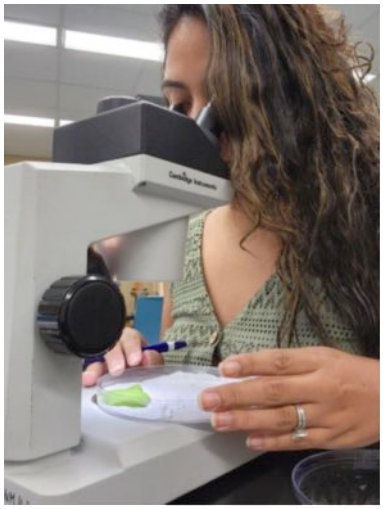
Undergraduate Research Experiences Completed by

St. Petersburg College Students

2023 Student Research Projects and URE Symposium



SPC St. Petersburg College

ST. PETERSBURG COLLEGE URE UNDERGRADUATE RESEARCH EXPERIENCES SYMPOSIUM

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About the Undergraduate Research Experiences Report

In 2018 St. Petersburg College (SPC) developed and implemented a model to provide interested STEM students with paid Undergraduate Research Experiences (UREs) facilitated by faculty in their field of interest. The URE implementation was made possible by The Tampa Bay Bridge to the Baccalaureate (TB-B2B) Program, which was grant funded by the National Science Foundation (NSF) as part of the Louis Stokes Alliance for Minority Participation (LSAMP).

Over the ensuing years, student and faculty interest in UREs has continued to increase. In 2021 building on this success, SPC initiated a collegewide expansion and began offering paid UREs to first generation students, in both STEM and non-STEM fields.

In 2022 and again in 2023, the SPC Foundation awarded a grant to further promote the expansion of paid UREs collegewide and to conduct the fall 2022 and fall 2023 Undergraduate Research Experiences Symposiums, which were collegewide events.

Students' final research reports for each URE completed by first generation and TB-B2B students during 2023 are contained within this publication.

Report Overview

Prior to the start of each semester in 2023, first generation and TB-B2B students were informed that 8-week research opportunities within their undergraduate major were available during the following semester, and included a paid stipend of $300. Interested students were provided the name of a professor in their field, and were directed to schedule a meeting with the professor to discuss their research interests. Once each student agreed to start a project, their professor updated the URE Commitment and Agreement form with the project details and the form was signed by both. A sample form is provided in Appendix A.

Seventeen SPC first generation and TB-B2B students participated in paid 8-week UREs within their field of interest during 2023. Students received their stipend after all research project requirements were met at the conclusion of the eight weeks, including the completion of a final report. UREs included research projects in eight categories: Biology, Ecology, Economics, Engineering, Marine Biology, Microbiology, Psychology, and Social Science.

Upon completing a URE, students were surveyed to measure their perspective about the impact the UREs had on them, and assist the college to continuously improve. The survey was adapted from the Community College Undergraduate Research Initiative (CCURI), and the Undergraduate Research Student Self-Assessment (URSSA) from the University of Colorado, and with their permission, we removed a few questions that were not applicable to our URE model. The survey consists of six categories: 1. GAINS IN THINKING AND WORKING LIKE A SCIENTIST; 2. PERSONAL GAINS RELATED TO RESEARCH WORK; 3. GAINS IN SKILLS; 4. OVERALL RESEARCH EXPERIENCE AND CHANGES IN ATTITUDES OR BEHAVIORS AS A RESEARCHER; 5. ACADEMIC AND CAREER

About the Undergraduate Research Experiences Report (continued)

IMPACT; 6. INTENT TO PURSUE MORE HIGHER EDUCATION DUE TO RESEARCH. Each category contains 4 to 8 question that align to specific aspects related to the category.

Fifty-nine students have completed paid UREs at SPC collegewide, and their research projects are featured on the college website at: Student Research. Six annual URE publications are available on the site beginning with 2018. Each booklet includes the final research reports submitted by student researchers each year.

SPC's Inaugural Undergraduate Research Experiences Symposium was held in fall 2022, and featured 22 student researchers alongside their poster presentations, which encompassed the fields of Biology, Ecology, Health Science, Microbiology, Psychology, Public Policy, Social Science, and Sustainability. Student researchers and faculty mentors are featured on the college website at: Symposium

In fall 2023, we held the second annual Undergraduate Research Experiences Symposium which featured 28 student researchers alongside their poster presentations, representing the fields of Astrophysics, Biology, Ecology, Economics, Engineering, Marine Biology, Microbiology, Physics, Psychology, Social Science, and Technology. Student researchers and faculty mentors are featured on the college website at: Symposium

Funding for first generation student researchers, and for the 2023 Undergraduate Research Experiences Symposium was provided by the SPC Foundation.

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Undergraduate Research Experiences

Listed below are the names of seventeen students who completed paid UREs with guidance from St. Petersburg College professors in five disciplines, and submitted their final reports contained within this document.

Biology UREs conducted with Professor Shannon Ulrich, PhD

- Summer Gallagher *Fish Forensics: Fraudulent Fish?*

Biology URE conducted with Professor Linae Boehme, PhD

- Lena Conway *Zooplankton Distributions in the Gulf of Mexico*

Biology URE conducted with Professor Ray Menard, PhD

- Alexandra Acuna *Antibiotics from Soil*

Biology URE conducted with Professor Bonnie Simmons, BS

- Xavier Phillips *The Impact of Urban Greenery on Microbial Air Quality*

Ecology UREs conducted with Professor Erin Goergen, PhD

- Sofia Andreeva *Effect of tap, deionized, and greywater on growth and nutrient content in chives*
- Anna Medeiros *Aphid control using essential oil as biopesticide*

Ecology UREs conducted with Professor Erica Moulton, MS

- Alexander Short *Microplastics in Pinellas County Waterways*

Engineering UREs conducted with Professor Brian Bell, PhD

- Sorie M. Bangura *Electrocardiogram Research*
- Gabriella Brouk *Investigating Electromyographs*

Psychology UREs conducted with Professor Sara Gomez, MA

- Allison Enriquez *Familial and Non-Academic Stress Effects on Motivation*
- George Sullivan *Gender's Influence on Conformity in an Elevator*

Psychology URE conducted with Professor Janice Kicklighter, MA

- Duke Panagiotis *Suicide: A Threat to National Security*

Psychology UREs conducted with Professor Sharon Olsen, MA

- Sofia Lachapelle *An Investigation of the Stroop Effect*

Psychology URE conducted with Professor Rebekah Barnett, PhD

- Kayla Dixon *Highlighting the Positive Influence of Community Centers and Community-Based Programs on Local Youth*

Social Science UREs conducted with Professor Sunita Kumari, PhD

- Ryan Dzialo *Utilizing Philips Curve to Understand Recent Economic Climate*
- Aimen Mudassar *Demographic Trends in Italy from 2015 to 2022: A Case Study*

Social Science UREs conducted with Professor Roberto Loureiro, PhD

- Godfrey Torres *Severed roots and fractured identities: the poignant saga of Serbian refugees*

Undergraduate Research Experiences Survey Results Highlights

The URE survey was administered to seventeen students who completed UREs in 2023, and all responded resulting in a 100% response rate. As of fall 2022, students are required to complete the survey prior to receiving their stipend. Below are some survey results highlights.

I. GAINS IN THINKING AND WORKING LIKE A SCIENTIST: APPLICATION OF KNOWLEDGE TO RESEARCH WORK: How much did you GAIN as a result of your URE:

Percent of respondents (17) who reported 'Great Gain' or 'Moderate Gain'

- Analyzing data for patterns: 94%
- Figuring out the next step in a research project: 100%
- Understanding the relevance of research to my coursework: 100%

II. PERSONAL GAINS RELATED TO URE:

Percent of respondents (16) who reported 'Great Gain' or Moderate Gain'

- Comfort in discussing scientific concepts with others: 100%
- Confidence in my ability to do well in future science courses: 100%
- Understanding what everyday research is like: 100%

III. GAINS IN SKILLS: How much did you GAIN as a result of your URE:

Percent of respondents (16) who reported 'Great Gain' or Moderate Gain'

- Writing scientific reports or papers: 100%
- Explaining my project to people outside my field: 94%
- Conducting database or internet searches: 88%

Percent of respondents (16) who 'Strongly Agree' or 'Agree' with the following statements:

- Doing research confirmed my interest in my field of study: 100%
- Doing research clarified for me which field of study I want to pursue: 88%
- My URE has prepared me to transfer from a 2-year to a 4-year institution: 100%

IV. Compared to your intentions BEFORE doing research, HOW LIKELY ARE YOU NOW to:

Percent of respondents (16) who are now 'Extremely More Likely' or 'Somewhat More Likely' to:

- Complete your Associates degree? 81%
- Transfer to a 4-year institution? 88%
- Complete your Bachelor's degree in science, mathematics, or engineering? 75%

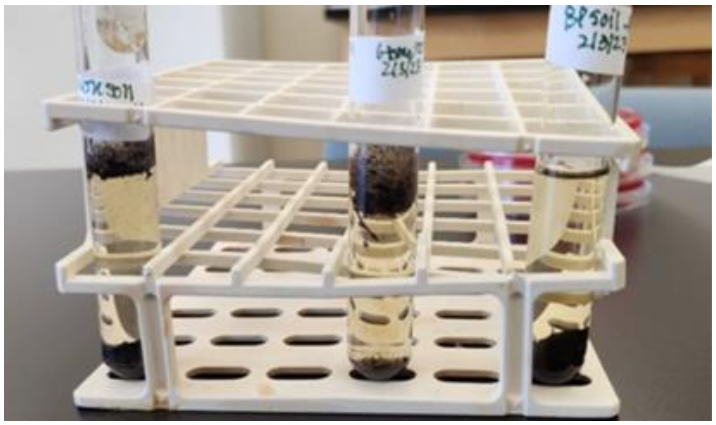
Source: This survey was adapted from the Community College Undergraduate Research Initiative (CCURI), and the Undergraduate Research Student Self-Assessment (URSSA) from the University of Colorado.

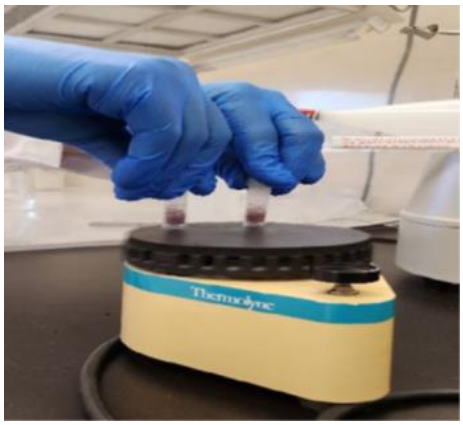
Student Comments (14)

- "…This endeavor honed my investigative, compositional, and evaluative proficiencies, endowing me with a sturdy repertoire of talents deployable across a spectrum of work arenas… I am profoundly appreciative of this transformative research endeavor and the priceless influence it has exerted on my personal and occupational development."
- Being able to work in a lab has given me the opportunity to see what it will be like to pursue my interest in becoming a Forensic lab technician. This project has also cemented the idea of me going into research school when I graduate from St. Petersburg College so I can continue to learn.
- "My research helped me understand what it was like to work as a scientist and opened different pathways I could go down."
- "It opened a door for future research in the sustainability field"
- "It helped me narrow my path for the future, with my research and future. occupation."
- "The experience of researching Italy's demographic trends from 2015 to 2022 has been lifechanging and has had a big impact on my plans for graduate school and my future profession… I'm looking forward to expanding my education and using what I learn to promote positive changes in the ever-evolving field of management."
- "This is my last semester at SPC, as I have been accepted into to USF for the spring. With that being said this research project was the final bit of confidence that I needed before pursuing my 4 year degree, and has cleared all doubts I had about continuing with my education…"
- "I plan to continue my work in finance and economics."
- "My research experience influenced my thinking about my future career in a positive manner. I truly did get to feel like a scientist and find out so many more aspects of what my degree can lead me to do."
- "I went into college knowing that I want to pursue a career in science. This research project has allowed me to have a hands on experience on a project that I was interested in. It has given me that little push to continue on with my education."
- "After completing this research project that has to do with a subject within the psychology field, it has made me more sure that this field of study is what I want to continue pursuing my education in."
- "I have always been interested in science; with each class I was taking I was getting more passionate about my goal which is to pursue a degree in the Environmental Field. After doing this research, I became even more motivated, and I gain more confidence in that field. Working with Dr. Goergen was incredible, and I cannot wait to experience more interactions with such educated, helpful, and amazing professionals. I am extremely grateful for the opportunity that was given to be St. Petersburg College. I am excited to see what I can do in the future."
- "I am still on the fence about graduate vs medical school, however, this research opportunity helped me gain a better understanding of the research process I would have to undergo in graduate school and I think I would feel comfortable pursuing graduate school if the medical path does not work out."
- "This project has definitely sparked an interest in tech for me. I've been doing a lot of outside research on arduinos and using my EMG technology outside of the project both for fun and to conduct some more experiments of my own. I'm sure I'll find lots of ways to incorporate technology and arduinos into my career as a mechanical engineer."

Source: This survey was adapted from the Community College Undergraduate Research Initiative (CCURI), and the Undergraduate Research Student Self-Assessment (URSSA) from the University of Colorado.

Biology Research Projects





First Generation Undergraduate Research Experience

Student Research Final Report

Name: Summer Gallagher **Professor:** Dr. Shannon Ulrich

Date: May 1, 2023

Outline of Responsibilities

- Attending weekly microbiology research meeting Mondays 1:00-2:00PM
- Performing research and laboratory experiments
- Meeting with Professor Ulrich on a weekly basis for status updates and determination of the following week's goals
- Complete compiled a report of the research/activities done each week (e.g., results observed, assumptions, and/or conclusions, learning achieved)

Research Topic: Testing fish fillets to ensure accuracy of labeling.

Weekly Reports & Data

Week 1

Met with Dr. Ulrich via zoom to discuss research topics and on what days to meet. Decided on possibly doing the project on identification of fish fillets using DNA sequencing and to meet Mondays at 1PM.

Week 2

First in-person meeting at the Microbiology lab in CL-NM 263. I toured the lab, practiced pipetting to build skills needed for the project as well as researching PCR, gel electrophoresis, and DNA extraction. Dr. Ulrich and I agreed on sample acquisition.

Week 3

Extracted DNA from the first 6 fish tissue samples.

Sample	Fish Type	Source
1	Red Fish	Caught by Jeannine Kwasnik
2	Tuna Steak	Restaurant
3	Mystery Fish	Caught and not labeled
4	Sushi Tuna	Publix
5	Sushi Salmon	Publix
6	Cod	Publix (bagged)

The following steps were used for the DNA EXTRACTION:

Protocols for Tissue Lysis and DNA Extraction

A. Cut ~10 mg (about the weight of a grain of table salt) * tissue, and place in a 1.5 ml (about 0.05 oz) sterile microcentrifuge tube.

Note*: Tissue does not need to be accurately weighted, but it is essential to only take a small amount of tissue with this extraction kit to obtain the optimal DNA yields for PCR.

B. Add 50 µl of buffer ATL and 5.56 µl proteinase K. Mix thoroughly by vortexing, and incubate at 56°C until the tissue is completely lysed. Vortex occasionally during incubation to disperse the sample. Lysis time varies depending on the type of tissue processed. Lysis is usually complete in 1–3 h. If it is more convenient, samples can be lysed overnight; this will not affect them adversely. After incubation the lysate may appear viscous but should not be gelatinous as it may clog the DNeasy Mini spin column.

C. Vortex for 15 s. Add 55.6 µl Buffer AL to the sample and mix thoroughly by vortexing. Then add 55.6 µl ethanol (96–100%) and mix again thoroughly by vortexing. It is essential that the sample, Buffer AL, and ethanol are mixed immediately and thoroughly by vortexing to yield a homogeneous solution.

Note: A white precipitate may form on addition of Buffer AL and ethanol. This precipitate does not interfere with the DNeasy procedure.

D. Pipet the mixture from previous step (including any precipitate) into the DNeasy Mini spin column placed in a 2 ml (about 0.07 oz) collection tube (provided). Centrifuge at 6000 x g (8000 rpm) for 1 min. Discard flow-through and collection tube.

E. Place the DNeasy Mini spin column in a new 2 ml (about 0.07 oz) collection tube (provided), add 140 µl Buffer AW1, and centrifuge for 1 min at 6000 x g (8000 rpm). Discard flow-through and collection tube.

F. Place the DNeasy Mini spin column in a new 2 ml (about 0.07 oz) collection tube (provided), add 140 µl Buffer AW2, and centrifuge for 3 min at 20,000 x g (14,000 rpm) to dry the DNeasy membrane. Discard flow-through and collection tube. Note: It is important to dry the membrane of the DNeasy Mini spin column, since residual ethanol may interfere with subsequent reactions. This centrifugation step ensures that no residual ethanol will be carried over during the following elution. Following the centrifugation step, remove the DNeasy Mini spin column carefully so that the column does not come into contact with the flow-through, since this will result in carryover of ethanol. If carryover of ethanol occurs, empty the collection tube, then reuse it in another centrifugation for 1 min at 20,000 x g (14,000 rpm).

G. Place the DNeasy Mini spin column in a clean 1.5 ml (about 0.05 oz) microcentrifuge tube and pipet 50 µl Buffer AE (warmed to 37°C) directly onto the DNeasy membrane. Incubate at room temperature for 1 min, and then centrifuge for 1 min at 6000 x g (8000 rpm) to elute.

Week 4

Extracted DNA from an additional 6 fish tissue samples.

Sample	Fish Type	Source

7	Snapper	Brooker Creek Publix (bagged)
8	Snapper	Gulf to Bay Publix (bagged)
9	Flounder	Gulf to Bay Publix (bagged)
10	Grouper	Gulf to Bay Publix (bagged)
11	Grouper	Brooker Creek Publix (bagged)
12	Grouper	Brooker Creek Publix (bagged)

Week 5

We performed the COI PCR that allowed amplification of the finned fish COI gene.

The following are the details of the PCR:

Target	Primer Sequence	Primer Conc.
COI FWD	5' – CACGACGTTGTAAAACGACTCAACYAATCAYA AAGATATYGGCAC – 3'	0.5 µM
COI REV	5' – GGATAACAATTTCACACAGGACTTCYGGGTGR CCRAARAATCA – 3'	0.5 µM

PCR PROTOCOL

To set-up the PCR "master" master mix, you will need to determine the number of samples you plan to analyze. Add 3 to that number (for the positive and negative controls; and one extra—because solution gets "stuck" on pipette tips during pipetting). Multiply the volume of each reagent by the number of samples (+3) to be analyzed. Use the following table to help you calculate:

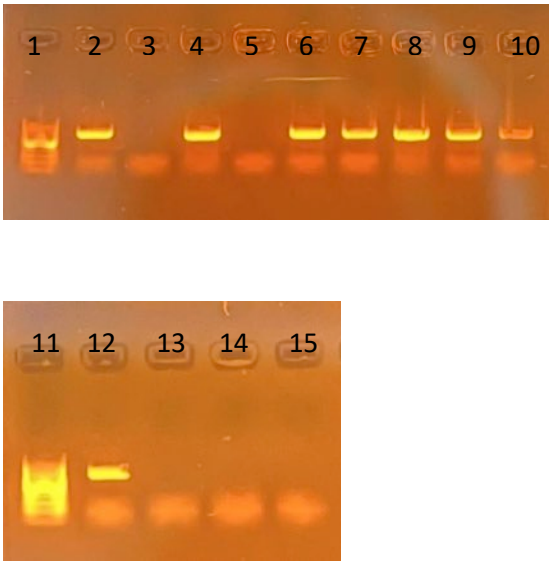
Reagent	Volume per reaction (ul)	Number of Samples + 3	Final volume of reagent for master-master mix (ul)
GoTaq® Green Master Mix	25	15	375
Forward Primer (10uM)	2.5	15	37.5
Reverse Primer (10uM)	2.5	15	37.5
ddH_2O	18	15	270

- Add the final calculated volume of each reagent to ONE 1.5-ml tube.
- Vortex briefly and quick spin.
- Add 48 ul of the master mix to a PCR reaction tube.

- Add 2 ul of your DNA samples.
- Close tubes.
- Label PCR tubes.
- Place in the thermocycler and select appropriate program with the following conditions: 94°C for 2 mins; 35 cycles of: 94°C for 30 sec, 55°C for 40 sec, 72° for 60 sec; and final extension at 72°C for 10 mins

Week 6

We analyzed the COI PCR results using gel electrophoresis and a UV transilluminator.



Wells:
1 – DNA ladder
2 – Sample 1
3 – Sample 2
4 – Sample 3
5 – Sample 4
6 – Sample 5
7 – Sample 6
8 – Sample 7
9 – Sample 8
10 – Sample 9
11 – DNA ladder
12 – Sample 10
13 – Sample 11
14 – Sample 12
15 – Negative Control

Figure 1. Gel electrophoresis results of the COI PCR.

Based on the gel electrophoresis results only 8 of the 12 samples were amplified by PCR. These 8 samples were then sent to Eurofins for DNA sequencing.

Sample	Fish Type	Amplified by PCR
1	Red Fish	YES
2	Tuna Steak	NO
3	Mystery Fish	YES
4	Sushi Tuna	NO
5	Sushi Salmon	YES
6	Cod	YES

7	Snapper	YES
8	Snapper	YES
9	Flounder	YES
10	Grouper	YES
11	Grouper	NO
12	Grouper	NO

Week 7

Sequencing results were received. All samples were identified as *Paenibacillus* spp. These results were unexpected and did not make any sense. After several discussions with Dr. Ulrich, we contacted the sequencing company and ordered the sequences to be re-processed. New sequences were sent. The "re-do" sequences were all finned fish.

Week 8

Data was compiled and analyzed.

Results and Conclusion

After gathering re-do sequencing, the results are as follows:

Table 1. Results of COI identification.

		BLAST SEARCH RESULTS					
Sample	Labeled	Max Score:	Query Cover:	E-value:	Percent Identity:	Scientific Name:	Common Name:
1	Red Fish	1144	95%	0.0	96.97%	*Sciaenops ocellatus*	Red Drum (Red Fish)
3	Mystery fish	1096	93%	0.0	96.32%	*Haemulon plumierii*	White Grunt (Common Grunt)
5	Sushi Salmon	1144	96%	0.0	96.45%	*Salmo salar*	Atlantic Salmon
6	Cod	1140	96%	0.0	96.57%	*Gadus morhua*	Atlantic Cod
7	Snapper	1101	87%	0.0	96.47%	*Lutjanus erythropterus*	Crimson Snapper
8	Snapper	1127	96%	0.0	96.04%	*Lutjanus erythropterus*	Crimson Snapper

9	Flounder	1151	96%	0.0	96.86%	*Limanda aspera*	Yellowfin Sole
10	Grouper	1140	95%	0.0	96.58%	*Epinephelus awoara*	Yellow Grouper

In conclusion, the experiment was a success; after receiving the re-do results from Eurofins we were able to use the sequencing data to determine the different types of fish we had via BLAST search. BLAST is a tool that finds similarities between sequences (as shown in the results table above). All the re-do fish samples that were sequenced were properly labeled. The results have proven that companies will label the fish products as they are for fish. However, some were labeled more vaguely than others. For example, the "snapper" (samples 7 and 8) was technically "crimson snapper." There are various reasons why fish are mislabeled such as by accident or by seafood fraud. This could be due to wanting to provide a cheaper version of the fish to make more profit from the sales of the fish. With this experiment it is concluded that the samples tested were accurately labeled. This research project has been a great experience and allowed me to gain valuable skills in microbiology such as pipetting that I will use in the future.

Zooplankton Distributions in the Gulf of Mexico Research Report

Lena Conway

Dr. Linae Boehme

12/12/2023

Literature Review:

The paper by ZM Gliwicz studies how zooplankton were affected by moon phases. In a period from 1982 - 1983 in southeastern Africa, it was found that during a full moon, or after sunset with a full moon, Zooplankton would have the highest risk of predation, because the exposure to light would make them easier to spot by sardines once they travel up the water column at night. It is also mentioned how predators will shift their food source once this full moon is over, since the zooplankton population is so low and it would be too dark to efficiently hunt them. This study further amplified my research because I saw a trend of a spike of zooplankton right before a full moon, which quickly declines, giving a good explanation to the distribution of zooplankton in the area.

Gliwicz ZM. 1986. A Lunar Cycle in Zooplankton. Ecology. 67(4):883–897. doi:https://doi.org/10.2307/1939811.

The book written by Johnson and Allen gives a very thorough description of zooplankton and their behaviors. It mentions every known species of zooplankton, what their preferred conditions are, and even what an abundance of them might mean for the environment. This book was used for the basis of my study; The photos helped identify species in my sample and I could learn about how they react to different conditions in the wild, for example how they react to changes in salinity and temperature. As someone just beginning this study, it was a good book in helping me understand what zooplankton are and why it is important to document them.

