B.Tech Project Report
Human Geography and Societal Needs
(HS202)

TITLE: Study on Typoglycemia

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Submitted by Group 37

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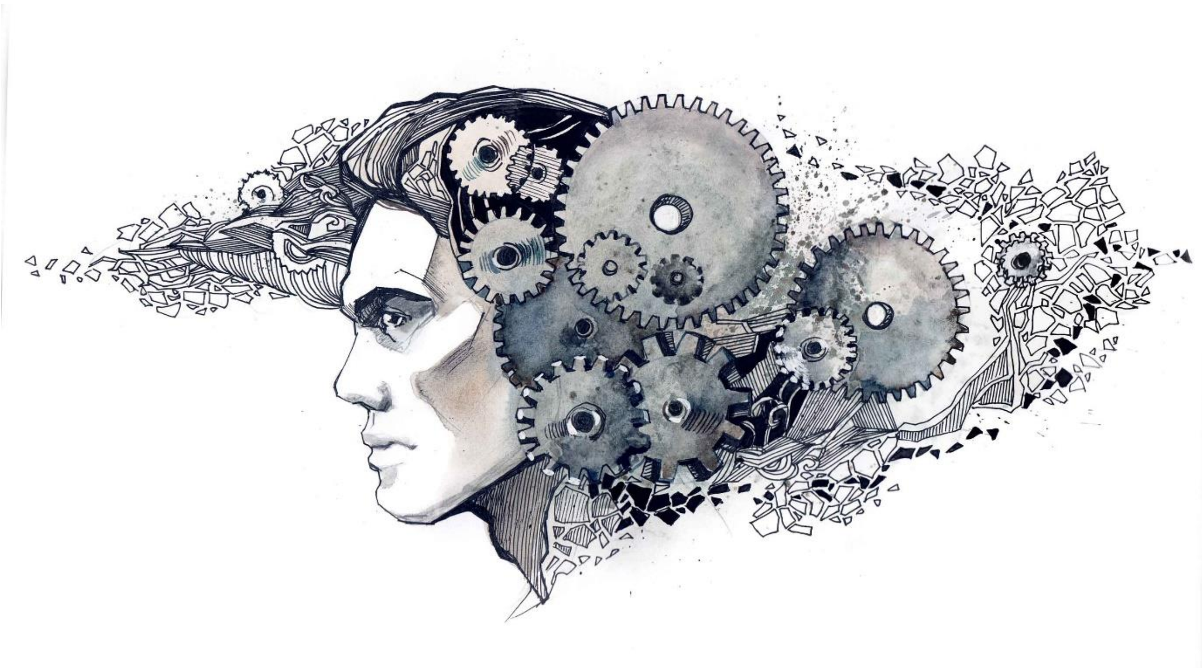

Abstract

This project report investigates Typoglycemia, or the transposed letter effect, examining its origins, cognitive mechanisms facilitating the comprehension of words with scrambled middle letters, and the constraints of this capability. Typoglycemia's study sheds light on the intricacies of human reading cognition. Despite our ability to decipher jumbled words, there are limits to this skill, suggesting nuances in our cognitive processing. Further research avenues are proposed to enhance our comprehension of reading as a multifaceted cognitive process. Understanding Typoglycemia not only enriches our knowledge of linguistics but also provides insights into broader cognitive functions. By exploring these phenomena, researchers aim to unlock a deeper understanding of how the human brain processes language, offering potential applications in education, psychology, and artificial intelligence.

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Introduction/Problem Statement:

This is a phenomenon that occurs when the brain interprets words even if the letters within them are scrambled. First noted in a study conducted in 1976 at Cambridge University, typoglycemia gained attention for its intriguing insight into how the human mind processes language. The term itself is a blend of "typo" (short for typographical error) and "glycemia" (related to blood sugar levels). Despite the jumbled arrangement of letters, the brain can often decipher the intended word, demonstrating the remarkable cognitive abilities involved in reading and comprehension. This phenomenon has sparked curiosity among linguists, psychologists, and neuroscientists alike, as it sheds light on the complex mechanisms underlying language processing in the brain. Understanding it not only offers insight into the intricacies of human cognition but also has practical implications for fields such as typography, education, and cognitive psychology.

***Typoglycemia* – portmanteau describing the brain's ability to read words that have internally scrambled letters but correct first and last letter.**

The fcat taht you can raed tihs txet shwos the way taht our birans pcresos wttrein txet. Dipetse the fcat taht the inside ltteres of ecah wrod are mexid up, it is siltl psoislbe to uanrdestnd msot wdros in tihs peice of txet.

Origins of Typoglycemia

The term "Typoglycemia" emerged in the early 2000s through a widely circulated email. It claimed a groundbreaking discovery by Cambridge University: as long as the first and last letters of a word remained correct, our brains could still understand the meaning. This sparked a wave of intrigue, showcasing the apparent resilience of our reading system.

However, investigations by journalists and researchers revealed a crucial fact: no such study existed at Cambridge University. Matt Davis, a senior research scientist there, even publicly debunked the association. Despite the lack of groundbreaking discovery, the phenomenon itself is very real and has been studied under the term "transposed letter effect" for decades. The answer lies in the remarkable interplay of several cognitive processes.

One key factor is shape recognition. Our brains are adept at recognizing the overall shape of a word, taking into account its length and the arrangement of letters. Even with scrambled middles, the word's overall form provides valuable information. Imagine the sentence, "This sntnce is still rdabl wth jmbld ltrs." While some words might appear confusing at first glance, the sentence structure and the general shapes of the words help us decipher their meaning.

