

THE COGNITIVE BENEFITS OF HANDWRITING AS A PREVENTION OF ALZHEIMER'S DISEASE

Rosângela Haydem Campinho Torres
Neurociência

All content in this magazine is licensed under a Creative Commons Attribution License. Attribution-Non-Commercial-Non-Derivatives 4.0 International (CC BY-NC-ND 4.0).



Abstract Exploring the Neurocognitive Impact of Handwriting Practice in Alzheimer's Prevention

Handwriting involves multiple areas of the brain, including those responsible for language, memory, and motor coordination. By regularly engaging these areas, the activity can help keep the brain active and healthy over time. It is important to note that handwriting is just one part of a healthy and active lifestyle, which also includes a balanced diet, regular physical exercise, adequate sleep, and varied mental stimulation. Regular handwriting practice can be beneficial as a form of prevention against Alzheimer's, but it is important to note that there are no guarantees that it will prevent the disease. However, there are several theories on how the brain activity involved in manual writing may be beneficial for cognitive health. Some ways in which handwriting may be considered useful in Alzheimer's prevention:

1. **Cognitive Stimulation:** Handwriting involves various cognitive skills, such as memory, language, planning, and organization. By exercising these skills regularly, you can help keep your brain active and stimulated, which may have positive effects on preventing cognitive decline associated with Alzheimer's.

2. **Activation of Multiple Brain Areas:** Handwriting involves complex coordination between various areas of the brain, including the motor cortex, visual cortex, somatosensory cortex, and areas related to language and memory. By engaging these areas regularly, you are promoting comprehensive brain activity that may be beneficial for long-term cognitive health.

3. **Creative Expression and Mental Processing:** Handwriting can facilitate creative expression and mental processing of information. This can help strengthen neural connections associated with language and abstract thinking, which may be useful in maintaining brain health.

4. **Active Lifestyle:** Handwriting is an activity that can be easily incorporated into your daily life, especially if you choose to take notes, write journals, or letters by hand. This can be part of an active and socially engaged lifestyle, which is also associated with a lower risk of developing cognitive diseases like Alzheimer's. Handwriting requires more cognitive effort than typing on a keyboard, as it involves letter formation and the connection between thoughts and motor movements. This type of challenging activity can help strengthen neural connections and maintain cognitive function and has been associated with better retention of information compared to typing. Regular handwriting practice can help strengthen both short-term and long-term memory, which may be useful in preventing memory loss associated with aging and Alzheimer's. Brain plasticity refers to the brain's ability to adapt and reorganize throughout life. Engaging in challenging activities, such as handwriting, can stimulate brain plasticity, which may help protect against neurodegenerative diseases like Alzheimer's. Research suggests that artistic and creative activities, such as handwriting, can reduce stress and anxiety, factors that have been associated with a higher risk of developing dementia.

Keywords: Healthy lifestyle. Physical activity. Cognitive stimulation. Risk factor control. Early diagnosis.

INTRODUCTION

The University of Norway study, published in the journal *Frontiers in Psychology* on January 26, highlights the benefits of handwriting compared to typing for brain development. This research examined how different writing methods affect the brain and found that writing by hand has significant advantages over typing in terms of cognitive processing and brain development.

One of the key findings of this study is

that handwriting is most strongly associated with activation of areas of the brain related to language, cognition and fine motor skills. This type of broader brain activation suggests that handwriting involves deeper cognitive processing than typing on a keyboard.

Additionally, research has found that children who write by hand perform better on tasks involving understanding and producing language, as well as retaining information. This suggests that practicing handwriting can have significant benefits for language and memory development.

These results highlight the importance of maintaining the practice of handwriting, especially in an increasingly digitalized world where typing has become predominant. Incorporating handwriting activities into education and everyday life can contribute to broader brain development and improve various cognitive skills, including language, memory, and motor coordination.

This study compared the effects of handwriting versus typing notes on laptops during academic lectures. The results showed that students who wrote by hand had better information retention and understanding of content compared to those who typed on a keyboard. Researchers have suggested that this is because writing by hand requires deeper processing, as students generally cannot transcribe information as quickly as when typing, so they synthesize and reorganize information more effectively.

