TOPIC:
-How does caffeine affect a child's memory?

BACKGROUND INFORMATION:
We have researched that it is possible to get a shorter memory from caffeine. Our research is exactly how much caffeine will affect your mind. Using Google, we have found that research DOES show that caffeine in certain amounts does affect a child's brain in one way or another. As most people know, caffeine can make you hyper and can help you stay awake if you drink it, but there can be other things that coffee can be accused of doing to you. This includes:

- Increased energy metabolism
- Increased activity in the brain and nervous system
- Increased alertness
- Etc.

Using tea, or drinking tea can alter the way that you think. As listed above, it can make you hyper or more alert. This is because it affects your brain in many ways. It affects the lateral prefrontal cortex, the default mode network (DMN), the visual cortex, and the motor network. The lateral prefrontal cortex, or the LPFC is the part of the brain that is responsible for cognitive thinking, planning, choice (selecting between things), and working memory. The DMN does something similar, with it being able to use memory and think about the future. The visual cortex is used to integrate visual or put together things you see to form a whole or to come to a conclusion, and information the motor network sends messages to execute reactions and responses. The LPFC and DMN work with memory, so caffeine affects your memory in one way or another. But in our experiment, we'll be testing how.

Most Psychologists use a simple list method to test memory; There is a list of random items that the "player" has a few seconds to study, and then they are told to repeat the list in the same order it was. This method is commonly used on people of all ages, and because it is more accurate. So, when we test people on their memory capabilities with and without caffeine, we will indeed be using this method. In the future, we will call this the "list test"

We've been focusing a lot on the mind and its connections to caffeine; But what about its impact on our bodies and impact on people? Caffeine has many connections with the body along with many risks, such as:

- Increased restlessness and shakiness
- Fast Heart Rate
- Insomnia
- Increased breathing
- Excitement
- Diarrhea
- High blood sugar
- Pregnancy (loss of pregnancy (which means killing the baby in the womb).
- Gout
- etc.

But aside from these, some things benefit the human body such as:

- An alert brain
- Decreased suicide risk
- Decreased risk of oral cancer
- Weight loss
- Improved brain function
- reduced different types of diseases such as Alzheimer's and Parkinson's disease
- Cataracts
- Reduce the chance of skin cancer
- Lower chance of getting kidney stones
- Reduce chance
- Stroke
- Reduce the chance of type 2 diabetes

What are these things though?

- Increased restlessness and shakiness, restlessness when it is harder to sleep, and shakiness is when it is harder to stay in a fixed position.
- Fast heart rate is when your heart rate/beat speeds up faster than it is.
- Insomnia is a condition that disrupts/makes it harder to sleep.
- Increased breathing is when you breathe in or out more than usual.
- Excitement is when you are very enthusiastic.

- Diarrhea is a condition when human feces comes out of the bowels as a liquid.
- High blood sugar is when the glucose in your blood reaches too high which can cause things like diabetes.
- Loss of pregnancy is when the baby that is in the womb passes away before the twentieth week of pregnancy.

But, what is caffeine? Caffeine is a bitter substance that occurs naturally in plants or flowers. This includes Coffee Bean, Tea Leaves, Kola Nuts, Etc. You will notice that in many foods caffeine is present in them. It also makes an appearance in energy drinks and soft drinks such as Gatorade, Coca-Cola, Prime Energy, Soda, 5-Hour Energy Extra Strength, etc. Caffeine is enjoyed around the world in its liquid forms such as Coffee, Tea, Hot Chocolate, Green Tea, Bubble Tea, Black Coffee, Latte, and Espressos. Etc.

The effects of caffeine usually last around 3-5 hours, but the effects will not be too drastic because we will be serving milk tea, not your regular coffee, so the effects would last around 2-4 hours. That's just enough for us to conduct the experiments properly and well.

