

What About Handwriting? It's Complicated!



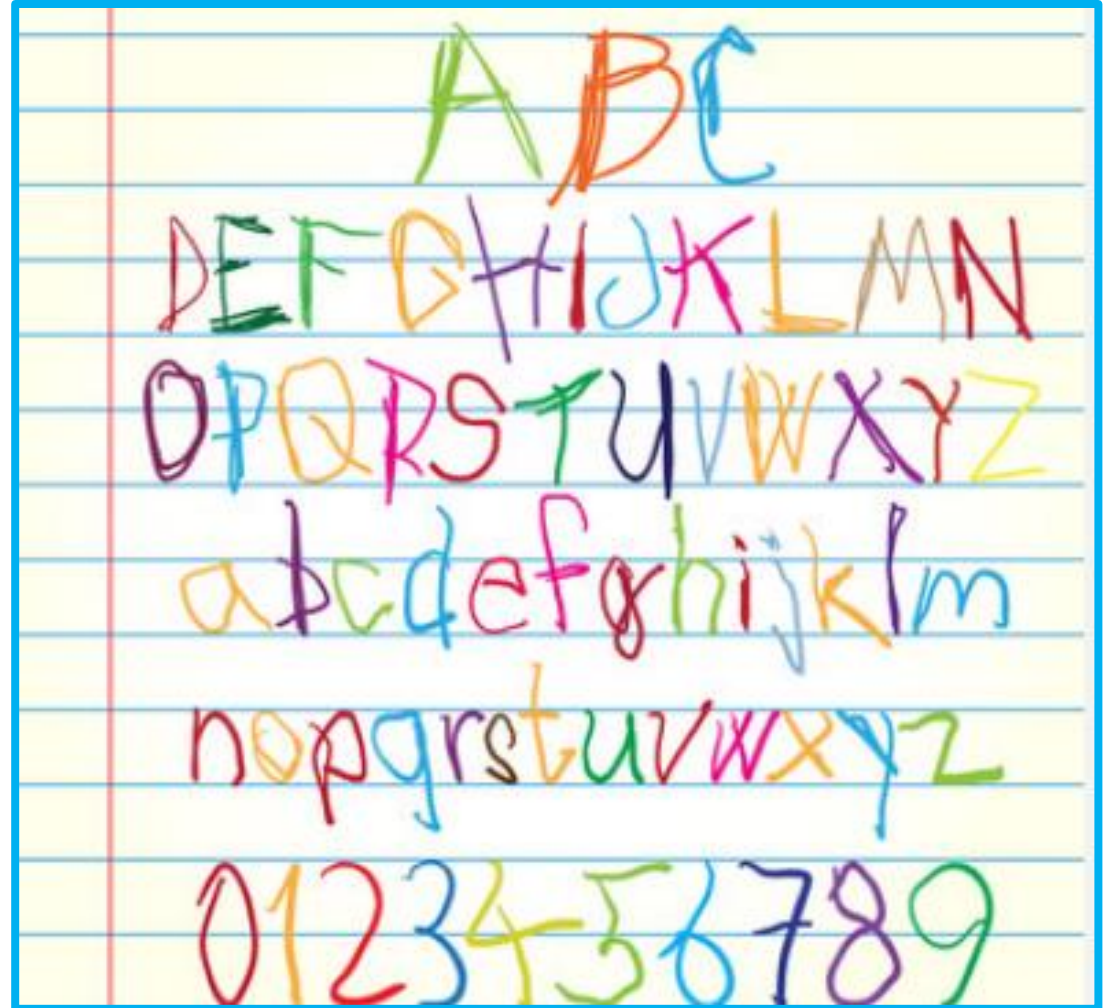
Robin Rettie, M.Ed, Special Education

Lighthouse Learning Resources

&

www.senso-science.com

YAY, Me!!!



