# Illusory Superiority

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PURPOSE: To help answer the following questions:

To what extent do people overestimate their proficiency in a given area?
How, if at all, is this evaluation influenced by peers' evaluations of their own skills?

HYPOTHESIS:

We hypothesize that one's metacognitive accuracy is positively correlated with proficiency. This is because to recognize accuracy, one must properly determine what is accurate which requires proficiency. If one is unable to differentiate between accuracy and error, they will be unable to accurately evaluate their performance or the performance of others. We are unable to hypothesize as to the severity of this correlation (the absolute value of the correlation coefficient). We also hypothesize that the more proficient individuals will more accurately anticipate their performance.

We also hypothesize that the more proficient individual's confidence in their performance will decrease after being exposed to their peers' evaluation of their own skills. We hypothesize that this is due to the "false-consensus effect."

PROCEDURE:

We're planning to have 4 control groups and 8 experimental groups, although this is subject to change as we may not have enough time to conduct the test on all homerooms in the time we are given. We will dedicate one homeroom from each grade ($9^{th}$-$12^{th}$) to a control group to allow for cross-sectional analysis between ages. We're measuring two aspects of the test, only one of which is a dependent variable in this experiment. The control groups will take the test without being asked confidence levels so that we may establish a base score and normal distribution as well as compensate for any change in subject proficiency due to requesting that the subject gauge their confidence in their response. We will then ask the control groups to turn in their responses. We will inform the control groups that it is crucial that they do not discuss the questions with anyone in their homeroom during the test and anyone outside of their homeroom after the test.

The remaining tests will be experimental. The subjects will list their responses to the questions as well as their confidence level as to the accuracy of their response (on a scale from one to seven) on each question on the test. Once each individual in the homeroom has completed the assigned task, they will be asked to flip over their response sheet (where they put their answers as well as their confidence) and to not discuss the questions with their peers.The instructor will then publicly survey the class on which questions individuals thought were easy, medium, or hard. The instructor will compile this information in

MATERIALS & EQUIPMENT:

- ❑ 5 Question Test
- ❑ 12 Homerooms
- ❑ 4 Control Homerooms
- ❑ 8 Experimental Homerooms
- ❑ Two Facilitators (Joe and Camilo)

PROCEDURE:

Request that all homerooms

Part 1:
Watch "Make Up Your Mind"
(Scientific American Frontiers, PBS, October 15, 2002)

Part 2:
Work in pairs with your lab partner to administer the Stroop Test to one another (one partner should time the other as he/she completes the test)
following the procedure below:

1. Take Stroop card #1 and say each word aloud. You may read left to right or up and down.
2. Have your lab partner record your time in seconds.
3. Repeat steps 1 and 2 two more times.
4. Move quickly to Test #2 below.
5. Take Stroop card #2 and say the color that each word is printed in aloud – NOT the word itself. Read it in the same direction as Test 1.
6. Have your lab partner record your time in seconds.
7. Repeat steps 5 and 6 two more times.

Part 3:

Work in pairs with your lab partner to administer the Trail Making Test to one another (one partner should time the other as he/she completes the test)
following the procedure below:

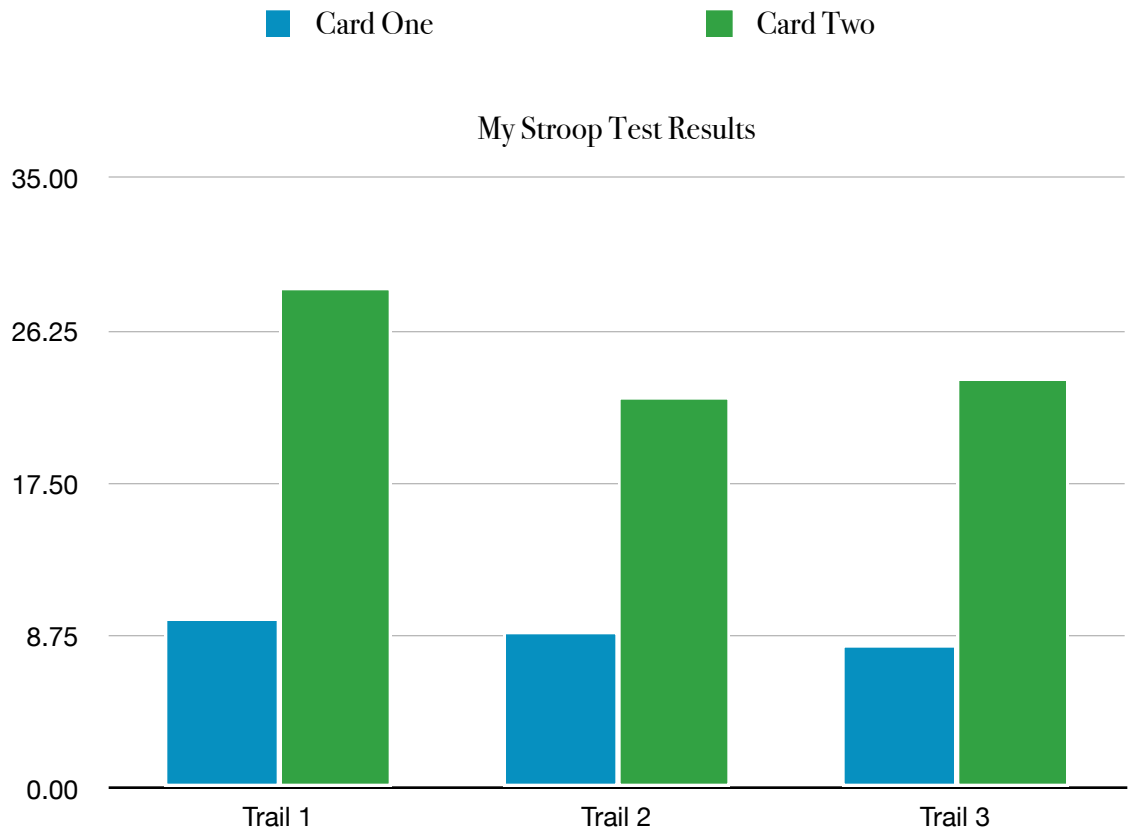
1. Take Trail Making card A and trace a trail through the numbers using a pencil as shown in Sample A .
2. Have your lab partner record your time in seconds.
3. Move quickly to Test card B
4. Take Trail Making card B and trace a trail through the numbers and letters (alternating between numbers and letters) using a pencil as shown in Sample B.
5. Have your lab partner record your time in seconds.

DATA TABLES AND OBSERVATIONS:

## *My Test Results*

| Trials | Card 1 | Card 2 |
|---|---|---|
| Trail 1 | 9.72 | 28.79 |
| Trail 2 | 9.04 | 22.5 |
| Trail 3 | 8.23 | 23.59 |