All this talk about tea and caffeine, what about memory? Memory is the psychological process of storing and retrieving information in the brain. Some things can improve how you remember things and memory in general, while other things, like age, greatly affect how much you remember and store memory. Memories are made when the brain finds information and approves that it will be useful in the future. Without memory, our body would not function at all. Your body would not function at all.

Adding on to the last paragraph, memory is important because if we did not have memory at all, we would not be able to do normal things; Such as: Eat, Talk, Walk, Or anything you need to live. Another important thing about memory is that it's beneficial for you. You won't remember anything or your phone password if you don't have it.

Almost every day, millions of people rely on caffeine to wake them up or to keep them awake. Caffeine is one of the most used ingredients in the world in everyday foods. Caffeine, like us, is usually talked about by many because of its

bad effects on your body. But, a lot of studies have shown that there are also positive effects of it. (Mentioned before) Such as:

- Increased Energy
- Alertness
- Ability to concentrate more
- awareness

These are quite simple, but there are more "complicated" ones.

- You could potentially live longer, according to studies. (Studies show that the leading causes of death in women are almost prevented by caffeine/coffee)
- Stronger DNA (Coffee decreases breakage between DNA strands)
- Caffeine is linked to preventing Alzheimer's and Parkinson's
- Coffee is also linked to warding off heart failure.

Another thing that we have noticed is that Caffeine: Benefits, risks, and Effects (medicalnewstoday.com) has stated that "Research from Johns Hopkins University suggests that a dose of caffeine after a learning session may help boost long-term memory." This shows that caffeine can improve memory for up to 24 hours but this is long-term memory, we are researching short-term memory so we would like to figure out if caffeine affects this instead of long-term memory.

HYPOTHESIS:
My hypothesis is whether caffeine can influence a person's eidetic memory by improving the memory or making it gradually worse, (eidetic memory means strong memory). If it does help with memory I think it is highly recommended that you should drink some caffeine before doing something like a test that you will have to use memory for. If it doesn't, I think you should stop drinking caffeine because why would you if it doesn't have many good qualities?

EXPERIMENT PROCEDURE:
This part will explain how the experiment goes in steps.

1. Give a person 1 cup of water to drink. Explain instructions briefly, and motivate them.

2. Use randomlists.com to list 10 everyday items (e.g. baby, chalk, banana, pencil etc.). The person will be given time (~15 seconds) to study and examine the list.

3. The list will become hidden and the person will be asked to read the list from memory

4. Look at the accuracy and rate /10

5. Ask the person to drink one cup of tea (containing caffeine). Make sure They drink it slowly, at a rate which they can finish.

6. Give them time to do other activities (games, video games, running etc.) for about 10 minutes

7. Ask the user to come back and take another list test and rate out of 10

8. Compare 2 results e.g

LIST TEST: [Generate a list of random things](#)

VARIABLES:

Controlled-
- People - Age 9-13
- The same amount of milligrams per cup served
- Same Amount of caffeine
- Same Test System

Manipulated-
- People
- Things On Test

Responding-
- Out of the list correct for both tests

- Effects of Caffeine on the brain

EXPERIMENT OUTCOME:

Kean-
Gender: M
Age: 11
  WITHOUT CAFFEINE - 4/10
  WITH CAFFEINE - 7/10

Anum-
  WITHOUT CAFFEINE- 4/10
  WITH CAFFEINE- 5/10

Ruhi-
Gender: F
Age: 10
  WITHOUT CAFFEINE- 5/10
  WITH CAFFEINE- 6/10

Ahyana-
Gender: F
Age: 9
  WITHOUT CAFFEINE- 5/10
  WITH CAFFEINE- 5/10

Hedaya-
Gender: F
Age: 10
  WITHOUT CAFFEINE- 4/10
  WITH CAFFEINE- 5/10

Moriah-
Gender: F
Age: 9
  WITHOUT CAFFEINE- 5/10

WITH CAFFEINE- 6/10

Abigail-
Gender: F
Age: 9
    WITHOUT CAFFEINE- 1/10
    WITH CAFFEINE- 3/10

Aayan-
Gender: M
Age: 11
    WITHOUT CAFFEINE- 10/10
    WITH CAFFEINE- 10/10

Daniel-
Gender: M
Age: 11
    WITHOUT CAFFEINE- 7/10
    WITH CAFFEINE(one serving)- 8/10
    WITH CAFFEINE(two servings) - 7/10