Prewriting and Development

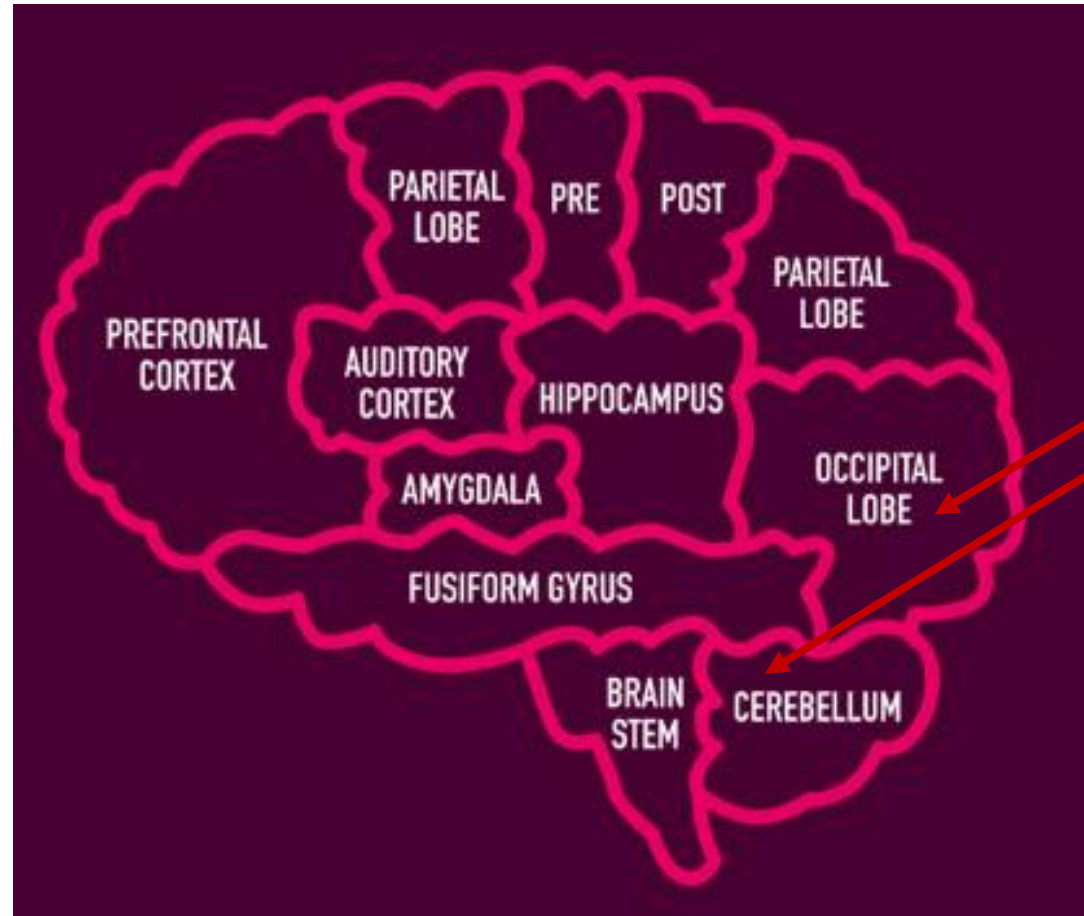
Each time our child (spontaneously- meaning using their own hands) draws a pre-writing shape, they are creating or further developing:

- Pathways in their **brain**
- Strengthening their **muscles** inside of their hands
- Developing the understanding of how hard or soft the **press** down ([sensory development](#))
- Learning to **coordinate micro-movements** of the shoulder, elbow, wrist and fingers
- Testing out different **grasps** using different types of writing materials
- Beginning to understand themselves as independent people who have to **ability to create** (ie: creativity and autonomy)

