

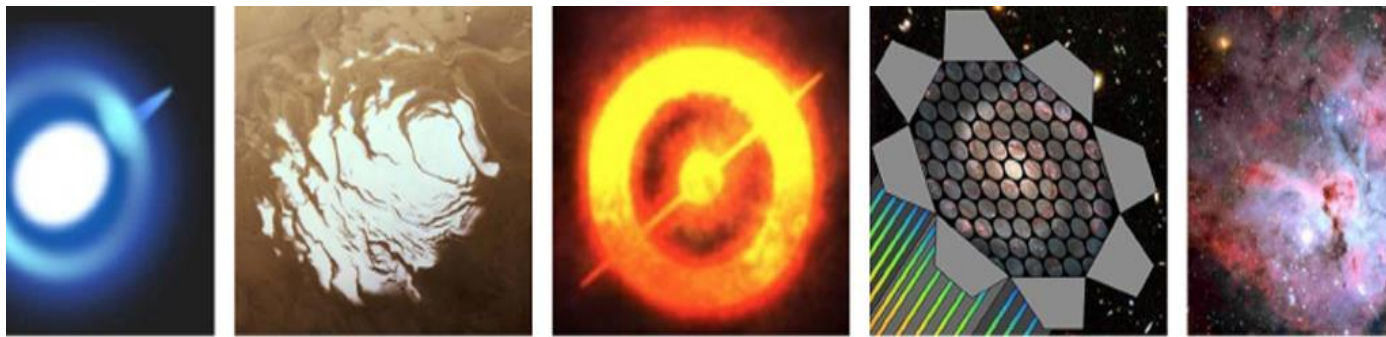


Using Virtual Citizen Science Activities to Introduce Students to Careers as Research Technicians

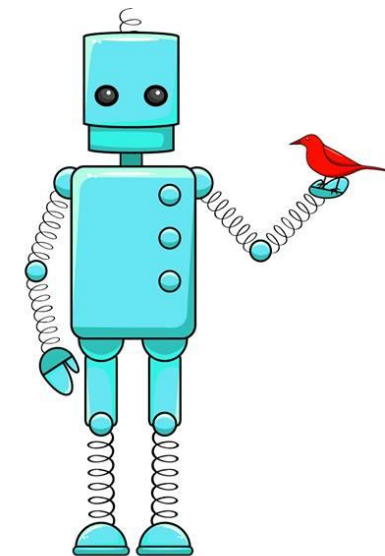
Sharon Gusky, Biology Professor, Northwestern Connecticut Community College, Winsted, CT

Kelsey Sudol, Adjunct Professor, Northwestern Connecticut Community College, Winsted, CT

Engaging Students from Classrooms and Camps to College and Advanced Technical Careers



ZOONIVERSE



scistarter
People-powered science.

Zooniverse.org

Scistarter.org


Three examples

Etching Cells-Zooniverse

Water Insights

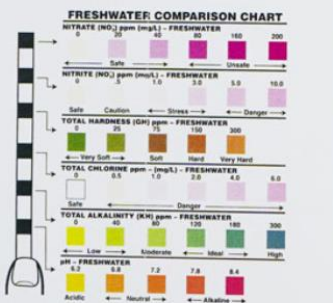

Stall Catchers- SciStarter

WaterInsights



Thank you for your interest in testing your community's water!

I created WaterInsights when I learned – and experienced firsthand in my own community – just how important it is to know the quality of your water. In fact, 40% of lakes in the United States are too acidic and 80% of surface water in India, where I was born, is contaminated with toxic substances, causing serious health problems and a scarcity of drinking water.

Student	Nitrate	Nitrite	Hardness	Chlorine	Alkalinity	pH	Type of water
1	0	1	150	0	80	6.8	snowmelt
2	0	0	0	0	0	6.2	snowmelt
3	0	0	300	0	40	6.2	snowmelt
4	0	0	0	0	0	6.2	snowmelt
5	0	0	0	0	0	6.2	snowmelt
6	0	0	25	0	0	6.2	tap water
7	20	0	300	0	80	7.8	tap water
8	20	0	300	0	300	8.4	tap water
9	0	0	150	0	180	7.8	tap water
10	0	0	75	0	80	6.8	tap water
11	0	0	300	0.5	80	6.8	tap water
12	20	0	0	0	300	7.2	tap water
13	20	3	25	0	80	6.2	tap water
14	0	0	75	1	40	6.2	tap water
15	0	0	75	0	40	6.8	tap water
16	0	0	25	0	40	6.8	tap water
17	0	0	0	0	40	6.2	tap water
18	0	0	25	0.5	0	6.8	tap water
19	0	0	75	0	80	6.8	tap water
20	0	0	50	0	80	6.2	well
21	0	0	0	0	40	6.2	well
22	20	0	300	0	80	6.8	well
23	0	0	0	0	120	7.2	well
24	0	0	25	0	40	6.2	well



Stall Catchers

ABSTRACT

Our team took part in a crowd research game, "Stallcatchers", created by researchers at Cornell University and the EysenckALZ organization. Research from the game is used to test their hypothesis that stalls, clogged blood vessels in the brain, are linked with Alzheimer's disease.