Lucas-
Gender: M
Age: 11
    WITHOUT CAFFEINE- 6/10
    WITH CAFFEINE(one serving)- 9/10
    WITH CAFFEINE(two servings) - 4/10

Neal-
Gender: M
Age: 11
    WITHOUT CAFFEINE- 5/10
    WITH CAFFEINE(one serving)- 5/10

WITH CAFFEINE(two servings)- 4/10

Arjun-
Gender: M
Age: 12
WITHOUT CAFFEINE- 7/10
WITH CAFFEINE(one serving)- 9/10
WITH CAFFEINE(two servings)- 8/10

Maryam-
Gender: F
Age: 12
WITHOUT CAFFEINE- 3/10
WITH CAFFEINE- 3/10

Zaid-
Gender: M
Age: 11
WITHOUT CAFFEINE- 6/10
WITH CAFFEINE- 6/10

Norah-
Gender: F
Age: 11
WITHOUT CAFFEINE- 1/10
WITH CAFFEINE- 2/10

Katie-
Gender: F
Age: 11
WITHOUT CAFFEINE- 3/10
WITH CAFFEINE- 4/10

Edward-
Gender: M
Age: 11
WITHOUT CAFFEINE- 3/10

WITH CAFFEINE- 2/10

Tiffany-
Gender: F
Age: 11
    WITHOUT CAFFEINE- 9/10
    WITH CAFFEINE - 2/10

Kaliyah-
Gender: F
Age: 11
    WITHOUT CAFFEINE- 4/10
    WITH CAFFEINE - 1/10

Simra-
Gender: F
Age: 11
    WITHOUT CAFFEINE- 6/10
    WITH CAFFEINE - 7/10

Avril-
Gender: F
Age: 11
    WITHOUT CAFFEINE- 5/10
    WITHOUT CAFFEINE:4/10

Aayan N-
Gender: M
Age: 11
    WITHOUT CAFFEINE- 4/10
   WITH CAFFEINE(one serving)- 4/10

We are thinking about doing a test after 5 or 10 minutes to see if that will change our results, if it does then that could benefit our project with extra information to give us higher chances of getting a better science fair project.

OBSERVATIONS:

As of right now, the tests that we ran with the person drinking caffeine are doing better than the tests without caffeine. In the future, this may prove that caffeine improves memory. For some people, the results were the same. This could mean that this caffeine tactic works only on some people better than others. A few people got lower results as they drank a second serving, which could mean that too much caffeine could result in it being more difficult for them to remember certain things and objects

ANALYSIS:

Our analysis is that after drinking a small amount of tea it seems to benefit your memory by helping you remember things, in this case, an assortment of 10 different objects. After drinking an amount of caffeine this stimulates the neurons inside of your brain. This makes it so that if you drink a small amount of caffeine your brain might start working faster since neurons generate electricity, therefore if they are stimulated the energy will get transmitted faster which could mean that your brain will start working better and so will your memory. With some of the people that we have tested, it shows that too much caffeine can excite the neurons too much and make it harder to focus and remember objects.
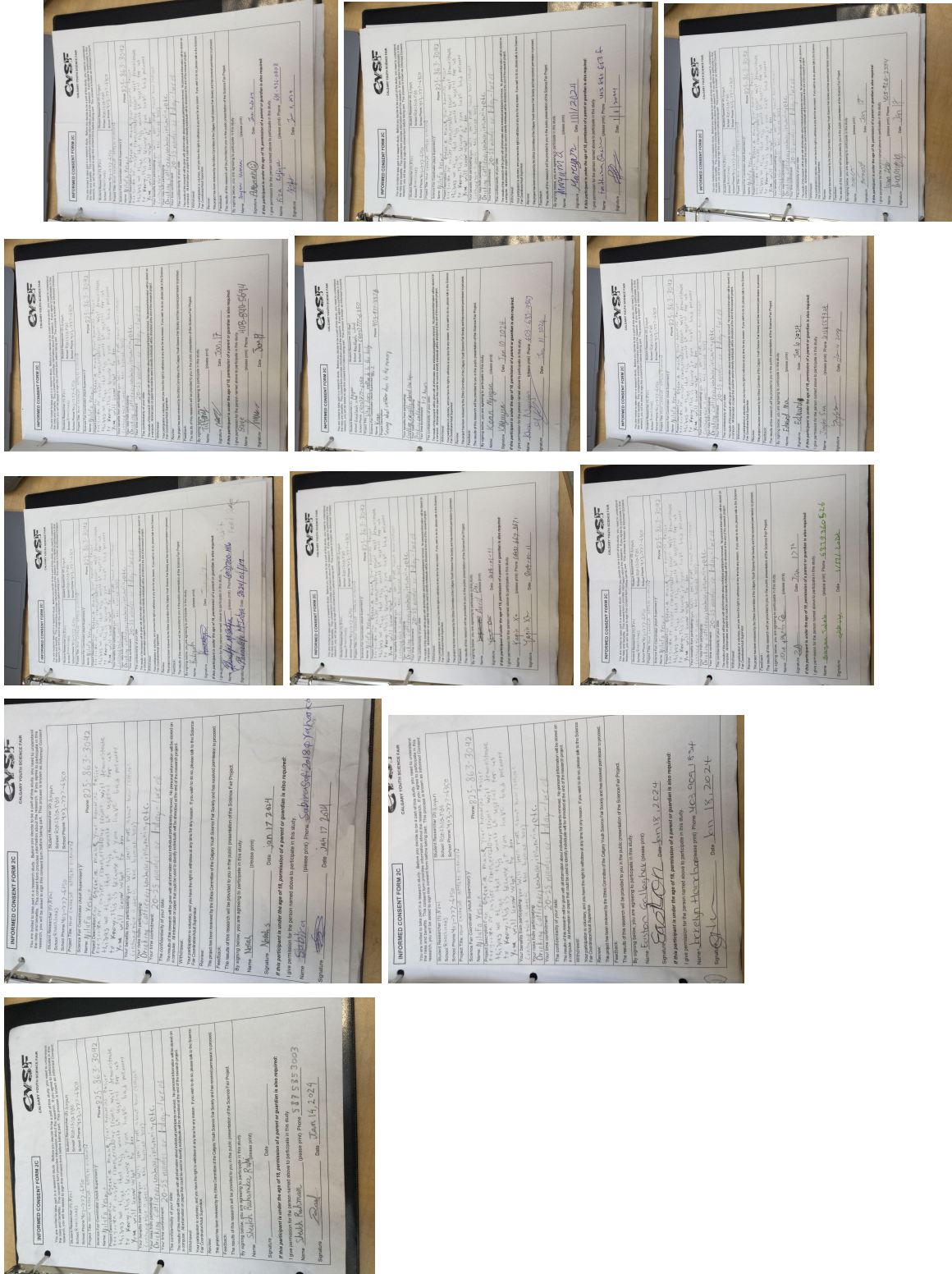
CITATIONS:

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[Caffeine Cheat Sheet: Which Drinks Have the Most?](#)

[How Long Does it Take for Caffeine to Wear Off? | Sleep Foundation](#)

[What Is Memory?](#)

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[Caffeine - StatPearls - NCBI Bookshelf](#).