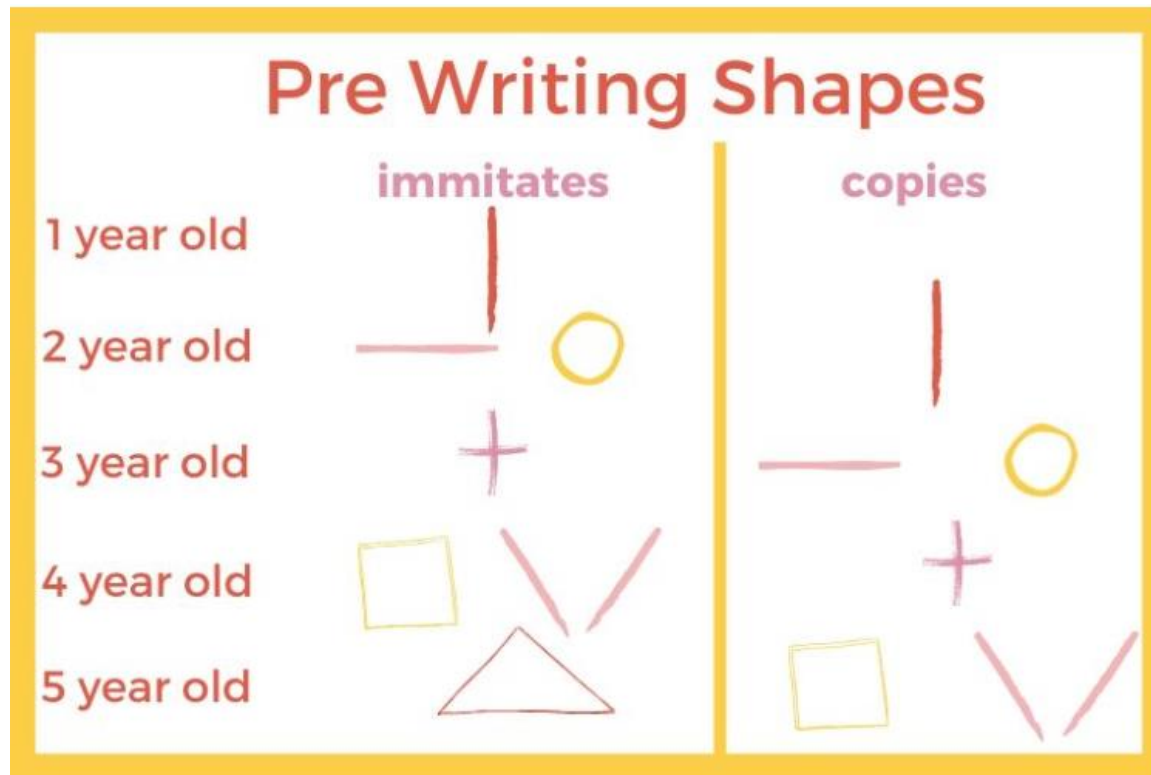
When light hits the **retina** (a light-sensitive layer of tissue at the back of the eye), special cells called photoreceptors turn the light into electrical signals.

These electrical signals travel from the retina through the **optic nerve** to the brain. Then the brain turns the signals into the images you see.

https://www.google.com/search?q=how+do+humans+see&rlz=1C1VDKB_enUS959US959&oq=how+do+humans+see&gs_lcrp=EgZjaHJvbWUyCQgAEEUYORiABDIHCAEQABiABDIHCAIQABiABDIHCAMQABiABDIHCAQQABiABDIHCAUQABiABDIHCAYQABiABDIHCACQABiABDIHCAgQABiABDIHCAkQABiABNIBCDQwOTNqMGo5qAIAAsAIB&sourceid=chrome&ie=UTF-8#fpstate=ive&vhid=Tu6AFAY3920-oM&vld=cid:0db6f8df,vid:TY1giZgddAs,st:0&vssid=l



The occipital lobes sit at the back of the head and are responsible for visual perception, including color, form and motion.



Perfection is NOT expected with developing writing skills!

