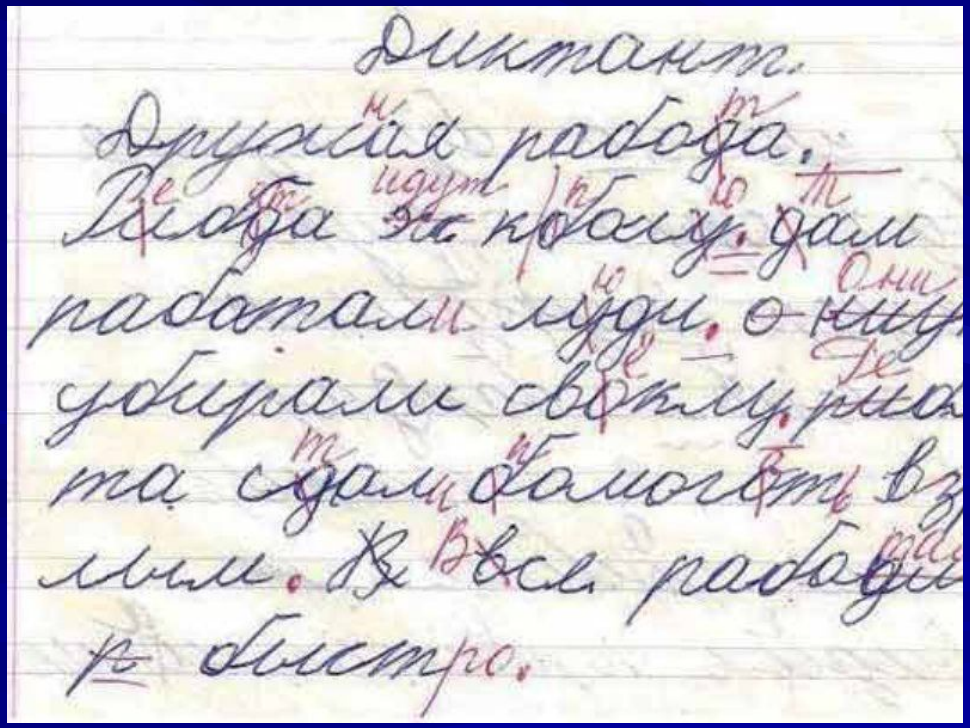
Component of the Functional System

5. Phonemic perception

Dysgraphia

Symptoms and compensations

Substitutions of opposite consonants (b/p)



Dysgraphia

Symptoms and compensations

Compensation

use of a context

Dysgraphia

The role in writing

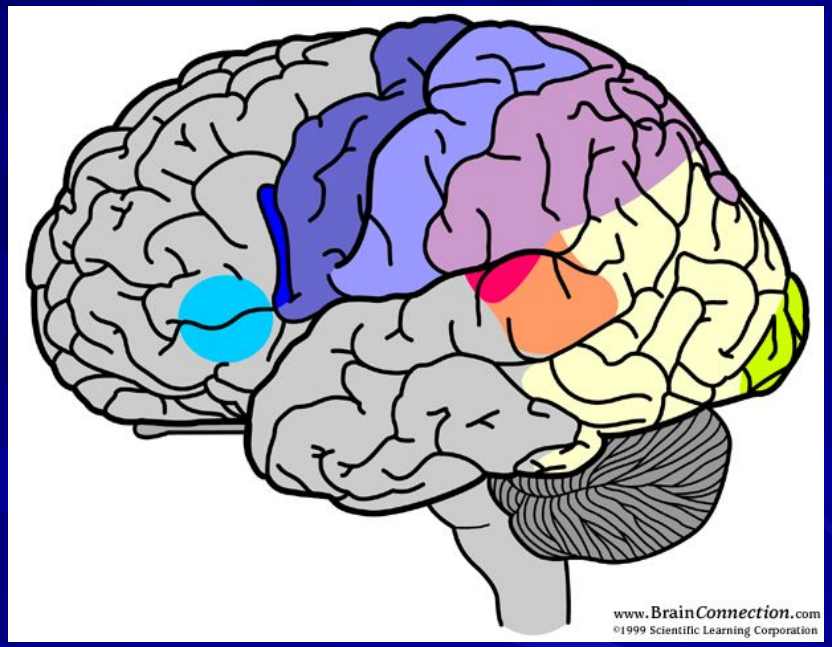
Differentiation of similar phonemes (opposite consonants, soft and hard consonants)

Brain area

Primary auditory area of left temporal cortex

Brain mechanism

Phonemic information Processing



Dysgraphia

Component of the Functional System

6. Working memory

Dysgraphia

Symptoms and compensations

- Omissions of words in sentences

- Changing position of words in a sentences

- *Compensation* – replacement words close in meaning

My friend Peter will come to me on Sunday.

