



WRITING BY PENS AND PENCILS VS. DIGITAL DEVICES: INSIGHTS FROM ONGOING LEARNING SCIENCE RESEARCH

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HANDWRITING VS. TYPEWRITING

As digital devices progressively replace pen and paper, taking notes by hand is becoming increasingly uncommon in schools and universities.

Using a keyboard is recommended because it's often faster than writing by hand.

Nonetheless, the latter has been found to improve spelling accuracy and memory recall.



HANDWRITING BUT NOT TYPEWRITING LEADS TO WIDESPREAD BRAIN CONNECTIVITY

“Typing may be faster than writing by hand, but it’s less stimulating for the brain.”

(Van der Weel and Van der Meer, 2024)

Frontiers in Psychology

WRITING BY HAND MAY INCREASE BRAIN CONNECTIVITY MORE THAN TYPING ON A KEYBOARD

After recording the brain activity of 36 university students, researchers in Norway determined that writing by hand may improve learning and memory.

A participant in the Norway study. Courtesy NTNU



WHAT DOES LEARNING SCIENCE SAY?

Handwriting activates almost the whole brain as compared to typewriting, which hardly activates the brain as such.

(Van der Weel and Van der Meer, 2024)

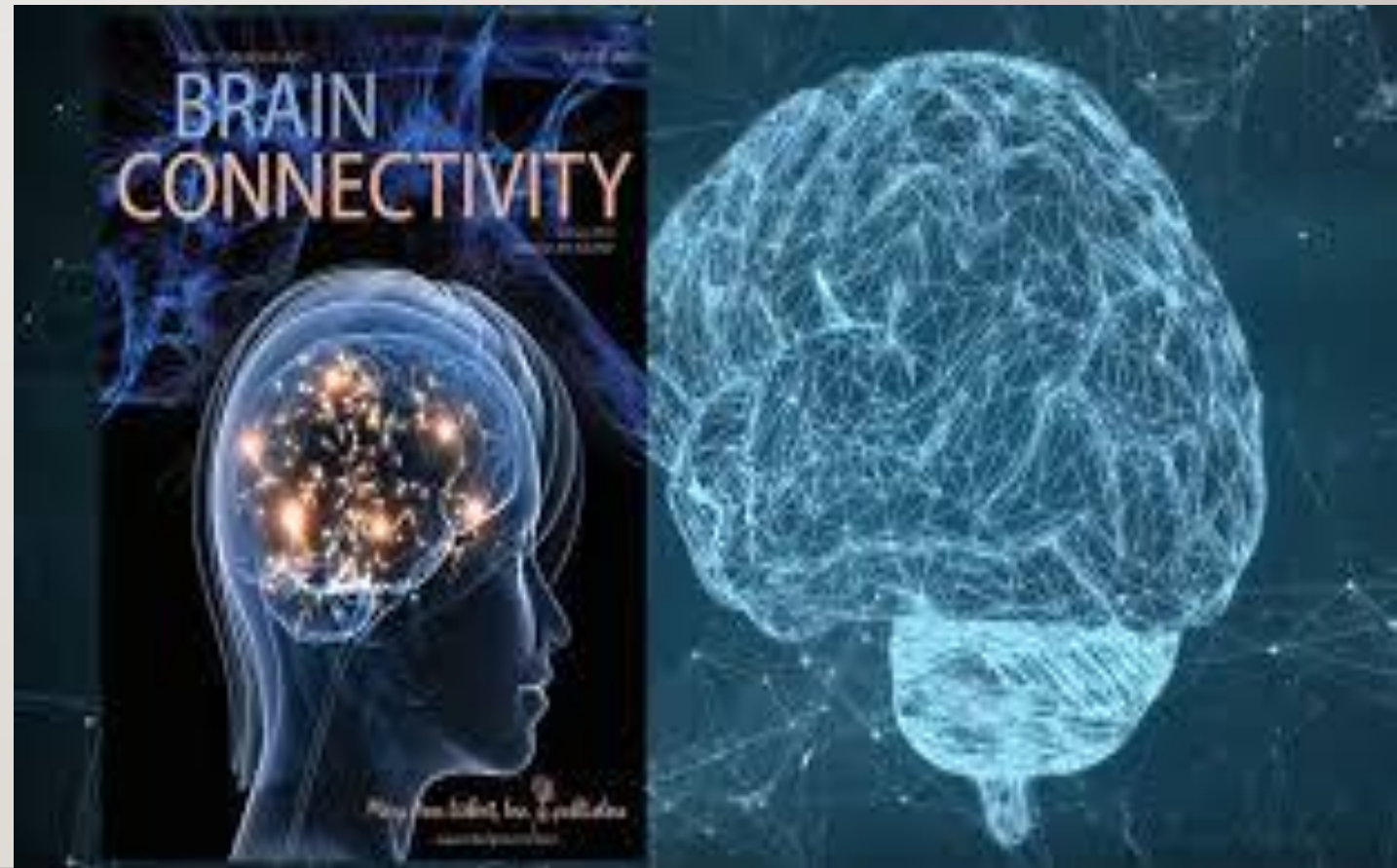


REAL SCENARIO.....

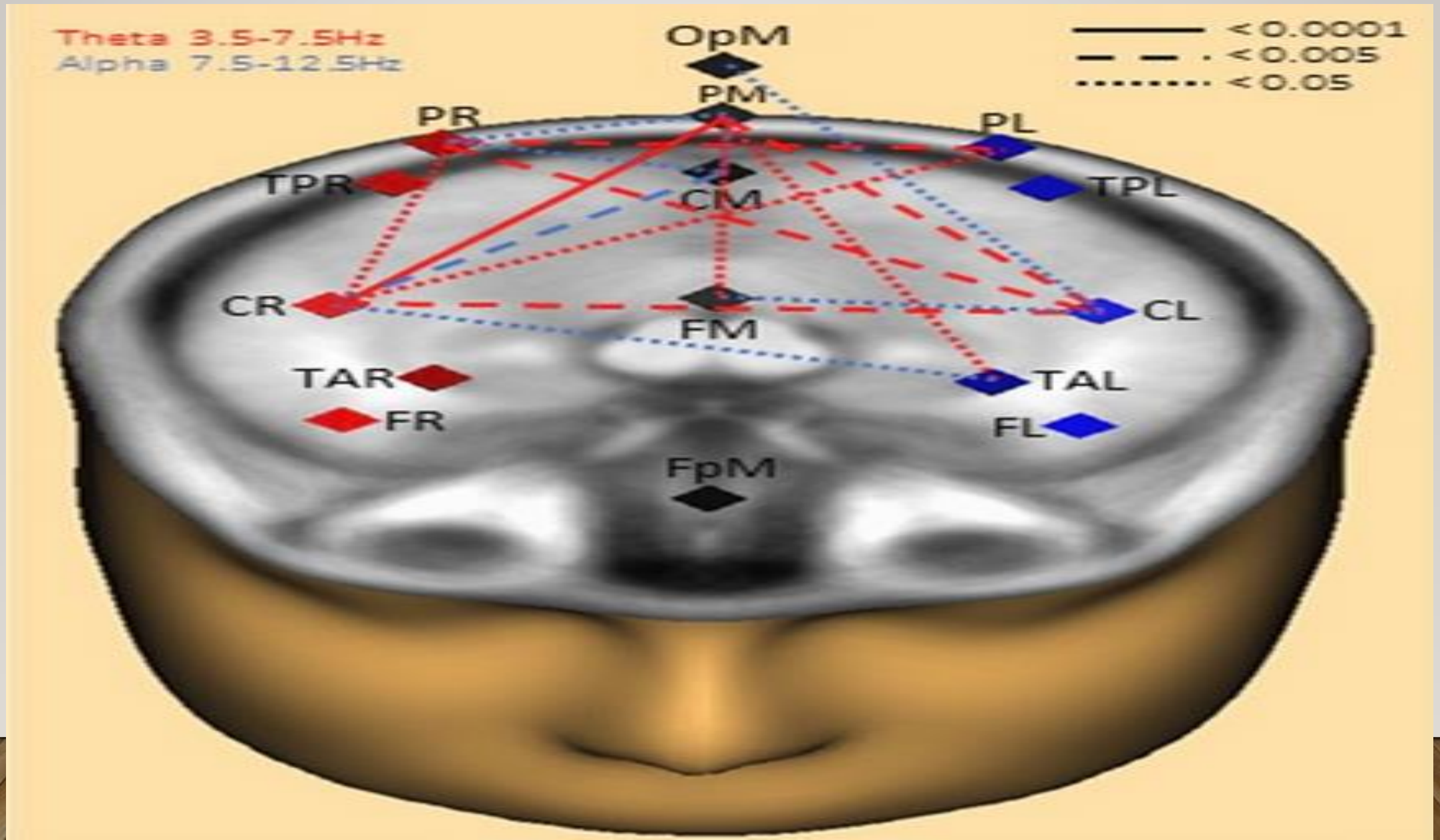
- When you have to form letters by hand, an 'A' will look completely different than a 'B' and requires a completely different movement pattern.
- By contrast, when typing, the keys look mostly the same, regardless of the letter. As a result, typing requires less brain activity in the visual and motor cortices.
- Because only small parts of the brain are active during typewriting, there is no need for the brain to communicate between different areas.