Johnson WS, Allen DM. 2012. Zooplankton of the Atlantic and Gulf coasts : a guide to their identification and ecology. Baltimore: Johns Hopkins University Press.

The paper The Open-Ocean Gulf of Mexico After Deepwater Horizon: Synthesis of a Decade of Research is a large study dedicated to understanding what happened after the Deepwater Horizons oil spill in 2010. By comparing not only different species in the water near the accident but the resilience vs. sensitivity of phyto- and mesozooplankton, researchers came to the conclusion that though these microscopic species are highly sensitive to the toxins produced after the accident, there were highly resilient enough to bounce back months after. However, this does that mean that every species affected was highly resilient to the toxins; It was also concluded that larger species like deep-pelagic micronekton were still highly vulnerable, but less resilient to the accident and would take more time to recover because of their longer growth times.

This information was important to my study because it revealed why the data would have spikes; Zooplankton can die off very fast, but their spawn makes up for these numbers, hence why the distribution of them skyrockets in some samples. It also gave me a better idea as to what affects their numbers, since they are highly sensitive any change in the environment could have an affect on them.

Sutton T, Milligan R, Daly KL, Boswell KM, Cook A, Maëlle Cornic, Frank TM, Frasier KE, Hahn DA, Hernandez FJ, et al. 2022. The Open-Ocean Gulf of Mexico After Deepwater Horizon: Synthesis of a Decade of Research. Frontiers in Marine Science. 9. doi:https://doi.org/10.3389/fmars.2022.753391.

In the study Zooplankton Community Responses to Oxygen Stress, researchers look at how the recent trend of oxygen depletion from global warming affects zooplankton communities in lakes. By analyzing 41 lakes with varying oxygen conditions during the peak of summer and at three different depths, it was found that freshwater zooplankton were highly tolerant to low oxygen environments. However, in lakes with the biggest oxygen changes, zooplankton numbers

were smaller in lower depths of waters, causing less carbon transfer between phyto- and zooplankton. Another important note the study made is that in these areas of low oxygen, smaller species dominated over larger species; Large Cladocera were the biggest component in lakes with normal oxygen, but switched to Rotifers and small Cladocera in anoxic areas.

This information helped me get a better understanding of what oxygen concentrations zooplanktons preferred and how they'd react under less oxygenated areas. The amount of oxygen in the water was also recorded using the YSI.

Karpowicz M, Ejsmont-Karabin J, Kozłowska J, Feniova I, Dzialowski AR. 2020. Zooplankton Community Responses to Oxygen Stress. Water. 12(3):706. doi:https://doi.org/10.3390/w12030706. https://www.mdpi.com/2073-4441/12/3/706/htm.

In the paper Investigating Seasonal Succession Patterns in Mesozooplankton community structure following Hurricane Harvey, researchers studied zooplankton distributions off the Texas shelf. From September 2017 to March 2018, samples were collected & recorded bi-monthly and it was found that the data produced a U-shape pattern over time, with a peak in October 2017 that was most driven by temperature and salinity. It was also found that community abundance was most prominent closer to shore, however diversity was more common the further off land. My biggest takeaway from this article is how temperature and salinity affect zooplankton; They are highly susceptible to change and their numbers will be different in which season they are collected.

Topor ZM, Robinson KL, Turcu A. 2020. Investigating Seasonal Succession Patterns in Mesozooplankton Community Structure Following Hurricane Harvey. Frontiers in Marine Science. 7. doi:https://doi.org/10.3389/fmars.2020.00462.

Data Collection:

** It is important to note that I only chose data that could be compared with the Moticam for this study **

Compound Scope:

Date	Place	Taxa	Quantity
9/1/2023	Inlet	Copepod	23
9/22/2023	Inlet	Copepod	14
9/29/2023	Inlet	Copepod	21
10/13/2023	Inlet	Copepod	0
8/25/2023	Johns Pass	Copepod	16
9/15/2023	Johns Pass	Copepod	23
9/22/2023	Johns Pass	Copepod	18
9/29/2023	Johns Pass	Copepod	142
10/13/2023	Johns Pass	Copepod	35
9/1/2023	Inlet	Crab Zoaea	20
9/22/2023	Inlet	Crab Zoaea	7
9/29/2023	Inlet	Crab Zoaea	2
10/13/2023	Inlet	Crab Zoaea	0
8/25/2023	Johns Pass	Crab Zoaea	29
9/15/2023	Johns Pass	Crab Zoaea	33
9/22/2023	Johns Pass	Crab Zoaea	131
9/29/2023	Johns Pass	Crab Zoaea	12
10/13/2023	Johns Pass	Crab Zoaea	16
9/1/2023	Inlet	Shrimp Zoaea	0
9/22/2023	Inlet	Shrimp Zoaea	2
9/29/2023	Inlet	Shrimp Zoaea	0
10/13/2023	Inlet	Shrimp Zoaea	1
8/25/2023	Johns Pass	Shrimp Zoaea	0
9/15/2023	Johns Pass	Shrimp Zoaea	0
9/22/2023	Johns Pass	Shrimp Zoaea	19
9/29/2023	Johns Pass	Shrimp Zoaea	11

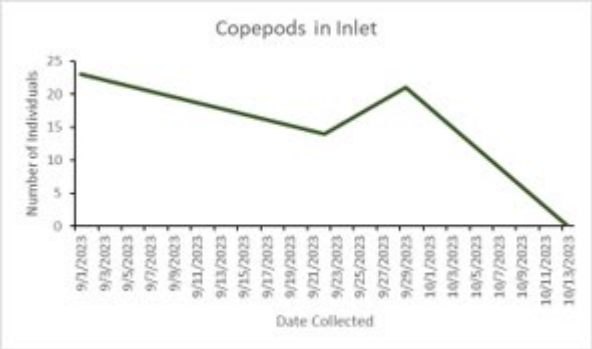
10/13/2023 Johns Pass Shrimp Zoaea 11

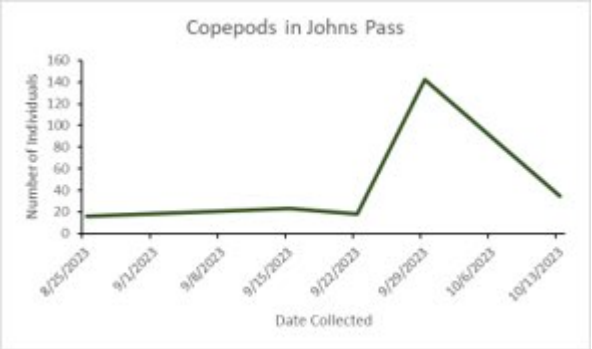
Moticam + Stereoscope

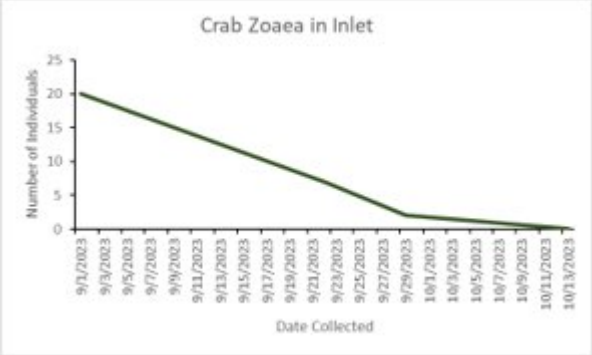
Date	Place	Taxa	Quantity
9/1/2023	Inlet	Copepod	6
9/22/2023	Inlet	Copepod	0
9/29/2023	Inlet	Copepod	15
10/13/2023	Inlet	Copepod	0
8/25/2023	Johns Pass	Copepod	27
9/15/2023	Johns Pass	Copepod	1
9/22/2023	Johns Pass	Copepod	0
9/29/2023	Johns Pass	Copepod	200
10/13/2023	Johns Pass	Copepod	3
9/1/2023	Inlet	Crab Zoaea	0
9/22/2023	Inlet	Crab Zoaea	3
9/29/2023	Inlet	Crab Zoaea	0
10/13/2023	Inlet	Crab Zoaea	2
8/25/2023	Johns Pass	Crab Zoaea	19
9/15/2023	Johns Pass	Crab Zoaea	1
9/22/2023	Johns Pass	Crab Zoaea	300
9/29/2023	Johns Pass	Crab Zoaea	15
10/13/2023	Johns Pass	Crab Zoaea	5
9/1/2023	Inlet	Shrimp Zoaea	4
9/22/2023	Inlet	Shrimp Zoaea	0
9/29/2023	Inlet	Shrimp Zoaea	0
10/13/2023	Inlet	Shrimp Zoaea	3
8/25/2023	Johns Pass	Shrimp Zoaea	10
9/15/2023	Johns Pass	Shrimp Zoaea	0
9/22/2023	Johns Pass	Shrimp Zoaea	4
9/29/2023	Johns Pass	Shrimp Zoaea	10
10/13/2023	Johns Pass	Shrimp Zoaea	7

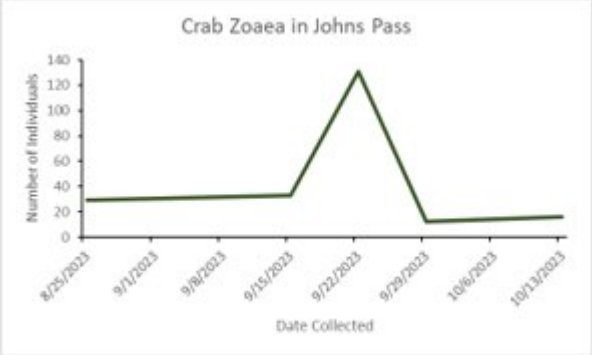
Results:

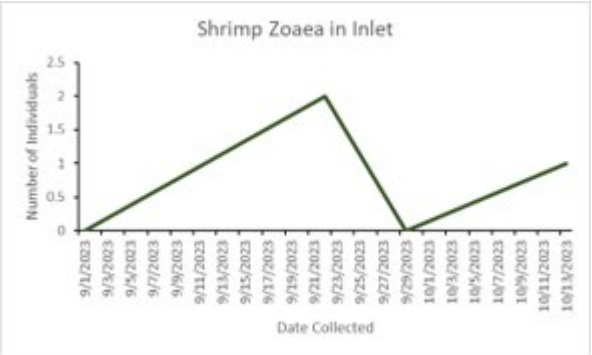
Distribution Counts



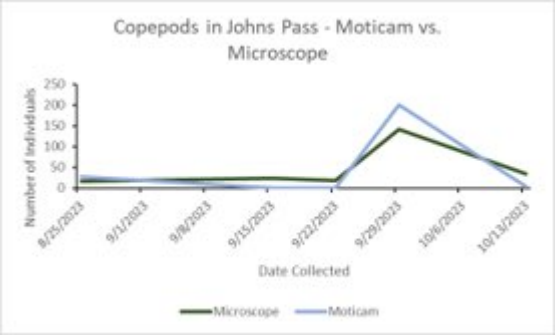


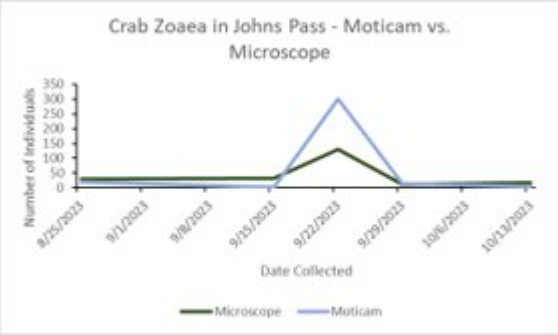


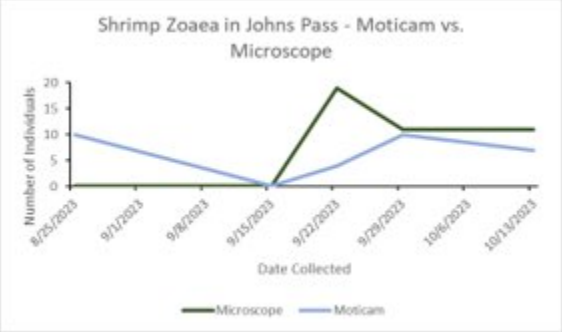




Compound Scope vs. Moticam with Stereoscope







Assumptions:

At the beginning of the study, it was assumed that storms that would come in the bay would have the biggest impact on zooplankton distributions. This assumption was made after learning how susceptible zooplankton are to tide changes, and are likely to move with the current during a huge storm. Since a few storms happened during the study, this assumption was still apparent up until data was made into graphs.

Another assumption made was that the Moticam connected to the Stereoscope would be best at counting zooplankton distributions and species. This assumption was made because the Moticam was good at taking photos of species and recording their behaviors, so they should've been better at counting zooplankton species.

Conclusion:

The results indicate stability in the amount of zooplankton between both the Inlet and the Johns pass collecting areas with a spike between 9/22/23 and 9/29/23. One possible explanation for this spike could be from moon phases, where more moonlight exposes the zooplankton to more predators (Gliwicz 1986). Between 9/22/23 and 9/29/23, the moon went from the first quarter to a full moon. Storms can also be an explanation for spikes in data: harsher tides bring in more zooplankton into estuaries and intracoastal areas (Topor, Robinson, Turcu 2020).

Compound Scope		Moticam + Stereoscope	
Pros	Cons	Pros	Cons
Easier to see specimens up close	Harder to count specimens in the sample; especially if samples are moving	Easier to record specimen movements	Difficult to see specimens up close
Easier to identify and label different species	Difficult to record movement or “re-find” an individual from the population	Ability to look at bigger sample at once via phone	Labeling specimens was more difficult if they were too small
		Easier to find less abundant species	

Overall, the compound scope and the stereoscope with the Moticam should be used for different projects. In studying zooplankton, the Moticam was the preferred method of studying behavior of individual species & recording unique findings. The compound scope was preferred for specifically counting up each species.

Learning Achieved:

In concluding the study, my biggest takeaway is that predicting zooplankton distributions does not have a clear solution. Though it was assumed that storms would be the biggest factor affecting their numbers, I believe that moon phases would be the biggest proponent in this study. Furthermore, I also learned how moon phases can shape zooplankton numbers; A fuller moon indicates more light for predators to see the zooplankton, so they will perish quicker in these phases. However, I cannot 100% agree that moon phases were the sole component in these results after learning how susceptible these organisms are to other factors like salinity, temperature, and tides. Though zooplankton migrate through the water column and are very fast swimmers, they are still microscopic organisms that can be easily pushed by tides, and if for say a storm passed through the area that would still affect their numbers.

When comparing the Moticam and regular compound scope, I was surprised to see that the idea of what is “best” at counting the zooplankton is a very gray line. Though the Moticam was great at taking photos and videos of the organisms, it didn’t help me count them. Trying to count every species in a sample of 50 ml of water was overwhelming at times, and I learned that trying to euthanize the zooplankton was harder in a bigger sample of water than the 1 ml samples that could be viewed with the compound scope, so zooplankton would still be wiggling around

when using the Moticam. When it comes to just counting and identifying organisms, from now on the compound scope with the three samples of 1 ml of water will be the preferred method, with the Moticam used exclusively for documenting their behavior and taking photos. Overall, this study helped me learn more about the behaviors of zooplankton and differences in the physical aspects of the different species, but also taught me how to properly conduct research in a lab and what techniques I would use in future studies.

STEM Program Student Research Project

Name: Alexandra Acuna **Professor:** Ray Menard

Dates: February 3rd, 2023 through April 14th, 2023

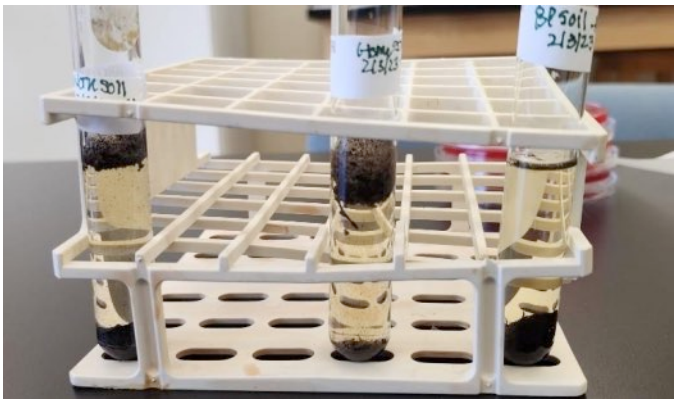
SOIL ANALYSIS

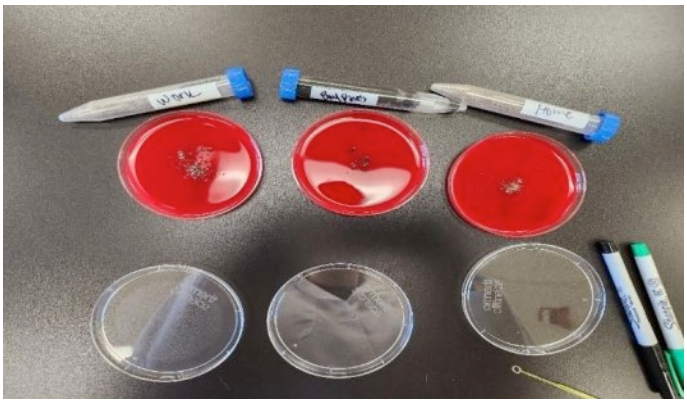
Purpose: The purpose of this study is to identify soil microbes with antibiotic producing microbes.

Experimental Approach: For this experiment soil samples were obtained from 3 different cities of Pinellas County: Seminole, Clearwater and St. Petersburg. The samples were brought back to the lab on SPC Gibbs Campus, microbes were isolated by various methods and identification was determined by microscopy.

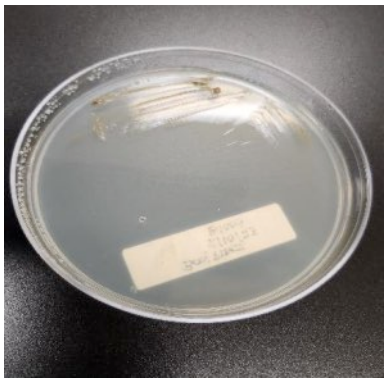
Weekly Processes and Observations:

Week 1 (2/3/23): After the initial meeting with Dr. Menard, where we discussed testing soil samples to see if they would produce antibodies, I took 3 samples in total, 1 from my backyard in Seminole, 1 from my job in Clearwater, and 1 sample from the SPC STEM Center in Bay Pines St. Petersburg. The image to the left shows the soil placed in a broth and the image to right shows that the bits of the soil were placed in blood augers to see what reaction they would produce. The blood auger samples were left incubating at 37°C over the weekend.





Week 2 (2/10/23): This week I used the samples to create a streak plate from each of the blood auger plates and from each of the broth solutions, in hopes of colonies forming. The image to the right is an example of how each of the streak plates were completed for each location, 6 streak plates were completed. They were left to incubate at 37°C over the weekend.



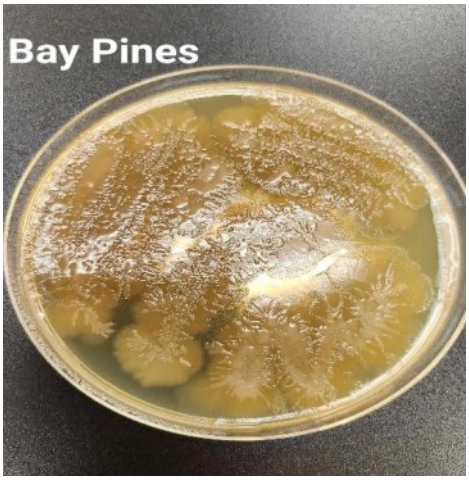
Blood Auger samples were photographed to show results from incubation over the weekend.

The broth samples were photographed to show results, note the color change from last week when sample was originally put into the broth.

Week 3 (2/17/23): The results from last week's streak plates are shown below.

This first row of pictures is the streak from the blood augers.

This second row of pictures is the streak from the broth.

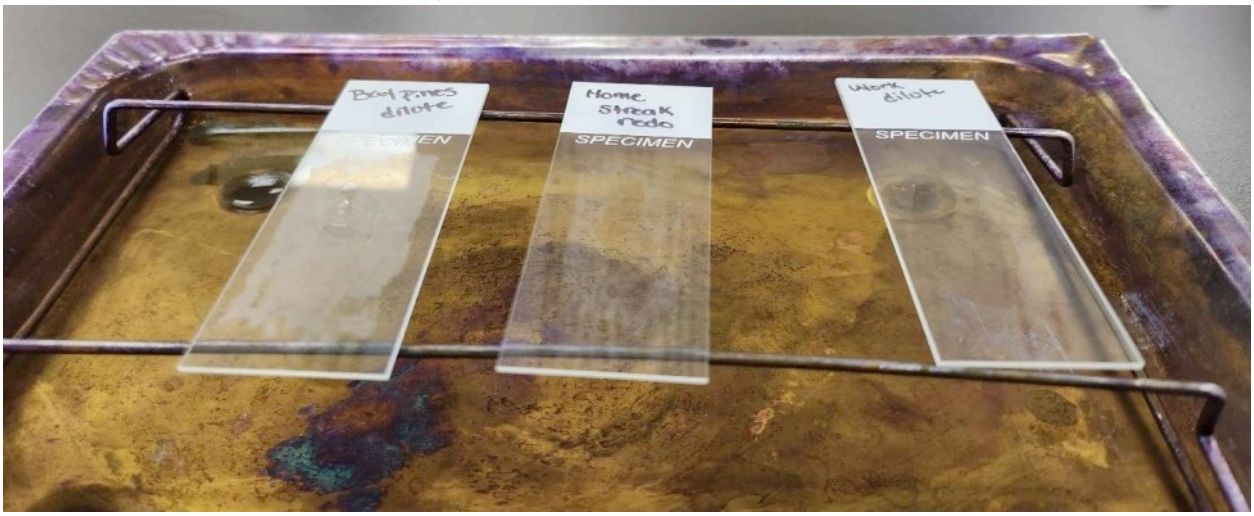


Since there were so many colony formations from both the blood auger and the broth, we decided to complete a dilution of 1/100 from the broth and create a streak from the broth augers. 5 new streak plates were created. 3 of the new streaks were dilutions of 1/100 of the original broth from each of the locations. The other 2 selected were from the streak of augers of home and work.

The following steps were taken to create the dilution:

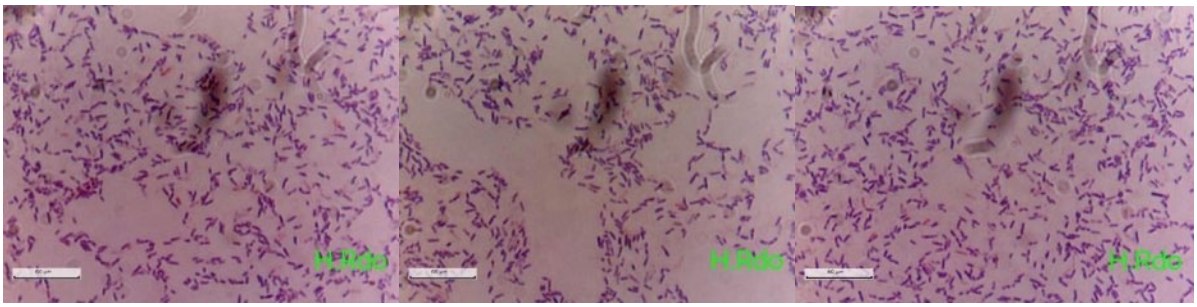
1. Add 9.9 mL of sterile water to 3 tubes.
2. Add 100 mL from each broth sample to corresponding labeled tube.
3. Label NA plates (i.e., work 1/100)
4. Add 100 mL of water dilute sample to plate.
5. Spread, incubate at 37°C.

Week 4 (2/24/23): Single colonies formed for each of the new streaks. I prepared 3 bacterial smears on a glass side and did gram stains to analyze under the microscope using a Moticam Microscope Cam to capture images of the gram stain results. The 3 plates chosen for the stains were the dilutes of both Bay Pines and Work and the Home broth/streak redone last week.