My friend will come to me

Dysgraphia

The role in writing

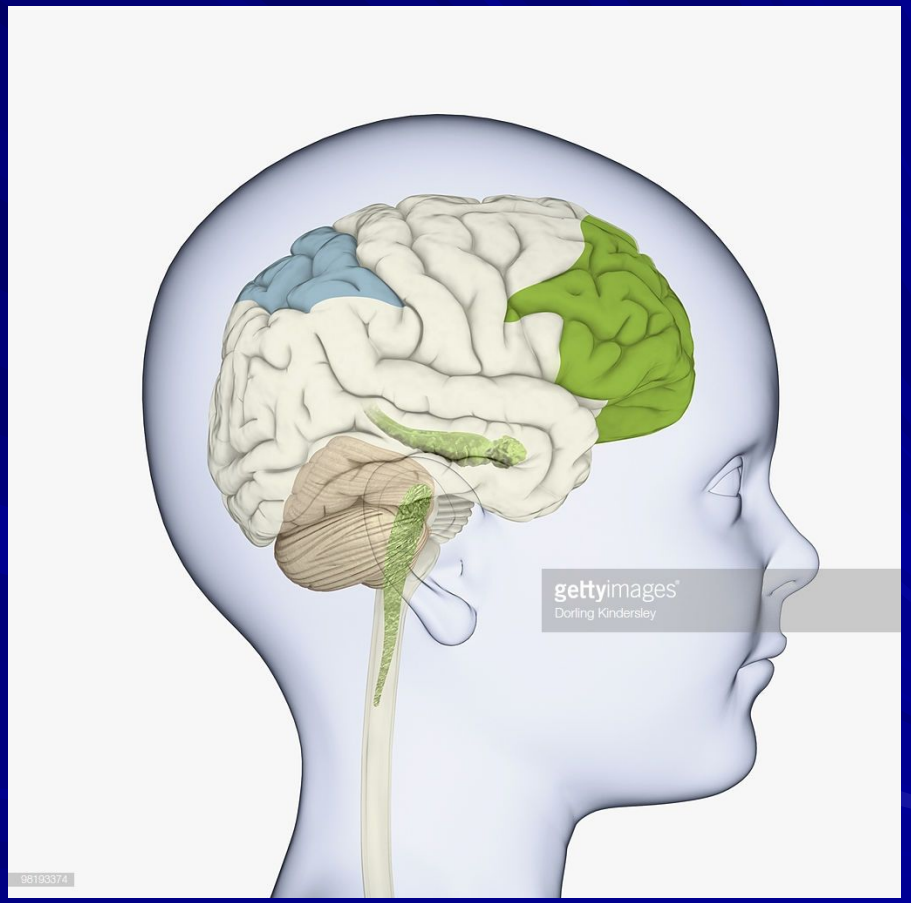
Retaining information for writing using working memory