The Cognitive Orchestra: How We Read Jumbled Words (Description of the problem)

The ability to read words with scrambled middle letters, a phenomenon often loosely referred to as Typoglycemia, showcases the remarkable efficiency and adaptability of our brains. But how exactly do we achieve this seemingly magical feat? The answer lies in a complex interplay of several cognitive processes, much like a well-rehearsed orchestra performing a challenging symphony.

The Conductor: Shape Recognition Sets the Stage

The first key player in this cognitive orchestra is shape recognition. Our brains are incredibly skilled at recognizing the overall visual shape of a word. This includes factors like the length of the word, the general arrangement of letters, and their relative positions within the word form. This shape recognition ability acts as the conductor of our cognitive orchestra, setting the stage for how we approach the jumbled letters. Even with the middle portion scrambled, the overall shape provides valuable information that helps guide our reading process.

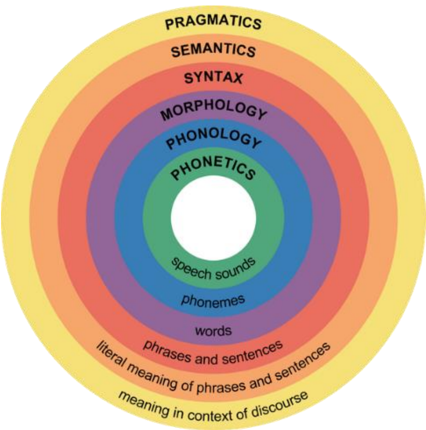
The Strings Section: Context Provides the Melody

Next in line is context, which plays a crucial role akin to the string section in our orchestra. The surrounding words and sentence structure offer essential clues about the intended meaning, helping us fill in the blanks when encountering scrambled letters. Imagine encountering the sentence, "Ths sntnce s stll rdabl wth jmbld ltrs." While individual words like "sentence" or "readable" might be initially unclear due to the jumbling, the context provided by the surrounding words creates a melody of meaning. By analysing the overall sentence structure and the known words, we can infer the missing information and decipher the meaning of the scrambled words.

The Percussion Section: Frequency Increases the Tempo

Another important instrument in this orchestra is word frequency. Our brains process words we encounter more often with greater ease, and this principle holds true even with transposed letters. High-frequency words, like those encountered daily in reading and conversation, have a stronger mental representation. This strong representation allows for faster recognition, even when the letters are scrambled, similar to how a familiar percussion pattern in music can be recognized quickly.

Expanding the Orchestra: Additional Instruments Join the Performance:



Beyond the core trio of shape recognition, context, and frequency, other cognitive processes contribute to our ability to read jumbled words, enriching the performance of our orchestra:

- **Phonology: The Harmony of Sounds:** The sound system of a language, phonology, plays a role akin to the harmony section. Words with similar sounds, even when spelled differently, can be easier to decode if the first and last letters provide a good starting point. Imagine the words "bat" and "cat." With the "b" and "t" in place, the phonological similarity between the two words allows our brains to make educated guesses about the scrambled middle letter, much like recognizing a familiar melody based on its key notes.

Consider the phrase, "Ths phrs s stll cmprhsnbl wth th f rst nd lst ltrs n plc." Here, the phonology of "phrase" and "comprehensible" helps us understand the meaning despite the scrambled middle sections. The "ph" sound remains intact, guiding our recognition despite the letter transposition.

- **Chunking: Efficient Processing Like a Skilled Musician:** Our brains process information in chunks, focusing on the beginning and end of words while filling in the gaps based on context and prior knowledge. This efficient strategy allows us to rapidly grasp the meaning of a sentence, even with imperfections, similar to how a listener can understand the overall meaning of a song even if they miss a few notes.

Chunking helps us decipher Here, we can chunk together "first" and "last" to understand the overall meaning of the phrase, despite the scrambled middle of "letters." Similarly, we can chunk "can read" to comprehend the overall message.

Some Current developments:

There are some interesting developments in cognitive science related to how the brain handles jumbled text. Here are a couple of key areas:

Role of Context: Studies show that our brains use surrounding context to make sense of jumbled words. For example, the sentence "Ths sntnc mks sns evn wth jmbld wrds" (This sentence makes sense even with jumbled words) is surprisingly understandable because of the overall context.

Visual Processing: Our brains are very good at picking up visual cues from letters' shapes and positions. Even when the order is scrambled, our brains can use this information to reconstruct the original word.

Familiarity: The more familiar we are with a word or phrase, the easier it is to understand it even when jumbled. This is why common words are typically easier to decipher in jumbled text compared to less frequent ones.

The Role of "Chunking": As mentioned earlier, our brains process information in chunks. This means we recognize familiar letter combinations or patterns even when shuffled within a word. This "chunking" ability significantly aids comprehension of jumbled text.

Researchers are also exploring the neural pathways involved in processing jumbled text using brain imaging techniques like fMRI.

This can help us understand how different brain regions work together to decipher scrambled words and sentences.

Need for Cognitive experiment:

There are several important reasons why cognitive experiments are crucial to our understanding of the mind:

Understanding brain: Our brains are incredibly complex organs, and unlike other organs, we can't directly observe their internal workings. Cognitive experiments act as a window, allowing us to see how the mind processes information, solves problems, remembers things, and more. By carefully controlling variables and observing participants' behavior and brain activity, we can piece together the underlying cognitive mechanisms.