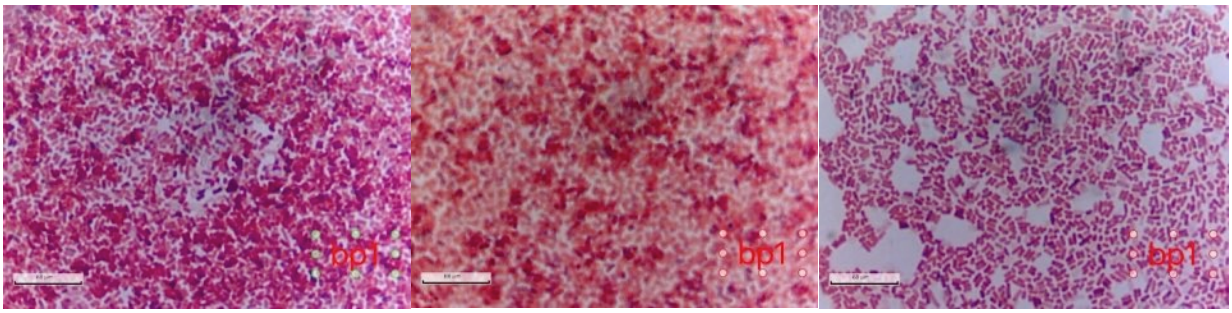


The Home broth/streak and the Bay Pines dilute showed good results for the gram stain, the Work dilution will have to be redone to obscure material in the microscope, (you can notice in the Home gram stain and was much worse in the Work dilution stain)

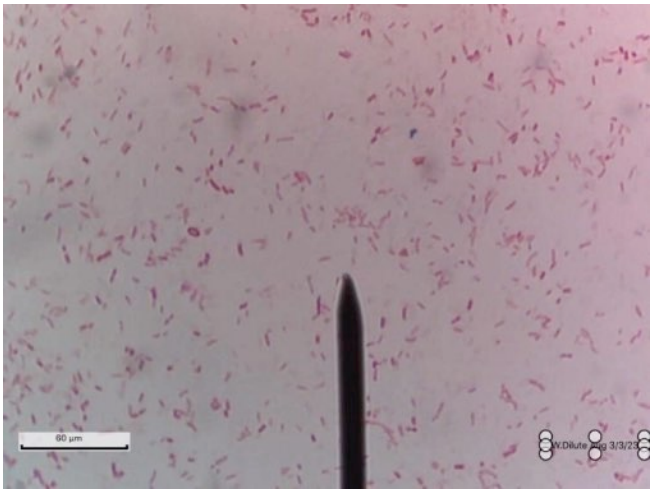
The first row is the gram stain of the Home broth/streak

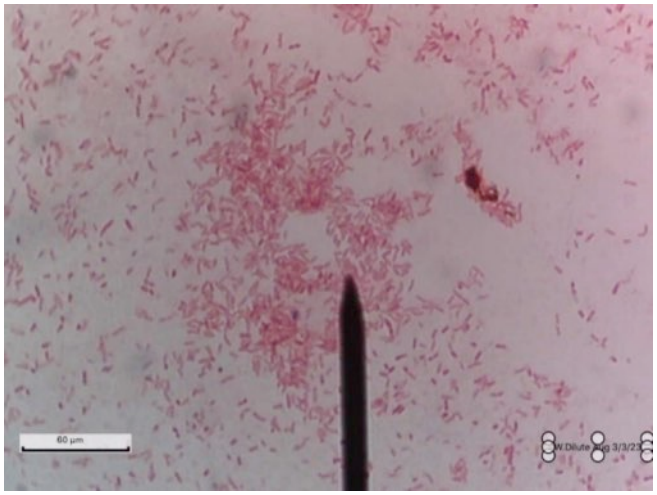


The second row is the gram stain of the Bay Pines dilution

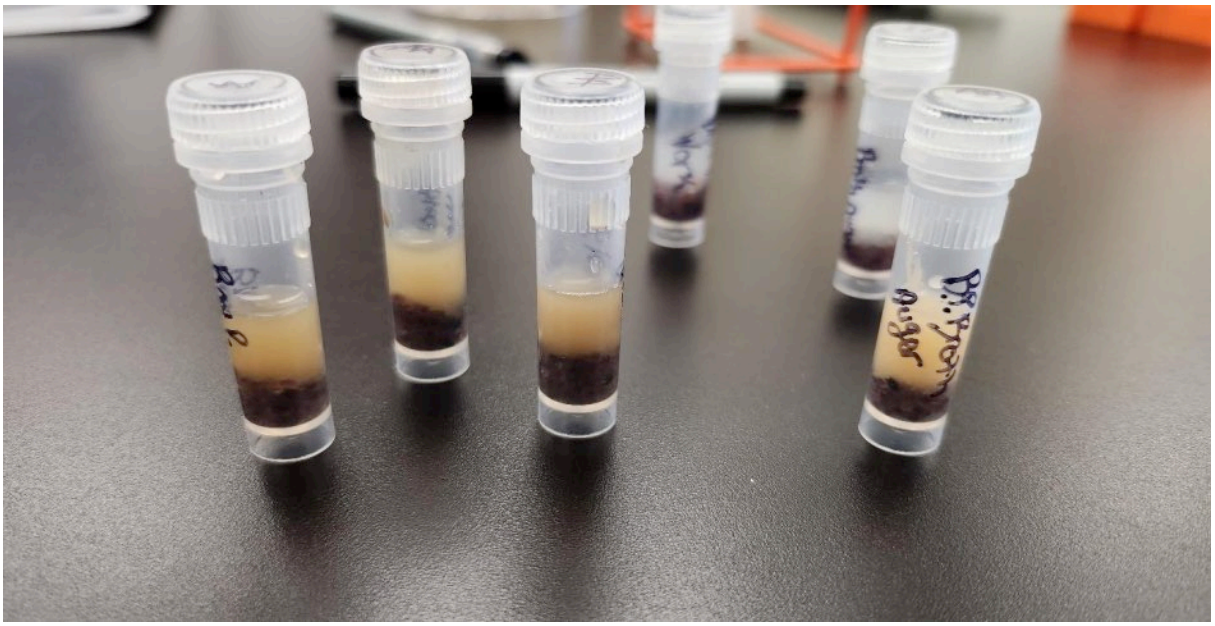


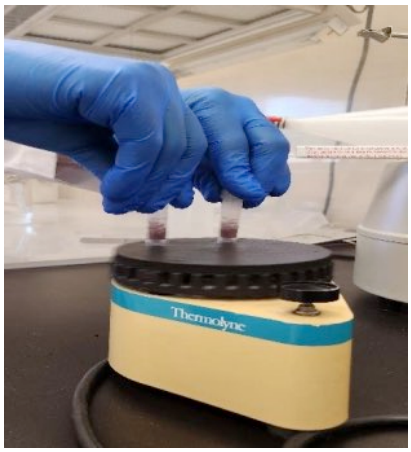
Week 5 (3/3/23): This week I redid the bacterial smear and gram stain for the work dilution slide.





Week 6 (3/24/23): This week we used the MOBIO-DNeasy PowerSoil Kit to isolate DNA from each location of the augers of both blood and broth (6 total tubes were made, pictured below).

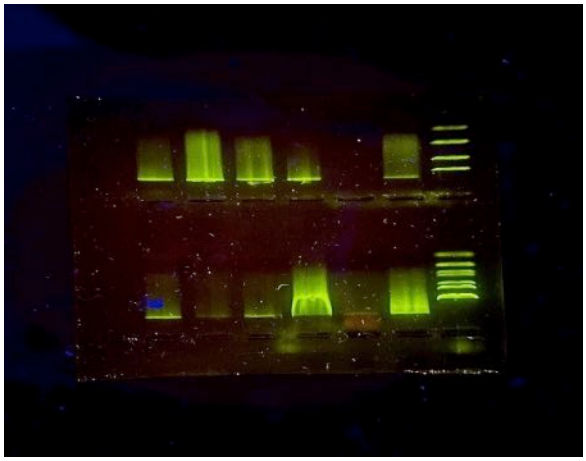


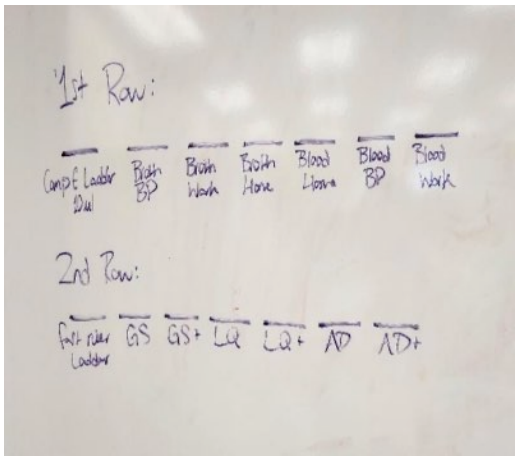


During the process of isolating the DNA, different pieces of equipment were used. The picture to the left shows the Thermolyne vortex mixer and the picture to my right is the Labnet Hermle Centrifuge.

The isolation was a 24-step process that included the equipment pictured above and refrigerating the tubes at 4°C to help the protein precipitate. The process ended with storing the DNA at -20°C for the weekend.

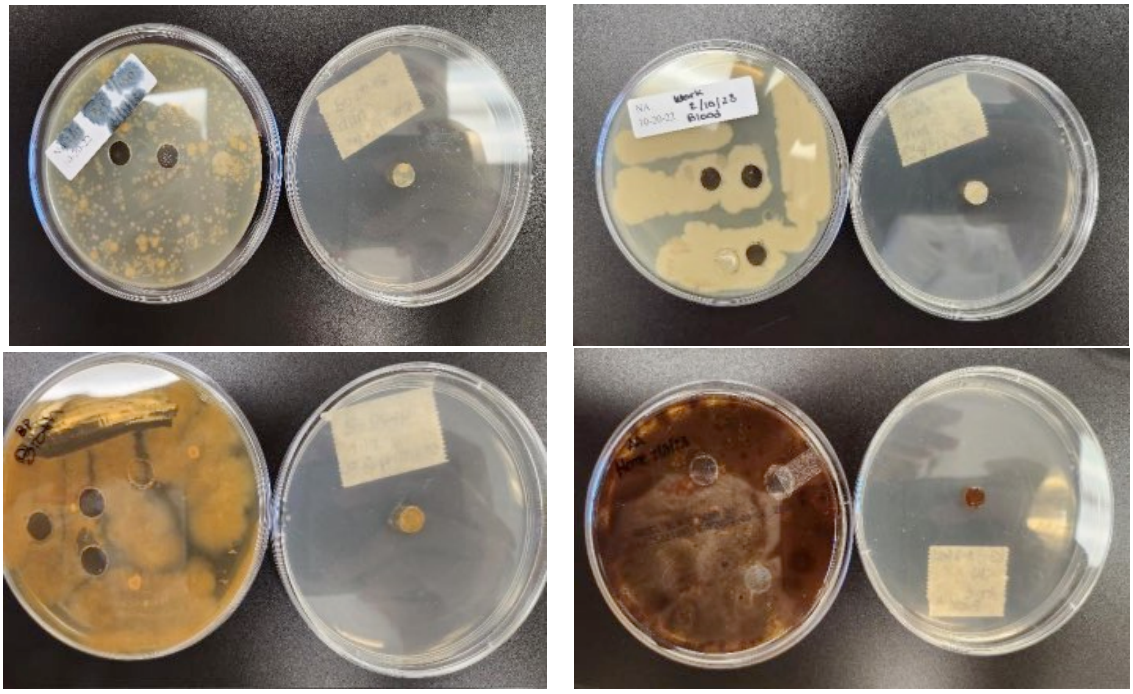
Week 7 (3/31/23): Gel electrophoresis was conducted by other students in Dr. Menard's research group, while I chunked pieces from 4 different plates to use for gram negatives, with E. Cloacae and C. Freudini. The plates selected were Bay Pines broth, Home blood auger, Work blood/smear, and the Bay Pines dilution. I also sprinkled the dirt over both bacterium types to see if anything would occur.



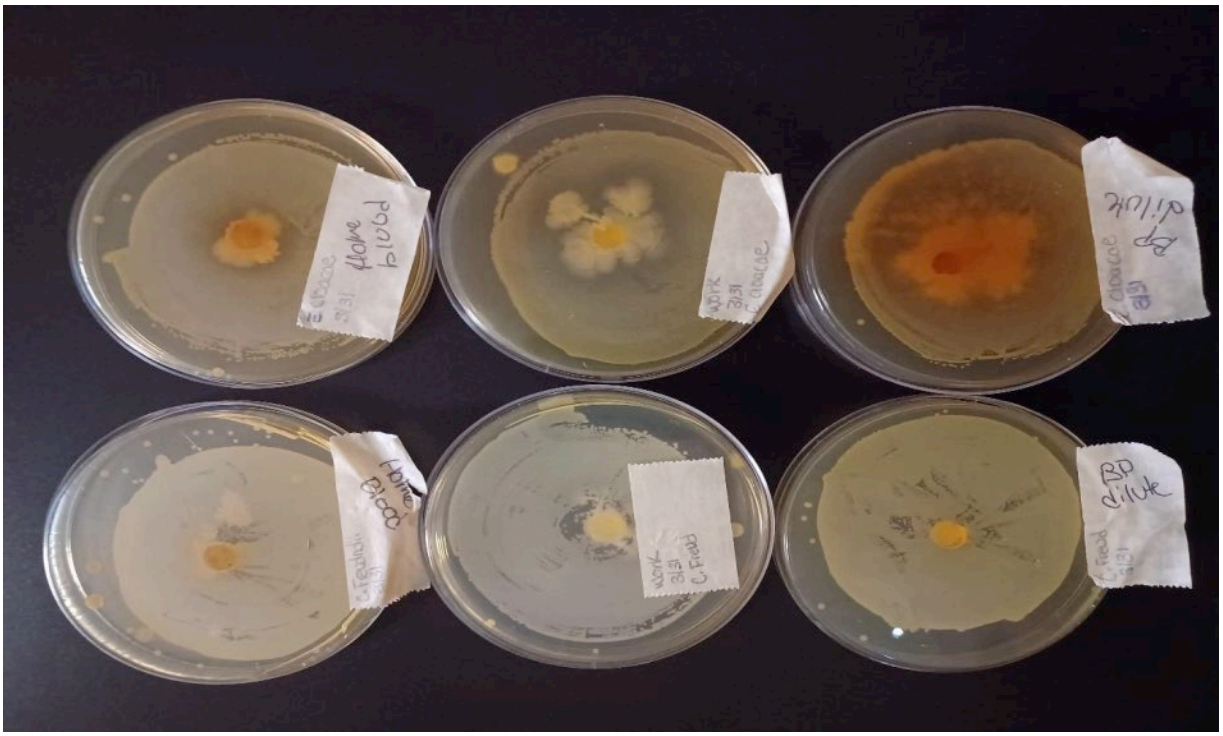


The images show the results of the gel electrophoresis, only the first row is applicable to this research.

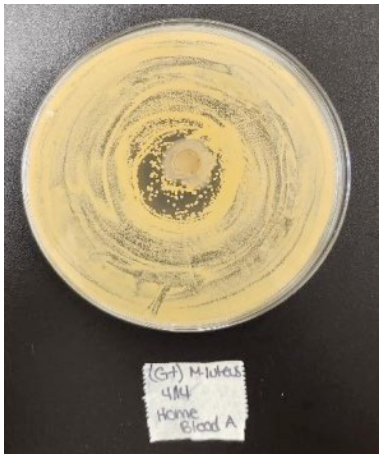
Week 8 (4/14/23): This week I chunked the same 4 auger plates from last week and conducted gram positives with the bacterium M. Luteus. The following images show the chunk in the center of the spread bacteria.

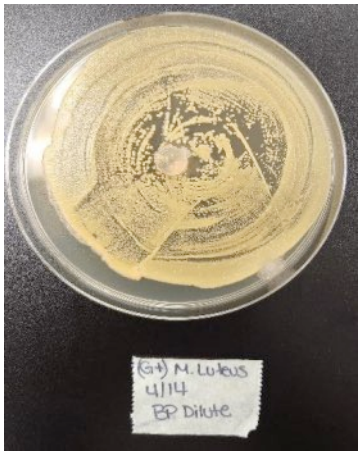


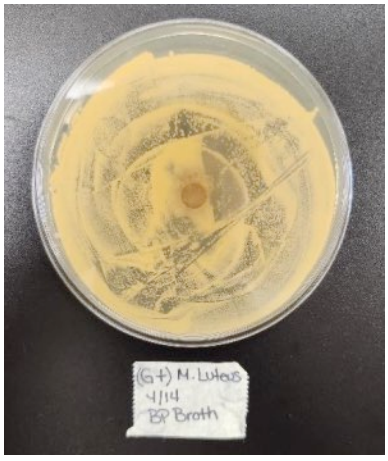
The results from last week's gram negatives are shown below, you can see that 3 of the plates of E. Cloacae had zones of inhibition.

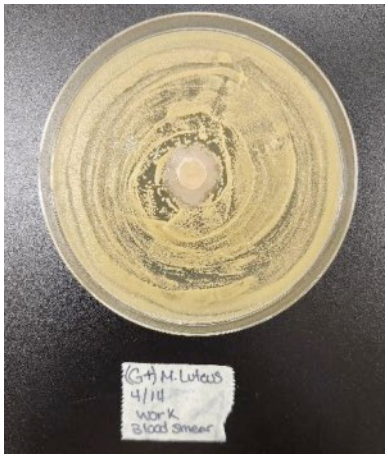


Week 9 (4/21/23): Wrap up of the research project commenced, auger plates were disposed of and took pictures of the results of the gram positives from the previous week. The pictures below show the results of the gram positives. It is possible there are zones of inhibition but not clear enough to distinctively say.









References

Alexander, S. K., & Strete, D. (2001). *Microbiology: A Photographic Atlas for the Laboratory*. Pearson.

Keating, S. (2016). *Microbiology: The Laboratory Experience*. W. W. Norton.

Student Research Final Report

Name: Xavier Phillips **Professor:** Bonnie Simmons

Responsibilities

- Attend weekly meetings every Monday for the next 8 weeks between 1:00pm-2:00pm
- Test the impact of different urban green areas to see its effect on microbial air quality such as Pseudomonas aeruginosa and Staphylococcus aureus.
- Write a complete report on the data gathered during the experiment.

Weekly schedule and Data reports

Week 1: 10/2/2023 – Met in the Lab

- Met with Professor Bonnie Simmons to discuss possible research topics, plan our weekly meetings, and fill out paperwork.

Week 2: 10/9/2023 – Met in the Lab

- Met with the Professor to prepare the materials that were going to be needed, such as making petri dishes that collect Pseudomonas aeruginosa (MSA), Staphylococcus aureus (HE), and both Pseudomonas aeruginosa and Staphylococcus (NA). We discussed possible locations and strategies on how to collect the samples to obtain the most accurate results which led us to test 6 different locations. There were 3 petri dishes made for each type, totaling 54 petri dishes made. Additionally, we discussed possible locations and strategies on how to collect the samples to obtain the most accurate results and decided on 6 different locations.

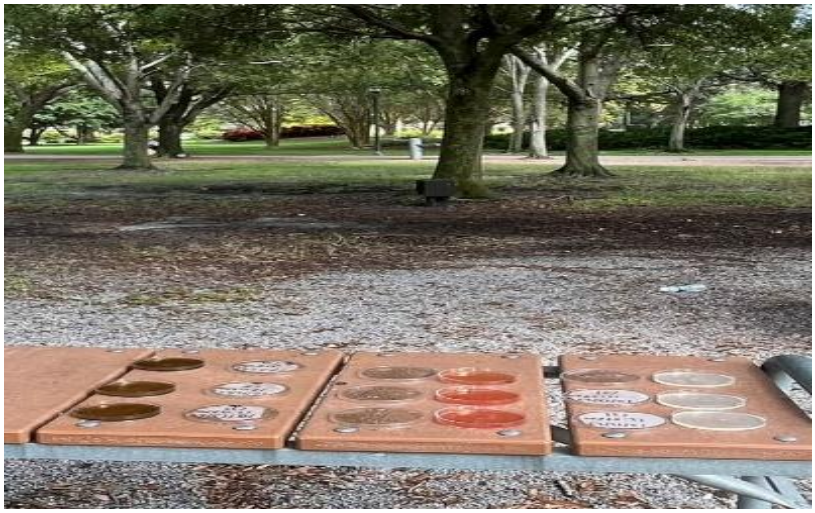
Week 3: 10/16/2023 – Met in the Lab

- Collected samples for Pseudomonas aeruginosa (gram negative) and Staphylococcus aureus (Gram positive) in different locations. Ensuring to follow sterile procedures by wearing gloves and sanitizing hands before and after sample collection. They were labeled (1-6) with 1 having the most urban greenery and 6 having the least urban greenery.

    - St. Pete's sunken Gardens (1)

    - Botanical Garden (2)

- Largo central park (3)



- Indian Shores Beach (4)

- Downtown St. Petersburg (5)

- Tampa City (6)

Week 4: 10/25/2023 – Met in the Lab

- Met with Professor Bonnie Simons in the laboratory to bring in my samples. The petri dishes were set in an autoclave for 48 hours with sufficient temperature to allow the bacteria to colonize. After the bacteria colonized, they were then put in an incubator.

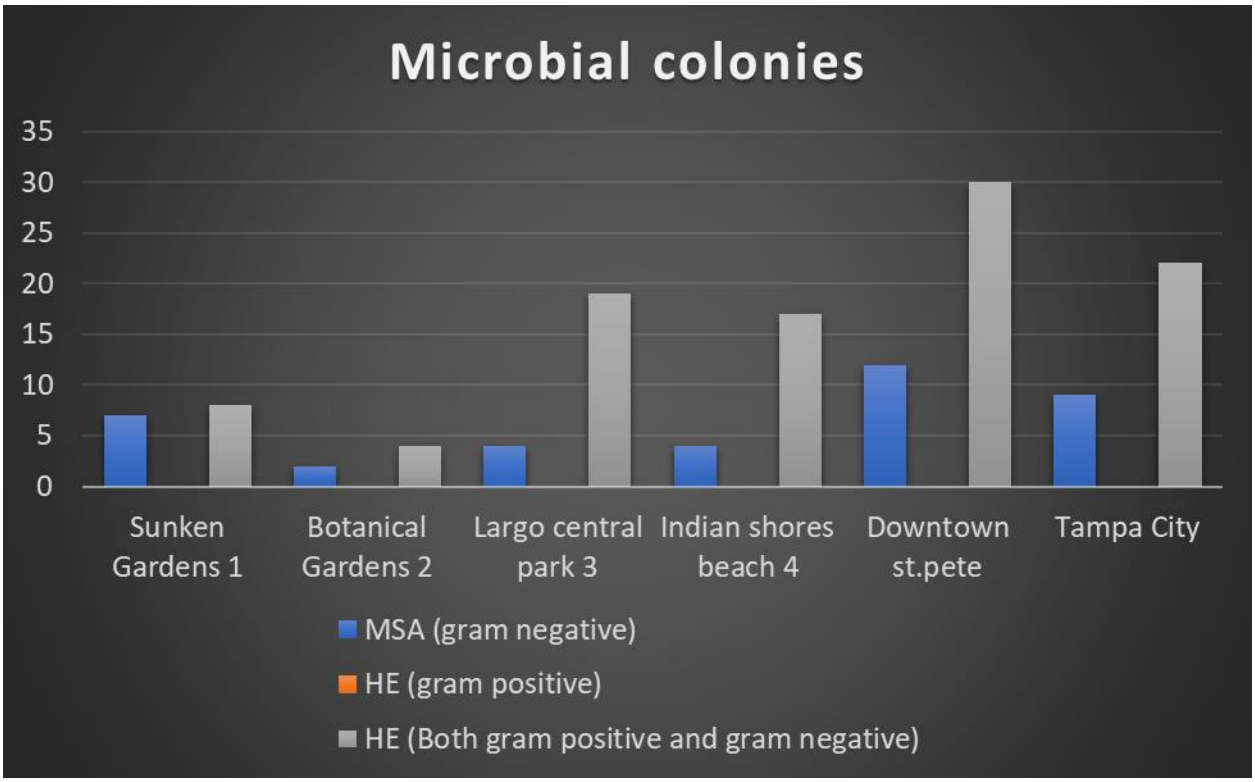
Week 5: 10/30/2023 – Over the phone

Met with Professor Bonnie Simons to discuss my progress on the experiment and the written report.

Week 6: 11/6/2023 – Met in the Lab

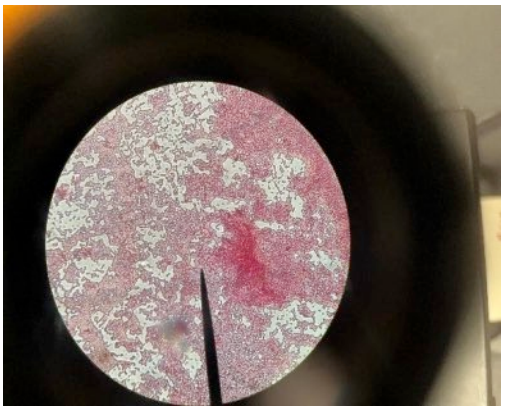
Met with Professor Bonnie Simons to review, analyze, and record the results of the experiment. My goal was to count the bacterial colonies formed from the Pseudomonas aeruginosa (MSA), Staphylococcus aureus (HE), and both Pseudomonas aeruginosa and Staphylococcus (NA) petri dishes.

