



Sensory Stimulus

An ME 208 Project



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Background

Ever had difficulty working or studying due to a noisy or distracting environment? It is known that the majority of people experience difficulty working at their full capacity when their senses are unintentionally being stimulated. Our topic pertains to how various types of sensory stimulus affect the average person’s short-term memory.

Research Question

How does sensory overload affect a human's short-term memory, and are certain stimuli more distracting than others?

Researcher Interview

Name: Matthew Yukio Nishimoto
Brain Computer Interfaces (BCI)
Uses BCI for neural rehabilitation
Can help people suffering from strokes and other brain related injuries
Question Asked: how to improve the stability for long term BCI’s because the brain can reject BCI and how to make it less invasive
How it’s performed: Implanted into brains to record healthy areas and to stimulate damaged areas to speed up the healing process.
Recorded binaurally: a neuron fires or doesn't and uses machine learning

Arduino Data Collection

We test short-term memory by showing people an image for 20 seconds, then display a question. Our code is a series of loops that repeat with each question that we ask. Data is collected by one of 4 buttons being pressed on the circuit, and then checking if the response matches a preset answer. The array of correct questions is saved.

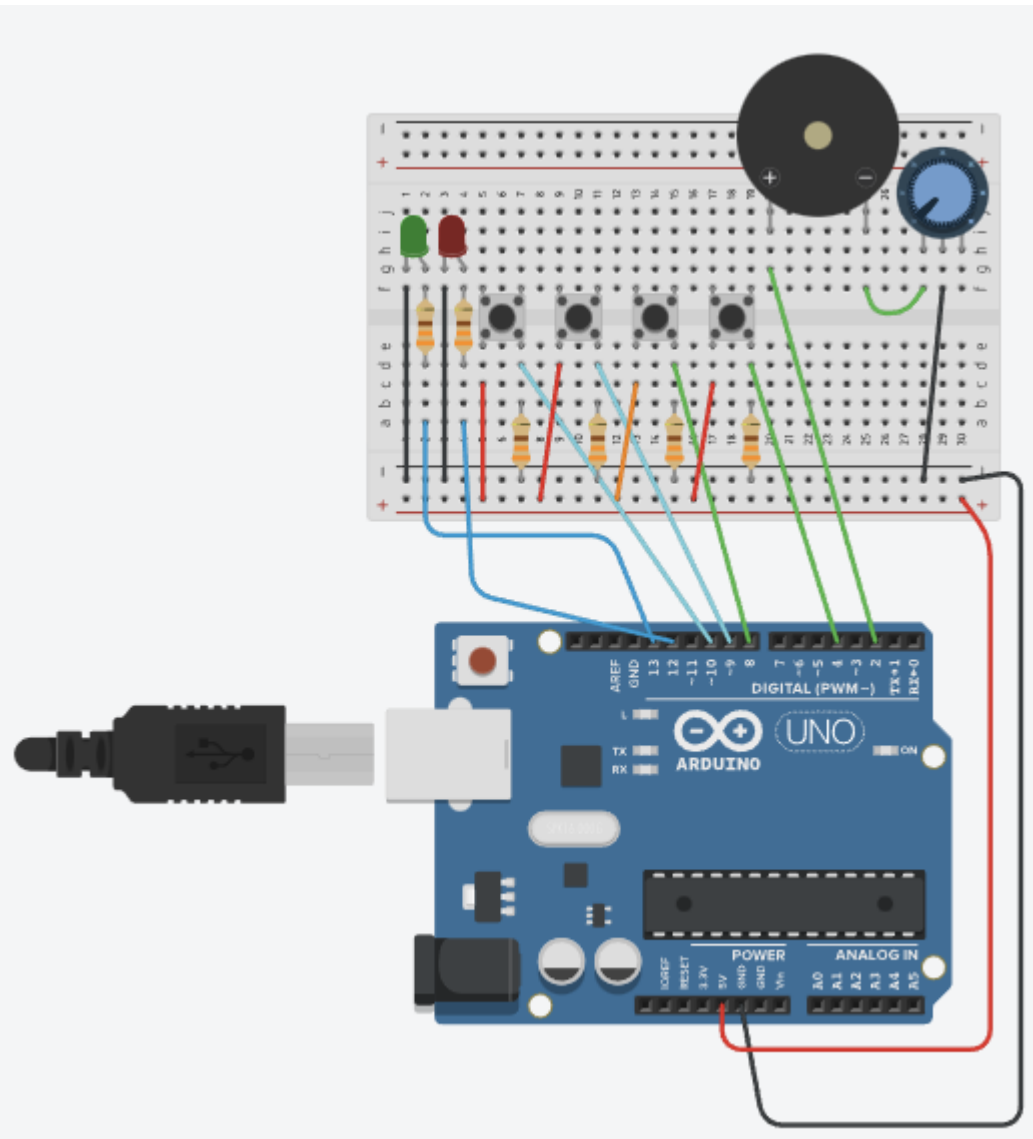


Figure 1: Circuit Diagram

Sensory Overload Data												0 = incorrect, 1 = correct, red = possibly inaccurate data							
Subject Name	Question 1	Question 2	Question 3	Question 4	Question 5	Question 6	Question 7	Question 8	Question 9	Question 10	Correct					Stimulus Level	Correct		
Waseem	1	0	0	1	1	1	0	0	0	0	4 out of 10					0	8 out of 12		
Nifemi	0	0	0	1	1	1	1	0	1	1	6 out of 10					1	5 out of 9		
Quinn											out of 10					2	3 out of 9		
Brian	1	0	0	1	1	1	1	0	1	0	6 out of 10								
Stimulus level	0	1	2	0	1	0	2	0	1	2									