Notice: All units are in seconds



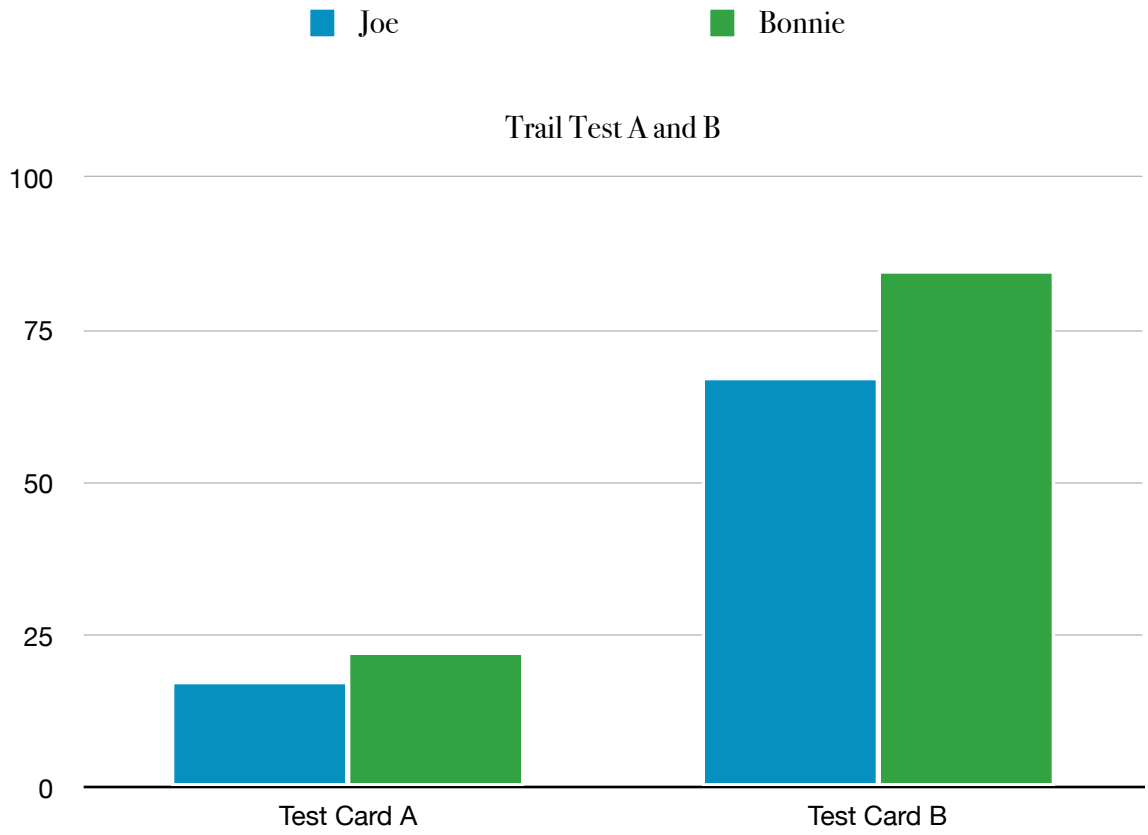

## My Partners Test Results

| Trials | Card 1 | Card 2 |
|---|---|---|
| Trail 1 | 7.88 | 16.31 |
| Trail 2 | 7.66 | 20.47 |
| Trail 3 | 7.97 | 14.75 |

Notice: All units are in seconds

## Trial Making Test

| Names | Test Card A | Test Card B |
|---|---|---|
| Joe | 17.28 | 1:07.16 |
| Bonnie | 22.09 | 1:24.93 |




The trail making tests both A and B are attached along with Stroop Test #2.

Observations of Stroop Tests 1 and 2:

I found the first test fairly easy, I didn't have to think about the color at all but only the word. After doing it three times I got the hang of it and as you can see in my data tables improved each time. The only thing I found challenging were the distractions, people were yelling out different words all at the same time and it made it a little harder to concentrate.

I found the second test a lot harder, I had to really think about the color and ignore the word. And it was especially difficult because I had gotten used to saying the word and ignoring the color. And as a tendency I usually read anything that is given to me, and obviously would ignore the color of the letters. So it was challenging to not read all of the words. One main factor that came in affect was the fact that I am color blind, this made it extremely difficult to tell the difference between brown, red and orange and yellow and green and all except for one was on the test.

I also found it was very difficult to focus due to the noise of the confined area. And after thinking about each problem as you may call it I would continue to move on even if I hadn't spoke the name of the color, and after glancing at the next problem my brain would be processing both and I would usually say the second one, first and get it incorrect. I also felt the urgency of skipping around when I came across a difficult one.

Observations of Trail Making Test A and B:

I found the first test very simple and easy, I just went from number to number in order in a short period of time. I found the second one a lot more challenging, I observed that I would constantly have to recite the alphabet, and would have to start from the beginning. One thing that I noticed was that I left the letter before I found the next number, and would struggle for a second to find it. And the times that I did find it quickly was when I was not frustrated.