There are several studies that have compared the performance of people who write by hand with those who type, especially in relation to learning, information retention and cognitive processing:

1. A study published in the journal *Psychological Science* in 2014 examined the impact of typing versus handwriting on learning and information retention. Researchers found that students who

took notes by hand performed better on comprehension tests than those who typed their notes. This suggests that writing by hand may promote better information retention compared to typing.

2. A study published in the *Journal of Cognitive Neuroscience* in 2017 compared the effects of handwriting and typing on brain processing. The researchers found that handwriting was associated with greater activation in areas of the brain involved in letter and word formation, as well as memory and learning processes, compared to typing.

3. Another study, conducted by researchers at the University of Washington and published in the journal *Trends in Neuroscience and Education* in 2016, reviewed various research on the impact of handwriting versus typing on cognitive and academic development. They concluded that handwriting may have specific benefits, such as better comprehension, information retention, and creative expression, compared to typing.

Writing by hand can be more beneficial for quickly retaining information for several reasons:

1. **Deeper processing:** Writing by hand involves a deeper process of encoding information than typing. When writing manually, individuals are more likely to process and synthesize information, which promotes deeper understanding and better retention.

2. **Selective attention:** When writing by hand, individuals tend to select and summarize information more efficiently as they cannot transcribe as quickly as they type. This forces them to prioritize the most important information and think critically about the material they are recording.

3. **Sensory stimulation:** The physical action of writing by hand can create a stronger

sensory connection with information, aiding memory. Hand movement when forming letters and words can reinforce the association between visual information and the sense of touch, helping with retention.

4. Muscle memory: Repeated practice of writing by hand can develop muscle memory, where the movement of the hands when writing becomes automated. This can make it easier to remember the information when reviewing or when faced with similar situations in the future.

5. Situational context: The act of writing by hand in a notebook or paper can create a specific situational context for the information, facilitating later recall. For example, remembering where in the notebook a certain piece of information was written can help with memory retrieval.

Overall, writing by hand can offer an advantage in quickly retaining information due to its deeper, more sensorial engagement with the material, as well as its ability to promote more selective and reflective processing. Cognitively stimulating activities, such as writing by hand, can be beneficial for brain health and potentially reduce the risk of developing dementia. Some ways writing by hand can help prevent Alzheimer's:

1. Brain stimulation: Handwriting involves multiple areas of the brain, including those responsible for language, memory and motor coordination. By engaging these areas on a regular basis, activity can help keep the brain active and healthy over time.

2. Improved cognition: Writing by hand requires more cognitive effort than typing on a keyboard, as it involves the formation of letters and the connection between thoughts and motor movements. This type of challenging activity can help strengthen neural connections and maintain cognitive function.

3. Memory stimulation: Writing by hand has been linked to better information retention compared to typing. Regularly practicing handwriting can help strengthen short- and long-term memory, which may be helpful in preventing memory loss associated with aging and Alzheimer's disease.

4. Promoting brain plasticity: Brain plasticity refers to the brain's ability to adapt and reorganize throughout life. Engaging in challenging activities, such as writing by hand, can stimulate brain plasticity, which may help protect against neurodegenerative diseases such as Alzheimer's disease.

5. Reducing stress: Some research suggests that artistic and creative activities, such as writing by hand, can reduce stress and anxiety, factors that have been linked to a greater risk of developing dementia.

Although writing by hand alone is not a guarantee against Alzheimer's disease, incorporating this practice into a healthy lifestyle, along with other brain health care measures such as regular exercise, a balanced diet and stimulating mental activity, may contribute to long-term cognitive health.

When we write by hand, several areas of the brain are involved in the process. Here are some of the main areas and their functions during handwriting: **Primary Motor Cortex**, this region of the brain is involved in the control of voluntary movements, including movements of the hand, arm and fingers during writing, **somatosensory Cortex:** receives and processes tactile sensory information, such as pressure, texture and temperature, coming from the fingers and hand while holding the pen or pencil and feeling the texture of the paper, **Visual Cortex**, this region is activated to process visual information, such as the shape of letters and words on paper, and also to coordinate the integration between vision and fine motor movement, **Basal Ganglia**

structures play an important role in motor control and motor learning, assisting in coordinating the fine movements needed to write by hand, The cerebellum plays a role in the coordination and fine control of muscle movements, contributing to the precision and fluidity of handwriting, **Frontal Lobe**, region that is involved in planning, organizing, and performing complex tasks, including writing. The frontal lobe coordinates movements of the hand and fingers according to instructions received from other areas of the brain. **Hippocampus** is important for memory and learning.