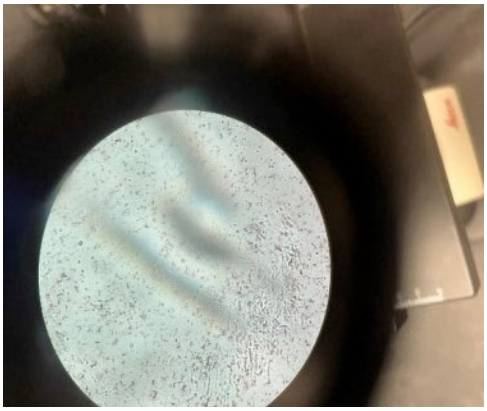
Location	Time/Date	MSA (Gram Negative bacteria)	HE (Gram positive bacteria)	NA (Collects both Gram positive and gram negative)
1	6:45pm/ 10/13/23	7	0,0,0	8
2	10:24am 10/13/23	2	0,0,0	4
3	12:07pm 10/13/23	4	0,0,0	19
4	11:14am 10/13/23	4	0,0,0	17
5	3:45pm 10/13/23	12	0,0,0	30
6	5:09pm 10/13/23	9	0,0,0	22



Week 7: 11/13/2023 – Met in the Lab

Met with Professor Bonnie Simons to start the gram staining process to determine if any gram-positive bacteria were detected since the HE (Gram positive) petri dish did not pick anything up. The process included sterilizing the air with a Bunsen burner, gathering a sample of one of the colonies and mixing it with a drop of water. After letting it air dry, I put a drop of crystal violet and shortly after added a drop of gram iodine.





Week 8: 11/27/2023 – Over the Phone

- Prepared the laboratory report and obtained feedback and suggestions from the Professor.

Discussion/Conclusions

Air quality is a critical aspect of environmental health, with microbial content playing a significant role. Areas that contain urban greenery, such as parks and gardens, have been recognized for their potential effect on air quality. This research was intended to investigate the correlation between microbial air quality and the level of urban greenery in different locations. To conduct this study, petri dishes were prepared to collect Pseudomonas aeruginosa (MSA), Staphylococcus aureus (HE), and a combination of both (NA). Six diverse locations were selected, labeled from 1 to 6 based on the degree of urban greenery, with 1 having the most and 6 having the least. Samples were collected following sterile procedures, including the use of gloves and hand sanitization. Results from microbial analysis revealed distinct microbial colony counts across the locations. Sunken Gardens exhibited 7 colonies of MSA, 0 colonies of HE, and 8 colonies of NA. Botanical Gardens had 2 colonies of MSA, 0 colonies of HE, and 4 colonies of NA. Largo Central Park showed 4 colonies of MSA, 0 colonies of HE, and 19 colonies of NA. Indian Shores Beach displayed 4 colonies of MSA, 0 colonies of HE, and 17 colonies of NA. Downtown St. Petersburg presented 12 colonies of MSA, 0 colonies of HE, and 30 colonies of NA. Tampa City showed 9 colonies of MSA, 0 colonies of HE, and 22 colonies of NA. After analyzing the results, a noticeable trend emerged, areas with higher levels of urban greenery generally exhibited lower microbial counts. Sunken Gardens, with the most urban greenery, showed the lowest MSA count among the locations. Conversely, Downtown St. Petersburg, an area with less greenery, displayed the highest microbial count.

To further understand the microbial composition, a gram staining process was initiated. Despite the absence of gram-positive bacteria detected by the HE (Gram-positive) petri dish, confirmation was sought through additional testing. The gram staining process involved sterilizing the air with a Bunsen burner, collecting a sample, and applying crystal violet and gram iodine. Results confirmed the absence of gram-positive bacteria in the samples. To assess the correlation between microbial counts and the level of urban greenery, Pearson correlation coefficients were calculated. The correlation between urban greenery levels and microbial counts for MSA, HE, and NA were as follows:

For MSA: r (Coefficient correlation) = -0.78

For HE: r = 0 (no variation as all counts were 0)

For NA: r (Coefficient correlation) = -0.85

The negative coefficient correlations for MSA and NA indicate a strong inverse relationship between the degree of urban greenery and microbial counts. This suggests that as urban greenery increases, microbial counts decrease. The absence of a correlation for HE aligns with the observation that no gram-positive bacteria were detected in the samples.

The findings suggest a potential relationship between urban greenery and microbial air quality. Higher levels of greenery appear to be associated with lower microbial counts, indicating a possible role of plant life in air purification. Several factors could contribute to these results. Green spaces may act as natural filters, trapping and reducing airborne microbes. Additionally, plants may release compounds that inhibit bacterial growth. These findings have implications for public health and urban planning, emphasizing the importance of integrating green spaces into urban environments for improved air quality.

Immunocompromised individuals, such as those undergoing medical treatments that weaken the immune system, may be more susceptible to infections from bacteria present in the air. Understanding the microbial composition and potential health risks associated with specific bacterial types is crucial, especially for vulnerable populations. When it comes to asthma and allergy concerns individuals may benefit from environments with lower concentrations of certain bacteria; particularly if those bacteria are known triggers for respiratory issues. This study's findings provide insights into the complex relationship between urban greenery and microbial air quality. While certain bacteria may be associated with respiratory health concerns, the overall microbial diversity in green spaces could offer benefits. These findings underscore the importance of a general approach to urban planning that considers both environmental and health factors. Further research is necessary to refine our understanding of specific health implications this can cause.

In conclusion, this research provides valuable insights into the impact of urban greenery on microbial air quality. The study demonstrated a correlation between the level of greenery and microbial counts, with higher greenery associated with lower microbial presence. The absence of gram-positive bacteria further underscores the potential air-purifying qualities of urban greenery. These findings emphasize the importance of incorporating green spaces into urban planning for the betterment of environmental health. This study opens possibilities for further research, including exploring the specific mechanisms through which urban greenery influences microbial air quality. As cities continue to grow, understanding the role of green spaces in maintaining a healthy urban environment becomes increasingly vital.

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Ecology Research Projects

STEM Program Student Research Final Report

Name: Sofia Andreeva **Professor:** Dr. Erin Goergen

Dates: 2/6/2023 through 3/27/2023

The effect of tap, deionized, and greywater on growth and nutrient content in chives

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Purpose:

People all around the world, especially in the Middle East and Africa, are experiencing water shortages (Travis, 2010). The usage of fresh water for irrigation purposes has become one of the most problematic topics during this century. Only 2.5 % of the Earth's water is freshwater (Shiklomanov, 1993), and 70% of that water is used for irrigation purposes (Schmidhuber and Tubiello, 2007). It is important to mention that around 1⁄4 of the produced food is lost in the food supply chain (Kummu, 2012), which leads to the conclusion that about 25% of the freshwater used for irrigation is wasted.

Scientists worldwide are trying to find an alternative irrigation method, and ways to use the water more efficiently, one of which is experimenting with greywater. Greywater is untreated water that comes from baths, showers, and washing machines. The usage of greywater is not a new method, there have been many experiments conducted to test if greywater could be used for irrigating trees, landscape plants, and even edible vegetables as long as the water does not touch the edible part of the plant. In 2020, M. Gorgich and team conducted an experiment on baby carrot, lettuce, and red pepper. The crops were treated with untreated greywater, treated greywater, and freshwater. In the end, they concluded there was no significant difference in the chemical properties between the usage of greywater and freshwater (Gorgich et al., 2020). There still has not been any experiment showing the effects on consumers' health after consuming greywater irrigated vegetables, and special attention should be addressed, Gorgich et al. (2020) states. In another experiment, the samples of soil, plants, and leachate showed that usage of greywater for irrigation was beneficial for the plant growth, while the levels of N and P stayed the same (Mohamed, 2013). Overall, there has been support that greywater could be used for irrigation, but scientists still do not have enough information about how this will affect humans' health and aquatic environments or if all crop species will respond the same.

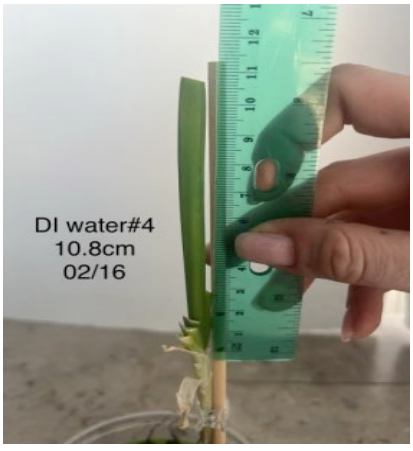
Hypothesis: In this experiment, I examined the effect of watering with untreated greywater from bath showers for irrigation of chives, and compared results with deionized water and tap water. I predicted that greywater would increase the growth of chives, based on prior studies. Further, I predicted that although greywater may increase plant growth, I do not think there will be a significant difference in the levels of tissue or soil nutrients (N, P, and K) between plants watered with tap water and greywater. The irrigation with DI water could lower the pH of the soil, which could lead to smaller levels of N, P, and K.

Experimental Approach: In this experiment, I tested the effects of tap water (n=4), deionized water (DI, n=4), and untreated greywater (n=5) on chives plants. After transplanting the plants in week zero, they were allowed to acclimate to their new environment and only tap water was used for irrigation. During the first week, the plants were watered 3-4 times a week keeping the soil moist at all times. After a one-week acclimation period, the irrigation treatments were initiated on 02/13. To ensure no differences between plants at the initiation of the experiment the chives were cut to the initial height, and the new treatment started. The height of the plants was measured twice a week, and again plants were watered 3-4 times a week, keeping the soil moist. During week 2 (02/20) and three (02/27), the chives were measured again and watered 3 times a week. During week 3, it was noted that three of the plants died (two of the tap water treatment and one of the greywater treatments). On 03/06 (week 4), the chives were measured and harvested. The total weight of each plant was recorded, and plant tissue N, P and K were measured in 2 randomly chosen plants from each treatment. Additionally, soil from each treatment was pooled into 2 different samples and analyzed for pH, N, P and K. Nutrient analysis for soil and plant tissue was conducted with Lamotte kits. For plant tissue analysis, the reporting was qualitative (low, medium, and high) based on colorimetric results, so to be able to graphically compare the treatments, the results were converted from low, medium, and high to numerical values.

Weekly Processes and Observations

Week 1 (2/6/23): 13 chives plants were potted into a fresh garden soil, and evenly cut and labeled for treatment identification. This week allowed the plants to adapt to the new environment and the plants were only irrigated with tap water. After two days, the plants seemed to adapt well and started growing. By the end of the week 11/13 plants had significant growth.

Week 2 (2/13/23): After the plants adapted, they were again cut to the same length as week one, and irrigation treatments began with tap water, DI water, and untreated greywater started. On 2/16/ 23, the chives were measured again.



Week 3 (2/20/23): During week 3, the plants were measured again. It seems that one of the pots that is irrigated with tap water, and one of the pots irrigated with greywater doesn't seem to be growing much.

Week 4 (2/27/23): During week 4, the plants were measured again, and it was noted that two of the plants had died (One tap water treatment and One greywater treatment). The treatment with different types of water continued even though they died. A few side growths were observed on some of the plants; it was measured and noted.

Figure 1: Representative sample of measurement technique done during week 2 for a plant in the DI water treatment.

Week 5 (3/6/23): During week 5, the chives were measured for the last time before the plants were harvested. After removing the plants from the pots, I recorded the total weight, and then tested the soil and plant tissue for pH, P, K, and N. The tests continued for two days.

Week 6 - 8 (3/13/23 - 3/27/23): During the final weeks of the project, I worked on collecting and summarizing the data, creating graphs of the results and working on the paper.

Results:

Soil:

A Lamotte soil testing kit was used for testing the pH, N,P, and K on the soil. The results showed that the pH of soil treated with tap water and greywater was basic (8), while the pH of the soil treated with DI water was 7 neutral (figure 2).

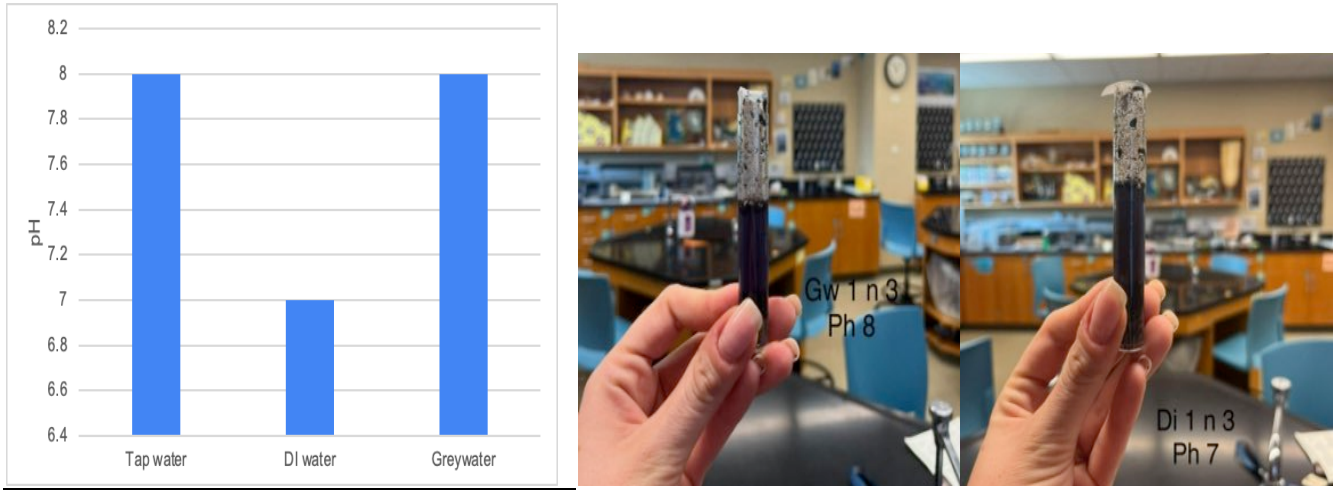


Figure 2: Soil pH testing results (a) for Greywater, DI water, and Tap water (b) colorimetric result for greywater and (c) and DI water.

Overall, when comparing soil nutrient status, it appears that the watering treatment did not cause the soil nutrient levels to differ significantly. The level of P in all soil samples showed to be high with 100lb per acre, regardless of watering treatment (figure 3, 4). Similarly, all treatments had high levels of K, ranging from 175 (greywater) to 225 lb per acre (DI water; figure 3,4). N levels for all treatments ranged between trace and low with average values of 20- 30 lb/ acre (figure 3, 4). In the greywater soil sample the level of N was low with 30lb per acre, while only trace levels (20 lb/acre) of N were found in the tap water treated soil sample. In the samples of DI water N averaged 22.5 lb/acre (figure 3,4).

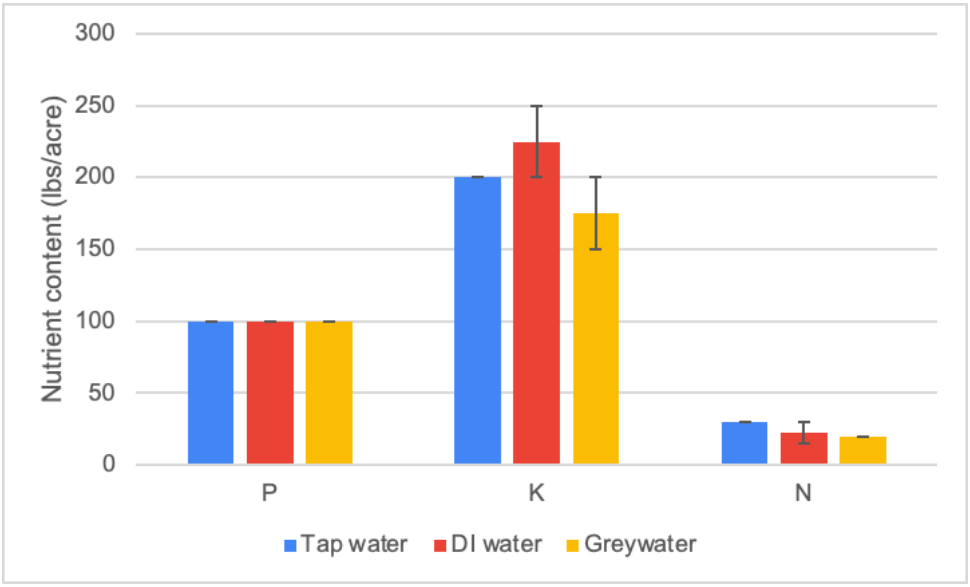


Figure 3. Soil nutrient testing results for samples watered with tap water, deionized water, and greywater.

Figure 4. Colorimetric results for (a-c) P, (d-f) K, and (g-i) N. In each series, treatments are tap water, DI and greywater.

Plant Growth:

On average, we found that we had the most growth, in terms of height in plants that received the tap water treatment, while those receiving DI water grew the least (figure 5a). When comparing growth over time, the plants watered with DI seemed to have the fastest growth, but then leveled out at week 3.

Similarly, plants watered with tap water had a peak of growth between week 2 and 3 before leveling out. In contrast, plants watered with greywater showed a slower, but steady increase throughout the 4 weeks (figure 5b).

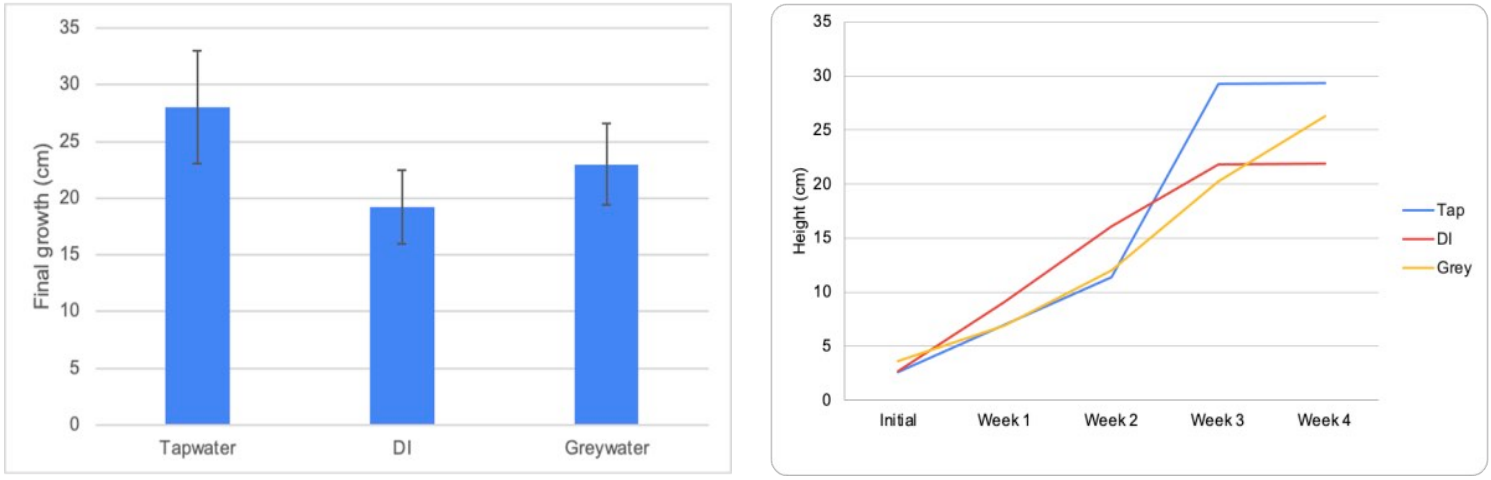


Figure 5. The growth of chive plants watered with tap, DI or greywater. (a) Final average height (b) average growth over the 4 week period.

Despite having similar heights for plants watered with tap and greywater, plants receiving tap water had nearly double the average biomass of either DI or greywater treated plants (Figure 6)

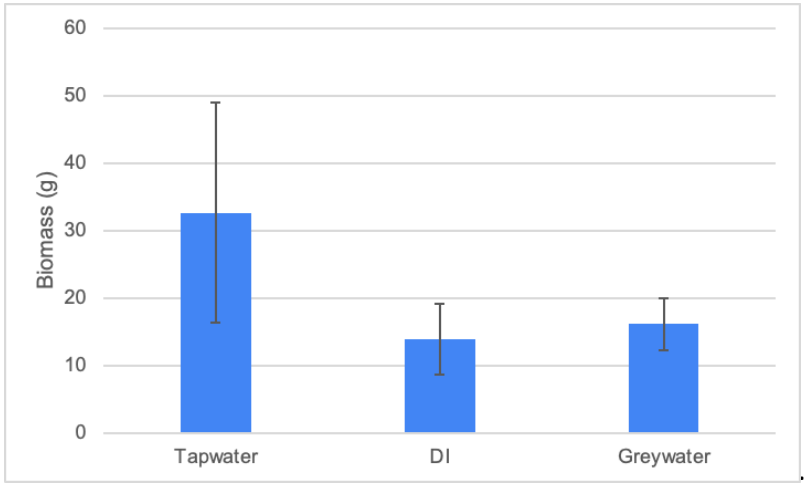
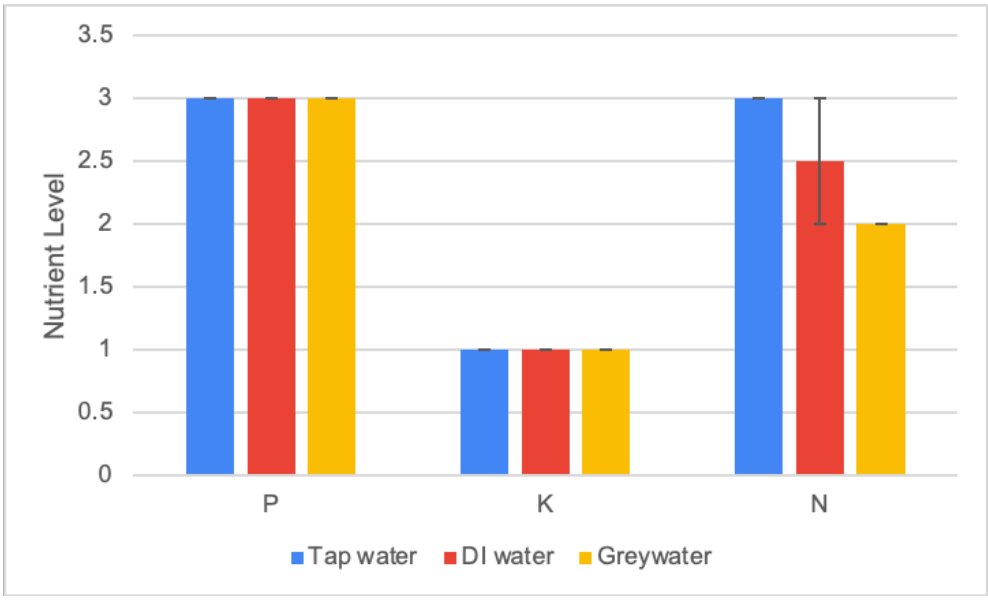


Figure 6. Mean final biomass of plants watered with tap, DI or greywater over the 4 week period.

Plant Tissue:

Plant tissue was tested before and after treatment. Initially, we found that before treatment the level of P was abundant, N adequate, and deficient of K. After the 4 week treatment, we tested a subsample of each treatment. The results showed that all of the plant tissues remained low in K, and high on P. An increase in

the level of N was shown in the tap water treatment from adequate to abundant and a slight increase in the DI watered plants, but the greywater levels stayed the same (figure 7a,b).



Key:	
Deficient	1
Low adequate	2
Abundant	3

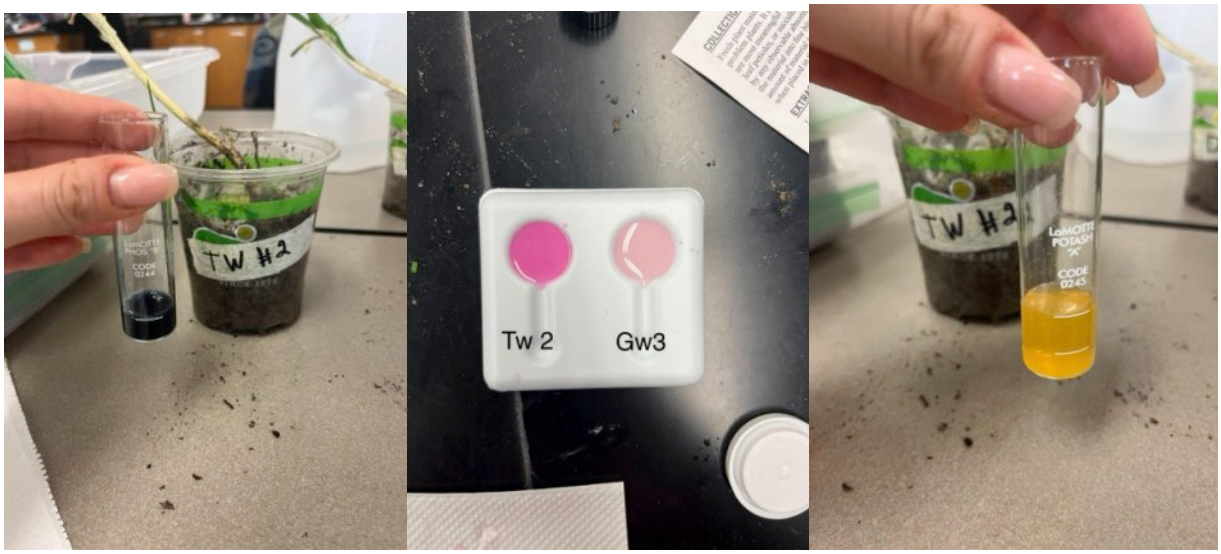


Figure 7. Results of plant tissue nutrient analysis. (a) average nutrient levels with 1 being deficient, 2 being low adequate and 3 being abundant. (b) example of phosphorus test for a tap water sample (c) example of nitrogen test for tap water and greywater sample and (d) example of a potassium test for a tap water sample.