Figure 2: Collected Data

Data Collection and Analysis Methods

With the array of correct questions (zeroes and ones), we can determine how many questions were correct for each level of stimulus

Stimulus 0: no distractions
Stimulus 1: short, recognizable clip is played before the question is asked
Stimulus 2: stimulus 1 plus party noise is played during the entirety of the slide

Earbuds and a laptop were used for testing



Figure 3: Image example

Results

75% correct for no stimulus
55% correct for 1 stimulus
33% correct for 2 stimulus

There is an inverse linear relationship between the amount of additional unwanted sensory stimulus and the number of questions that people got correct.

Conclusion

- A subject's ability to recall something from short term memory linearly declines as sensory stimulus is increased during a visual-focused activity.
- Further research is needed to determine whether short-term memory is affected in the same way when a person is intentionally focusing on audio. There are many different modifications that could be made to our procedure that would provide us data for a different sensory stimulus.

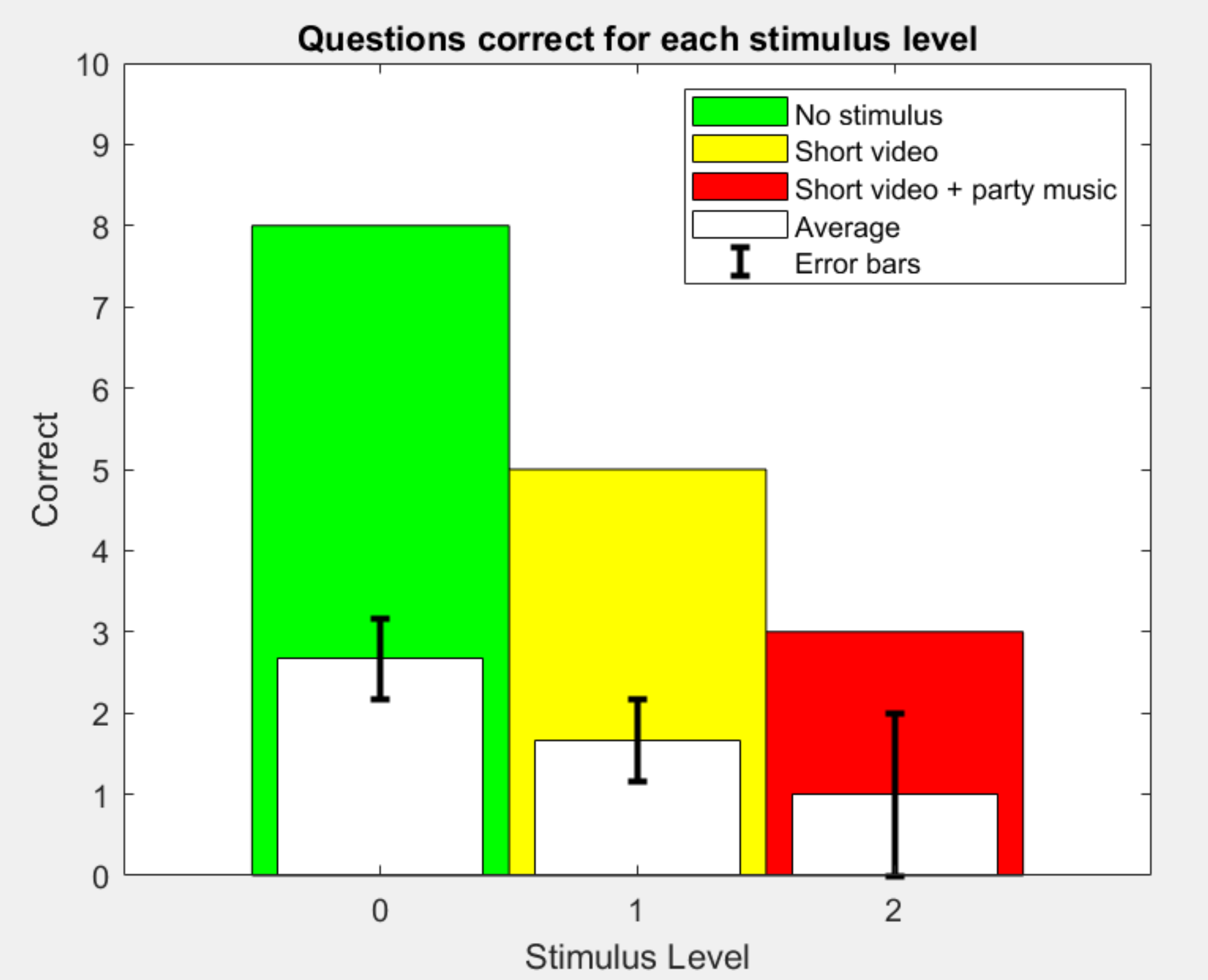


Figure 4: Data Representation