CALCULATIONS:

Calculate your average speed for Stroop Test #1

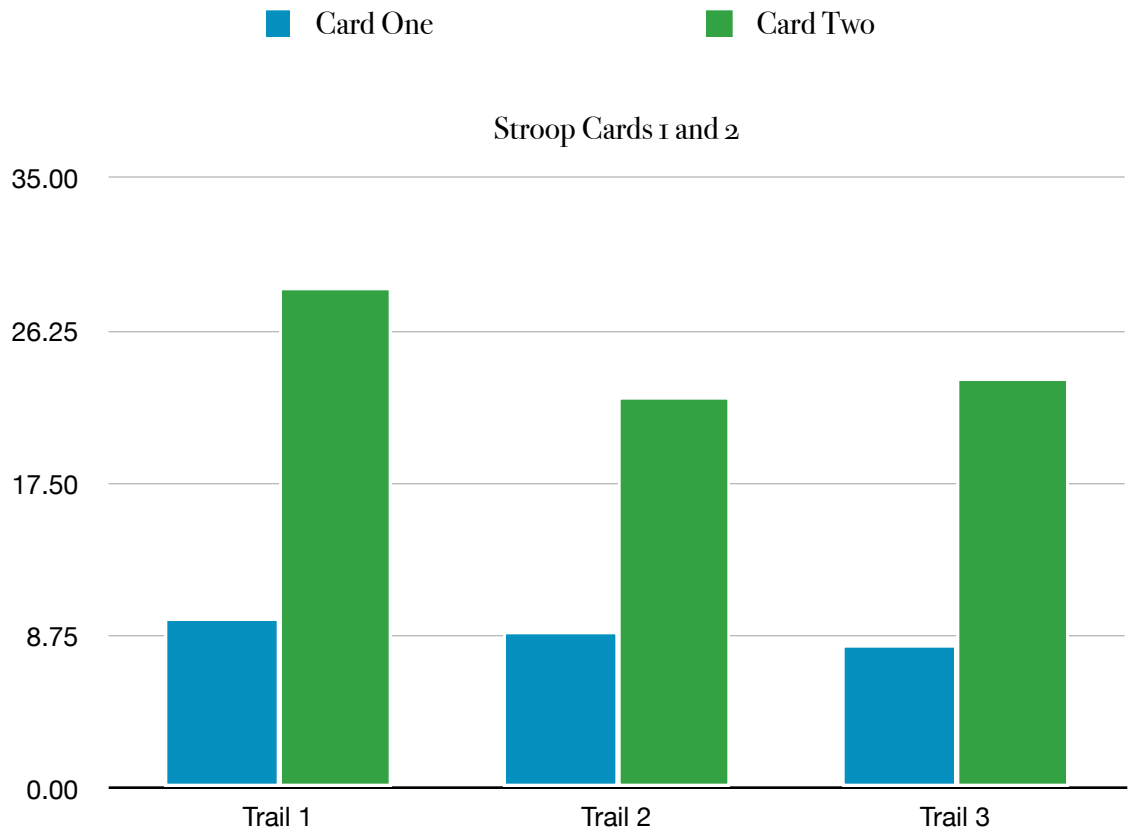
Calculate your average speed for Stroop Test #2

Calculate the difference between your average speed for Stroop Test #2 and your average speed for Stroop Test #1.

Calculate the difference between your speed for Trail Making Test A and your speed for Trail Making Test B.

DATA ANALYSIS AND RESULTS:

In this lab I measured how long it took to read aloud a word which was the name of the color it contained. I did not notice any difference from reading the word in color and reading it if it were black. We did this because we needed to get familiar with these instructions, and get used to ignoring the color but saying the word. The second Stroop test's instructions were to say the color of the word, which was always different from the word. I found it very difficult, it was especially difficult the first time because we had just finished the first Stroop test, and the instructions were to move on to the second Stroop test as fast as possible so that our brain would still be set on doing the first Stroop test. The second Stroop test is attached.

