The Stroop Effect and Warped Words

Autumn Kinney
Berwick Area High School
10th Grade
First Year
The Stroop Effect is when subjects read colors non-congruent to the words. John Ridley Stroop discovered the Stroop Effect in 1935. It occurs in the Anterior Cingulate Cortex, known as area 25 of the brain. The key functions of the Anterior Cingulate Cortex is to detect errors, prepare for the anticipation and preparation before task performances, and to regulate emotions.
There are four different theories as to how the Stroop Effect works.

- The speed of processing - the brain can read words faster than recognize color.
- Selective attention - the brain needs to use more of its attention to recognize color than words.
- Bottleneck - the brain analyzes information unconsciously through automatic process.
- Parallel distributed processing - the brain analyzes information and builds specific pathways for doing each task.
• Warped words are circled and colored non-congruently to the words.
• This should reduce the interference of the Stroop Effect.
• This might not completely take away the Stroop Effect.
Question

- If the words are Warped will there still be a Stroop Effect?
Hypothesis

- Warping words will either decrease or eliminate the magnitude of the Stroop Effect. The amount of extra time it takes to read the non-congruent words should be less if the words are Warped.
Materials

- Stroop Effect template with congruent colored letters
- Stroop Effect template with non-congruent colored letters
- Warped Words template with congruent colored letters
- Warped Words template with non-congruent colored letters
- Timer
- Participants in grades 6\textsuperscript{th} – 12\textsuperscript{th}
Instruments
Procedure

1. The participants will be asked to sit across from me. I will then place the first survey instrument in front of them upside down.

2. I will then tell them the instructions, to read the **color** not the **word**. They will then be asked to flip the survey instrument over and begin.

3. When they start to speak I will begin the timer. When they say the last color on the survey instrument I will stop the timer.

4. I will then write down the time it took them to complete the task under trial #1.
5. The participants will remain sitting and I will place the second survey instrument in front of them upside down. Then repeat steps 2 and 3. I will then write down the time in trial #2.

6. For the 3\textsuperscript{rd} and 4\textsuperscript{th} survey instruments repeat steps 2 and 3. The times will then be written down in trial #3 and trial #4.

7. Repeat steps 1 through 6 for each participant.
Variables

- **Independent Variable** - Instrument surveys with words coordinated or not coordinated with their colors and with some surveys Warped to disguise the interference of the Stroop Effect
- **Dependent Variable** - The time it takes to complete each task
- **Control** - Straight words versus Warped words
- **Constants** - Script, instruments.
<table>
<thead>
<tr>
<th>Participant</th>
<th>Trial 1</th>
<th>Trial 2</th>
<th>Trial 3</th>
<th>Trial 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female 6th</td>
<td>23.19</td>
<td>44.40</td>
<td>26.07</td>
<td>40.13</td>
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<tr>
<td>Female 6th</td>
<td>39.48</td>
<td>51.09</td>
<td>30.19</td>
<td>35.15</td>
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<tr>
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<tr>
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<tr>
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<td>39.41</td>
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### Data Average

<table>
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<th>Participant</th>
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<th>Trial 3</th>
<th>Trial 4</th>
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<tbody>
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Data Averages Warped Words

![Bar chart showing warped words across different trials. Series 1 has lower values, while Series 2 has significantly higher values.]
### Numerical Comparison of Stroop Effects

<table>
<thead>
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<th></th>
<th>Straight</th>
<th>Warped</th>
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</thead>
<tbody>
<tr>
<td>average</td>
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<td>13.28</td>
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<tr>
<td>std dev</td>
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<td>3.05</td>
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<td>23.96</td>
<td>16.33</td>
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<tr>
<td>low end</td>
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</table>
Magnitudes of Stroop Effect

Time Difference Between Congruent and Non-Congruent Words

- Series 1
- Series 2
Conclusion

• It supported the hypothesis that if the words are warped there is less of a Stroop interference.

• The time it took for participants to read the Warped words decreased from that of the straight words.
Sources of Errors

- The timing could have been a few seconds off.
- The environment could have been different for each participant
  - One session could have been louder than some of the others.
Further Research

- Gender differences.
- If less of the word was colored, would be a Stroop interference?
References