Conclusion:

When testing the soil pH, the greywater and the tap water treatment had a basic pH of 8, and the treatment with deionized water was lowered to neutral 7. Although we didn't test the initial pH level of the soil, all treatments utilized the same soil and had the same plants growing, suggesting that any differences in final pH is a result of the watering treatment. Further, as DI water is pure water, it makes sense that it should

have a pH closer to neutral. These results support my hypothesis that the treatment with deionized water will have a different pH level than the other types of treatment.

Nutrient levels were similar among treatments with all types of watering having high levels of K, moderate levels of P, and low levels of N. Despite any lack of significant differences due to treatment, DI had slightly higher amounts of K and tap water had slightly elevated levels of N compared to the other treatments. Other studies have found conflicting results on the effect of greywater usage. For example, Pinto et al. (2010) found no effect of greywater irrigation on soil N and P, but these results conflict with other studies that found soil organic matter, and thus nutrient availability increased with greywater irrigation (Mohammed et al. 2013). These conflicting results could be due to duration of the experiment; both my study and the Pinto et al. (2010) study were of short duration while the study by Mohammed et al. (2013) was over a much longer time period.

After the 4 weeks of treatment with tap, DI, and greywater we had the highest average growth in tap water, even though we lost two of the plants during the treatment. The greywater treatment was expected to have the highest growth, but it was shown to have the second highest growth, although differences were not significantly lower than tap water. However, when also looking at the overall biomass, the tap water plants had nearly double the amount of biomass compared to the other two treatments. This indicates that although tap water and greywater treated plants had similar heights, the tap water plants allocated more biomass to belowground roots. Although differences were not significantly different, this suggests that tap water may be a better source of irrigation for plants if the goal is to establish a healthy root system. This lack of difference in biomass by plants given greywater is similar to the results of Pinto et al. (2010) who also found no difference in total biomass between plants given greywater and tap water. However, their study did not include treatment with DI. Another factor to consider is the duration of the experiment. Over the course of the 4 weeks, the treatment affected the growth pattern with only the plants in the greywater treatment showing a continual increase in growth. It is possible that if the study were continued for a longer period of time, results of final growth and biomass may have differed.

Plant tissue was tested before and after treatment. Initially, we found that before treatment the level of P was abundant, the level of N adequate, and deficient in K. After the 4 week treatment, results showed that all of the plant tissues remained low in K , and high on P. An increase in the level of N was shown in the tap water treatment from adequate to abundant, which agrees with the results of more available N in the soil of tap water treated plants. Since we did not see a big difference in the plant tissues, the results do not support my hypothesis that the level will be higher in the greywater treatment.

Overall, the results of this study indicate that use of greywater is a potential source of irrigation, especially in areas where freshwater is limited. Although it did not result in the increased growth that was expected or contain higher nutrient content, the fact that there was no difference between greywater and tap water indicates that it can be used in place of municipal water.

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Techniques and Procedures Utilized

Literature research skills:

- Reading and summarizing scientific studies.
- Using background reading to formulate hypotheses to be examined.

Field sampling techniques learned:

- *A ruler was used for measuring the height of the plant. The initial height was marked and it was always measured from the mark.*
- *The chives were clean from the pot and individually measured on a scale - root and leaves.*
- *We used a Lamotte kit for analyzing the nutrients in soil and plant tissues. (Figure 8)*

Figure 8: Extraction solution from plant tissue for analyzing.

Data analysis techniques learned:

- Collection of data in a notebook and cataloging it in an online database.
- Interpreting the data by creating graphs to show the different patterns and trends.
- Writing up the major results of the study and comparing it to existing literature.

STEM Program Student Research Final Report

Name: Anna Medeiros **Professor:** Dr. Erin Goergen

Dates: September 7th - October 26th

Aphid control using essential oil as biopesticide

Abstract:

Aphids are pests of almost all cultivated plants, worldwide. Nowadays, most of the essential crop protection against aphids is based on the application of synthetic insecticides (Ikbal and Pavela 2019); however, these insecticides have a negative impact on non-target organisms, including humans. Therefore, new plant protections are being studied and developed; a promising one is essential oils [EOs] (Ikbal and Pavela 2018). The EOs isolated from plants are among the substances generally considered environmentally friendly and have the potential to be used as biopesticides without compromising the existing population of botanical plants (Ikbal and Pavela 2018). To establish the efficacy of citronella and grapefruit essential oils as viable biopesticides, an experiment with bean plants and aphids was performed. In a controlled environment, aphids were added to leaves of bean plants that were coated with a solution of citronella, grapefruit, or a mix of citronella plus grapefruit, and a solution without any essential oils. The main focus was to observe the aphid's preference, as in each trial they were given the choice to settle in one of the EO treated leaves or the control leave, over a period of 24h. Our results indicate that EOs from citronella and grapefruit have shown some efficacy in contact tests as significantly fewer aphids chose treatment leaves as opposed to the control. This

suggests that these EOs can be considered as an optimal source of active substances for the development of botanical insecticides against aphids.

Keywords: Essential oils · Aphids · Botanical insecticides

Introduction:

Aphids are pests of almost all cultivated plants, worldwide (Figure 1). Aphids directly damage crop plants by phloem feeding and indirectly through disease transmission (Czerniewicz et al. 2018). Aphids are small sap-sucking insects from the superfamily Aphidoidea (Ikbal and Pavela 2019). Given their frequent parthenogenetic reproduction and a relatively short life cycle, they are a highly successful group of insects from an ecological point of view (Ikbal and Pavela 2019). Once an aphid finds an appropriate host species, it simultaneously feeds and reproduces (Stern 2010). The nymphs stay close to their mothers, creating a large colony and while growing, the nymphs molt several times, growing bigger each time. By sap-sucking, the aphids weaken the host plant and because they replicate so fast, they are a problem for many crop species (Stern 2010).

Figure 1. Bean plant with aphids and an insert of an aphid under 20x magnification.

Currently, most essential crop protection against aphids is based on the application of synthetic insecticides derived from active substances and growth regulators (Bass and Field 2011; Bass et al. 2014, Chakraborty et al. 2019). However, these insecticides may have negative impacts such as environmental pollution, pesticide residue in food, pesticide resistance, and damage to

non-target organisms, including humans (Czerniewicz et al. 2018, Zhang et al. 2018; Costa 2018).

Over the last decade, the usage of pesticides have caused concerns about the negative effects on not only pollinators, but also on human health. During the years from 2000 - 2011, the state of Florida reported over 400 acute illnesses related to pesticides, and over 8,000 cases of acute illnesses related to pesticides were reported nationwide (Damalas and Eleftherohorinos 2011). Therefore, new plant biopesticides are being studied and developed; a promising one is the use of plant derived essential oils (EOs) (Czerniewicz et al. 2018, Ikbal and Pavela 2019). Biopesticides do not target a specific species, can be as effective as synthetic pesticides, and do not harm the environment (US EPA 2023). Botanical insecticides are usually produced from extracts of medicinal plants or plants used in the food industry, and thus are viewed as products associated with minimum health and environmental risks (Isman 2015). Highly promising plant metabolites with useful insecticidal activities also include the group of plant essential oils (Benelli, et al. 2016), which are complex mixtures of simple aromatic terpenes obtained from aromatic plants.

In this study, I examined the effectiveness of an EO coating on reducing settlement of aphids on bean plant leaves. It was predicted that the leaves that received a treatment (citronella/grapefruit/mix) would not be chosen by the aphids, given that citronella has a strong lemon-like aroma and aphids tend to avoid such scent. Also, combination of citronella oil and grapefruit should be more efficient given that the addition of citrus smell, found in the grapefruit oil, should repel the aphids more.

Experimental Approach:

To determine the effect of citronella, grapefruit, and the mixture of essential oils as aphid repellent, 18 bean leaves were collected from the SPC Clearwater garden (n=9 control and n=3 per essential oil treatment). Each treatment was repeated 3 times (n=9 total for each EO treatment). The leaves were cleaned with water and soaked in their respective treatment solution for 15 seconds and then allowed to dry for 30 minutes. Treatment solutions were a mixture of 0.075% Tween, 2% EtoH, and 0.4% essential oil (Treatment leaves only) in DI water. Once dry, a control leaf and treatment leaf were placed into a 15cm diameter petri dish with a moistened paper towel at the bottom to maintain humidity. Finally, with the assistance of a microscope, 10-15 aphids were sorted and placed in the middle of each petri dish between the leaves.

After 24 hours, each dish was examined and the number of aphids found on the control or treatment leaf was recorded, along with the number of aphids left on the paper towel (no choice). The percent choice for each condition was calculated and an average for each treatment (citronella, grapefruit, and the mixture of essential oils), control (no essential oil) or no choice was found. Differences in aphid choice for each EO treatment was analyzed with an ANOVA and post-hoc t-tests.

Weekly Processes and Observations

Week 1: I met with Dr. Goergen to talk about the project and planning for supplies needed for the following week. It was discussed how many petri dishes would be necessary to complete the experiment. Per our analysis and based on the experimental design of Ikbal and Pavela (2019), we decided to use citronella oil and grapefruit oil because it showed potential as an

aphidicide. Also, we calculated the amount of oil used in 1L of solution, for each treatment. For citronella and grapefruit, it was used 0.8 mL of oil in each solution; and for the citronella + grapefruit solution it was used 0.4 mL of citronella and 0.4 mL of grapefruit.

Week 2: September 14th was the first day of the experiment. 9 petri dishes in total (3 petri dishes containing different sizes of leafs with only citronella oil, each; 3 petri dishes containing different sizes of leafs with only grapefruit oil, each; 3 petri dishes containing different sizes of leaves with only citronella + grapefruit oil, each) were constructed (Figure 2) with a treatment leaf on one side of the 20cm diameter petri dish as described in the methods After 24 hours, the 9 petri dishes of this experiment were examined and the number of aphids on the control leaf, on the treatment leaf, or still on the filter paper were counted with the assistance of a stereo microscope (Cambridge instruments). The data was recorded and analyzed in excel sheets. After counting and cleaning out the dishes, the experiment was reset as before for another replication.

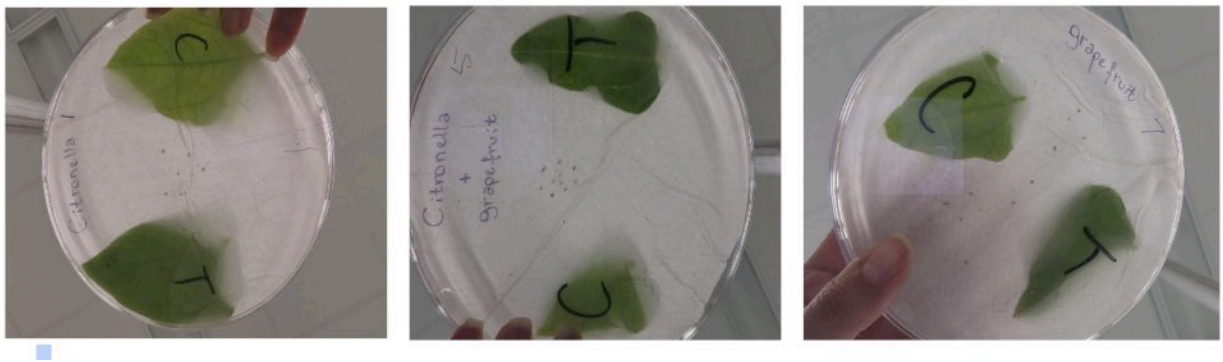

Figure 2. Experimental set-upfor each EO treatment: (left) CItronella treatment petri dish #1(middle)Citronella + Grapefruit treatment Petri dish #5 and (right) Grapefruit treatment Petri dish #7.

Week 3: September 21, was the second week of treatment. All 9 petri dishes with aphids were checked and the aphis were counted to verify how many of them were on the control leaf and how many were on the treatment leaf (Figure 3). After counting, we repeated the procedure.

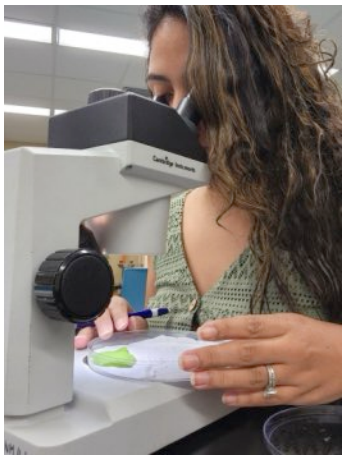

Figure 3. Leaf under stereo microscope (digital image).

Week 4: September 28 was the third week of treatment. All 9 petri dishes with aphids were checked. Then, with the use of a microscope, the aphis were counted to verify how many were on the control leaf and how many were on the treatment leaf (Figure 4). It was decided that no other replicates would be made, and to start working on the data collected from the previous weeks.

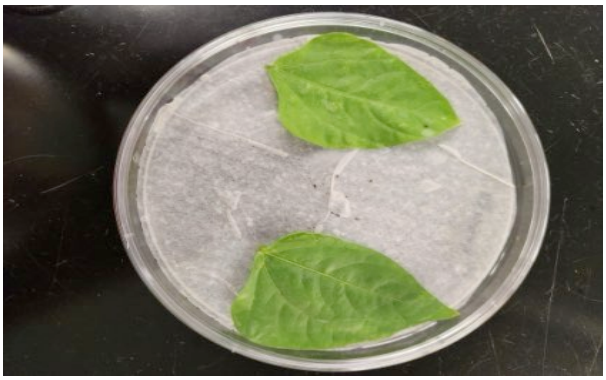

Figure 4. Aphids on leaf (left; under 20x magnification) and (right)aphids on leaf (digital image).

Week 5: On October 5th, we did preliminary data and found that the treatment with only citronella oil was the most efficient. The treatment with citronella and grapefruit was next, and grapefruit alone was the least efficient.

Week 6: On October 13th, additional data analysis was conducted. The total number represents the aphids that made a choice plus the aphids that did not make a choice. The number of aphids that chose the control leaf were counted too.

With these data, we used the formula $AVG\ \% = \ 1 \ - \ (C/T)$, with C = control and T = total. An ANOVA and T-test was performed, with the data collected, to better understand and verify the effectiveness of treatment.

Week 7: During this week I continued to work on my final report.

Week 8: During this week, I worked on my poster for the URE Symposium.

Results and Discussion:

In this case study, results indicated that all leaves treated with EOs had significantly lower aphid settlement than either control or no selection (Figure 5, Table 1), with the exception of the grapefruit alone.

Table 1. ANOVA results for each treatment comparing settlement on treatment, control and no choice.

ANOVA	F	P
Citronella	6.251	0.005
Citronella + Grapefruit	3.354	0.047
Grapefruit	2.064	0.143

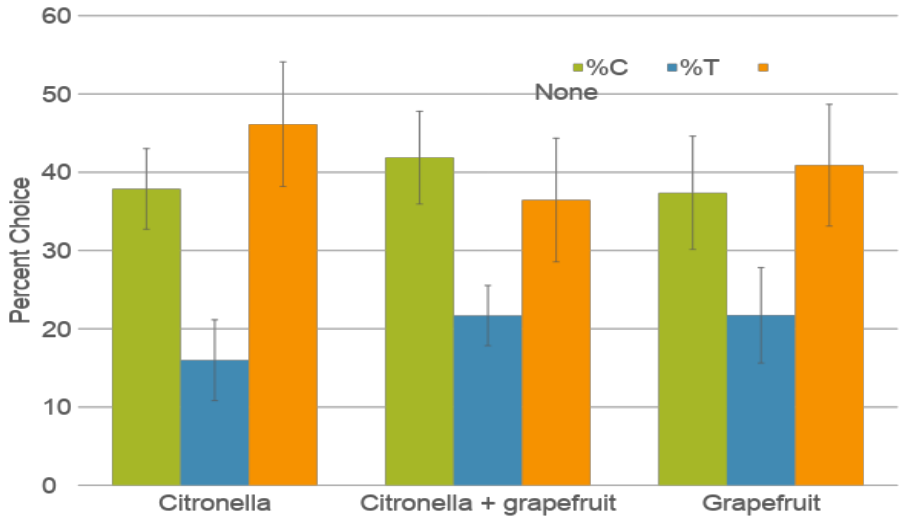

Figure 5. Effect of essential oils on settlement choice of aphids.

Of all of the EOs, citronella was the most effective in repelling aphids with only 16% aphid presence. Contrary to my hypothesis, the citronella + grapefruit treatment was not the most effective at repelling aphids, having a 21.7% presence, the same as grapefruit alone. In all EO treatments, there was no significant difference in aphid choice between the control and no choice ($p>0.05$). However, all EO treatments had significantly fewer aphids settle than on the control leaf ($p<0.05$). Thus, preliminary data indicates great potential for EO's as a possible aphid repellent, given that all treatments showed some effectiveness in repelling aphids.

Overall, the data supports the idea that plant essential oils have the potential to reduce colonization of aphids. Similar to companion planting, this would reduce the need of synthetic pesticides (Ahmed et al. 2020) without the potential for resource competition. In this study, the most effective essential oil was citronella, but all EOs reduced colonization of bean plants relative to the control, a similar result seen in other studies of ECO effectiveness (Czerniewicz et al. 2018). There was no difference between the number of aphids that chose the control over

no choice, suggesting that it was the EO present in the solution that prevented colonization rather than simply the presence of the solution on the leaves. The presence of these plant secondary metabolites (EOs) can negatively impact aphids chemically by disrupting host attraction (Youssef et al 2009) or enzymatically by decreasing necessary enzyme production (Czerniewicz et al. 2018).

The results obtained in this study suggest that EOs have the potential to effectively reduce infestation by aphids. However, to determine if use of EOs is a viable long-term, large-scale method for pest control, future experiments are needed to determine four main factors. First,the phytotoxic effect, if any, on the plants. Preventing aphid impacts is irrelevant if the treatment also damages plant tissue. Second, the toxicity for aphids. Deterring colonization may help crop production but may only shift where the aphids are having an impact if population sizes are not reduced. Third, the toxicity for other insect species. Although many insects are pests, there are other beneficial insects needed in an agricultural setting, so it is important to determine potential impacts on non-target insects. Finally, any damage to the plants. The EOs may chemically react when exposed to heat. In addition, the plant may become impermeable if EO prevents gas or fluids from going through.

It is imperative to have more studies in this field due to the increasing demand for biopesticides due to the growth of conscious buyers, in which people do not only purchase an item by necessity but also according to their core value. A recent study by NielsenIQ found that 78 percent of US consumers say that a sustainable lifestyle is important to them (Bar Am, et al. 2023). Yet, many companies report that it is challenging to implement environmental policies to generate sufficient consumer demand for their products.

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Stem Program Student Research Final Report
Name: Alexander Short **Professor:** Erica Moulton, MS
Dates: 9/05/2023 to 11/16/2023

Microplastics in Pinellas County Waterways

Purpose:

The purpose of this research project is to determine how much microplastic is contained in 1000 mLs of water from various bodies of water in Pinellas County. Samples were collected from the top layer of various fresh and saltwater bodies within Pinellas County

Hypothesis: Water near a shipping channel and active-use beaches will have higher concentrations of microplastics than areas with fewer boats and no visitor-use beaches. I based my hypothesis on predicted that the seawater from Fort DeSoto would contain the most microplastics since it is close to a major shipping channel, and many beach visitors versus the inlet at Bay Pines where there is not a beach and no active boats.

Experimental Approach: In this research, I determined sample sites that would allow me access to the water without special access permits or permission required. Sites were also then narrowed down to represent fresh and saltwater with high and low human impact, such as beach visitors or boaters. These sites were then mapped out and scheduled for collection days.

Prior to beginning the collecting I attended the Keep Pinellas Beautiful (KPB) microplastics sampling class. To be consistent in sampling I used the KPB Beautiful methodologies to collect the water samples which can be found in the Florida Microplastics Awareness Project Volunteer Manual (referenced below).

Armed with a consistent sampling method for all the sites, I went out to collect. Based on my course schedule and the time needed to process, I used the approach of making sure one sample was collected and processed on average every nine days. Each sample consisted of 1000mL of water. The samples were collected in glass containers or silicone bags that were cleaned before sampling and then rinsed at the sample site, a KPB protocol. The samples were labeled, collected, and sealed. Each container label contained the location they were taken from, dates, times, and site information about user activity. All samples were placed in a dark box and transported to the STEM lab at Bay Pines. They are transported in a dark box to prevent algae from growing in the water.

At the STEM Center lab, each sample was placed in its separatory funnel, covered with a towel, and left to sit for four days. After four days, a small amount of water was drained from the bottom of the separatory funnel to remove the turbidity and other bits of debris. The remaining water sample was filtered through filter paper. The filter paper was allowed to dry for 24 hours. The dry filter paper was glued to a small glass Petri dish. The Petri dish was then placed under a microscope and all the microplastic pieces were removed with tweezers. These pieces were given a flame test, where each piece was held one inch above a flame for one second and then placed under the microscope again. How the piece burnt (chemical reaction) verified if it was microplastic or not. The piece count was listed on a spreadsheet.

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Microplastics in Pinellas County Waterways

Observations:

Week 1: Set up the lab. Obtained all necessary supplies needed to conduct the sampling and processes. Practiced using the equipment to become proficient in collecting the samples, storing and transporting the samples, and operating the lab equipment.

Week 2: Collected a test water sample. Conducted the lab experiment as a test. Verified the process was accurate and repeatable.

Week 3 and 4: Collected a sample from Fort Desoto. Spent time in the lab testing the samples. Started recording my findings.

Week 5 and 6: Collected water samples from two ends of Eagle Crest Lake. Spent time in the lab testing the samples. Recorded data for both of my samples taken at Eagle Crest Lake.

Week 7: Went to Weeden Island to collect a water sample. Did testing in the lab. Recorded data from Weeden Island.

Week 8: Visited John's Pass. Collected a water sample. Tested that sample in the lab. Recorded data from John's Pass.

Results:

While I was conducting this research, I noticed that my samples that had access to multiple different water currents held more microplastic. The sample that was taken at Fort Desoto has double the amount of microplastic that any other sample.

Fort Desoto-

There were 82 pieces found in this sample with only 61 pieces that tested positive to be Plastic.

Stem Program Student Research Final Report
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Microplastics in Pinellas County Waterways

Color of microplastics found	Unknown type fibers	Plastic fibers	Natural fibers	Plastic Fragments	Microbeads	Plastic Film	TOTALS
Black	5	4	0	0	0	0	9
Blue	5	27	0	0	0	0	32
Brown	0	0	0	0	0	0	0
Clear-White-Cream	0	0	0	0	0	0	0
Crystalline	0	0	0	0	0	0	0
Green	1	1	0	0	0	0	2
Grey	0	0	0	0	0	0	0
Opaque	0	0	0	0	0	0	0
Orange	0	0	0	0	0	0	0
Other	0	1	0	0	0	0	1
Pigmentation	0	0	0	0	0	0	0
Pink	1	4	0	0	0	0	5
Purple	0	0	0	0	0	0	0
Red	0	0	0	0	0	0	0
Tan	1	10	0	0	0	0	11
Transparent	6	14	0	0	0	0	20
Unknown	0	0	0	0	0	0	0
White	1	0	0	0	0	0	1
Yellow	1	0	0	0	0	0	1
TOTALS	**21**	**61**	**0**	**0**	**0**	**0**	**82**

Eagle Crest Lake East drain

There were a total of 33 pieces fount however only 24 of them were plastic.

Color of microplastics found	Unknown type fibers	Plastic fibers	Natural fibers	Plastic Fragments	Microbeads	Plastic Film	TOTALS
Black	3	5	0	0	0	0	8
Blue	2	3	0	1	0	0	6
Brown	0	0	0	0	0	0	0
Clear-White-Cream	0	0	0	0	0	0	0
Crystalline	0	0	0	0	0	0	0
Green	0	0	0	0	0	0	0
Grey	0	1	0	0	0	0	1
Opaque	0	0	0	0	0	0	0
Orange	1	3	0	0	0	0	4
Other	0	0	0	0	0	0	0
Pigmentation	0	0	0	0	0	0	0
Pink	1	0	0	0	0	0	1
Purple	0	0	0	0	0	0	0
Red	0	0	0	0	0	0	0
Tan	0	1	0	0	0	0	1
Transparent	1	8	0	0	0	0	9
Unknown	0	0	0	0	0	0	0
White	0	3	0	0	0	0	3
Yellow	0	0	0	0	0	0	0
TOTALS	**8**	**24**	**0**	**1**	**0**	**0**	**33**

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Microplastics in Pinellas County Waterways

Eagle Crest Lake West drain

There were a total of 32 pieces found however only 27 were plastic.