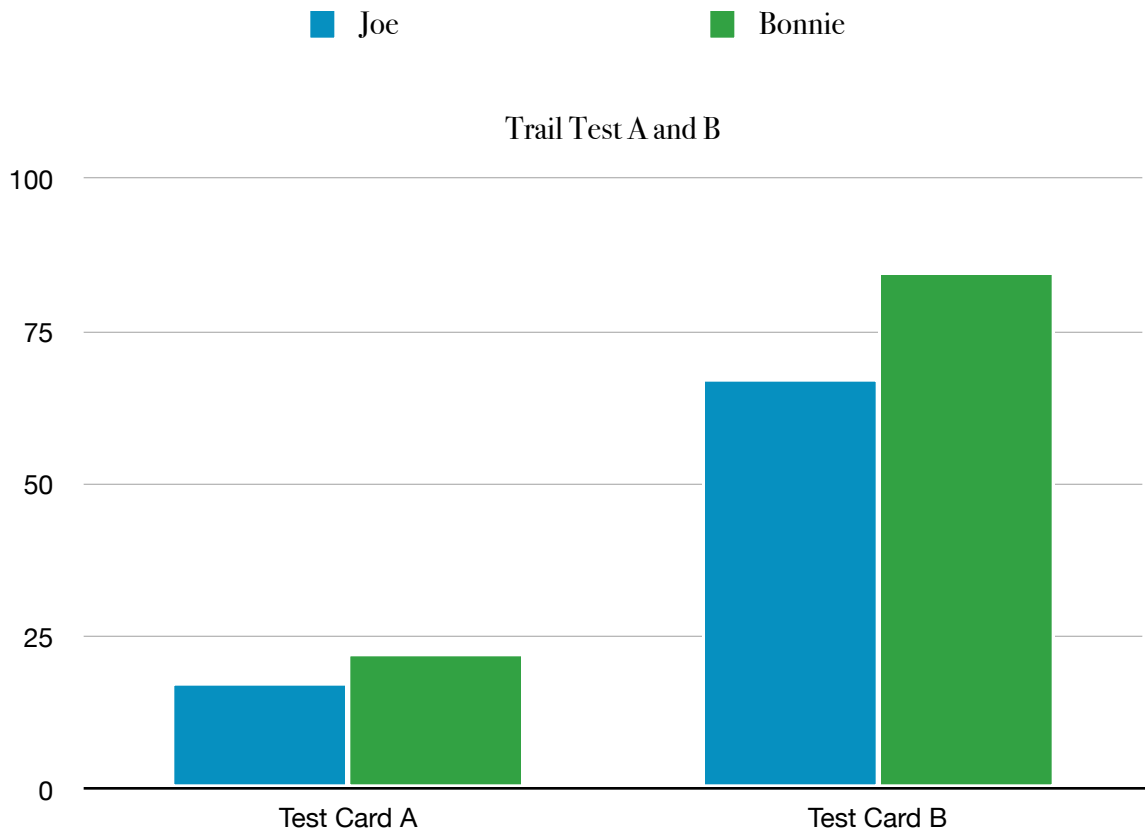



I created this graph because I found it easier to analyze data in a graph format. This is a graph that I created based on the data tables that we recorded of the first and second Stroop test, all of the units are in seconds. The first Stroop test (indicated by the blue bar) shows that there was a slight decrease each trial. The average decrease for the first Stroop test of all the trials was 74.5 mili-seconds (a decrease of 68 mili-seconds the first trial and 81 mili-seconds the second trial). I think that the reason for this slight decrease was because my brain was "warming up" and I slightly improved each time.