Writing by hand has been linked to better information retention, and the hippocampus plays a crucial role in this process.

These are just some of the areas of the brain that are active during handwriting, showing how it is a complex and multifaceted activity that involves several brain regions working together.

FINAL CONSIDERATIONS

Scientific evidence highlights the numerous brain benefits associated with the practice of handwriting. Recent studies, such as the one carried out by the University of Norway and published in the journal *Frontiers in Psychology*, emphasize that writing by hand activates fundamental brain areas related to language, cognition and fine motor skills in a way that typing cannot replicate.

Additionally, handwriting has been consistently linked to better information retention, language development, and improved memory. These benefits are not only relevant for school-aged children, but also for adults at all stages of life.

Therefore, promoting the practice of handwriting can be crucial to maintaining a healthy and active brain. Incorporating handwriting activities into educational settings and everyday life can help stimulate

cognitive development, promote effective learning, and provide long-term benefits for brain health.

As such, it is important to recognize the lasting value of handwriting in an increasingly digitized world and continue to encourage its use as an essential tool for developing and maintaining brain health throughout life.

Unlike handwriting, when typing on a computer or cell phone, the process mainly involves areas of the brain related to visual processing, coordination.

motor and linguistic processing, such as: Primary Motor Cortex and Somatosensory Cortex: While we type on the keyboard, the areas of the brain responsible for fine motor control and tactile sensation of the hands and fingers are involved, although they may be less active than during typing. Handwritten, due to the different nature of the interaction. When typing, we are constantly processing visual information, such as the letters on the keyboard, the position of our fingers, and the text on the screen.

The **Frontal Lobe** plays a fundamental role in planning and executing complex tasks. During typing, the frontal lobe is involved in coordinating finger movements and selecting words to type. While we type, areas of the brain involved in language, such as the temporal cortex and parietal cortex, are active, especially when we are formulating words and sentences. Just like in handwriting, the cerebellum plays a role in coordinating movements during typing, contributing to the accuracy and fluidity of typing.

Compared to handwriting, typing may involve less activity in certain areas of the brain, especially those related to fine motor control and tactile sensation. However, areas involved in visual, linguistic, and planning processing are still active during typing.

The ability of a person with Alzheimer's disease to write by hand can vary widely

depending on the stage of the disease and the impact it has had on motor and cognitive skills. Points to consider:

1. Stage of the disease: In the early stages of Alzheimer's disease, a person may be able to write by hand with relative ease, especially if memory for fine motor procedures is still intact. However, as the disease progresses, motor and cognitive skills may decline, affecting the ability to write.

2. Fine motor decline: Alzheimer's disease can affect fine motor control of the hands and fingers, which can make handwriting more challenging as the disease progresses. The person may have difficulty holding

the pen or pencil steady, resulting in less legible handwriting.

3. Cognitive decline: Alzheimer's disease affects cognitive function, including language and the ability to organize and plan. This can make composing sentences and organizing ideas more challenging when writing by hand.

4. External help: In advanced stages of the disease, the person may need assistance or guidance to write by hand. This may involve support from caregivers or the use of adaptive devices such as special pens or support devices to hold paper.

REFERENCES

1. James, K. H., & Engelhardt, L. (2019). Learning and Remembering with External Representations: A Developmental Study of the Effectiveness of Physical and Virtual Manipulatives. *Psychological Science*, 30(1), 3–13. <https://doi.org/10.1177/0956797618808767>
2. 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>
3. Hanover Research. (2012). The Educational Implications of Handwriting. Retrieved from <https://www.hanoverresearch.com/media/The-Educational-Implications-of-Handwriting.pdf>
4. Konnikova, M. (2014, June 2). What's Lost as Handwriting Fades. *The New York Times*. Retrieved from <https://www.nytimes.com/2014/06/03/science/whats-lost-as-handwriting-fades.html>
5. Mangen, A., Walgermo, B. R., & Brønnick, K. (2015). Reading linear texts on paper versus computer screen: Effects on reading comprehension. *International Journal of Educational Research*, 58, 61–68. <https://doi.org/10.1016/j.ijer.2012.12.002>