By viewing mice brain images taken with advanced imaging techniques, individuals with no prior experience can assist with the identification of stalls in mice affected by Alzheimer's. The team collected data during the process, finding that stalls were present in nearly 27% of all blood vessels viewed.

BACKGROUND

Alzheimer's Disease is a neurological disorder that causes impaired memory and thinking skills which eventually lead to an inability to carry out even simple tasks (NIA, 2017). Usually affecting people 65 years of age and older, it involves shrinking of the brain, cell death, and deposits of plaque that all affect blood flow, negatively impacting the transportation of nutrients and gases necessary for healthy function. This can cause the buildup of amyloid plaques, a suspected cause of the disease. The disease has no known cure.

Researchers at Cornell University have discovered links between "stalls", clogged blood vessels in the brain, and Alzheimer's. Working with the EysenckALZ organization, they created an online game that allows users to identify stalls in images of mouse brains. The researchers are hoping to form a connection between these stalls and their relationship to Alzheimer's in human patients to help combat the disease, when stalls were reversed in mice, it improved memory and reduced other associated symptoms.

Our hypothesis was that a high percentage of mice with Alzheimer's will have stalls.

Terms and Concepts:

Alzheimer's Disease: an irreversible, progressive brain disorder involving shrinking of the brain, cell death, and deposits of plaque in the brain (National Institute on Aging, 2017).

Stall: a clog in a blood vessel caused by white blood cells, reducing blood and oxygen flow (Stall Catchers, 2019).

Amyloid Plaque: plaque formed from an excess of amyloid beta proteins, thought to cause inflammation in brain blood vessels (Stall Catchers, 2019).

PROCEDURES

- Our team members played Stall Catchers (available at stallcatchers.com) and collected data from over 20 videos per member.
- Each team member watched a series of videos and determined if the blood flow was stalled or flowing, following training available on the site.
- If the blood was stalled, the team member would use their mouse to click on the location the stall was detected.
- Each team member recorded the results from 20 videos and determined the average stalls within their dataset.
- Our team then combined our findings to come to our final results.

Basic Process



An example of the game screen, showing a stall in two places (circled in red)

RESULTS

Stall Catchers ID	Stall	Flowing	Stall	Flowing
Stall 1	Stall (Flowing)	Flowing	Stall (Flowing)	Flowing
Stall 2	Stall (Flowing)	Flowing	Stall (Flowing)	Flowing
Stall 3	Stall (Flowing)	Flowing	Stall (Flowing)	Flowing
Stall 4	Stall (Flowing)	Flowing	Stall (Flowing)	Flowing
Stall 5	Stall (Flowing)	Flowing	Stall (Flowing)	Flowing
Stall 6	Stall (Flowing)	Flowing	Stall (Flowing)	Flowing
Stall 7	Stall (Flowing)	Flowing	Stall (Flowing)	Flowing
Stall 8	Stall (Flowing)	Flowing	Stall (Flowing)	Flowing
Stall 9	Stall (Flowing)	Flowing	Stall (Flowing)	Flowing
Stall 10	Stall (Flowing)	Flowing	Stall (Flowing)	Flowing
Stall 11	Stall (Flowing)	Flowing	Stall (Flowing)	Flowing
Stall 12	Stall (Flowing)	Flowing	Stall (Flowing)	Flowing

Figure 1: Image data and results

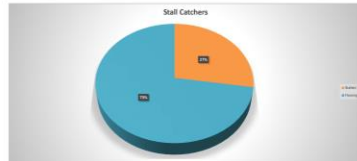


Figure 2: Pie chart depicting the percentage of stalled blood vessels in viewed images.

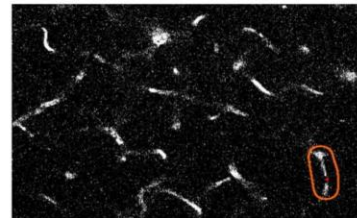


Figure 3: A stalled blood vessel in a reviewed image

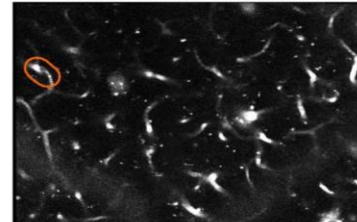


Figure 4: A flowing blood vessel in a reviewed image

DISCUSSION

This experiment is helping to find a cure for Alzheimer's disease by seeing if there is a relationship between stalled blood vessels and Alzheimer's. A stall, an area in the brain where the blood vessel is clogged, appears as a black spot in Figure 3. 27% of blood vessels viewed appeared to have stalls (Figure 2). In Figure 4, a flowing blood vessel, you will see no black spots that are stuck, and blood is flowing in a single direction without any interruptions. 73% of blood vessels viewed appeared to be flowing (Figure 2).