The second Stroop test (indicated by the green bars) shows that it took me a lot longer (19.07 seconds). This is because the instructions were to say the color of the word and not the word, which took a lot of concentration. As you can see there was dramatic decrease (6.74 seconds) in the amount of time it took me to finish Stroop test between the first and second trial. This is because I had just finished the last trial of Stroop test number one and my brain was set on it, so I had to adjust from saying the word to saying the color. What I found odd was that there was an increase in the time (1.5 seconds) it took me on the second Stroop test between the second and third trial. I came to the conclusion that it was the environment that caused the increase.

In my science notebook I specifically noted that I was a lot more distracted the third trial then any other trial I had done. And I think this is why there was an increase in the time it took me. The measurements of the amount of time it took me allowed me to better understand one of the ways that the brain works and how factors in the environment around you can affect what you're doing.

After the two Stroop test's were completed we did what was called the Trail making test. Where we would use a pencil or pen to draw a line from one number to the next in order. All the numbers were mixed up so that you couldn't find a pattern. The first Trail test I found easy, and it did not take me much time to do it. Below is a graph of the time it took me and my partner to do the Trail test.

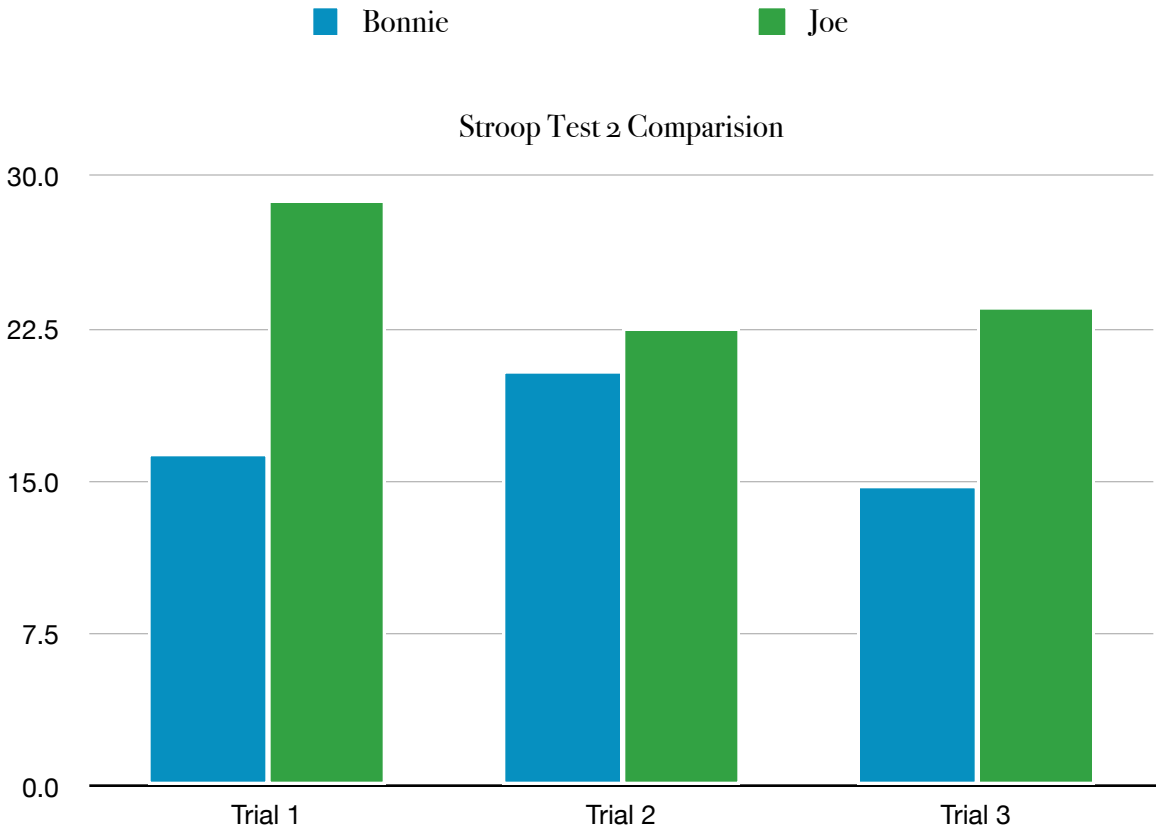



All units are in seconds. I have decided not to compare and analyze my partners data, for unnecessary reasons. As you can see the comparison between the first test connecting number's in order and the second test matching a letter with a number (A,1,B,2,C ect.) are completely different. It took almost four times as long (3.8 times) to do the second test than the first test. One very interesting thing that I found was actually an accident, in trying to calculate how many times longer it took to do the first test than the second test I accidently calculated my lab partners data instead of mine. After realizing my mistake I calculated mine only to find that I got the exact same number, 3.8. So it took both me and my partner the exact same amount of times more to do the second test than the first test. Even though it took me partner longer to do both tests.

I think that one of the reasons that it took longer to do the second Trail Test is because it takes longer for the brain to process a number and a letter at the same time.

These measurements allowed me to better understand what are some of the reasons that the brain processes slower in some situations and faster in others.

