ESS 200 Names: **Smarty Pants**

Experimental Design

Practice #1 – Reaction Time Experiment

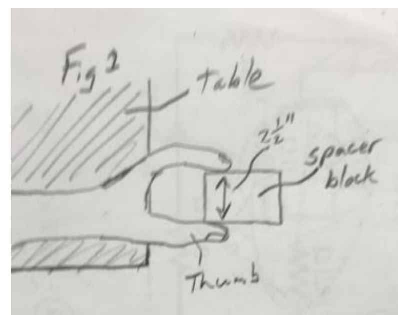
Experimental Question: Is there a relationship between eye color and visual reaction time in a school classroom?

Manipulated Variable: Eye color (Blue eyes or Brown Eyes)

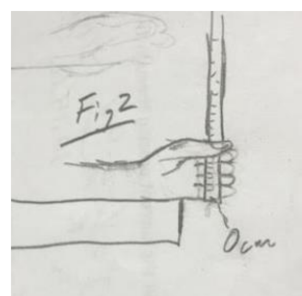
Responding Variable: Reaction time (how quickly the subject catches a dropped ruler)

Hypothesis: I think blue-eyed people will have faster reaction times, because blue eyes are more light-sensitive than brown eyes. The classroom is a somewhat low-light environment, so I think the extra light sensitivity will give blue-eyed people an advantage in noticing when the ruler has been dropped.

Procedure: First, I selected 5 blue eyed students and 5 brown eyed students to participate in my experiment. I selected students by moving down the class roster, in alphabetical order, approaching each student and determining whether he or she had brown or blue eyes. I continued through the class roster until I found 5 willing participants from each eye color group. For simplicity, I only selected right handed students*.

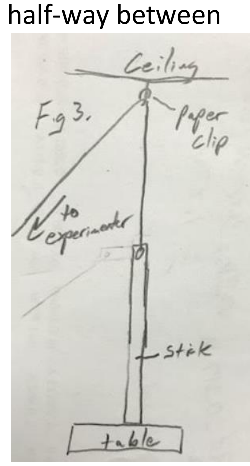


Next I tested each student. Before testing began, I read the same set of instructions to each student. These instructions described what would happen and exactly what the test subject was supposed to do.



The test subject sat in the same chair at the same desk in the same part of the adjoining empty classroom, facing the same direction [*this is why students needed to have the same dominant hand – so that they could face the same direction]. The test subject rested his or her left forearm on the table with his or her fingers and thumb extending beyond the table edge (See Fig 1). A 2.5 inch wide spacer block was placed between the subject's thumb and fingers, and the subject was asked to keep his/her hand in that position after the spacer block was removed. If the distance between fingers and thumb changed, the spacer block was returned to achieve the proper spacing.

Immediately after removal of the spacer block, a meter stick was held vertically, approximately half-way between last knuckles of the subject's thumb and forefinger. The zero cm end of the stick was held even with the top of the desk (Fig 2), and any swing in the meter stick was eliminated. At this point, one experimenter said "ready," and then released the meter stick at a predetermined interval within the next five seconds. The subject had been instructed to grab the stick as soon as it was released. After grabbing the meter stick, the subject continued to hold the stick with his/her hand in its original position. The distance that the meter stick had fallen was then measured, relative to its starting point (starting point = table top level).



To prevent the test subject from predicting the drop by watching the experimenter, one experimenter released the meter stick from behind the test subject. This was accomplished by hanging the meter stick from a string that feeds through an overhead paperclip which was attached to the ceiling (Fig 3). One experimenter was able to control the raising, lowering, and dropping of the meter stick simply by using the string.

This process was repeated three times for each test subject, and the distances fallen were averaged for each test subject. For the first try, the time interval before the drop was approximately 3 seconds. For the second drop, the time interval was 2 seconds. For the third drop, it was 4 seconds. These intervals were not made known to the test subject. They were counted silently by the experimenter with the string. If the subject appeared to be simply guessing when the stick was going to fall, he or she was removed from the experiment and another subject was found using the class roster. Students were informed that they would receive a tasty candy for cooperation and successful completion of the experiment. Removed students received no candy.