Brain area

Prefrontal cortex

Brain mechanism

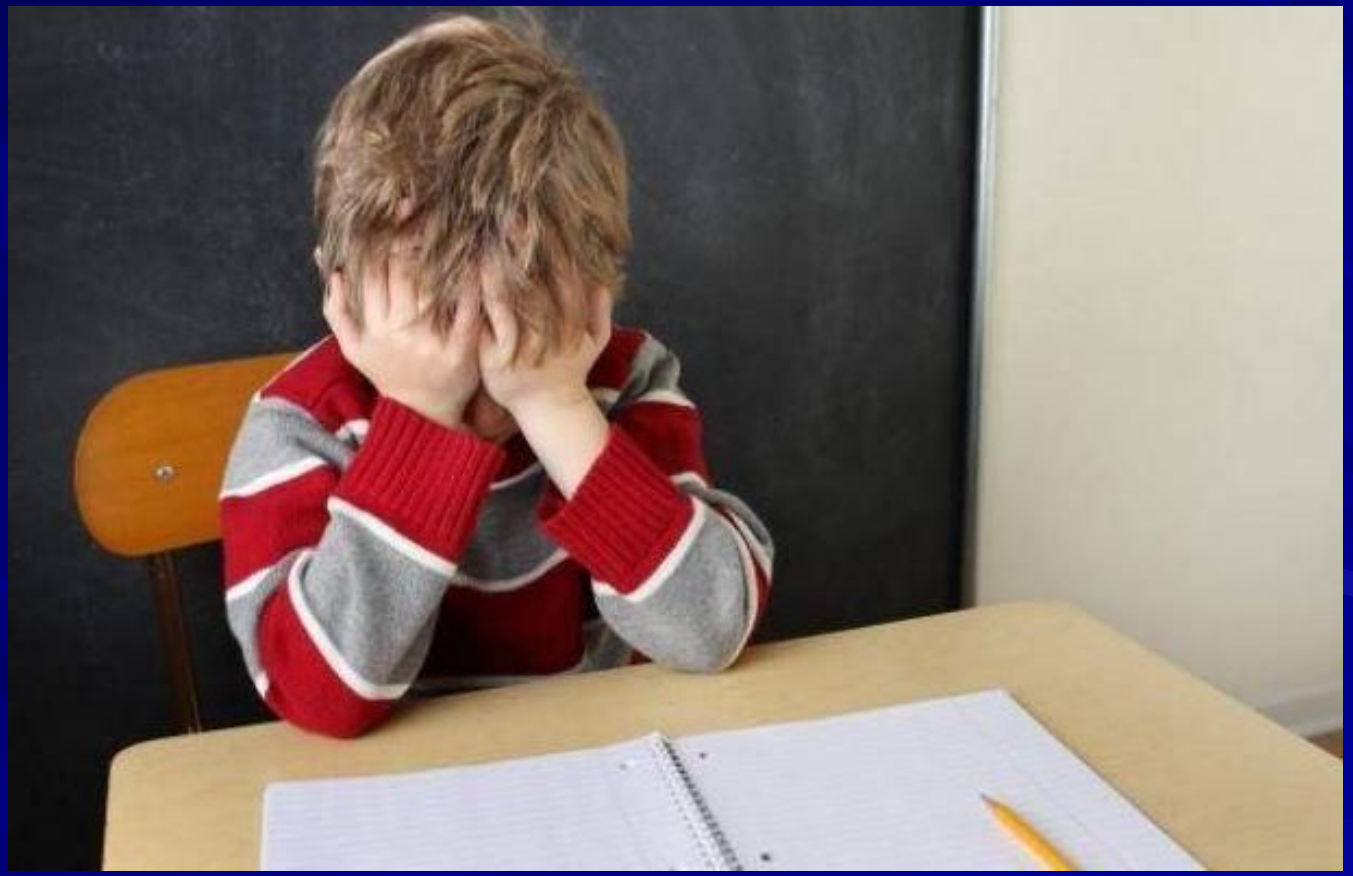
Working memory



Dysgraphia

Component of the Functional System

7. Stability in writing



Dysgraphia

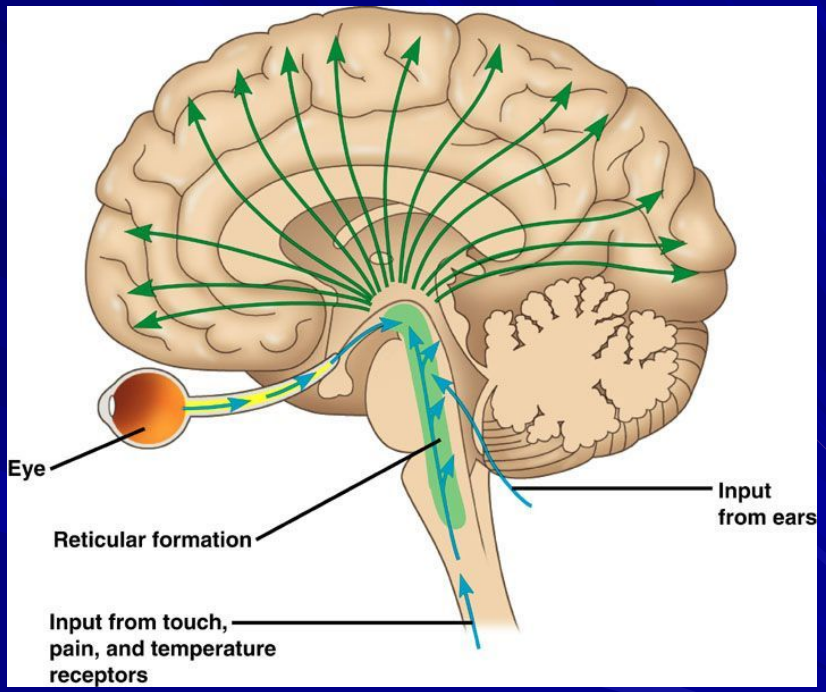
Symptoms of disturbances and compensations

- Micrographia
- Fluctuations in pen pressure
- Intervals disproportion
- Slow writing
- Difficulties in retaining working posture
- Large fluctuations in the rate and success of writing during a lesson

Dysgraphia

The role in writing

- Maintaining the level of cortical activation during writing
- Stability of activation and attention concentration



Brain area

First functional unit (unit of activation)

Brain mechanism

Neurodynamic mechanism