In combining my observational data and my data graph I noticed that it took my partner a significantly less amount of time to accomplish Stroop test number two than I did. I think that this is because I'm color blind, and this may be one of the reasons I did




quite poorly compared to my partner.

According to my observations I encountered two types of problems in the second Stroop test. I would stall and think about the word and color, or I would impulsively say it and get it wrong. I found these two problems evenly distributed among the test. This information is identical to the notes I took from the movie we watched. The movie stated that the older brain tends to have a slower response time, and the younger Brian has a faster response time but is often less accurate. And the teen brain is in the middle, which would mean that at some points it would stall for a long period of time, or it would instantly answer the question but less accurately.

I also noticed that at the very beginning of my first trial of the second Stroop test I incorrectly stated a color, my teacher pointed this out and I would repeat the color as I saw it. After three tries of saying the exact same thing I looked at it closer. And realized

that I was saying the wrong color. There could be two reasons why I did this. Either I was not being mindful of the text. Or I wasn't remembering the instructions correctly. Also stated in my notes of the movie we watched on the Brain was that the teen brain often understands the instructions completely, but when the situation arises where it needs to use those instructions it gets confused and makes the wrong decision. This could be the reason why I incorrectly stated the color three times.

It is worth noting that the distractions could have caused a different result in all of the tests. Another possible source of error could have been that I stopped in between each test to record observations. When the instructions in the procedure stated to do the next test immediately. This could also have altered the results that I got, because there was a time in between for the brain to forget the process that we were doing and thus could have lowered the time it took me to do the second test.

QUESTIONS TO CONSIDER:

Part 2:

Which words tend to trip you up?

Often the words that tripped me up were in the second Stroop test. They tended to be whatever words contained the following colors: Yellow, Green, Red and Orange. This is because I often confuse these colors because I am color blind.

Was it the same word every time?

No it was not, because it was not the word I was struggling with but the color of the word.