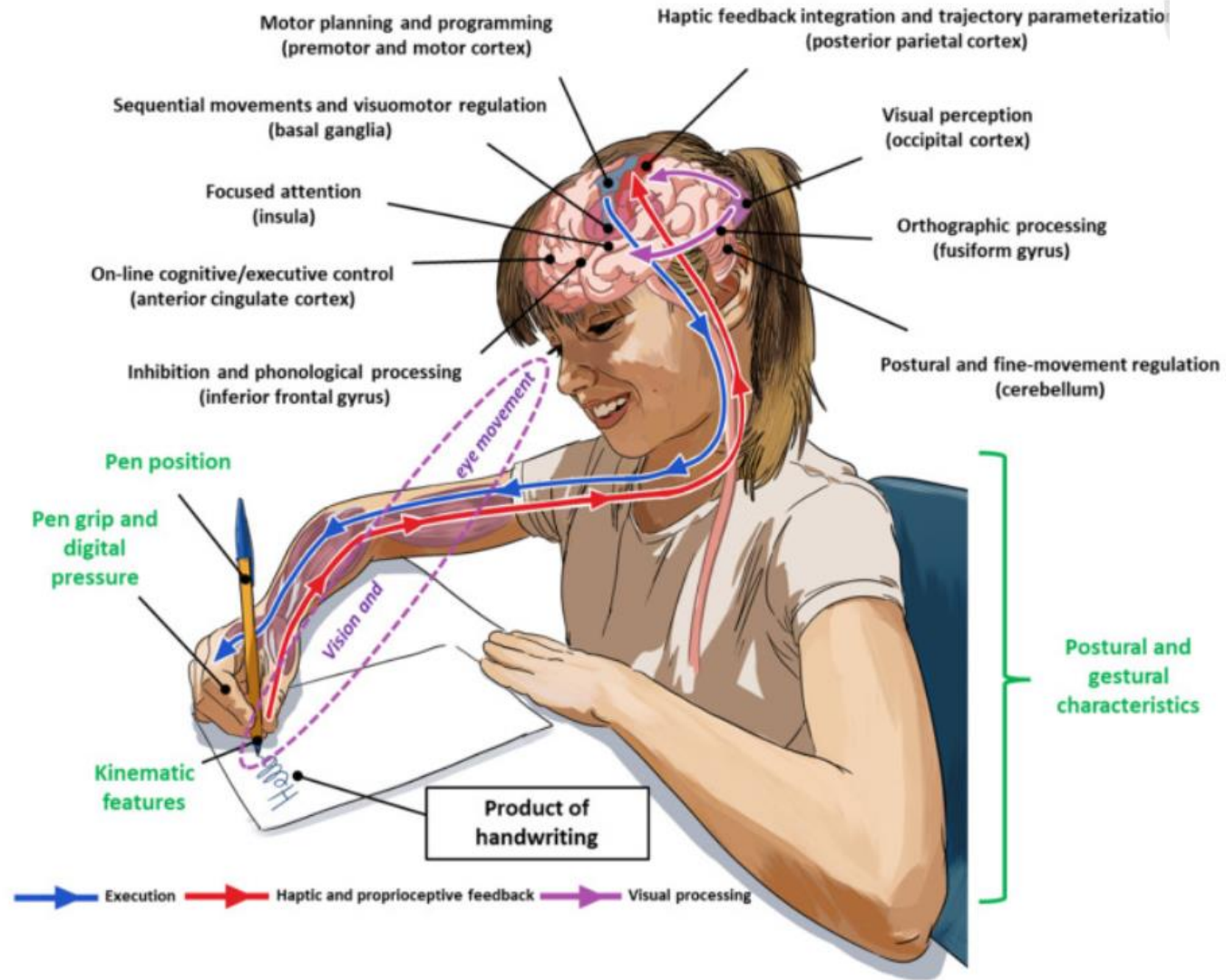
- **1 year old:** imitates vertical line
- **2 year old:** imitates horizontal line and circle, and copies vertical line
- **3 year old:** imitates + and copies horizontal line and circle
- **4 year old:** imitates square, left and right diagonal lines (\ /) and copies plus sign.
- **5 year old:** imitates triangle and copies square, left and right diagonal lines (\ /)

