

Stream - Physical Aid

Topic - Dyslexia Reading Aid

Dyslexia is a neurodevelopmental disorder that affects the way individuals process language, particularly in relation to reading. People with dyslexia may experience difficulties in recognizing and decoding words, which can make reading challenging. Here are some common struggles that individuals with dyslexia may face when it comes to reading:

1. **Phonological Processing Difficulties:** Dyslexia often involves difficulties in phonological processing, which is the ability to recognize and manipulate the sounds of spoken language. This can affect the ability to connect letters to their corresponding sounds, making it challenging for individuals with dyslexia to sound out words.
2. **Difficulty with Decoding:** Decoding involves translating written words into spoken language. People with dyslexia may struggle with this process, leading to difficulties in recognizing and understanding words on a page. They may have trouble breaking down words into their individual sounds and blending them together.
3. **Word Recognition Challenges:** Individuals with dyslexia may have difficulty quickly recognizing and recalling common words, even those they have encountered frequently. This affects reading fluency and can slow down the overall reading process.
4. **Reading Comprehension Issues:** Dyslexia can impact not only the decoding of words but also the comprehension of written material. Understanding the meaning of sentences, paragraphs, and longer texts may be more challenging for individuals with dyslexia.
5. **Visual Distortions and Reversals:** Some individuals with dyslexia may experience visual distortions, such as seeing letters or words differently than they appear. Reversals of letters or words, such as confusing "b" with "d" or "was" with "saw," are also common.
6. **Difficulty with Sequencing:** Dyslexia can affect the ability to accurately sequence letters, sounds, or words. This may lead to problems in reading and spelling words in the correct order.
7. **Working Memory Challenges:** Working memory is crucial for holding and manipulating information during the reading process. People with dyslexia may have limitations in working memory, which can further contribute to difficulties in reading and processing information.

It's important to note that dyslexia does not reflect a lack of intelligence; individuals with dyslexia often have average to above-average intelligence. With appropriate support, interventions, and strategies, individuals with dyslexia can develop effective reading skills and overcome many of these challenges. Early identification and tailored interventions are key to helping individuals with dyslexia build strong reading abilities.

All the issues described above, when combined, mean that individuals diagnosed with dyslexia, and other speech disorders including aphasia find it difficult to speak, with very little assistance and aid available. Recovery is also very difficult, despite therapy and other aids available. We believe that along with generative AI, we can help individuals with dyslexia reach their true potential, and also be well integrated into society.

Our goal is to first use a Large Language Model (LLM) to display a small paragraph, along with other reading aids like pictures and videos about the paragraph being read to provide some context to the users, to help the individuals read more easily. All of this will be very intuitive and easy to read. The paragraph generated will have varying reading level difficulty, and using a real-time speech-to-text GPT model, track the user's progress through the text. When a mistake is detected, stop the user and provide feedback, with a prompt. This application can be used for training those with reading impediments like dyslexia, through the production effect (speaking aloud and pronouncing words correctly improves learning over silently reading) and having a personal aid tracking your every word to make sure it's spoken correctly.

In the future, we aim to enhance the capabilities of this application by incorporating features such as the ability to offer feedback on speech. This will involve analyzing various elements, including speech patterns, tone, and pacing. We believe that this functionality could serve as a valuable tool for public speaking training. Additionally, we plan to introduce a feature that provides images and videos as part of the feedback, thereby enhancing the overall user experience.

Literature Review -

1. A research study investigated the production effect and its impact on learning, emphasizing the efficacy of pronouncing words in comparison to silent reading or a control condition involving simply reading a random word. The study, conducted by Bailey et al. (2021), explored the neural correlates of the production effect through an fMRI study. The findings are reported in the article titled "Neural correlates of the production effect: An fMRI study," published in

Brain and Cognition (Volume 152, Page 105757), and can be accessed at <https://doi.org/10.1016/j.bandc.2021.105757>.