Testing Theories: Cognitive theories propose explanations for how different mental processes work. Experiments provide a way to test these theories. Researchers design tasks that challenge specific predictions of a theory. If the results align with the predictions, it strengthens the theory. If not, it prompts revision or the development of new theories.

Applications in Real Life: Understanding how the mind works has a wide range of practical applications. It can inform the design of educational programs that cater to different learning styles. It can help improve user interfaces for technology to be more intuitive. Research on memory can be used to develop techniques for people with memory disorders. The knowledge gained from cognitive experiments has a ripple effect across many aspects of our lives.

Diagnosing and Treating Disorders: Cognitive experiments play a role in identifying and diagnosing cognitive impairments associated with conditions like dementia, ADHD, or learning disabilities. By comparing performance on specific tasks to established norms, these experiments can help pinpoint potential issues. Additionally, understanding cognitive processes can lead to the development of more effective treatments and interventions for these disorders.

Unveiling the Human Experience: Ultimately, cognitive experiments contribute to our understanding of what it means to be human. They shed light on how we perceive the world, make decisions, and interact with each other. This knowledge can foster empathy, improve communication, and even challenge philosophical assumptions about consciousness and free will.

In essence, cognitive experiments are essential tools for unraveling the mysteries of the mind. They allow us to test ideas, develop practical applications, and gain a deeper understanding of ourselves and others.

Objective:

The objective of this experiment is to investigate the cognitive processes involved in deciphering scrambled text, known as typoglycemia, with the ultimate goal of enhancing text comprehension and readability in various contexts.

In real-world scenarios, such as digital communication, signage, or educational materials, text readability plays a crucial role in ensuring effective communication and information retention. However, factors like word length and letter arrangement can significantly impact readability, potentially leading to comprehension difficulties and errors.

By conducting this experiment, we aim to address the following key questions:

1. Understanding Cognitive Processing: What cognitive mechanisms are involved when individuals attempt to decipher typoglycemic text? By studying participants' reading strategies and error patterns, we can gain insights into how the human brain processes scrambled text and identify potential bottlenecks in comprehension.

2. Optimizing Text Design: How can we design typoglycemic text to maximize readability and comprehension? By analyzing participants' performance on different word lengths and letter arrangements, we

can identify optimal text configurations that minimize cognitive load and facilitate accurate decoding.

3. Informing Educational Practices: How can findings from typoglycemia research be applied to educational settings to improve literacy instruction? Understanding the challenges posed by scrambled text can inform teaching strategies and curriculum development, ensuring that students develop robust reading skills that extend beyond traditional text formats.

4. Enhancing User Interfaces: How can typoglycemia research inform the design of user interfaces and digital content? Insights gained from this experiment can guide the development of user-friendly interfaces and communication tools that prioritize readability and accessibility for diverse user populations.

Overall, by elucidating the cognitive processes underlying typoglycemia and its implications for text comprehension, this experiment seeks to contribute to the broader goal of enhancing communication effectiveness and promoting literacy in both digital and traditional mediums.

PsychoPy: A Tool for the Typoglycemia Orchestra

While PsychoPy isn't directly designed for surveys, it can be a valuable tool in crafting experiments to explore the cognitive processes behind Typoglycemia, the ability to read words with scrambled letters. Here's why:

What is PsychoPy?

PsychoPy is a free and open-source software program designed for building psychological experiments. It allows researchers to present visual and auditory stimuli, record responses, and precisely control the timing of events within an experiment. This makes it ideal for creating tasks that investigate how our brains process jumbled words.

Relevance to Typoglycemia Research

Here's how PsychoPy can be used to study Typoglycemia:

Lexical Decision Tasks: One approach is to design a lexical decision task. In this experiment, participants would see a series of letter strings, some real words and some non-words, with varying degrees of letter scrambling. PsychoPy can be used to precisely control the presentation time of each word and record the participant's response (real word or non-word) along with their reaction time. By analysing these responses, researchers can gain insights into how quickly and accurately people can recognize words with different levels of jumbling.

Eye-Tracking Studies: Another approach involves using PsychoPy in conjunction with eye-tracking technology. This allows researchers to monitor where participants look on the screen as they attempt to read jumbled words. By analysing eye fixation patterns and saccades (eye jumps), researchers can understand how our gaze patterns shift when encountering scrambled letters compared to correctly spelled words. This can reveal how our visual information processing adapts to decipher jumbled text although we could not use this feature, we tried to implement it but were limited by technological constraints(unavailability of good webcam in laptops).

Masked Priming Tasks: PsychoPy can also be used for masked priming tasks. In this type of experiment, a briefly presented word (prime) is followed by a target word (often jumbled). By manipulating the prime word and the degree of scrambling in the target, researchers can investigate how prior exposure to certain letter combinations influences our ability to decipher scrambled words. This can shed light on the role of phonology (sound systems) in typoglycemia.

Benefits of PsychoPy:

There are several advantages to using PsychoPy for Typoglycemia research:

Customization: PsychoPy allows for highly customized experiments, enabling researchers to tailor the stimuli (word types, scrambling levels) and response options to their specific research questions.

Open-Source and Free: Being free and open-source software, PsychoPy makes research accessible to a wider range of researchers without budgetary constraints.