RECENT STUDIES SUGGEST THAT...

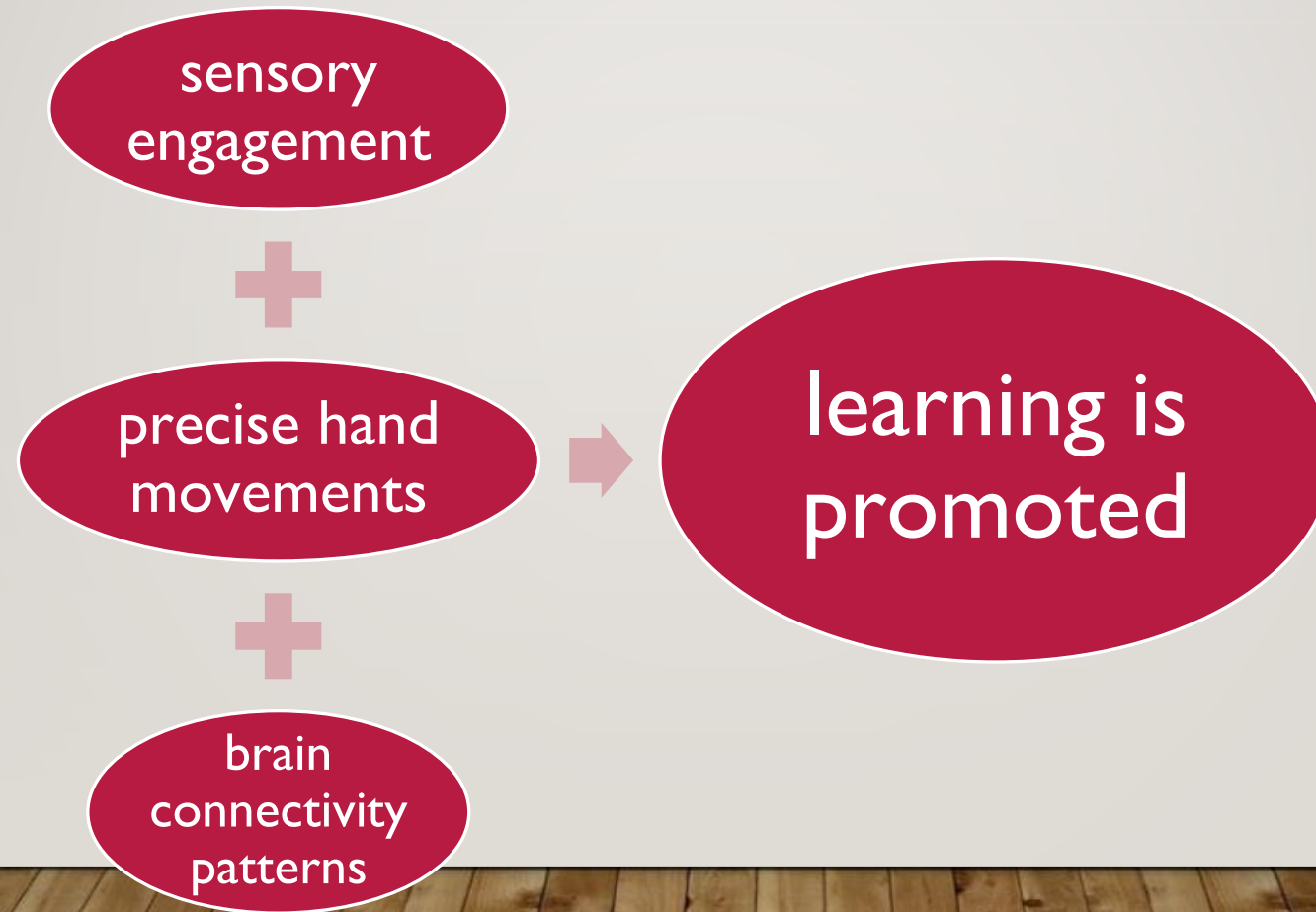
Brain connectivity patterns during **handwriting** are more elaborate; this is crucial for memory formation & encoding new information.