Color of microplastics found	Unknown type fibers	Plastic fibers	Natural fibers	Plastic Fragments	Microbeads	Plastic Film	TOTALS
Black	0	1	0	0	0	0	**1**
Blue	1	10	0	0	0	0	**11**
Brown	0	0	0	0	0	0	**0**
Clear-White-Cream	0	0	0	0	0	0	**0**
Crystalline	0	0	0	0	0	0	**0**
Green	1	0	0	0	0	0	**1**
Grey	0	0	0	0	0	0	**0**
Opaque	0	0	0	0	0	0	**0**
Orange	0	1	0	0	0	0	**1**
Other	0	0	0	0	0	0	**0**
Pigmentation	0	0	0	0	0	0	**0**
Pink	0	3	0	0	0	0	**3**
Purple	0	0	0	0	0	0	**0**
Red	0	0	0	0	0	0	**0**
Tan	2	2	0	0	0	0	**4**
Transparent	1	10	0	0	0	0	**11**
Unknown	0	0	0	0	0	0	**0**
White	0	0	0	0	0	0	**0**
Yellow	0	0	0	0	0	0	**0**
TOTALS	**5**	**27**	**0**	**0**	**0**	**0**	**32**

Weedon Island

There were a total of 36 pieces found however only 23 were plastic.

Stem Program Student Research Final Report
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Microplastics in Pinellas County Waterways

Color of microplastics found	Unknown type fibers	Plastic fibers	Natural fibers	Plastic Fragments	Microbeads	Plastic Film	TOTALS
Black	0	1	0	0	0	0	1
Blue	5	9	0	1	0	0	15
Brown	0	0	0	0	0	0	0
Clear-White-Cream	0	0	0	0	0	0	0
Crystalline	0	0	0	0	0	0	0
Green	0	0	0	0	0	0	0
Grey	0	0	0	0	0	0	0
Opaque	0	0	0	0	0	0	0
Orange	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Pigmentation	0	0	0	0	0	0	0
Pink	0	4	0	0	0	0	4
Purple	0	0	0	0	0	0	0
Red	0	0	0	0	0	0	0
Tan	5	6	0	0	0	0	11
Transparent	2	3	0	0	0	0	5
Unknown	0	0	0	0	0	0	0
White	0	0	0	0	0	0	0
Yellow	0	0	0	0	0	0	0
TOTALS	**12**	**23**	**0**	**1**	**0**	**0**	**36**

Johns Pass

There were a total of 42 pieces found however only 26 were plastic.

Color of microplastics found	Unknown type fibers	Plastic fibers	Natural fibers	Plastic Fragments	Microbeads	Plastic Film	TOTALS
Black	0	0	0	0	0	0	0
Blue	12	11	0	0	0	0	23
Brown	0	1	0	0	0	0	1
Clear-White-Cream	0	0	0	0	0	0	0
Crystalline	0	0	0	0	0	0	0
Green	0	0	0	0	0	0	0
Grey	0	0	0	0	0	0	0
Opaque	0	0	0	0	0	0	0
Orange	0	1	0	0	0	0	1
Other	0	0	0	0	0	0	0
Pigmentation	0	0	0	0	0	0	0
Pink	0	1	0	0	0	0	1
Purple	0	0	0	0	0	0	0
Red	0	1	0	0	0	0	1
Tan	3	3	0	0	0	0	6
Transparent	1	8	0	0	0	0	9
Unknown	0	0	0	0	0	0	0
White	0	0	0	0	0	0	0
Yellow	0	0	0	0	0	0	0
TOTALS	**16**	**26**	**0**	**0**	**0**	**0**	**42**

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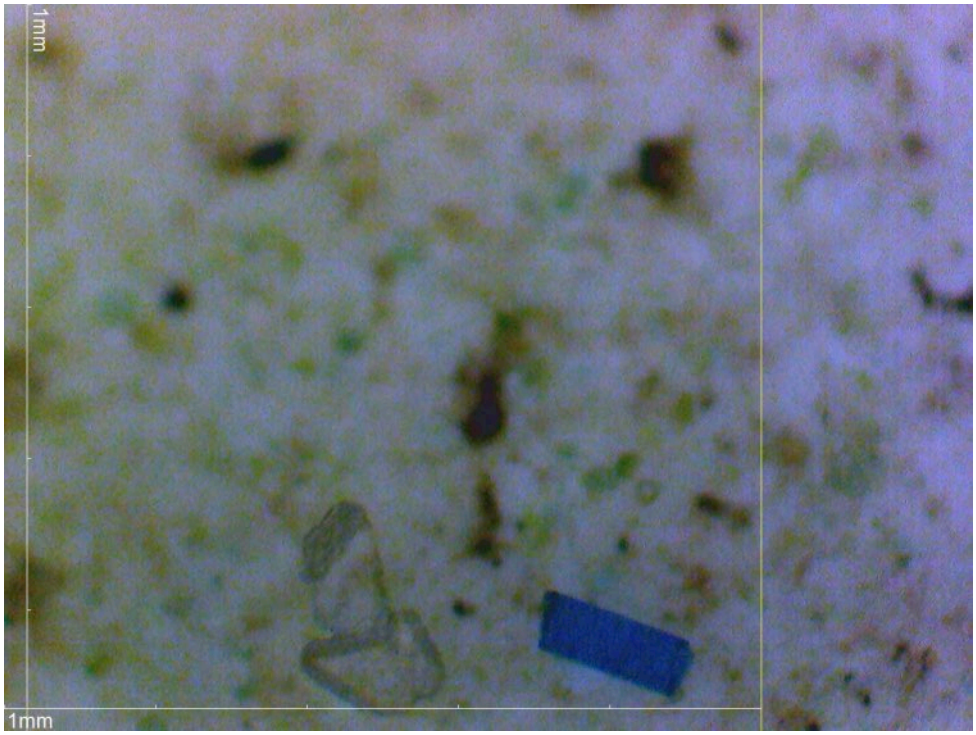
Microplastics in Pinellas County Waterways

Pictures:

Below is the only Microplastic fragment that I found throughout my whole research, the object next to it is a grain of salt for reference.



Below is an unknown fiber that could not be identified as microplastic or natural fiber.

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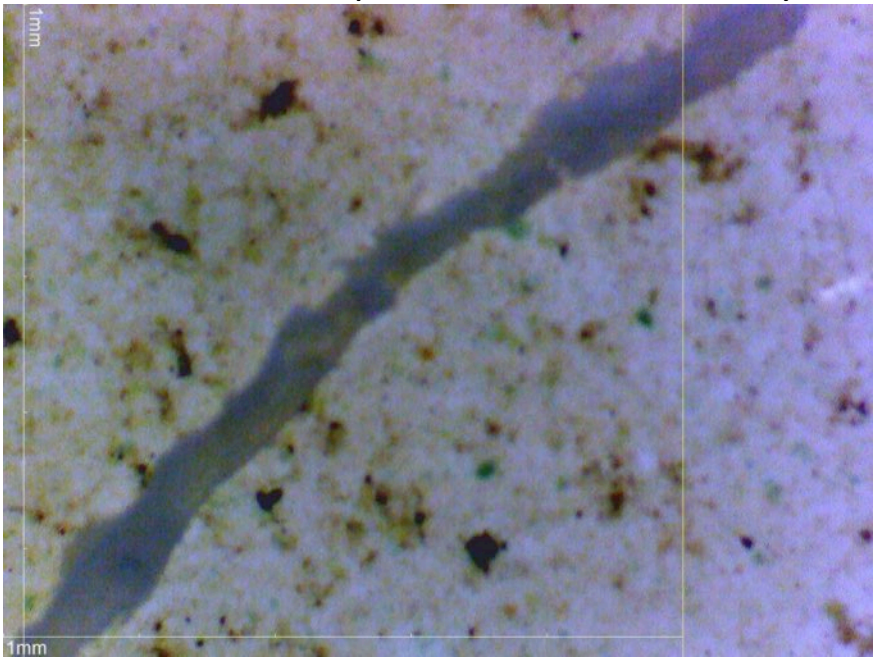

Below Is a long piece of microplastic that is situated next to a grain of salt.

Below is a bundle of microplastic that contains 7 pieces total and is situated next to a grain of salt.

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Microplastics in Pinellas County Waterways

Conclusions: My hypothesis “Water near a shipping channel and active-use beaches will have higher concentrations of microplastics than areas with fewer boats and no visitor-use beaches” was true. Although more testing needs to be done, this work demonstrates even more evidence that the human impacts in an area are adding to the microplastic contents in our oceans.

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Microplastics in Pinellas County Waterways

Resources:

Shostak, A. (2021, October 25). Microplastics 101. Keep Pinellas Beautiful. https://www.kpbcares.org/kpb-blog/2020/8/17/microplastics-101

Franke, Devon (2023, September 15). Microplastics Sampling Methodologies Lecture notes, PowerPoint slides. Keep Pinellas Beautiful, Keep America Beautiful Affiliate.

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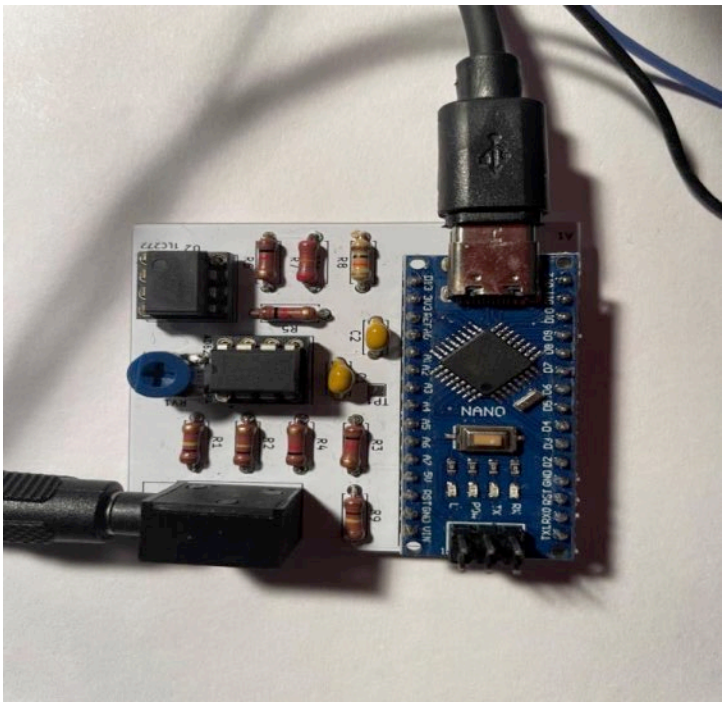
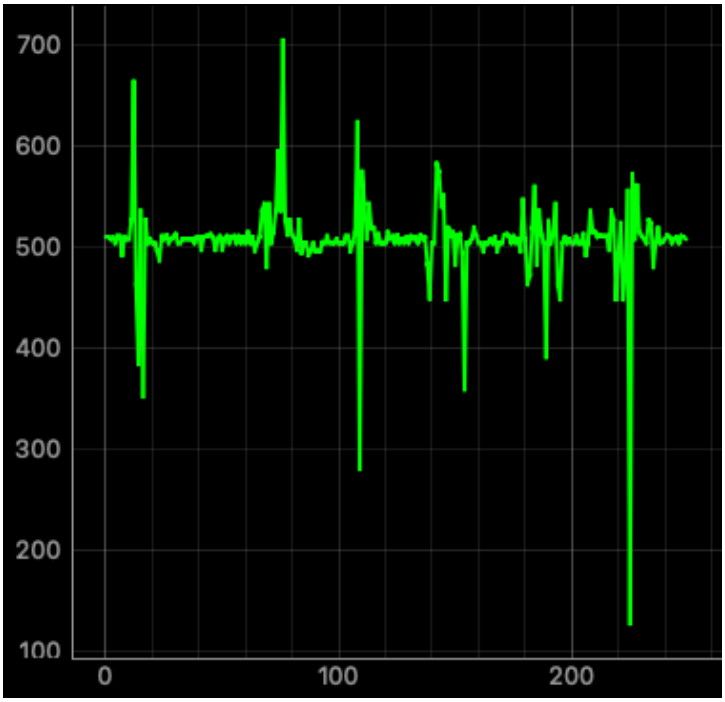
Communications, I. (n.d.). Florida Sea Grant Extension & Education Program. Microplastics - Florida SeaGrant Programs - University of Florida, Institute of Food and Agricultural Sciences - UF/IFAS. https://flseagrant.ifas.ufl.edu/microplastics/

Engineering Research Projects





SORIE MITCHELL BANGURA

A.A ENGINEERING

ST. PETERSBURG COLLEGE

ECG RESEARCH PROJECT

PROFEESOR: BRIAN BELL

DECEMBER 4, 2023

Introduction

ECG is short form of electrocardiogram. Electrocardiogram is a device used to measure the rate and rhythm of the heart. The heart beats are possible and driven by several electrical impulses. The connection between electricity and the heart started in 1780 when Italian anatomist Luigi Galvani observed that when he touched the nerves of a frog's leg, it appeared to contract. He based this contraction because of the electrical stimulation of the heart. However, the first human electrogram was measured in 1887 by Waller who was a lecturer of physiology at St Mary's Medical School.

Motivation

According to American Medical Association Journals, Heart disease deaths increased by 4.8%, the largest increase in heart disease deaths since 2012 and it was the first leading cause of the death in USA in 2020 at around 690,888 deaths. A huge amount of heart disease is due to abnormalities of the electrical activity of the heart causing irregular rhythm of the heart at a faster or slower rate. Factors such as hypertension, alcohol, smoking, and mental stress disturb the regular electrical activity of the heart and its beat. Using an ECG to monitor the heart rhythm helps us to take preventive measures and solutions to what we must avoid giving us a healthy heart.

Background

ECGs are mostly used in situations where a person experience palpitation, chest pain, stroke, black out or sudden fall, and breathlessness. When it comes to reading the ECG graph there are different phases that interpret the heart rhythm. These phases are sub-categorized into waves called the PQRST and U waves.

HOW ELECTRIC ACTIVITY IN THE HEART HAPPENS

Our body is made up of millions of cells which contain electrolytes. The electrolytes in the heart are sodium, potassium, and calcium (all positive charges). The movement of these cells between the cell membranes by pumps create electrical activity. At rest the heart has a negative charge at about -90 mv. When the electrolytes start to cross the cell membrane, through the ion channel (a door that allows electrolyte to pass) it moves from an area of highest concentration to a lower concentration.

Electrical impulse causes the sodium ion channel to open and allow sodium to enter the cell. It causes a change in the negative charge of the heart to positive. The charge change causes an electrical potential called depolarization. After a high concentration of sodium, it becomes depolarized and the sodium ion channel closes.

Immediately after depolarization, the calcium ion channel opens and allows calcium to enter but at a slower rate that does not change the electric potential but remains at rest and causes mechanical contraction.

Finally, the mechanical contraction causes the potassium channel to open and moves potassium into the cell. Movement of potassium causes an electrical potential called repolarization. Repolarization from the resting electric potential.

The change in depolarization and repolarization causes electrical activity in the heart which spreads around different tissues. Electrical activity can be measured by placing an electrode on the skin which results in the formation of the PQRST and U waves when viewed on a screen connected to an ECG.

HOW PARTS OF THE HEART RESPOND TO THE ELECTRICAL ACTIVITY

The electrical activity goes through parts of the heart called the sinoatrial node (SA node), atrioventricular node (AV node), bundle of His, left and right bundle branches, and Purkinje fibres. The cardiac cycle starts in the sinoatrial node found on the right atrium of the heart. Its depolarization produces the highest number of beats per minute around 60 – 100. The depolarization is transferred to the atria causing it to depolarize and transfer to the AV node. The AV node slows down the electrical activity and heartbeat to about 40-60 beats per minute to prevent the ventricles from high atria rate. The electrical impulses move to the bundle of His which create branches to move the impulse to the left and right ventricles. Finally, these branches come to the Purkinje fibres that carry the electrical every part of the ventricles.

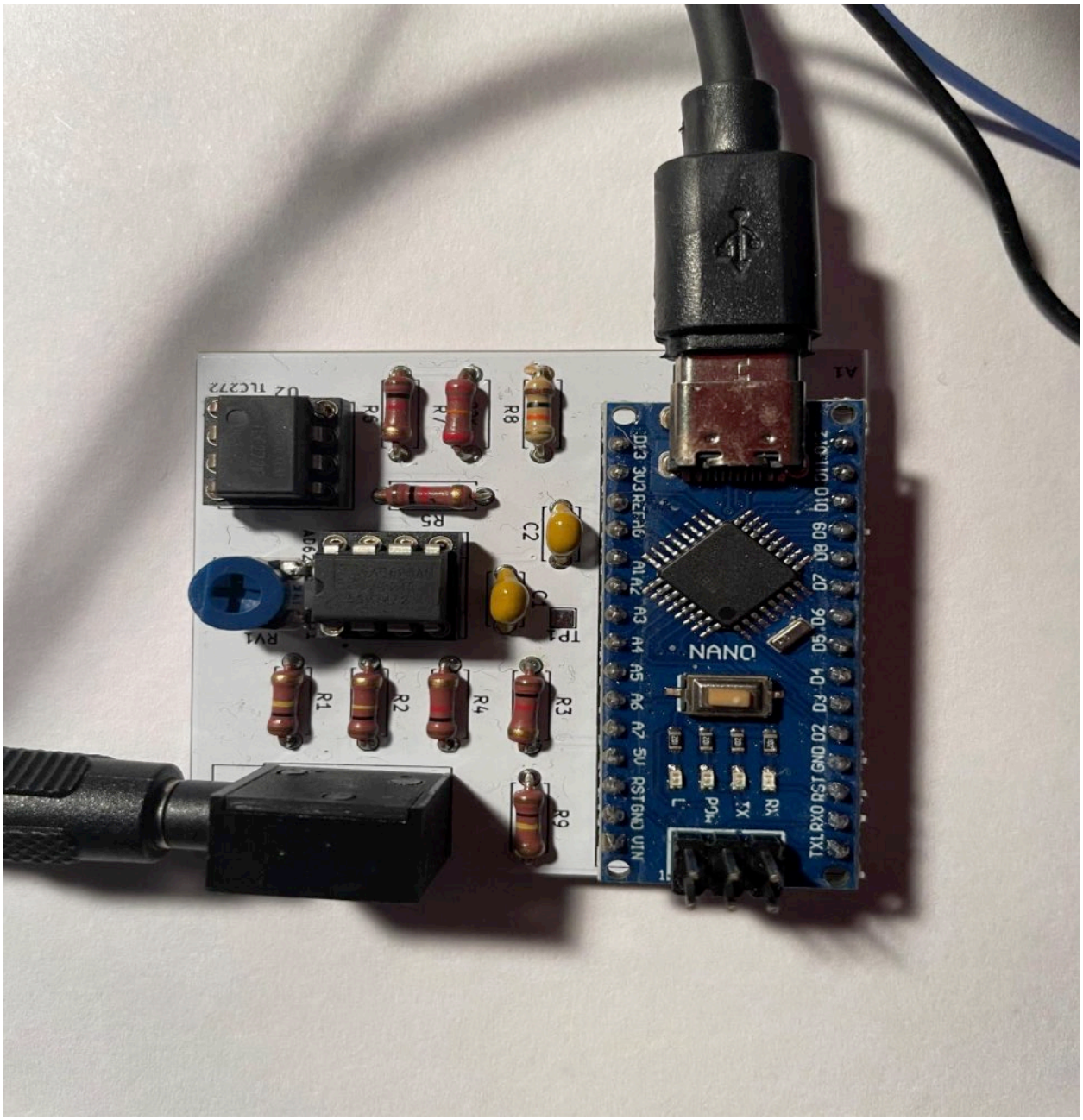
Procedure

Understanding this concept, a device can be created to measure the heart's electrical activity. The device created in this research consists of materials such as

- Resistors (100k, 10k, 22k, 1k)
- Capacitors (2.2uF)
- PCB board
- ICEs
- Arduino
- 3 Leads
- Electrodes
- 3mm Audio Jack

- Potentiometer
- USB cables

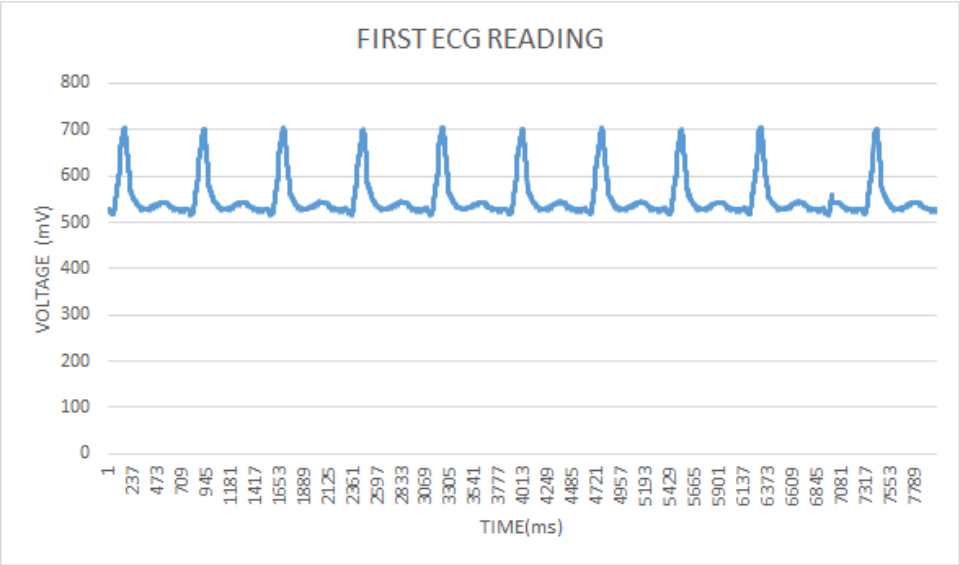
Each of the components were soldered to the PCB using a soldering kit. Careful attention was placed on the orientation of the ICEs. The resistors regulate the flow of electrical activity through the PCB board. The capacitors stored the required amount of charge. The three leads were connected to the audio jack to allow the flow of electric activity from the electrode (which was connected to the leads) to the PCB board. The software program was written using Arduino. Specific drives were installed to the computer to enable the software to connect to the hardware and record heart electrical activity. The electrodes connected to the audio were placed in different positions on the body to measure the electrical activity. A three-lead electrode was used. The red lead placed on the bottom rib cage close to the middle of the clavicle, the black lead placed on the upper left part of the chest, and the blue lead placed on the upper right part of the chest.