Teaching vs. Exposure

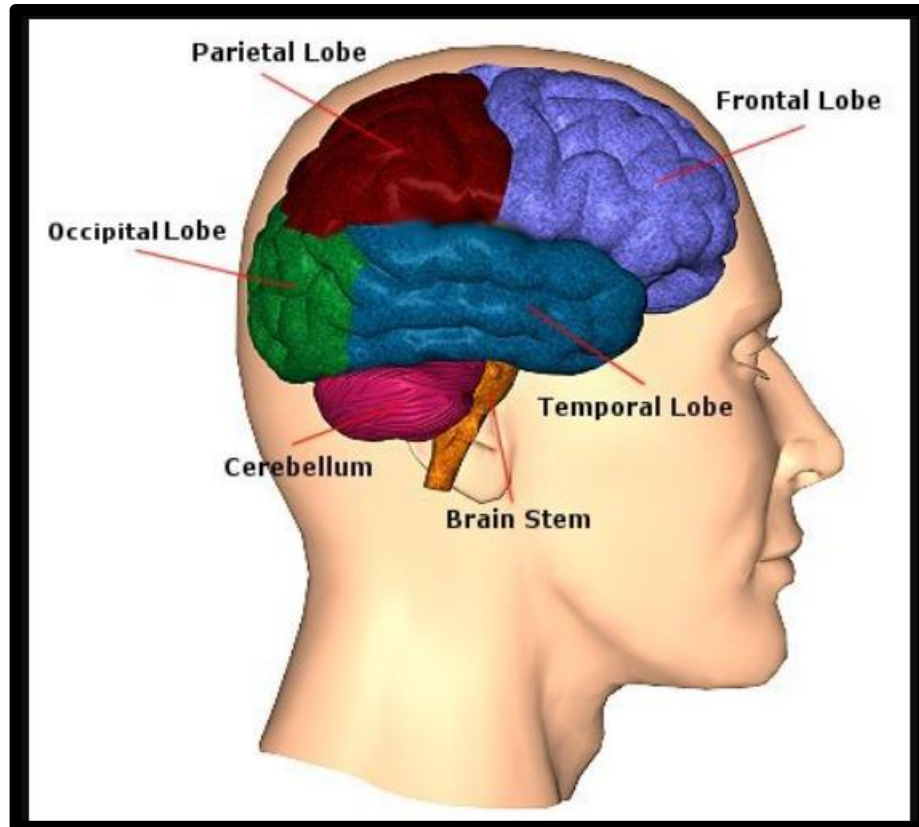
Imitate: After watching someone else draw the pre writing shape, the toddler is able to draw it themselves.

Copy: The toddler can look at a picture of a pre-writing shape and reproduce it.

<https://otholly.com/pre-writing-shapes/#:~:text=By%20age%204%20your%20toddler,left%20and%20right%20diagonal%20lines.>



<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10813961/figure/children-11-00031-f001/>



In utero: XX – human brain default is female brain, both sides of the brain are developing word ability – verbal.


XY chromosome testosterone comes in at about 4 months and reformats the male brain; when born, male brain has not developed verbal on the right side of the brain. Result is more males develop visual/spatial skills on the right side.

XX females utilize both sides of the brain use for word ability – verbal.

Parietal Lobe: near the back and top of the head above the ears; **the parietal lobe controls the ability to read, write, and understand spatial relationships.**



What does it appear to be a child's angst when communicating about coloring/handwriting/cutting?

- ✎ Discomfort when writing, such as painful feelings in hands.
- ✎ Unrecognized vision deficits, neuromuscular eye disorders.
- ✎ Inability to recall stroke patterns; top/bottom, left to right. 
- ✎ Dyspraxia, neurodevelopmental condition in children - (developmental coordination disorder).
- ✎ Processing Speed, Working Memory...?

Executive function, letter knowledge, motor skills, and writing surface.