CONNECTIVITY RESULTS OF WRITING OVER TYPING



THE CAREFUL FORMING OF LETTERS DURING **HANDWRITING**, INVOLVING PRECISE HAND MOVEMENTS AND SENSORY ENGAGEMENT, CONTRIBUTES EXTENSIVELY TO THE BRAIN'S CONNECTIVITY PATTERNS THAT PROMOTE LEARNING.



MORE EVIDENCE SUPPORT HANDWRITING

- The brains of children and young adults show increased activity when writing by **hand** compared to **typing**.
- Handwriting may aid in connecting visual and motor skills, potentially enhancing letter recognition in children.

(Ose Askvik et al., 2020 & James, 2017)



LETTER
RECOGNITION
WORKSHEETS

OTHER RESEARCH HIGHLIGHTS IN FAVOR OF HANDWRITING.....

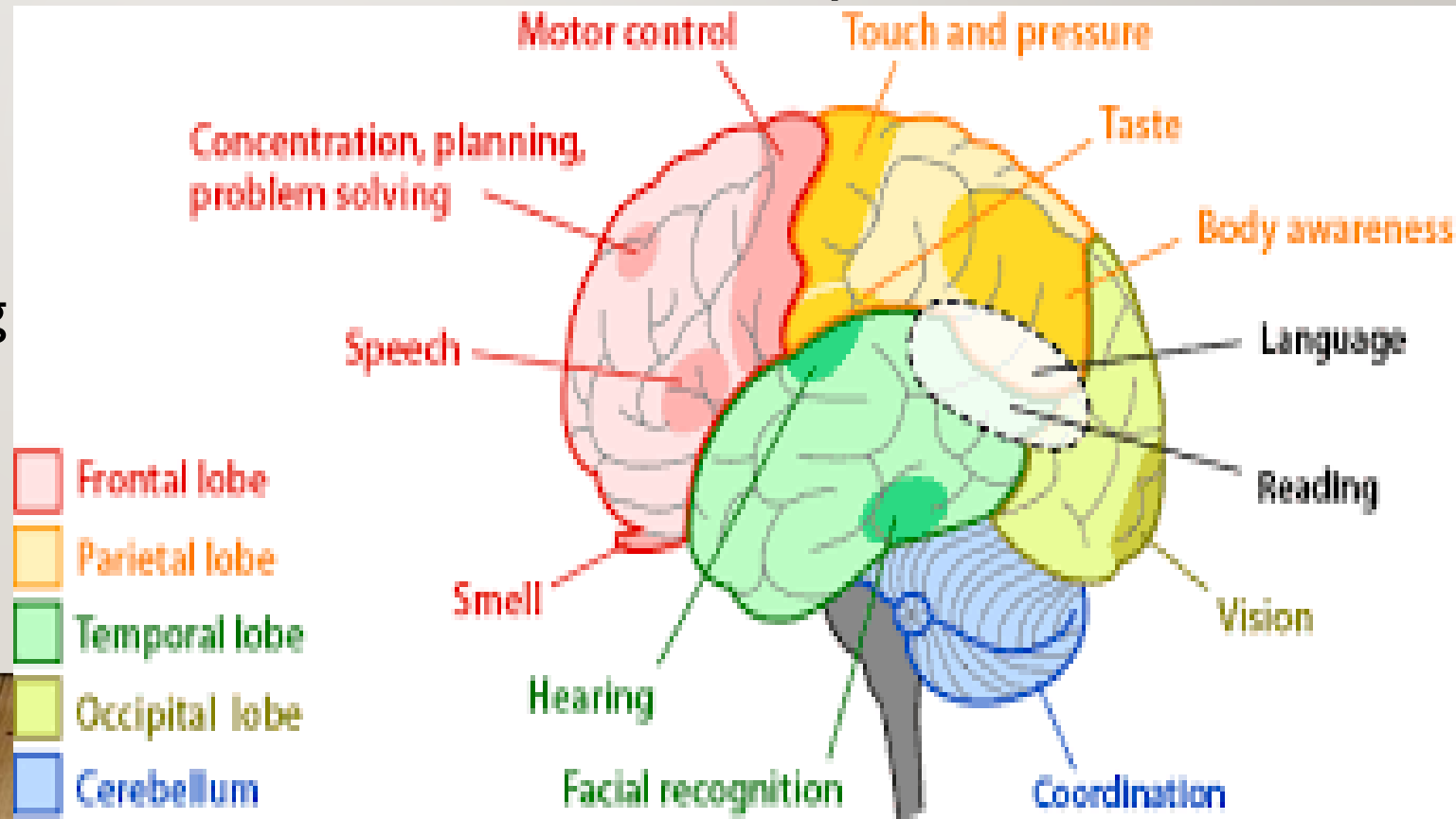
- While older adults might see cognitive benefits from handwriting, the largest benefits are when the brain is still **developing**.
- Writing by hand can be more beneficial **for some children than others**.
- For kids who have **fine motor issues**, handwriting can be a challenge for them.
- There's some evidence that handwriting, especially cursive handwriting, works especially well for students with **dyslexia** (i.e., inaccurate and disfluent word reading and spelling).