Versatility: PsychoPy can be used for various psychological experiments beyond Typoglycemia, making it a valuable tool for broader research endeavours.

Limitations to Consider:

While PsychoPy offers a powerful toolset, some limitations need to be considered:

Programming Knowledge: Using PsychoPy effectively requires some programming knowledge in Python. Researchers may need to invest time in learning the software or collaborate with someone who possesses the necessary programming skills.

Steeper Learning Curve: Compared to survey tools, PsychoPy has a steeper learning curve. Researchers need to understand experimental design principles and data analysis techniques to utilize it effectively.

In conclusion, PsychoPy, while not a survey tool, serves as a valuable tool for researchers investigating the cognitive processes behind typoglycemia. Its customizability, free availability, and versatility make it a strong contender for designing experiments that explore how our brains decipher the fascinating phenomenon of reading jumbled words.

The code we used to run our survey :

```
import csv

import os.path

import time

from psychopy import visual, core, event, gui
```

```
# Define questions and correct answers

questions = ["Write this word as is: bird", "Write this word as is: bicycle",
"Write this word as is: chocolately", "Baanna",
"Husabnd","Oouctps","Lbiarry","Aeudvntre","Lnadascpe","Chcoltoaey","Gtuiar","Baeskt
","Pruple","Rsoe", "Moon", "Hnad" ,"Snad"]

correct_answers = ["bird", "bicycle",
"chocolately","banana","husband","octopus","library","adventure","landscape","choco
laty","guitar","basket","purple","rose","moon","hand","sand"]

# Set up PsychoPy window

win = visual.Window(size=(800, 600), units='pix', fullscr=False)

# Set up text stimuli

text_stim = visual.TextStim(win, text='', color='black')

# Instructions

instructions_text = "Press Enter to start the quiz. write the correct word for
given jumbled ones and press Enter to submit your response."

instructions = visual.TextStim(win, text=instructions_text, color='black')

instructions.draw()

win.flip()

# Wait for Enter to start the quiz

event.waitKeys(keyList=['return'])

# Check if CSV file exists

csv_file_path = r"C:\Users\Tanish Goyal\Desktop\hs202\participant_responses.csv"

file_exists = os.path.isfile(csv_file_path)

# Initialize list to store participant responses

participant_responses = []

# If the CSV file exists, load existing participant responses

if file_exists:

    with open(csv_file_path, mode='r') as file:

        reader = csv.reader(file)

        for row in reader:

            participant_responses.append(row)

# Determine the participant number

participant_number = len(participant_responses) + 1

# Loop through questions

participant_data = [f"Participant {participant_number}"]

for i, question in enumerate(questions):

    # Display question

    text_stim.text = question

    text_stim.draw()

    win.flip()
```

```
    # Start time for current question
    start_time = time.time()
    # Create a text box for participant response
    response_box = gui.Dlg(title="Question")
    response_box.addField('Answer:')
    response_box.show()
    if not response_box.OK:
        core.quit()  # Quit if participant closes the response box
    response_text = response_box.data[0].lower()  # Get response and convert to
lowercase
    # Record response time
    response_time = time.time() - start_time
    # Check answer correctness
    correct = response_text == correct_answers[i]
    # Append participant response to participant_data
    participant_data.extend([response_text, response_time, correct])
# Append participant_data to participant_responses
participant_responses.append(participant_data)
# End of quiz
end_text = "End of quiz. Thank you for participating!"
end_stim = visual.TextStim(win, text=end_text, color='black')
end_stim.draw()
win.flip()
core.wait(2)
# Save participant responses to CSV file
with open(csv_file_path, mode='w', newline='') as file:
    writer = csv.writer(file)
    for response_data in participant_responses:
        writer.writerow(response_data)
# Close PsychoPy window
win.close()
core.quit()
```

Code Explanation :

This Python code is a quiz program using the **PsychoPy library**. Let us break it down into easy-to-understand parts with examples:

1. Importing Libraries:

- `csv`: This library helps in reading and writing CSV files.
- `os.path`: It helps in performing operations on file paths.
- `time`: It provides functions for working with time.
- `psychopy`: This library is used for creating psychology experiments in Python.

2. Defining Questions and Correct Answers:

- The `questions` list contains the questions for the quiz.
- The `correct_answers` list contains the correct answers corresponding to the questions.

Example:

```python
questions = ["alppe", "hlleo", "pziza"]
correct_answers = ["apple", "hello", "pizza"]
```

3. Setting up PsychoPy Window:

- It creates a window where the quiz will be displayed.

4. Displaying Instructions:

- It shows instructions to the participant before starting the quiz.

5. Waiting for Participant to Start:

- It waits for the participant to press Enter before starting the quiz.

6. Checking if CSV File Exists:

- It checks if a CSV file exists to store participant responses.

7. Initializing Participant Responses:

   - It initializes an empty list to store participant responses.

8. Loading Existing Participant Responses (if CSV file exists) :

   - If the CSV file exists, it loads existing participant responses into the list.

9. Determining Participant Number:

   - It calculates the participant number based on the number of existing responses.

10. Looping through Questions:

    - It goes through each question in the quiz.

    - Displays the question.

    - Waits for the participant's response.

    - Records response time.

    - Checks if the response is correct.

    - Appends participant's response data to the list.

11. End of Quiz:

    - It displays a message indicating the end of the quiz.

12. Saving Participant Responses to CSV File:

    - It saves all participant responses to a CSV file.