Behavior





Nonpreferred task






ASSESSMENTS

WRITTEN EXPRESSION

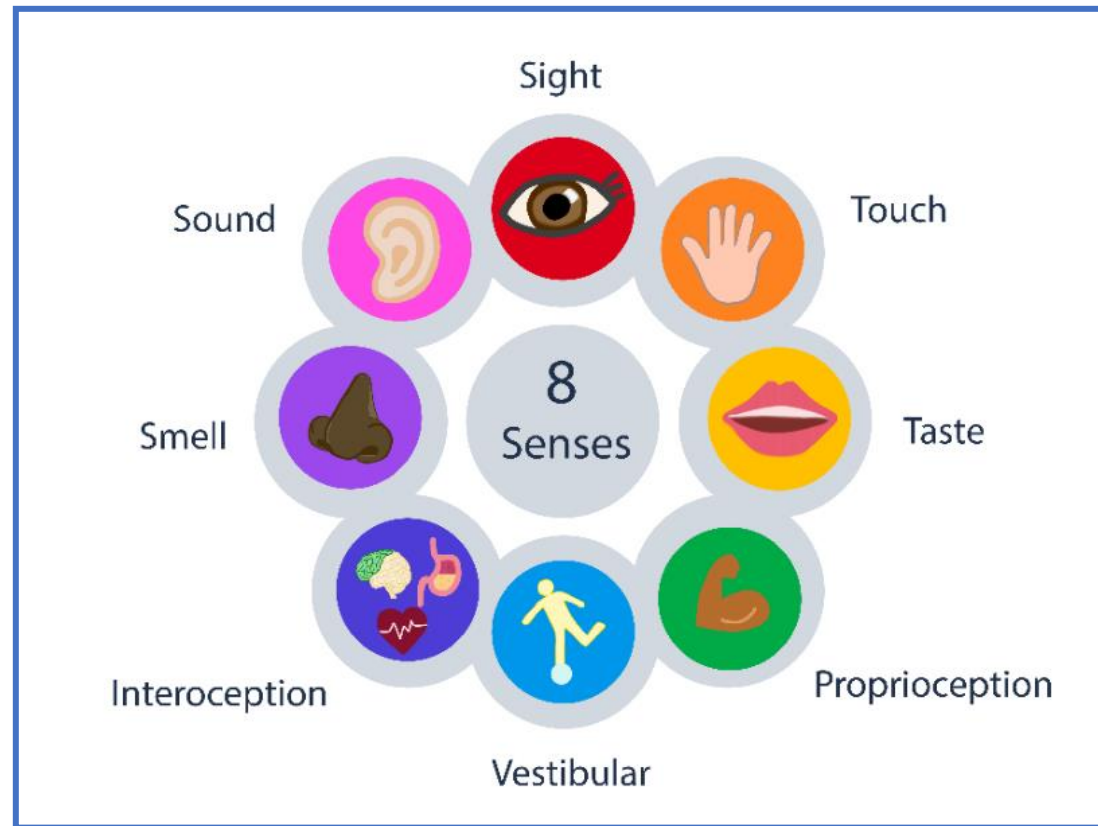
-  TOWL Test of Written Language | Fourth Edition - writing achievement and read or hear a prepared story starter
-  TOWE Test of Written Expression | Fourth Edition - spelling, punctuation, word usage, and quality

OCCUPATIONAL THERAPY

-  Screener of Handwriting Proficiency – HWT, FREE!
(<https://www.lwtears.com/resources/screener-handwriting-proficiency>)
-  THS-R; The Test of Handwriting Skills, Revised – untimed
-  Beery VMI - Beery Buktencia Developmental Test of Visual Motor Integration – 6th Edition.