The stalled blood vessels that were viewed are a problem because it leads to a lack of nutrients and oxygen traveling to the brain, and harmful molecules build up that can contribute to the progression of the disease. Researchers give the example that Alzheimer's patients can have nearly 2% of their brain capillaries clogged, which leads to a 30% reduction in blood flow. By having regular citizens play the stalling catching game to identify stalls or flow in the brain, it will speed up Alzheimer's research and allow scientists to further identify the causes of this disease.

SOURCES OF ERROR

Sources of error are numerous, with a large source being that this project is dependent upon having people who are not formally trained trying to identify stalls. There are also errors that may be associated with how the game is viewed, with limitations based on the screen that the individual is using. It may be easier identifying on a larger monitor than on a small laptop or mobile device. Because our experiment data is combined from all four group members with varying levels of proficiency, all completing this for the first time, there is a likelihood that we were not as accurate as individuals more accustomed to this research.

CONCLUSION

In this experiment, the lab group engaged in a game that is designed to further research that relates to stalls in blood vessels and Alzheimer's disease. Our hypothesis in this experiment stated that stalls would be seen in a high number of blood vessels in mice with Alzheimer's. The data from the experiment indicated that about one third of all the images viewed contained stalls in blood vessels. Although researchers are still trying to prove that stalls impact Alzheimer's disease, it is clear that stalls have a negative impact on blood flow and oxygen in the brain. Such conditions most definitely could have the potential to influence Alzheimers.

There were multiple takeaways from the experiment. The experiment introduced what stalls are, as well as what Alzheimer's disease is, while explaining the significance of both. Additionally, the stall catchers game enabled the lab group to learn how to correctly identify stalls through microscopic imaging.

ACKNOWLEDGEMENTS

"What is Alzheimer's Disease?" BASICS OF ALZHEIMER'S DISEASE AND DEMENTIA/What is Alzheimer's Disease?, U.S. Department of Health and Human Services/The National Institute on Aging's, 17 May 2017, www.nia.nih.gov/health/about-alzheimers-disease.

Stall Catchers, The Human Computation Institute, 11 Jan. 2013, stallcatchers.com/about/science-1.

Stall Catchers

Stall Catchers Lab



Abstract

Stall Catchers is a program created by the Human Computation Institute to help find a cure for Alzheimer's Disease. Alzheimer's is a widely known devastating disease that mainly attacks our elders that many scientists are trying to cure. In this lab scientists were tasked with identifying stalls in blood vessels in a rat's brain. Scientists hypothesized that the number of stalled vessels identified would be less than the number of flowing vessels identified. At the end of the lab this hypothesis was upheld as only 20% of the vessels were stalled.

Background & Introduction

Alzheimer's disease is a progressive neurodegenerative disorder. It occurs when plaque begins to build up in the synapses between neurons. After this, the brain will begin to die off from no chemical signals being sent through the neurons. In the search for a cure for Alzheimer's, doctors realized an increase of stalls in patients. Stalls are blocked vessels in the brain that inhibit blood flow. A person with Alzheimer's is likely to have 2% of their brain vessels stalled. This 2% leads to 30% of the brain not receiving proper blood flow.

Stall catchers is a study developed to help speed the process of finding a treatment for Alzheimer's. Originally founded by the Human Computation Institute, with help from Cornell and U.C. Berkely, Stall Catcher's, is a program where individuals from all over the world can identify stalls from videos of vessels. When viewing a video, participants are asked to label the vessel as flowing, meaning that blood flow is not inhibited, or stalled. With the identified stalls, the Stall Catchers team hopes to minimize the time it will take to find targeted treatments for Alzheimer's patients.

Hypothesis

With labeling the vessels as either stalled or flowing we should expect to see less stalled vessels given that in one Alzheimer's patient they are likely to have 2% of their vessels stalled indicating that the number of stalled should be less than flowing.

Methods

Website/URL : <https://stallcatchers.com/main>

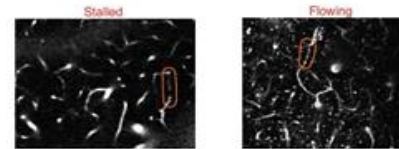
Once you reach the website, you can read and watch the information on Stall Catchers before you start to collect data. The video will allow you to be able to understand what a stall looks like and how to identify one throughout the experiment.