13. Closing PsychoPy Window:

    - It closes the PsychoPy window after the quiz is finished.

Example:

```python
with open (csv_file_path, mode='w', newline='') as file:
    writer = csv.writer(file)
    for response_data in participant_responses:
        writer.writerow(response_data)
```

This code essentially creates a simple quiz program where participants can answer questions, and their responses along with response times are stored in a CSV file.

Exploring Typoglycemia: A Survey on Reading Jumbled Words

This report details a survey designed to investigate the phenomenon of typoglycemia, where participants attempt to decipher words with scrambled middle letters. The survey aimed to assess reading accuracy and response times for words of varying lengths.

Methodology:

Participants: A group of 62 participants volunteered for the survey. All participants were in the age group of 18-22 years, however there was regional and linguistic diversity.

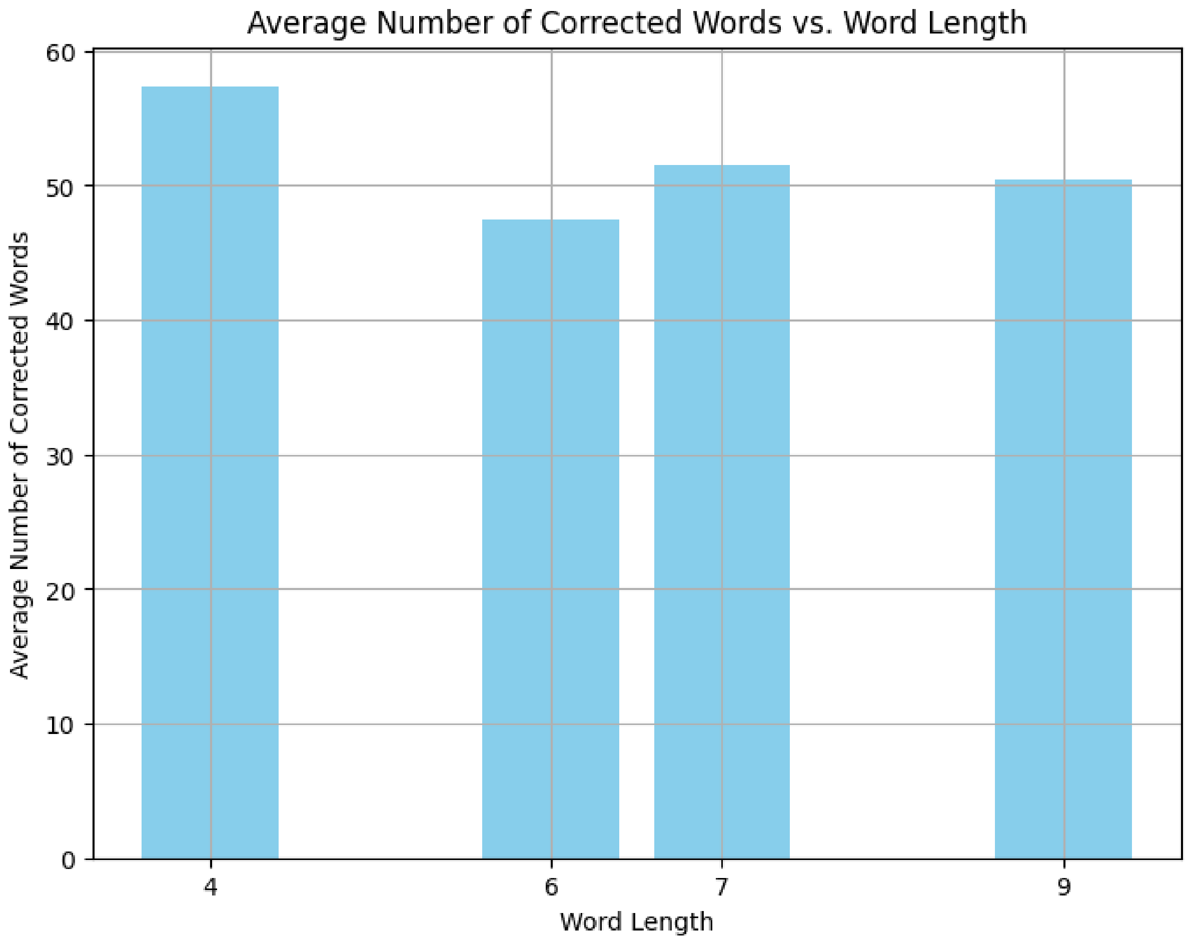
Stimuli: A list of words with varying lengths (e.g., 4-letter, 6-letter, 8-letter words) was prepared. Each word was presented in a jumbled format, with the first and last letters remaining in their correct positions and the middle letters scrambled.