To prevent changing classroom conditions from affecting results, data collection alternated between blue eyed and brown eyed students. A coin toss was used to decide which eye color test subject would go first.

Finally, reaction times were inferred from the distances fallen by the meter stick before it was caught. A shorter distance meant a faster reaction time.

Controlled Variables (list at least three important ones):

1. Distance between thumb and finger

2. Motivation to cooperate with the experimenters

3. Blue and brown eyed students alternated, so the part of class (beginning, middle, end) did not vary between the two groups

4. All students received identical instructions

5. No students were able to watch the procedure before they participated in the experiment.

Results (Fill in the table below)

	Responding Variable (and units of measurement) : Average Distance fallen by the meter stick (cm)	
Trial #	**Test Group 1:** Blue Eyed Students	**Test Group 2:** Brown-Eyed Students
1	15	12
2	14	10
3	18	20
4	27	5
5	15	15
6		
7		
Average	17.8	12.4

Statistical Test Used (Circle all that apply):

Mann-Whitney U T-Test for Independent Means T-Test for Dependent Means

One-tailed test (a.k.a. one-sided) Two-tailed test (a.k.a. two-sided)

Significance level: 0.01 0.05 0.1

P-Value Calculated by Statistical Test:

P=0.158

Conclusion:

My hypothesis was not supported by this experiment. In fact, the average distances dropped by the meter stick (17.8 cm for blue-eyed students and 12.4cm for brown-eyed students) suggest that brown-eyed people actually have faster reaction times. Clearly my hypothesis was incorrect, and in light of that, I did not even need to prove this with statistics.

However, I did want to investigate whether or not brown-eyed people might actually have significantly faster reaction times. The proper thing to do in this situation was to conduct a two-tailed test, and that is what I did. My two-tailed T-Test for independent means produced a p-value of 0.158, which does not meet the significance cutoff of $p \leq 0.05$. Therefore, I cannot say with 95% confidence that brown-eyed people have faster reaction times.

ESS 200 Names: ____

Experimental Design

Grading Sheet Practice #1 – Reaction Time Experiment

1. By reading the experimental question, can you easily identify a manipulated and a responding variable?
   2 – yes 1 – no

2. Are the manipulated and responding variables correctly identified? 2 – yes 1 – no

3. Can the manipulated variable be measured to produce numerical data? 2 – yes 1 – no

4. Does the hypothesis include a prediction regarding how changing the manipulated variable will affect the responding variable? 2 – yes 1 – no

5. Does the hypothesis include a logical reason for this prediction?
   2 – yes 1—There's a reason, but it's not logical 0 – No reason is provided

6. Does the procedure provide enough detail so that you could repeat this experiment and expect similar results? Can you visualize what is happening?
   3 – Yes, exactly 2 – Pretty much; I get the general idea

   1 – No. This procedure is unclear. 0 – There is no procedure.

7. If the manipulated variable require measurement, was the measurement tool precise? 2 – yes 1 – no

8. Does the procedure include a precise means of measuring the responding variable? 2 – yes 1 – no

9. Are the listed controlled variables factors that would affect the responding variable if they were not controlled?
   3 – all are 2—two of them are 1 – one of them is 0 – non are

10. Did the experimenters leave out any important controlled variables for this experiment? If so, what are they?

11. In the results section, is the responding variable correctly titled, with correct units?
    2 – Titled correctly, correct units 1 – Either units or title is correct 0 – Neither correct

12. Are the two test groups labeled (titled) in a way that clearly demonstrates how the manipulated variable was varied?
    2 – yes 1 – no

13. Did the experimenters use the correct type of test (dependent vs independent means)? 2 – yes 1 – no

14. Did the experimenters use the correct type of test (one-tailed vs two-tailed)? 2 – yes 1 – no

15. Did the experimenters choose the correct significance level (0.05)? 2 – yes 1 – no

16. Did the experimenters calculate the p-value correctly? 2 – yes 1 – no

17. In the conclusion, did the experimenters provide the correct answer to the experimental question, based on their calculated p-value? 2 – yes 1 – no

18. In the conclusion, did the experimenters cite the p-value as evidence? 2 – yes 1 – no

19. In the conclusion, did the experimenters cite the test group averages as evidence? 2 – yes 1 – no

Total Points = ___/ 38