Procedure

In the Stall Catchers Lab, each of us followed specific steps to be able to collect data and determine if our hypothesis was correct.

Our overall goal of this experiment was to identify stalls. Stalls are areas in the brain that our blood stops flowing due to clogged blood vessels. Before we could begin, we watched a tutorial that allowed us to know what a stall looked like and how to identify them.

Our first step was to watch a short movie of blood vessels in a rat's brain through a virtual microscope. In each movie there was a specific blood vessel outlined that we had to determine if any stalls occurred throughout the movie or if it was a flowing blood vessel. (An example of both a stalled and flowing blood vessel are seen below.)



If we determined that the blood vessel was stalling, we would identify the spots it was stalling by using a mouse to click a red dot where the stalling occurred.

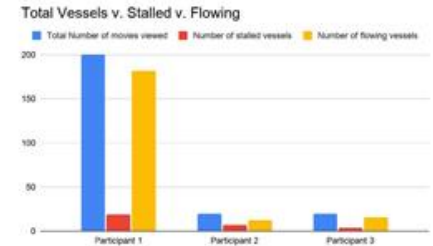
If the blood vessel had no stalls and was considered to be a flowing blood vessel, we identified that movie with no stalled blood vessels and moved on to view another movie and repeat the process.

We repeated this process for about 20 to 200 movies depending on the participant. After we identified the number of stalls in each movie we recorded the data in a table.

Results

Participants	Total Number of movies viewed	Number of stalled vessels	Number of flowing vessels
Participant 1	200	19	181
Participant 2	20	7	13
Participant 3	20	4	16

Results



Discussion

Looking at our results participant 1 viewed more vessels than participants 2 and 3. It can also be seen that there is a significant gap between the number of stalled and flowed vessels. We can also see that in participants 2 and 3, who both viewed twenty stalls, participant 2 also viewed more stalls compared to participant 3. In total 240 vessels were viewed, with 30 of them being stalled and 210 of them being flowing. With our data 12.5% of vessels were stalled.

One possible source of error in this lab is that some of the vessels were not verified by the scientists running the project. If they were not identified, it was based on our judgment. Another issue could be the number of vessels viewed for everyone in the group. One person could have viewed only twenty vessels while someone else could have viewed two hundred vessels. With this, it could alter the data once it was all composited together.

Looking at all of the data collected, from all three participants, we can conclude that there are more flowing than stalled vessels. This aligns with our hypothesis as well as the information provided by the Stall Catchers team. They noted that for each person there are approximately 2% total stalled vessels. This indicates that there should be a significant difference between stalled and flowing vessels.

Conclusion

In conclusion our original hypothesis was correct. When watching the movies of the blood vessels in a rat's brain, we identified more flowing blood vessels than stalled.

After performing this experiment and analyzing our data, we can conclude that while stalled blood vessels leads to 30% of the brain not receiving the correct blood flow to function properly, stalled blood vessels are not as common as expected.

Just like many diseases, Alzheimer's disease is still a mystery to many scientists but the information and data from the Stall Catchers lab allows us to be one step closer to a possible cure.

Asked 100 students in General Biology to
Select the Bioscience careers that they
are familiar with

72% were not familiar with any of them

Environmental Technician 8%

Biotechnician 4%

Chemical Technician 4%

Engineering Technician 4%

Research Technician 4%

Sterile Processing Technician 4%

Visit <https://www.biotech-careers.org/> Write a post on two careers, read and respond to three postings

The careers you chose I agree are very important. They affect every person in our society by being the food we buy within the grocery store that we buy just assuming there isn't anything wrong with it. I find it so interesting, how jobs like these that can affect so many pay so little, yet you have to have a wide range of skills and knowledge.

Food inspectors are really important in the food industry. Many consumers should appreciate them because they help to ensure the safety of diners. Lots of restaurants are shut down every year because they fail inspections, and without food inspectors, these same restaurants would be able to continue serving food from unsanitary environments.

After completing the Water Insights lab, I've developed a deeper appreciation for water quality technicians. Comparing the quality of water in my area to water in other areas of the country made me realize how many elements are in our water supply and the importance of treating it properly. There will always be a need for this job.

I find it crazy that even after being exposed to potentially life threatening pathogens and hazardous materials, Environmental health and safety techs only make \$40,000-\$50,000 a year. Granted its somewhat higher than the average pay of a biotech career, it just seems like this particular career holds a greater risk.



Using Virtual Citizen Science Activities to Introduce Students to Careers as Research Technicians

Sharon Gusky, sgusky@nwcc.edu

Kelsey Sudol, ksudol@nwcc.edu