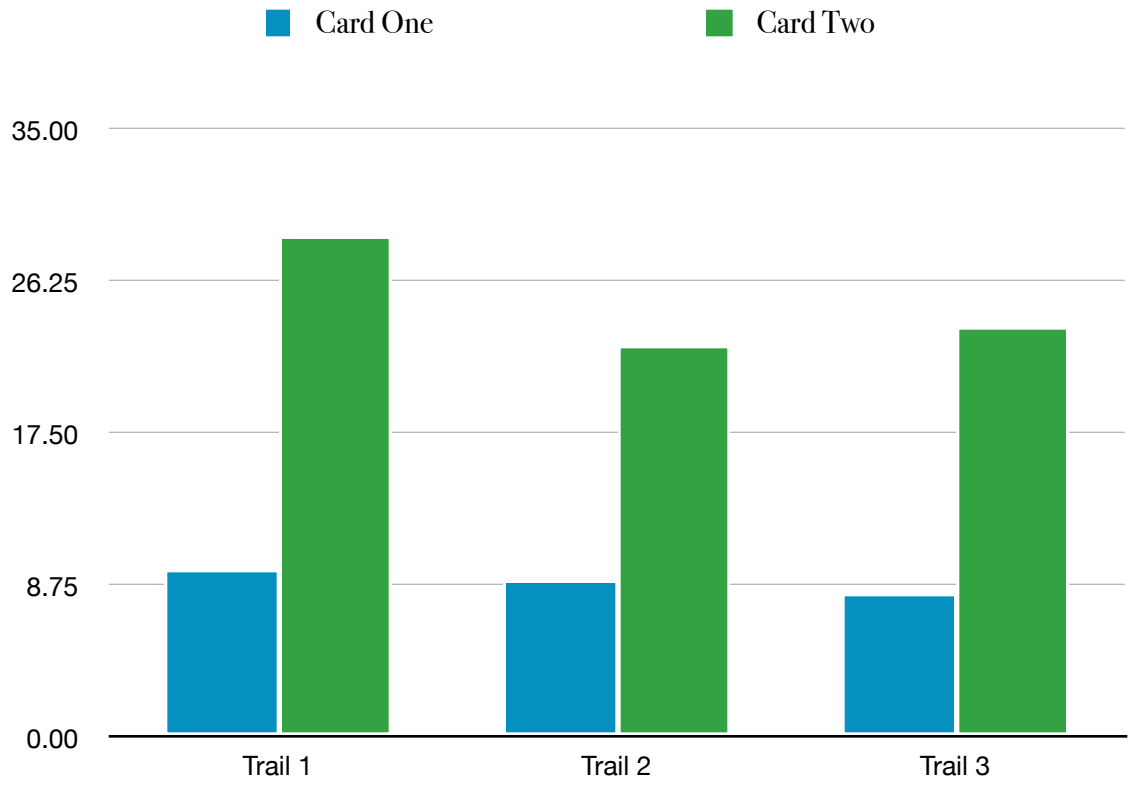
Did the color of the word make any difference?

Yes, it did because once again it was not the word that tripped me up but the color.

Did the test get easier the more times you did it?

Yes, as you can see in this graph, the first Stroop test (indicated by the blue bar) took me less time each trial, I think that this is because my brain was adapting to reading in this form. In the second Stroop test (indicated by the green bar) it took me very long to complete the first trail and a lot less time in the second round.

I think that the reason it took me so long in the first trail of the second card is because I had just finished the first card where the instructions were to say the word and not the color and the second card had the opposite instructions, so I continued making mistakes thus raising my time because I had already adjusted to saying the word and not the color. I think that the reason it took me longer the last trial of the second card was because I noticed that there were a lot more distractions than the other trials.




Notice: All units are in seconds

Part 3:

How much longer did Test B take?

The B test took 49.88 seconds more than the A test. I think this is because it took a lot more thinking to match the numbers and the letters then just the numbers.

Why do you suppose it took longer to do Test B?

I think this is because it took a lot more thinking to match the numbers and the letters then just the numbers.

Do you think that, with practice, you could improve your score? Why?

I think that if you practiced each Stroop test separately you would improve, because you would get used to processing just the color and not the word. And the same situation with the first Stroop test.

CONCLUSION:

I learned that I like to look at information in a graph format rather than a Data Table format. I also learned all about the differences between the Teen brain and the older and younger brains. I learned that the prefrontal cortex is hardly in use at all in the early years of life. And how the prefrontal cortex can have an effect on decision making, behavior, making the right choices for ourselves and creating long term goals. I had the opportunity to even see how important the prefrontal lobe has an effect on our decision making from a short movie that we watched.

Additional Questions:

What would happen if we were to have the same tests taken only on adults and young children, and take observations and see if it coincides with the movie we watched.

What would be the results if we took the same test but with no distractions?

What were to happen if we were do the same tests but we did not know we were being timed? Would that have an affect on the results?