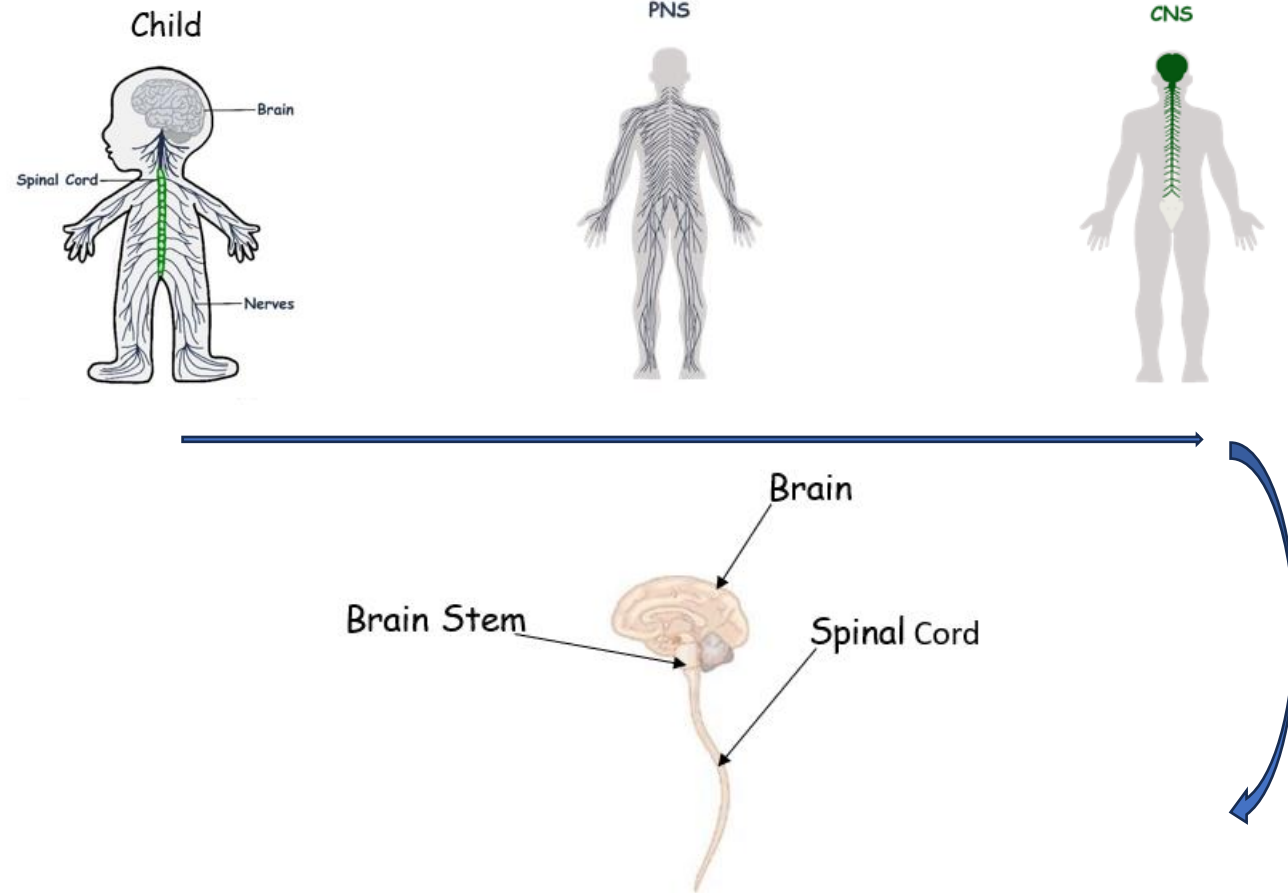
Georgia Writing Project (GaWP) provides educators in schools and/or districts with high-quality professional learning emphasizing teachers as writers to develop students as writers.

 **Why** is handwriting causing my child to meltdown?



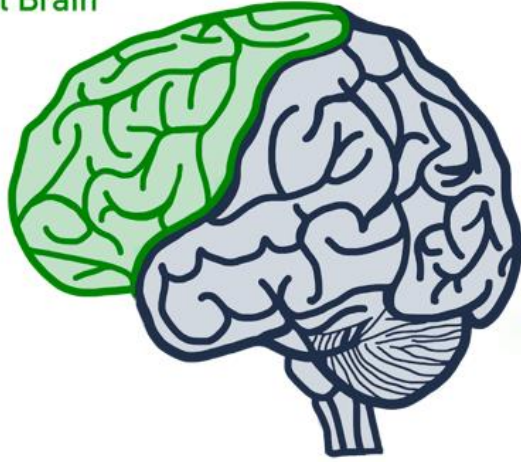
Contributing factors: Sensory Processing challenges, Memory (short/long) – Motor Planning, Executive Functioning - coping, Ocular Deficits, Processing Speed, Fluidity, Letter Reversal, and Case Substitutions, Phonological Processing, Auditory Process, Orthography, and other contributing conditions.

Body external stimuli process



Brain

Rational Brain



Emotional Brain

Global regions of the brain that interact to maintain self-regulation:
rational brain - prefrontal cortex and emotional brain - limbic system.

Prefrontal Cortex



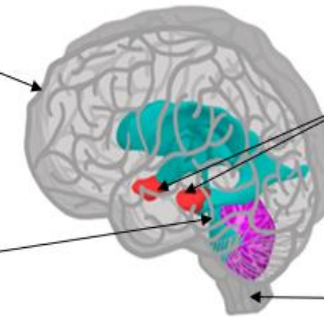
Amygdalas









Hippocampus



Brainstem



How is demystify handwriting challenges processes supportive?

-  Share the child's learning challenge with him/her – **Name it to tame it!**
-  ADHD, Autism, Disorder of Written Expression, Dysgraphia, etc.
-  Research with your child/students others who are diagnosed with similar needs.
-  “Challenges” and “Strengths”.
-  Encourage, teach, and demonstrate self-advocacy.
-  One-page-profile

The connection between ADHD and handwriting is so common that some researchers suggest that doctors include a handwriting analysis as part of testing for ADHD. Teachers often report immature, messy handwriting in students with ADHD.