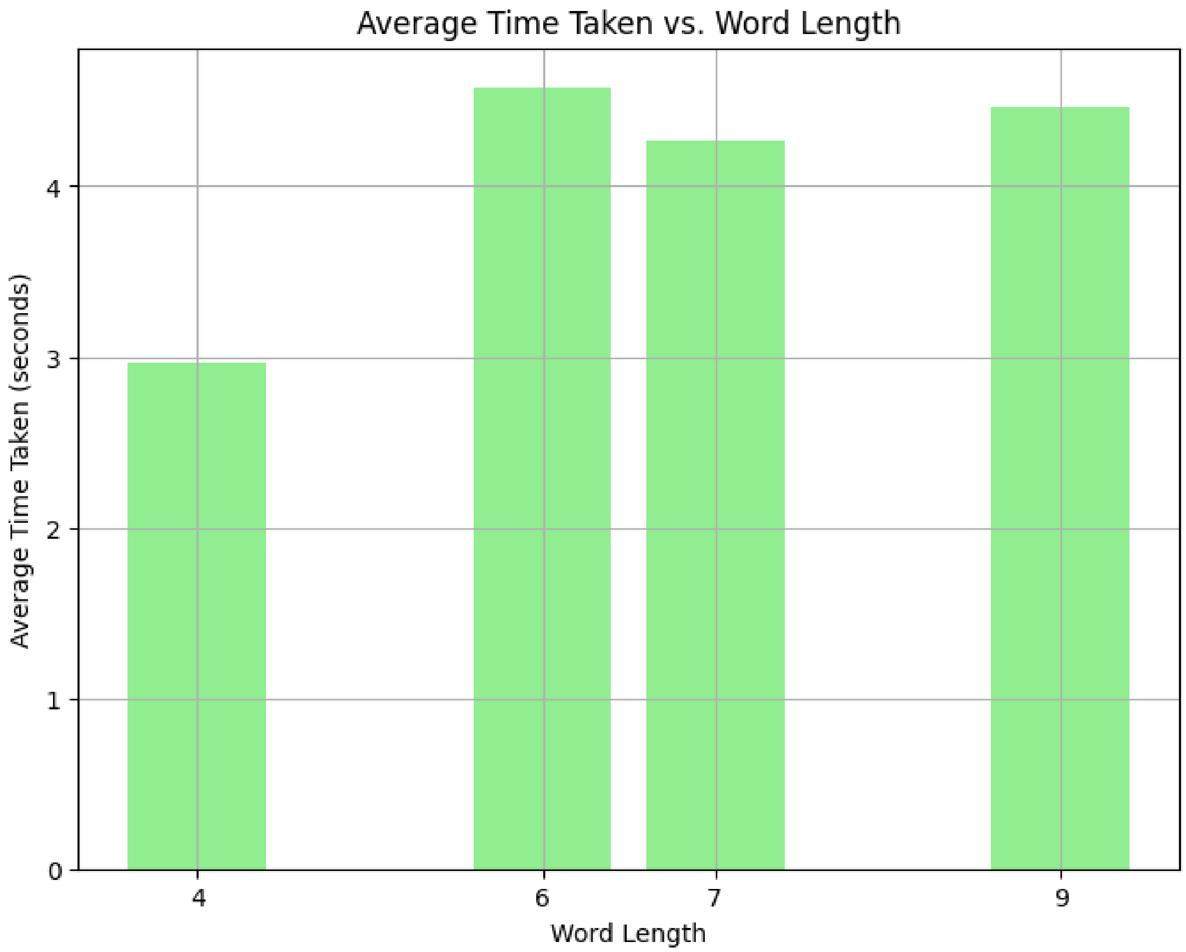
Procedure: Participants were presented with the jumbled words one at a time on a computer screen. They were instructed to decipher the correct word and type it into a designated text box. The time taken to respond for each word was recorded.

	A	B	C	D	E
1	word	no_letters	no_correct	avg_time	avg_time per letter
2	bird	4	60	4.46408	1.116020364
3	rose	4	56	3.06369	0.765923262
4	moon	4	58	2.55773	0.639432415
5	hand	4	57	2.36297	0.590741607
6	sand	4	56	2.36297	0.590741607
7	banana	6	26	6.33759	1.056265436
8	guitar	6	54	4.84471	0.807452321
9	basket	6	56	3.69031	0.61505115
10	purple	6	54	3.4496	0.574933237
11	bicycle	7	56	4.94614	0.706591325
12	husband	7	51	3.68501	0.526430676
13	octopus	7	55	3.87621	0.553743582
14	library	7	44	4.5686	0.652656519
15	adventure	9	48	4.6203	0.513366782
16	landscape	9	53	4.30935	0.478816352
17					