2. The study focuses on the double-deficit hypothesis (DDH) of dyslexia and aims to investigate if individuals with different subtypes of dyslexia exhibit variations in reading fluency at different levels (letter, word, and connected text). Additionally, the study explores whether children with dyslexia, identified by either low-achievement or ability-achievement discrepancy criteria, display similar differences when classified by the DDH. The research involved assessing 158 children in second and third grades with severe reading impairments, categorizing them into three reader subtypes based on the DDH. The results indicate that these subtypes display distinct fluency differences at various reading levels, highlighting separate reading profiles and diverse routes to reading difficulties. Notably, the patterns among DDH subtypes are primarily influenced by the ability-achievement discrepancy group. The findings have implications for intervention strategies, reading theories, and a more nuanced understanding of dyslexia heterogeneity. Katzir, T., Kim, Y.-S., Wolf, M., Morris, R., & Lovett, M. W. (2008). The Varieties of Pathways to Dysfluent Reading: Comparing Subtypes of Children With Dyslexia at Letter, Word, and Connected Text Levels of Reading. *Journal of Learning Disabilities*, 41(1), 47–66. <https://doi.org/10.1177/0022219407311325>

Brainstorming -

Ideas -

1. Unicorn BCI System Paired with Generative AI for Stress Detection (doesn't work because license keys have expired/deleted).
2. Brain neurostimulation including tDCS for those with dyslexia - so that extra neural activity can be controlled and reduced via stimulation.
3. **(Current)** Develop an application designed as a physical reading aid. Use a LLM to generate texts of varying reading level difficulty, and using a real-time speech-to-text GPT model, track the user's progress through the text. When a mistake is detected, stop the user and provide feedback. This application can be used for training those with reading impediments like dyslexia, through the production effect (speaking aloud and pronouncing words correctly improves learning over silently reading) and having a personal aid tracking your every word to make sure it's spoken correctly.

User-Survey Analysis

This idea was inspired by one of the members' interactions with their cousin's back home, who both have dyslexia and struggle to read, and hence learn, and in turn also interact with others to their full potential.

Unfortunately, we were not able to collect any survey data from the users because the target user group is very niche and difficult to access. However, we did some research online and found a lot of potential for our idea :

The author also shares a personal anecdote about a friend with dyslexia who excelled in working with computers but hesitated to pursue computer science due to concerns about debugging code. Gen AI is presented as a solution that filters out coding challenges related to dyslexia before compilation, removing barriers to unleashing creativity. -

<https://www.thehrdirector.com/features/artificial-intelligence/gen-ai-opens-whole-new-world-dyslexic-individuals/>

The article explores the intersection of artificial intelligence (AI) and dyslexic thinking, emphasizing the potential synergy between the two. The author, Gemma Spence from VMLY&R Commerce, discusses how AI can positively impact dyslexic individuals in the workplace, particularly in creative fields such as advertising and consulting.

The article emphasizes that AI can assist dyslexic individuals in overcoming literacy and working memory challenges by rapidly aggregating and organizing information. AI-powered tools facilitate efficient research, summarization of content, language translation, and access to text-to-speech and speech-to-text features. This enables dyslexic thinkers to access and comprehend information more easily, enhancing their learning experience.

Research by MadebyDyslexia is cited, revealing that dyslexic thinkers excel in exploring ideas and are early adopters of evolving technologies. Dyslexic individuals, known for their natural curiosity and creativity, can leverage AI to process data efficiently while approaching problems differently and making unique connections. The article mentions historic dyslexic thinkers like Albert Einstein, Stephen Hawking, Leonardo da Vinci, and Pablo Picasso.

Low-fi Prototype



1.33x

Drag and drop your files, or type, paste, and edit text here.

Natural Reader is a professional text-to-speech program that converts any written text into spoken words.

We have both free and paid subscriptions to our applications to meet different users' needs on different budgets. Our Plus subscription includes exclusive features and the use of Plus Voices, our newest and most advanced voices. Plus Voices enable fluid and natural-sounding text to speech that matches the patterns and intonation of human voices.

Free users can sample the Premium Voices for 20 minutes per day and the Plus Voices for 5 minutes per day. Or use any available Free Voices unlimitedly.

You can also listen and go with our mobile app. By using the mobile camera, you can even use our app to listen to physical books and notes.

If you are interested in using our voices for non-personal use such as for Youtube videos, e-Learning, or other commercial or public purposes, please check out our Natural Reader AI Voice Generator web application.

Our Chrome extension allows you to listen to webpages, Google Docs, online Kindle books, and emails directly from the browser. Add it to Chrome for free.

Turn **text to speech** in 170 languages and find the voice that suits your needs.



Text to speech
Audio

0:10