INCONCLUSIVE EVIDENCE YET....

Whether taking notes on paper VS. a laptop can help people remember and understand information better in the classroom or raise their performance on tests?

A lot of the connections are happening from the frontal and temporal regions of the brain, which are more memory-related.



MORE EVIDENCE: TAKING NOTES

When **laptops** are used solely to take notes, they may still be impairing learning because their use results in **shallower processing**.



Taking notes on laptops performed worse on **conceptual questions** than students who took notes longhand.

Whereas taking more notes can be beneficial, laptop note takers' tendency to transcribe lectures verbatim rather than processing information and reframing it in their own words is **detrimental to learning**.

(Mueller & Oppenheimer, 2014)



KEY TAKEAWAYS:

- Writing by hand stimulates greater brain activity and may enhance memory retention.
- Handwriting, particularly cursive writing, can benefit children's cognitive development and letter recognition.
- Integrating both handwriting and typing in educational settings may optimize learning outcomes.

SELECTED BIBLIOGRAPHY

- Van der Weel, F. R., & Van der Meer, A. L. (2024). Handwriting but not typewriting leads to widespread brain connectivity: a high-density EEG study with implications for the classroom. *Frontiers in Psychology, 14*, 1219945.
- Ose Askvik, E., Van der Weel, F. R., & van der Meer, A. L. (2020). The importance of cursive handwriting over typewriting for learning in the classroom: A high-density EEG study of 12-year-old children and young adults. *Frontiers in Psychology, 11*, 550116.
- James, K. H. (2017). The Importance of Handwriting Experience on the Development of the Literate Brain. *Current Directions in Psychological Science, 26*(6), 502-508. <https://doi.org/10.1177/0963721417709821>
- Mueller, P. A., & Oppenheimer, D. M. (2014). The Pen Is Mightier Than the Keyboard: Advantages of Longhand Over Laptop Note Taking. *Psychological Science, 25*(6), 1159-1168. <https://doi.org/10.1177/0956797614524581>