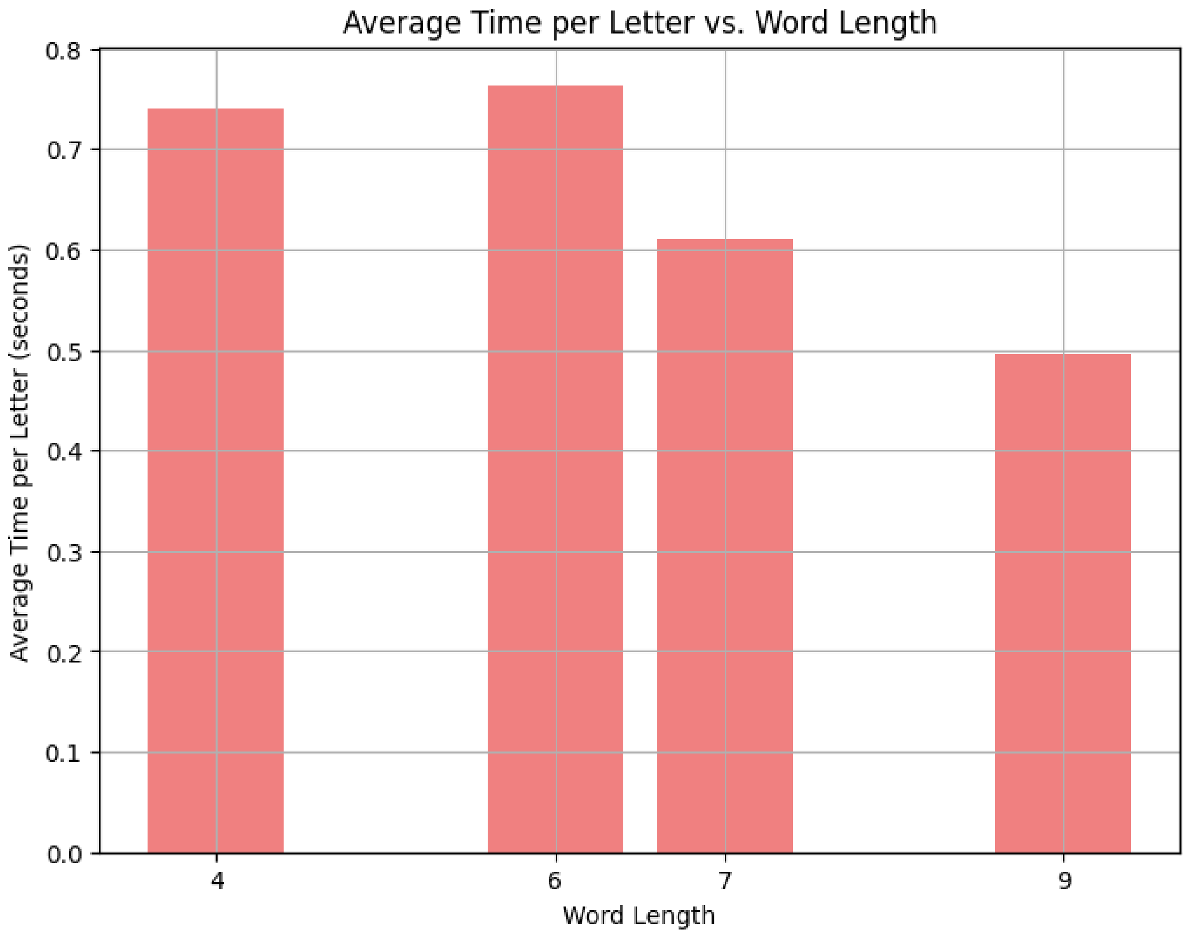
Raw Data to Calculated Data for drawing certain conclusion

no_letters	avg_no_correct	avg_time	avg_time_pl	accuracy	avg_time/acc	avg_time_pl/acc
4	57.4	2.96229	0.7405719	0.92581	3.19968326	0.79992
6	47.5	4.58055	0.7634255	0.76613	5.97882736	0.99647
7	51.5	4.26899	0.6098555	0.83065	5.13936501	0.7342
9	50.5	4.46482	0.4960916	0.81452	5.48156623	0.60906





Average Time Taken vs. Word Length
Average Time Taken (seconds)
0
1
2
3
4
4
6
7
9
Word Length



Results:

1. Word Length vs. Average Number of Corrected Words (avg_no_correct):

- As the word length increases, the average number of correctly deciphered words decreases. This suggests that longer words may pose more difficulty for participants to decipher accurately in typoglycemia format.

2. Word Length vs. Average Time Taken (avg_time):

- There's a general trend that as word length increases, the average time taken to decipher the words also increases. This indicates that longer words require more time for participants to process and decipher correctly.

3. Word Length vs. Average Time per Letter (avg_time_per_letter):

- Similar to the trend observed for average time taken, the average time per letter increases as the word length increases. Longer words have a higher average time per letter, suggesting that participants spend more time processing each letter in longer words.

4. Accuracy:

- The accuracy is calculated as the ratio of the average number of correct words to the total number of words. It's evident that shorter words (with 4 letters) have the highest accuracy, followed by words with 7 letters, then 6 letters, and finally 9 letters. This aligns with the observation that shorter words are easier to decipher.

5. Efficiency:

- Two metrics are used here to measure efficiency: average time divided by accuracy (avg_time/acc) and average time per letter divided by accuracy (avg_time_pl/acc).
- Shorter words (4 letters) demonstrate the highest efficiency based on both metrics, followed by words with 7 letters, then 6 letters, and finally 9 letters.
- This suggests that participants are most efficient at deciphering shorter words, as they achieve higher accuracy with less time and effort.

Overall, the analysis indicates that word length significantly influences the time taken and accuracy in deciphering typoglycemia words, with shorter words being deciphered more accurately and efficiently compared to longer words.

Observations:

Unexpected Observation 1:

There was one interesting observation, we found that 6 lettered words have lower accuracy as well as require more time per letter to be deciphered. Let's delve deeper into the data to understand why 6-letter words might appear harder to decipher compared to 7 or 9-letter words, despite the general trend suggesting otherwise.

Looking at the provided data:

6-Letter Words:

Average Number of Corrected Words: 47.5

Average Time Taken: 4.580553216

Average Time per Letter: 0.763425536

7-Letter Words:

Average Number of Corrected Words: 51.5

Average Time Taken: 4.268988679

Average Time per Letter: 0.609855526

9-Letter Words:

Average Number of Corrected Words: 50.5

Average Time Taken: 4.464824104

Average Time per Letter: 0.496091567

From the provided data, it seems that 6-letter words indeed have a lower average number of correctly deciphered words compared to 7-letter words. Additionally, the average time taken for 6-letter words is higher than that for 7-letter words. However, the average time per letter for 6-letter words is also higher than for 7-letter words.