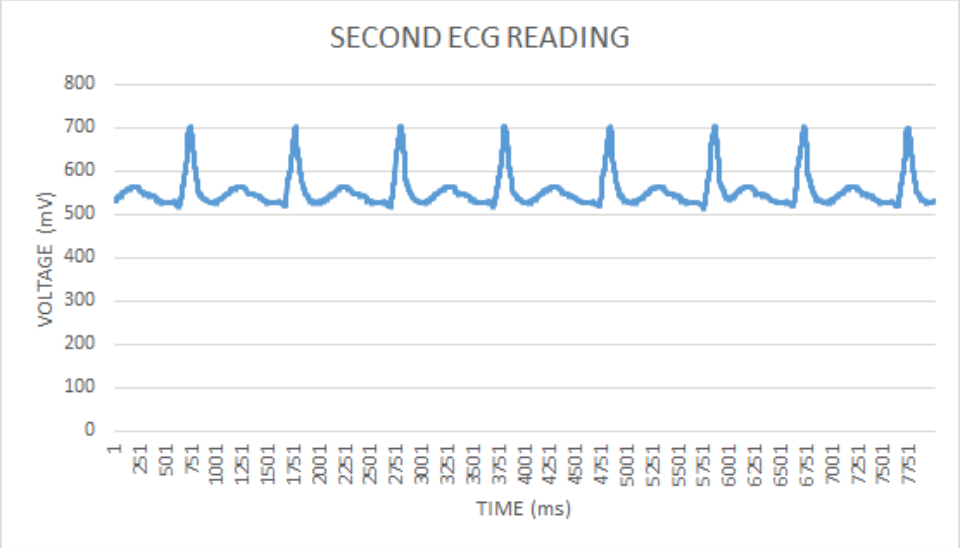


Data Collection

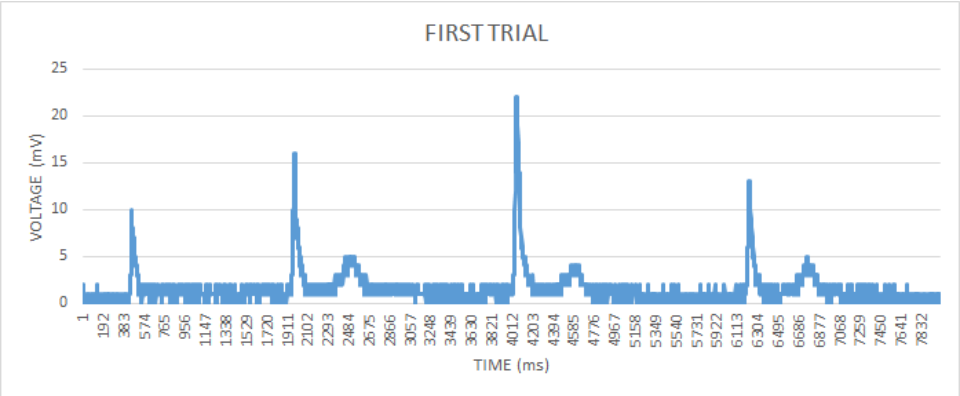
I did multiple data collection on a simulator and myself using the built ECG and these are the following readings

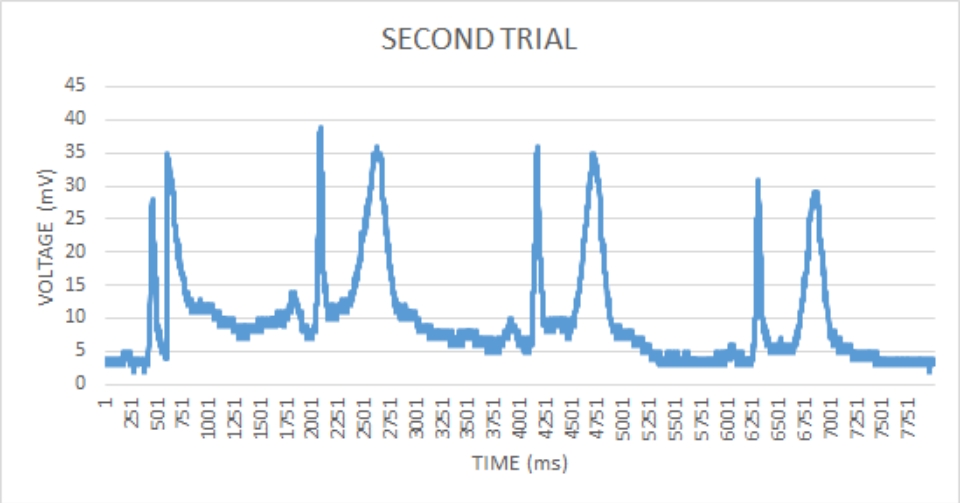
Readings from a simulator

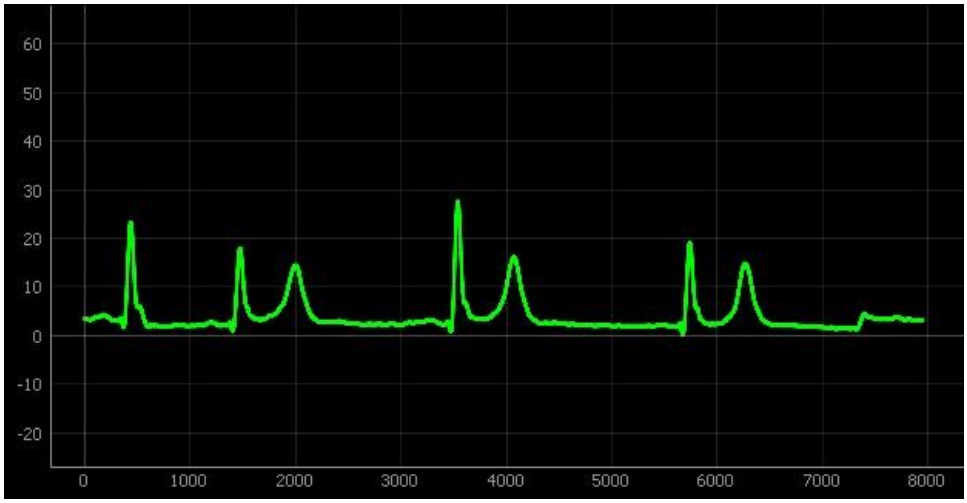




Reading from Human Trials (myself)







Conclusions

From the data above, it shows different wave patterns on the graph. Each wave pattern represents a different stage of electrical activity in the heart. Firstly, the P wave was created by the depolarization of the artia. Secondly, the QRS is caused by the depolarization of the ventricles. T wave is caused by the repolarization of the ventricles. Lastly, the U wave is the final wave, and it represents a slower heartbeat before the wave cycle begins again. The SA node can generate electrical activity by itself and therefore is one of the reasons why some who have lost function of different parts of their bodies still experience a heartbeat and are alive. One of the ways to determine if someone is dead is by using an ECG to check whether there is any electrical activity on the heart because no heartbeat signifies no electric activity passing through the tissues from the heart.

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Investigating EMGs

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What is an EMG?

Before one can understand what an EMG does, it is important to know the answer to the question: how do our muscles know when to move and contract? Our nervous system is responsible for most of the communication between our brain and muscles. The contraction of our muscles is signaled by small electrical signals sent out by our neurotransmitters. These small electrical signals (microvolts) are what an electromyograph (or EMG for short) measures for.

What are EMGs usually used for?

These graphs are often used by in a clinical setting by neurologists to test for muscle and neurological disorders including pinched nerve, muscular dystrophy, carpal tunnel syndrome, and other disorders. EMGs are also used to by software developers to further develop artificial intelligence and create assistive technology, "sEMG-based hand gesture recognition plays an important and fundamental role for computers or assistive devices to understand human body language" (Hu, 2018).

Types of EMG

There are different ways that EMGs can be used, "[c]hanges in electrical activity of smooth muscle fibers during contraction or relaxation can be detected on surface of skin (surface EMG) or directly within the myometrium (needle EMG) as an electromyography (EMG) signal" (Domino, 2017). Needle EMGs are an invasive form of assessment for the muscles. They are often used by medical professionals and neurologists in a medical setting to assess the functioning of muscles and nerves and test for disorders. Medical professionals use needle EMGs

rather than surface EMGs (which are also sometime referred to as sEMGs) because they are more precise and offer more accurate results and they are also able to target deeper muscles. Surface EMGs may also be used in a medical setting, but because surface EMGs do not pierce through the skin and enter the muscle directly, it is only able to measure superficial muscles. Surface EMGs are non-invasive, they use electrodes that stick to the surface of the skin. This makes them a much better candidate for use outside of a clinical setting and for personal experimentation.

Which EMG will I use?

In my experiment, I will be using surface EMG for "static muscle assessment and dynamic muscle assessment, utilizing standardized electrode placements, conditions, and movements during assessment" (Sella, 2019) to find an answer to my central question and test my hypothesis.

A brief history of EMGs

From as early as the late 18th century we have known that our muscles transmit electrical signals to communicate and move. The first recordings were from when "Galvani showed that electrical stimulation of animal muscle tissue produced contraction" (Kazamel & Warren, 2017) in 1771. There were no known ways to both accurately measure and graph these electrical signals until the 1930s when scientists began amplifying the electrical activity of single motor units using needle electrodes. EMGs made their way into medical use by the end of World War II. They were used to measure nerve and muscle damage in soldiers and war victims. As the knowledge of EMGs expanded, so did the use. More neurological and muscle disorders were

able to be assessed and diagnosed using EMGs as research on them continued. Presently, EMGs are still used in medical settings and developing further to diagnose and aid neuromuscular disorder, but the uses are beginning to expand rapidly outside of the clinical setting.

The future of EMGs

In recent years, software developers and programmers have been looking into EMGs for expanding artificial intelligence, virtual reality, assistive technology, and gaming. They have been researching and developing ways to connect our physical bodies to virtual reality by using custom EMG controllers to create a more immersive experience when gaming and even create programs to aid and track rehabilitation of nerves and muscles in those with disabilities and prosthetics. Currently scientists and developers are using EMGs and "applying it to the game based training for kids who need prosthetic arms to train both use and muscle strength" (Smith, 2018).

Central Question

What determines the amount of activity an EMG records when placed on a muscle group?

My Hypothesis

I believe that size determines the amount of activity an EMG records when placed on a muscle group. My hypothesis is that larger muscle groups will create higher spikes on the EMG than smaller muscle groups when activated.

How will I test my hypothesis?

First, I will create a list of muscle groups I plan on testing and put them in order of largest to smallest by measuring how large they are on my body with a measuring tape. Then, I will conduct my experiment by placing my electrodes on each muscle group individually, relaxing and then tensing my muscles repeatedly, and recording the data. Next, I will write down any observations. After that, I will analyze my data for any patterns, write down further observations, and compare it to my hypothesis. Finally, I will write down my conclusion. In my Conclusion I will state whether my hypothesis was proven or disproven.

Software and Hardware

The software I will be using to conduct this experiment is Arduino Connect v1.1.0-b4 (originally, I used v1.1.0-b.2 but before running the experiments, I updated my software). The hardware I will use is a Charles' Labs OpenEMG Arduino Sensor, snap electrodes, and a MacBook Air that uses an M1 chip.

Complications with Technology

At first, there was trouble with connecting the hardware to the software. Once the needed adapters to connect the USB-mini port to the USB-C port on the MacBook, the Arduino software still did not have an option to connect to the physical Arduino. For the port to become available, and FTDI driver was needed. Once FTDI software was downloaded, the program was up and running smoothly and there were no further complications. The initial complication most likely occurred because this software was originally created for those using a desktop computer which

already had the needed software to connect rather than a MacBook which does not already have the needed software.

Muscles:

The muscles that I plan to measure in this experiment are my rectus abdominis (abs), quadriceps (thigh), gastrocnemius (calf), frontalis (forehead/eyebrows), biceps brachii (upper arm), flexor digitorum superficialis (forearm), pollicis brevis (thumb), and sternocleidomastoid (neck). I chose to measure these muscles because they are surface muscles, this means that they will be accessible through sEMG. I will measure each muscle by taking its length and width of my own muscles and then using online research to find the average thickness of each muscle for a female and converting all units to cm. I will multiply these three variables to find the total volume each muscle takes up in cubic centimeters. The data for the sizes of these muscles will be listed in a chart in order of size from smallest to largest.

Procedure

I will place the electrodes connected to the red and blue wire along the muscle that I am measuring for EMG activity and the electrode connected to the black wire on a different place on my body and not on the same muscle (see fig. 1). I will then quickly tense and relax the muscle every second. At the end of this ten second period of tensing and relaxing my muscles I will click export PNG to download an image of a snapshot of the last few seconds my EMG was running (see fig. 2). I will repeat this three times for each muscle to ensure accurate data.

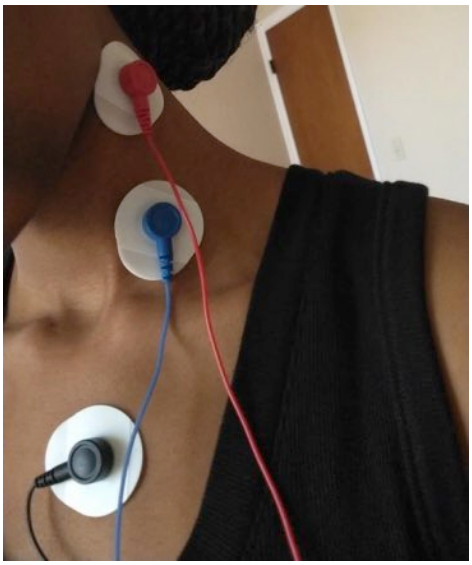


Figure 1 Electrodes placed to measure the sternocleidomastoid

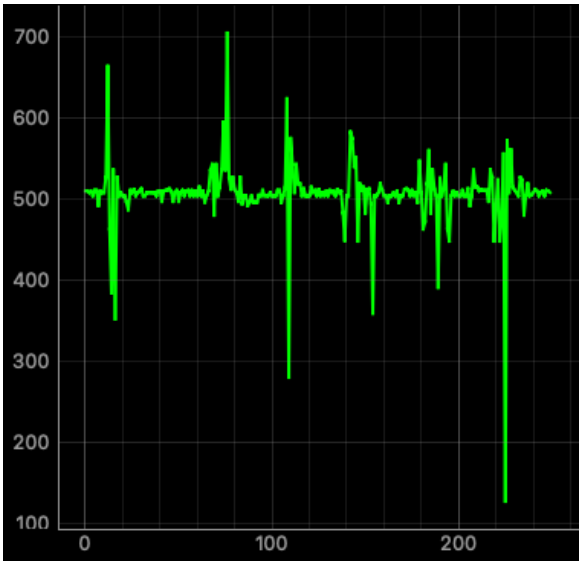


Figure 2: Electromyograph representing the electrical activity of a muscle being tensed.

Experiment

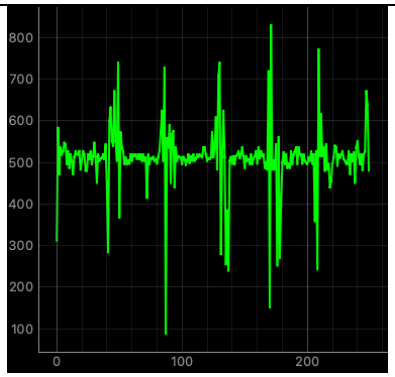
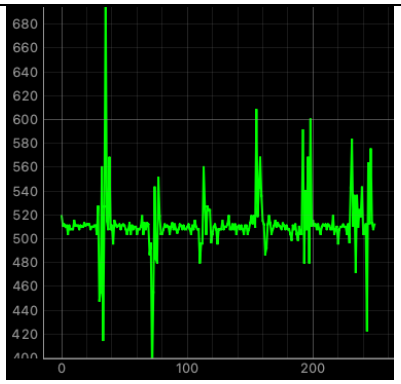
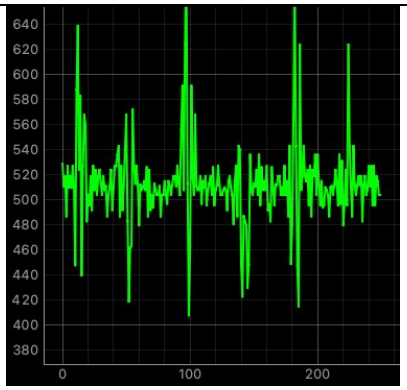
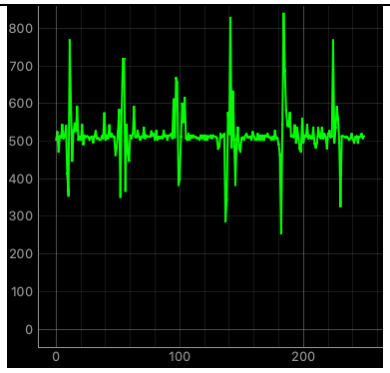
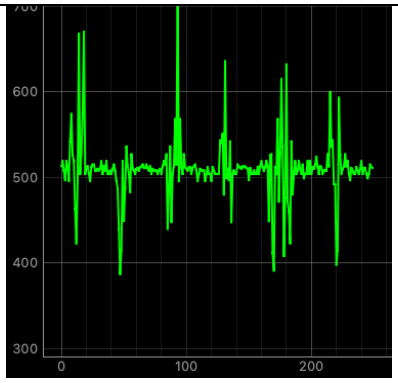
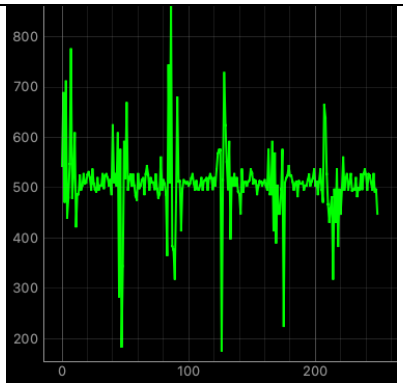
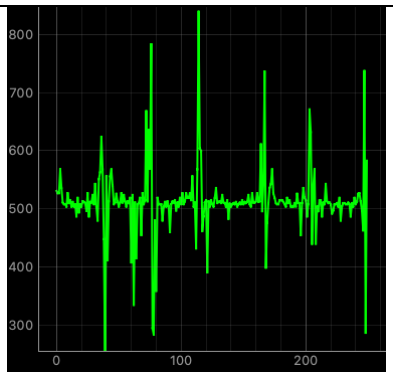
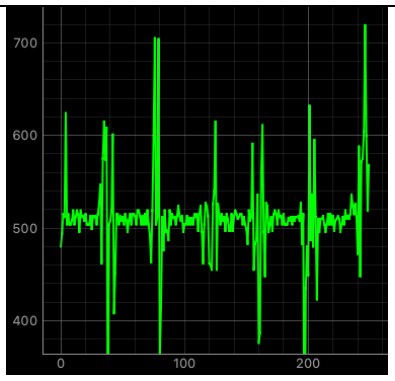
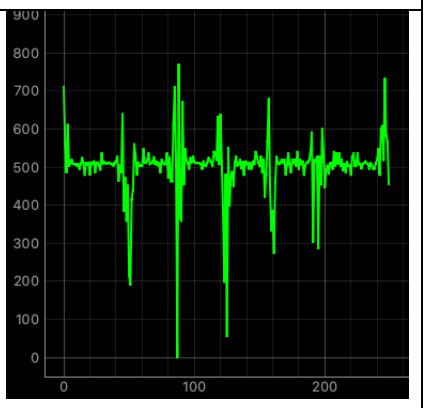
Each graph shows different ranges depending on how much electrical activity was recorded in the 10 second period. Only data from Graphs showing lower ranges of electrical activity show signals between 560 and 460 while graphs with greater activity show signals between 800 and 200. Only data from the last 5 or 6 seconds were shown on the graphs above. The first 4 second period of tensing and relaxing muscles allowed enough time to adequately calibrate the graph to fit an efficient scale. I made sure to research how to flex each muscle to target that muscle specifically, for example I found that “The flexor digitorum superficialis flexes the middle phalanges of the medial four digits at the proximal interphalangeal joints.” (Hoshika, Nimura, Takahashi, Sugaya, & Akita, 2020). So, when finding the right muscle and measuring for electroactivity, when looking for the flexor digitorum superficialis, I checked which muscle tensed when I flexed my fingers and then continued to tense and release that muscle to graph the spikes in electroactivity.

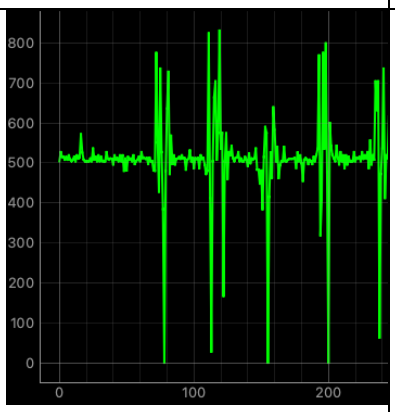
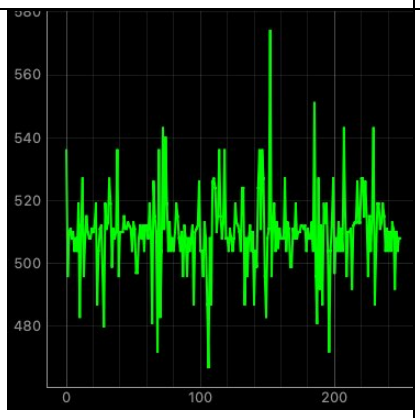
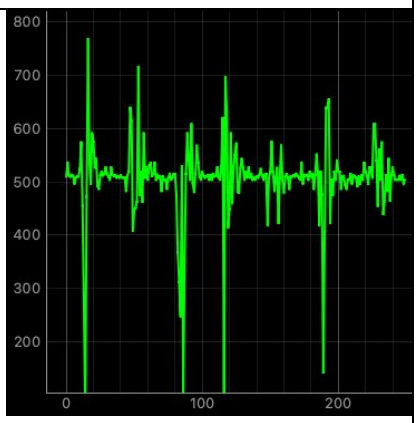
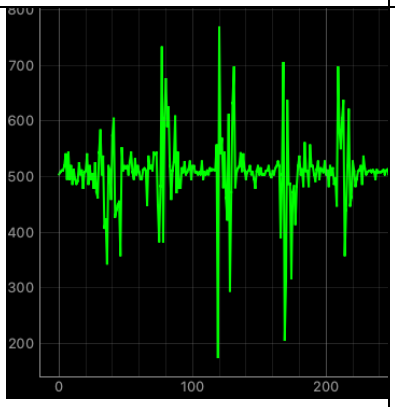
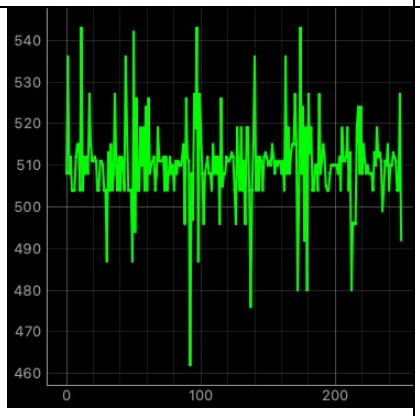
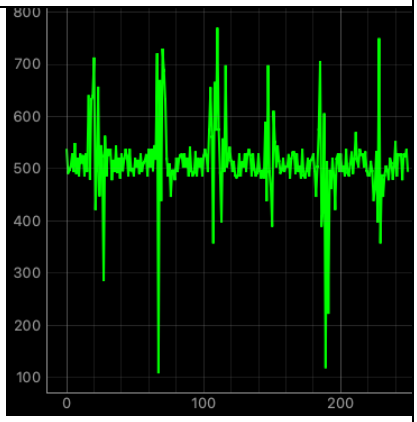
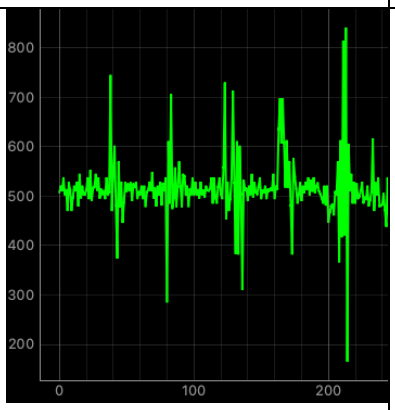
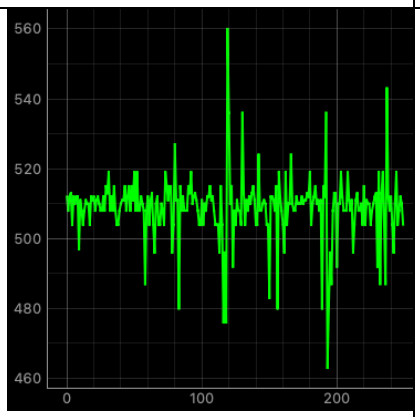
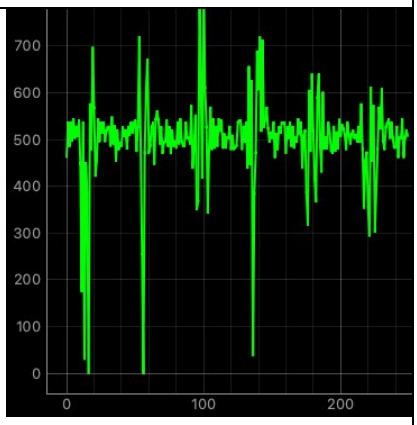
Data