FYI...

- Unknown visual impairment (VI) due to;
 - Intermittent Alternating Exotropia,
 - Convergence Insufficiency,
 - Deficiency of Saccadic Eye Movement,
 - Disorders of visual cortex (due to) inflammatory disorders which qualifies as a Cortical Visual Impairment.

Cortical Visual Impairment due to inflammatory disorder (right side of the brain) located in the occipital lobe, the visual cortex is the primary cortical region of the brain that receives, integrates, and processes visual information relayed from the retinas.

Damage to this area of the brain is often described as Cortical Visual Impairment. CVI is a temporary or permanent visual impairment caused by the disturbance of the posterior visual pathways and/or the occipital lobes of the brain. It is a condition that indicates that the visual systems of the brain do not consistently understand or interpret what the eyes see.

Convergence Insufficiency is the inability to maintain binocular function due to eye muscle coordination (keeping the two eyes working together) while working at a near distance. Exotropia is a form of strabismus (eye misalignment) in which one or both eyes turn outward.

Saccadic Eye Movement/Oculomotor Dysfunction (OMD) Deficiency is also known as Ocular Motility Dysfunction, which is the inability of the eyes to accurately jump from one target to another

Gross Motor Activities

Crossing the Midline

•Crosswalks

- Stand upright
- Lift LEFT knee up in a marching motion and place RIGHT hand on LEFT knee
- Repeat with opposite arm and knee and continue in a rhythmic movement

•Windmills

- Stand upright with feet spread apart
- Straighten both arms out to the side
- Reach down with RIGHT arm and touch LEFT foot
- Repeat with opposite arm and foot and continue in a rhythmic movement

•Tracing the infinity sign


•Opposite knee to elbow

- This exercise is similar to Crosswalks except you touch your elbow to your opposite knee while standing upright.

•Reaching across body with trunk rotation to grab pieces of puzzle, blocks, etc. to put together on opposite side

Before Writing



-  Prewriting Exercises
-  Draw ideas
-  Write

Handwriting and Written Expression

Handwriting: putting ideas on paper with a writing tool; pen, pencil, etc., which may or may not be legible for the reader determine the meaning of the form or content.

Written Expression: putting ideas on paper to convey thoughts or messages, a written form of communication.

Haptic, the ability to grasp something - perception of objects by touch and proprioception, especially as involved in nonverbal communication.

Science - The more you write, the more neural connections are formed within your brain. When you pen words on paper, the neurons in your brain fire signals at rapid speed, thus enabling you to make more connections

Handwriting is an important activity, which requires complex sensorimotor, perceptual, and cognitive skills.

Resources

Brain Structure and Function

<https://web.northeastern.edu/nutraumaticbraininjury/braintbi-anatomy/brain-functions/#:~:text=Parietal%20Lobe%3A%20near%20the%20back,write%2C%20and%20understand%20spatial%20relationships.>

Psychologically speaking: your brain on writing

<https://uwaterloo.ca/writing-and-communication-centre/blog/psychologically-speaking-your-brain-writing>

List of Occupational Therapy Assessment Tools

<https://www.pearsonclinical.com.au/products/occupational-therapy-and-physiotherapy.html>

Testing Written Expression: Myths and Misconceptions by Melissa Farrall, Ph.D.

<https://www.wrightslaw.com/info/test.written.lang.htm>

Types of Educational tests

<https://concordspedpac.org/TypesTests.html>

Videos

Childhood dyspraxia: James' story

<https://www.youtube.com/watch?v=ncnVYonMA5Y>

Michael Gurian on Brain Development and Writing

<https://www.youtube.com/watch?v=23gEcTPYFic>

CITATION

Is There a Deficit in Product and Process of Handwriting in Children with Attention Deficit Hyperactivity Disorder?

A Systematic Review and Recommendations for Future Research

Frédéric Puyjarinet¹, Yves Chaix^{2,3}, Maëlle Biotteau^{2,3}

Affiliations

- PMID: 38255345
- PMCID: PMC10813961
- DOI: 10.3390/children11010031

<https://pubmed.ncbi.nlm.nih.gov/38255345/>

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