One possible explanation for this observation could be the complexity of the specific words chosen for the experiment. It's possible that the 6-letter words in the dataset are more complex or less familiar to the participants compared to the 7 or 9-letter words. This increased complexity could lead to more errors and longer decoding times despite the shorter word length.

Another factor to consider is the distribution of letters within the words. Some combinations of letters may be more challenging to decipher than others, regardless of word length.

To further investigate why 6-letter words appear harder to decipher, it would be beneficial to examine the specific characteristics of the words in this category, such as their frequency, phonetic structure, and semantic complexity. This analysis could provide additional insights into why participants struggle more with 6-letter words compared to 7 or 9-letter words in the typoglycemia experiment.

Unexpected Observation 2:

The accuracy of the word "banana" appears to be notably lower compared to other words in the dataset. Let's examine why this might be the case:

Word Length: "Banana" has 6 letters, which is the same length as other words with relatively high accuracy therefore, the length of the word alone may not be the primary factor contributing to its low accuracy.

Typoglycemia Format: The typoglycemia format involves scrambling the letters within a word while keeping the first and last letters intact. It's possible that the specific arrangement of letters in "banana" in typoglycemia format may create a particularly challenging pattern for participants to decipher compared to other words. Certain combinations of letters may lead to confusion or difficulty in reconstructing the original word.

Phonetic Similarities: Another factor could be the phonetic similarity between "banana" and other words. In the typoglycemia format, words that sound like each other when spoken aloud may be more prone to confusion. "Banana" shares phonetic similarities with words like "bandana" or "banana," which could lead to errors in deciphering.

Semantic Distraction: The word "banana" is also a commonly known object, and participants might be more prone to semantic interference when trying to decipher it. Familiarity with the word's meaning might distract participants from focusing solely on deciphering its scrambled form accurately.

Individual Differences: It's important to consider individual differences among participants. Some individuals may have had more difficulty with the word "banana" due to factors such as language proficiency, cognitive abilities, or prior exposure to typoglycemia tasks.

Overall, the low accuracy of the word "banana" in the typoglycemia experiment could be attributed to a combination of factors related to the specific characteristics of the word, its phonetic properties, semantic distractions, and individual differences among participants. Further analysis or experimental manipulation could help clarify the underlying reasons for its lower accuracy compared to other words in the dataset.

Limitations:

Sample Size: The representativeness of the results depends on the sample size. A larger sample size would provide more generalizable findings.

Learning Effect: As participants encounter more jumbled words, they might become faster and more accurate over time. Ideally, the survey should be designed to minimize this learning effect.

Typing speed: The survey relies on participants tying the word on keyboard. Alternative methods like eye-tracking could provide more objective measures of processing time.

Conclusion:

This survey offers a preliminary investigation into typoglycemia. By analysing accuracy and response times, we can gain insights into how well people can read jumbled words and how word length might influence this ability. Further research with larger samples and additional methodologies can provide a deeper understanding of the cognitive mechanisms underlying this intriguing phenomenon.

Limitations of the Orchestra:

While the cognitive orchestra can be remarkably effective, it's important to remember that it also has limitations:

- **Complexity Overload:** Highly technical terms or words with uncommon letter combinations pose a significant challenge. Imagine encountering a term like "deoxyribonucleic acid" with scrambled letters. The lack of familiarity with the word form and its low frequency make it difficult to decipher, much like encountering a complex musical piece with unfamiliar instruments can be overwhelming.
- **Sentence Structure Matters:** Complex sentence structures and longer sentences can make it harder to glean meaning from scrambled words. The greater the cognitive load of processing the sentence structure, the less attention is available for understanding individual words with transposed letters. Imagine trying to understand a song with complex lyrics while also trying to decipher a new melody, both tasks can be overwhelming.
- **Individual Differences:** Reading fluency, vocabulary size, and overall cognitive processing speed can influence how well someone navigates jumbled words. Individuals with better reading skills and a larger vocabulary are more likely to handle the scrambled sections smoothly, similar to how some listeners might grasp complex music more readily than others.

Conclusion: A Symphony of Cognitive Processes:

In conclusion, the ability to read words with scrambled letters, often associated with the term typoglycemia, isn't a single trick. It's a complex symphony played by a well-rehearsed cognitive orchestra. Shape recognition sets the stage, context provides the melody, and word frequency increases the tempo. Additional instruments like phonology and chunking further enhance the reading process. However, this orchestra has limitations, and the ability to decipher jumbled words can be impacted by factors like complexity and individual differences. Understanding this intricate dance of cognitive processes allows us to appreciate the remarkable flexibility and resilience of our reading system. By delving deeper into these processes, we can gain valuable insights into the fascinating world

Some of the Glimpses of how we took the survey:

Survey Pics

Contributions:

Code and Survey Creation: Aditya Yadav, Tanmay Goyal

Research: Tanmay Goyal, Sonu Koli, Aditya Yadav

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Report: Tanish Goyal, Sonu koli, Aditya Yadav

References:

https://en.wikipedia.org/wiki/Transposed_letter_effect

https://www.classes.cs.uchicago.edu/archive/2022/winter/11111-1/typoglycemia/index.html

Link to Experimental data:

https://1drv.ms/x/s!Aq2XSOxBKxw7kHemDvO7DHUuhjuU?e=nija8Q