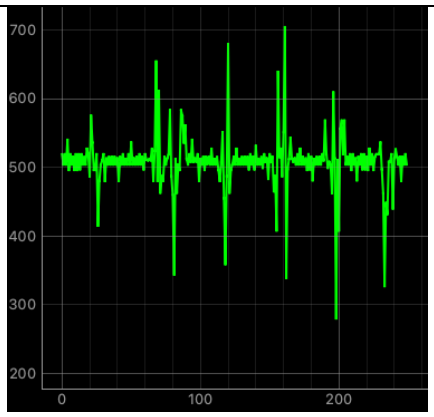
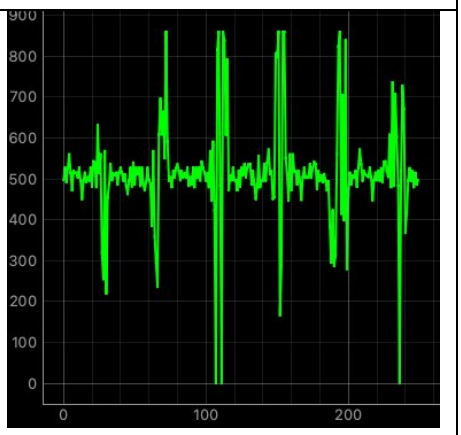
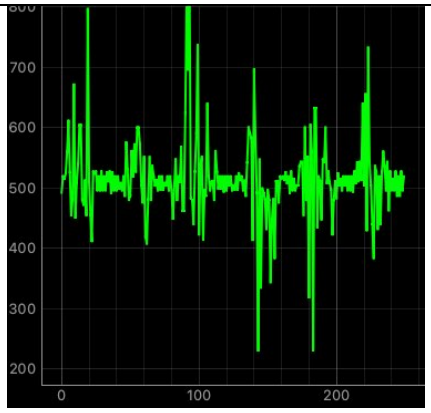
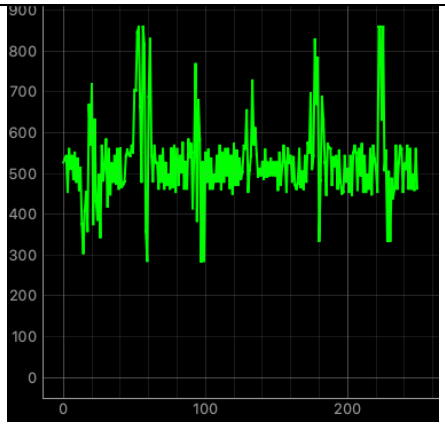
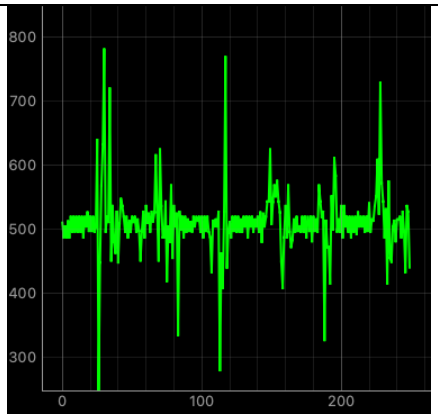
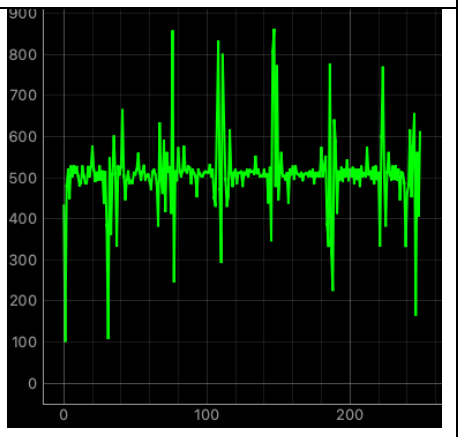
Table 1. Muscle Size:

	Length	Width	Thickness	Total Volume
Pollicis Brevis	5 cm	3 cm	0.35	5 cm^3
Frontalis	7 cm	12 cm	0.140	12 cm^3
Sternocleidomastoid	15 cm	2 cm	1.83	35 cm^3
Flexor Digitorum Superficialis	18 cm	4 cm	0.54	39 cm^3
Rectus Abdominis	17 cm	11 cm	1.984 cm	371 cm^3
Biceps Brachii	10 cm	13 cm	3 cm	390 cm^3
Gastrocnemius	11 cm	22 cm	1.69 cm	409 cm^3
Quadriceps	38 cm	29 cm	3.37 cm	3714 cm^3

Table 2. Electromyograph Results:

	Pollicis Brevis- 5 cm^3	Frontalis 12 cm^3	Sternocleidomastoid 35 cm^3
Trail One			
Trial Two			
Trial Three			

	Flexor Digitorum Superficialis- 39 cm³	Rectus abdominis- 371 cm³	Biceps Brachii- 390 cm³
Trial One			
Trial Two			
Trial Three			

	Gastrocnemius- 409 cm^3	Quadriceps- 3714 cm^3
Trail One		
Trial Two		
Trial Three		

Analysis

There were not any noticeable patterns among the graphs that supported the hypothesis that smaller muscles would have smaller spike of electrical activity than larger muscles. Some muscles did have larger spikes than others, but this spike did not correlate with the size of the muscle. The muscle with the smallest size (the pollicis brevis) had very steep spikes that ranged between 300 and 800 which was very similar to the largest muscle (the quadriceps) which ranged between 300 and 850. Upon further research I've found an answer to my initial central question of what determines the amount of activity an EMG records when placed on a muscle group. In my hypothesis I believed that it was the size of the muscle that determined the size of the spike upon further research I've found that "[t]ension, velocity and electrical activity are thus interdependent, and integration of the electrical record provides a composite measure of the number of active fibres and their frequency of excitation" ((Bigland & Lippold, 1953). In other words, it's the amount of force that determines the amount of electroactivity exhibited by a muscle, not the size of the muscle.

Conclusion

To summarize, in this project I researched what EMGs are as well as their history, current uses, and future and then I developed and preformed an experiment to utilize my own sEMG. In my experiment I sought out to find an answer to my central question and test my Hypothesis. Through experimentation I found no correlation between muscle size and amount of electroactivity recorded. The experiment did not support my hypothesis. Through further research I found that what determines the amount of electrical activity recorded through EMGs was not muscle size, but muscle force.

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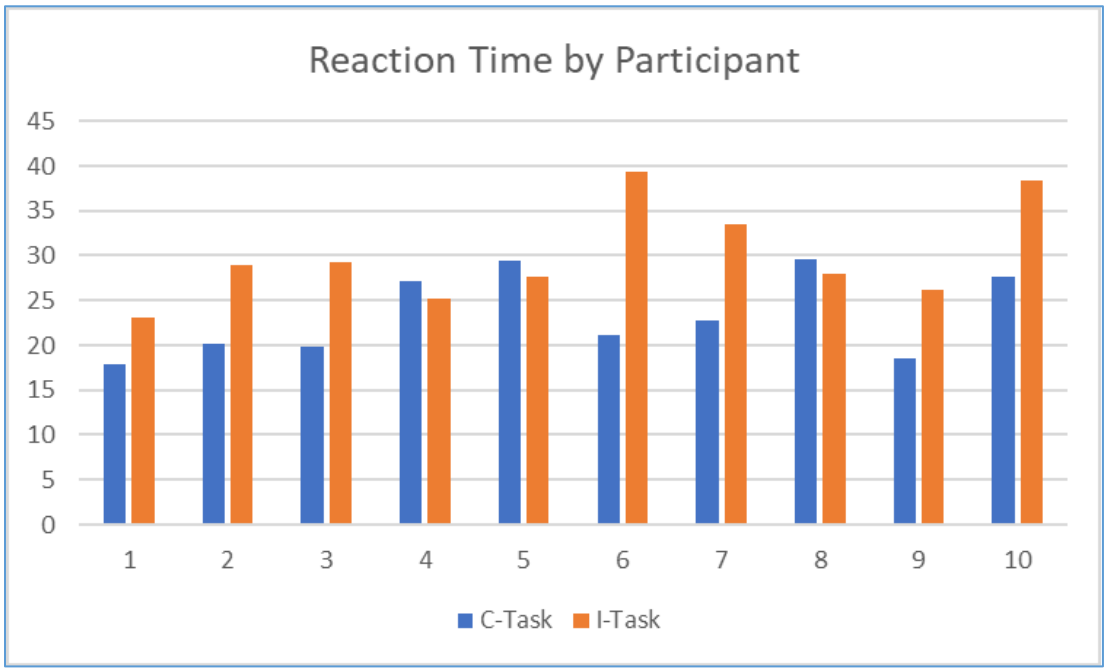

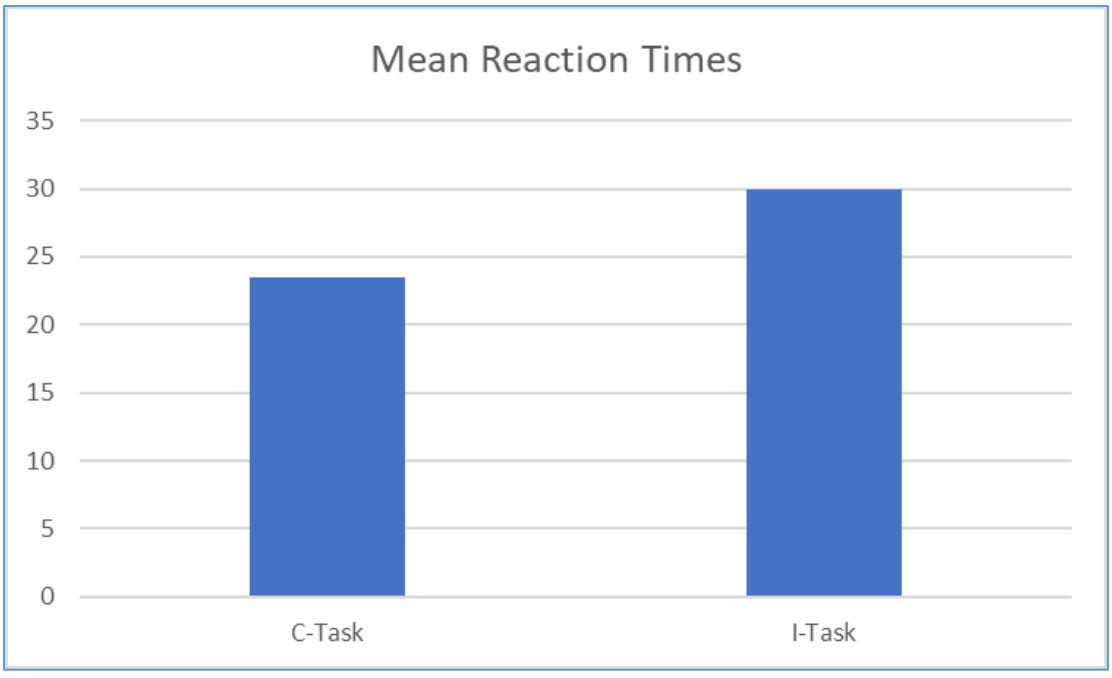

Familial and Non-Academic Stress Effects on Motivation and Engagement in Undergraduate Students

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Undergraduate Research Experience

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4/11/23

Familial and Non-Academic Stress Effects on Motivation and Engagement in Undergraduate Students

Stress is an emotional or physical strain that many undergraduate students experience as they transition from their teenage years into the reality of adulthood. Common stressors of students include maintaining good grades, learning to balance different aspects of life (social, work, school, familial, etc.), increasing responsibilities such as paying for classes or working while being a student, finding time to attain necessities for function (eating or sleeping), and managing time for self-care (Adams et al., 2016). Additionally, college students come from all types of backgrounds. The culture and familial expectations that influence a student may induce stress as most traditional college students are still in the process of developing who they are.

Family Influence on Academic Performance

Prior research has found that family support improves academic performance in college students (Cheng et al., 2012). Undergraduate students, specifically those immediately going to college after graduating high school, are under significant stress from the life shift that occurs due to becoming college students. When faced with stress, people will seek out methods or strategies which ease their stress, and typically family support is one of the first methods tried to ease tension. Perceived familial social support helps stabilize student GPAs and acts as a buffer when students are faced with a lack of familial financial support (Cheng et al., 2012).
This means that familial social support has a positive influence on academic performance, even if lacking financial support puts a strain on the student.

Familial stress may be produced even if a student is being supported economically because factors such as feelings of pressure to perform or balancing familial obligations with academics can affect a student's performance (Mistry et al., 2021).

Mistry et al. (2021) looked at the perception of financial stress from parent and child perspectives and examined how this transference interfered with children's academic performance. Although this study did not look at undergraduate or college-age students, it still has the important conclusion that stress expressed by parents can transfer over to their children. Children from lower-income households tended to struggle more in school (Mistry et al., 2021). This sharing of stress can disrupt a student's focus on school and be the basis for why students take on other obligations to alleviate family burdens or meet familial expectations.

Non-academic Stressors

Dryer et al. (2016) investigated academic motivation and engagement in disabled university students. Social stress can be caused by isolation and a lack of meaningful relationships (Cheng et al., 2022). Finding community and forming relationships with people is imperative to the college experience. Students that need to devote a lot of time and effort to academics make the sacrifice of their social life suffering (Dryer et al., 2016). Increased time spent on academics and a student's self-motivation may improve academic achievement, but the stress caused by putting emphasis on academics is not diminished (Deng et al., 2022).

Students that work while going to school may attain benefits such as developing life skills, increasing responsibility, or feeling like better students because of balancing their time, but students that perceive work or other non-academic factors as overly demanding of their time find that these obligations interfere with school, which results in being tired, missing class, or being unable to dedicate enough time to their classes (Creed et al., 2015). Stress in low-income students is caused by unbalanced responsibilities (Adams et al., 2016). A student unable to balance school requirements and work responsibilities or financial responsibilities may face a decline in performance in one or both realms due to building stress.

Adams et al. (2016) found that perceived stress acted as the meditator of financial strain, mental health issues, academic integration, and social integration. This means that perceived stress was the most important factor in determining how these influences affected a student. Students coming in as first-generation students or from low-income households were more likely to be stressed by factors like financial influence and were more likely to consider dropping out of college (Adams et al., 2016).

Impact of Engagement & Motivation on Students

Experience of stress from familial, economic, and personal stressors impacts a student's engagement and motivation as some students are not equipped to balance all these life factors at the undergraduate level. Factors of familial and non-academic stress can be related. For example, familial expectations of a student to help with financial stress by working part-time while attending school place pressure on a student to perform well enough in both aspects to ease their own stress (Adams et al., 2016). Idealistically, students would place importance on academics and non-academics equally, however, realistically speaking that is not always the case. Students may choose to place importance on one aspect over the other, such as being more stressed academically, more stressed non-academically, or disregarding both aspects entirely in pursuit of what is perceived as most beneficial to the person (Creed et al., 2015).

Purpose of Study

The current project will look at similar factors of perceived stress and study how perceived stress related to familial and nonacademic stressors may affect a student's engagement and motivation with college courses. The current study will focus on a broader sample of students than specifically disabled participants and will factor in influences such as class

modality and the number of credit hours being taken. Additionally, this study will not take student ethnicity into account.

Methods

This study looked at how familial and non-academic stress affects college students' motivation and engagement in academics. Participants were required to agree to an informed consent page. This project used a self-reported survey to gather participant information. Three professors at SPC were contacted and informed about the project to send the survey out to potential participants. Participants were eighteen to twenty-five years of age and pursuing undergraduate education at St. Petersburg College.

The survey consisted of several demographic questions. These questions included information such as age, gender, number of credits taken this semester, and GPA at SPC based on a 4.0 scale. Participants were asked for credit hours to determine if they were part-time (1-11 credits) or full-time students (12+ credits). Participants were also asked how many classes they were taking in different modalities (in-person, live-online, or strictly online), how many hours spent on school (including class time, studying, etc.), how many hours on average a week they worked for pay, and how many hours a week they volunteered.

Additionally, a Likert scale is utilized to collect student responses regarding perceived stress. Likert scale questions were attached to a specific category. The categories were familial stress, non-academic stress, academic engagement, and academic motivation. Likert questions were shuffled so participants could not recognize a question pattern. The Likert scale was rated from 1-5, one being strongly disagree to five being strongly agree. The familial stress section had four questions, the non-academic section had six questions, and the academic engagement & motivation section had seven questions.

Familial

1. My family supports my academic endeavors.
2. My family's expectations of me have influenced my major choice.
3. I attend college because that is what my family expects.
4. I am expected to care for family members that live with me.

Non-academic

1. My family has enough money for monthly expenses (bills, groceries, etc.)
2. I have money to buy items or experiences that I want (money for going out/eating out, having fun, etc.)
3. I pay for my college expenses (tuition, books, supplies, etc.)
4. My family pays for my college expenses (tuition, books, supplies, etc.)
5. Work interferes with my ability to complete assignments.
6. Work interferes with my ability to attend classes.

Academic Engagement & Motivation

1. I feel that I have the ability to seek help outside of class (Tutoring, office hours, etc.)
2. I attend all my classes every week.
3. I spend enough time on my classes weekly to succeed.
4. I participate in class. (Asking questions, partaking in class discussions, etc.)
5. I enjoy the challenge of my classes.
6. I enjoy obtaining new knowledge from my classes.
7. My desire to obtain a degree is as high as it was when I started college.

Familial stress was defined as the student's home environment, familial responsibilities such as caring for relatives, familial support, and familial expectations placed on the student.

Non-academic stress will be defined as a student's extracurriculars, financial stress, and work stress. Academic motivation will be measured by GPA, the number of credits a student is taking, and time spent on school. The modalities of a student's classes will be considered. Academic engagement was measured by student desire and ability to seek outside help with school, attendance of classes, and student feeling adequate learning is being achieved.

Results

For this study, N = 40. The participant age range was 18-24 years of age and the average age was 19.61 years of age. Regarding gender, 72.97% of participants identified as female, 18.92% identified as male, and 8.11% identified as non-binary. Part-time credit hours were defined as 1-11 credit hours being taken while full-time was 12+ credit hours. When asked how many credits participants were taking, 48.65% of participants were part-time students while 51.35% of participants were full-time. Regarding class modality, 8.82% of participants were taking 1 class in-person or Live Online, 29.41% were taking 2 classes in-person or Live Online, 14.71% were taking 3 classes in-person or Live Online, and 47.06% were taking 4 or more classes in-person or Live Online. When asked about fully online classes, 43.75% of participants were taking 1 class as strictly online, 31.25% were taking 2 classes online, 21.88% were taking 3 classes online, and 3.12% were taking 4 or more classes online. When asked about SPC GPA, 5.56% reported a GPA in the range of 0.0-1.0, 5.56% reported a GPA in the 1.0-2.0 range, 25.00% reported a GPA in the 2.0-3.0 range, and 63.89% reported a GPA in the 3.0-4.0 range. When asked the average amount of hours a week spent on school, 2.78% of participants reported spending 1-3 hours a week on school, 27.78% reported spending 3-6 hours a week on school, 27.78% reported spending 6-9 hours a week on school, and 41.67% reported spending 9 or more hours a week. When asked the average amount of hours a week participants worked for pay,

14.71% of participants responded working 1-5 hours a week, 8.82% reported working 6-10 hours, 17.65% reported working 11-15 hours a week, 17.65% reported working 16-20 hours a week, and 41.18% reported working 21 hours or more per week. When asked how many hours per week participants volunteered, 96.97% participants responded with volunteering for 1-5 hours a week and 3.03% responded with volunteering 6-10 hours a week.

When asked if participants feel supported by family in academic endeavors, the average response was 4.59 and 68.97% participants responded they strongly agree. When asked if familial expectations influenced participant's major choice, the average response was 3.00, however, 24.14% responded as they strongly disagree and this percentage was the same for respondents that strongly agree. When asked to rate if participant believes attending college is because of familial expectation, the average response was 2.76. When asked if participants are expected to care for a relative that lives with them, the average response was 3.03, but 23.33% of respondents reported they strongly disagree while 30.00% reported they strongly agree.

When asked about participant's family having 'enough' money for monthly expenses, the average response was 3.50. When asked if a participant has money for items or experiences that are not necessities, the average response was 3.03. When asked if participants pay for all college expenses, the average score was 3.50, but 36.67% reported they strongly agree and 16.67% responded they strongly disagree. When asked if participant's family pays all college expenses, the average response was 2.38 with 41.38% reporting they strongly disagreed. When asked if work interfered with participant's ability to complete assignments, the average response was 3.14 while 24.14% stated they strongly disagree and 27.59% responded they strongly agreed. When asked if work interfered with participant's ability to attend class, the average score was 2.10 with 51.72% of participants selecting strongly disagree.

When asked about perceived ability to seek help outside of class, the average response was 3.57. When asked if participants attend all classes every week, the average response was 4.21 with 67.86% of participants selecting strongly agree. Participants were asked to rate if they spend enough time weekly on classes to succeed, the average response was 3.80 and 40.00% of participants responded they agreed. When participants were asked to rate if they participated in class, the average response was 3.47. When asked if participants enjoy being challenged by classes, the average response was 3.03. When asked if participants enjoyed obtaining new knowledge from classes, the average response was 4.07 and 41.38% responded they strongly agree while 3.45% responded they strongly disagree. When asked if participant desire to obtain a degree was as high as it was when starting college, the average score was 3.53 and 16.67% of participants strongly disagreed while 40.00% reported they strongly agree.

Discussion

The main purpose of the study was to examine if familial and non-academic stress impacted an undergraduate student's academic motivation and engagement. The results imply that participants preferred to take the bulk of classes in-person or live-online in comparison to fully online classes. Most participants in this study had a GPA that fell into the higher range of 3.0-4.0 alongside with the majority spending 9+ hours on school a week. Many of the participants reported working for pay or volunteering, one interpretation of these findings is that participants must devote a lot of time to not only non-academic responsibilities, but also to academics to maintain good standing.

Most participants felt supported in academic endeavors by their families and that academic choices such as major were not completely influenced by familial expectation. The research done by Cheng et al. (2012) is supported by this study because most participants

reported feeling supported and reported GPAs on the higher end of the scale. Overall, participants reported they took the financial responsibility of paying for college. Based on research done by Creed et al. (2015), the participants of this study lean toward being academically stressed despite reports of non-academic responsibilities because most participants attend classes, attempt to get help outside of class, and enjoy obtaining knowledge from their classes.

One limitation of this study is the small sample size. Having such a small sample size makes it harder to generalize the findings of this study and in some of the results creates extremes in responses which then average out to a neutral response. The data of this survey would need a larger sample to be analyzed in further detail. The sample size was also limited by the age range of 18-25 years as SPC provides programs to those under eighteen alongside people older than twenty-five.

Another limitation was the wording of questions. For example, in the demographics section, there should have been an option of "I do not work for pay" and "I do not volunteer" as participants could have misinterpreted, they needed to put a response even if the question did not apply to them. Responses could also not be entirely truthful because of the self-perceived nature of the Likert scale.

Construct validity is another concern of this survey as the Likert scale questions were developed by the researcher and have not been tested further to verify that the questions measure the study's intended variables. Based on this study alone, that is not enough evidence to know for certain if the variables were consistently assessed and measured.

Survey fatigue was present as the number of respondents dropped severely toward the end of the questionnaire. This impacts the results as not all questions had a consistent number of responses.

Despite these limitations, this study supports the concept that family support helps ease stress caused by academic stressors and despite having non-academic responsibilities, students attempting to obtain higher education will try to maintain motivation and engagement with classes if the chosen priority is academics.

In terms of future research, it would be useful to investigate cultural differences for responses to perceived non-academic stress and the impact of that on academic motivation and engagement. Additionally, more research needs to be done on traditional undergraduate students to see how self-motivation and non-academic stress influence academic performance. Specifically, familial stress and its' effects on undergraduate students is an area lacking in research.

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Suicide: a Threat to National Security

Duke A. Panagiotis

St. Petersburg College

Research Symposium

Kicklighter

Mar. 9. 2023

Suicide: a Threat to National Security

The topic of Suicide Prevention is important to today's communities, households, and public policy due to the fact we are in a crisis. It is the objective of my research to identify the threat and find ways to bring suicide prevention strategies into daily life and find ways for individuals to engage with members of their household and local community.

The objective of my study is to identify the ways suicide effects America as well as finding ways to reduce the amount of deaths. I examined the ways to reduce suicides on a community level and attempted to convert it to an individual and local community level prevention program to ensure all individuals are able to do something to reduce the threat to themselves and their loved ones.

Seeing the death toll is austonding. Here are some statistics compared to a major conflict.

- In Operation Iraqi Freedom, 4,431 people died in combat
- In 2020, 45,979 Americans died by suicide
- There was a decrease in suicides during the pandemic compared to the 47,511 in 2019.

The objective of my study is to identify the ways suicide effects America as well as finding ways to reduce the amount of deaths. I examined the ways to reduce suicides on a community level and attempted to convert it to an individual and local community level prevention program to ensure all individuals are able to do something to reduce the threat to themselves and their loved ones.

Identifying suicidal tendencies and symptoms of depression are paramount in reducing the number of attempts and casualties.

Increased risk factors:

- One or more mental health conditions, including substance use disorder
- Impulsive behaviors

- Undesirable life events or recent losses
- Family history of mental or substance use disorder
- Family history of suicide
- Family violence, including physical, sexual, or verbal or emotional abuse
- Past suicide attempt
- Gun in the home
- Exposure to the suicidal behavior of others

Looking at the demographics, this is a national issue that affects all walks of life.

Age:

Middle-aged adults (aged 35–64 years) account for 47.2%

Youth and young adults ages 10–24 years account for 14% of all suicides

Adults aged 75 and older: account for fewer than 10% of all suicides but have the highest suicide rate (19.1 per 100,000). Men aged 75 and older have the highest rate (40.5 per 100,000)

Sex:

Men are almost 4x more likely to commit suicide than women.

LGBTQ students are nearly 4x more likely to commit suicde than heterosexual students.

Race:

Native Americans are the most at risk, followed by white non-hispanic Americans.

Occupations:

Veterans: Veterans have an adjusted suicide rate that is 52.3% more than the non-veteran US

adult population.

Labor (Minors, gas and oil extractors): These jobs have the highest suicide rates in both males and females.

Researching the statistics of how many Americans died to suicide in 2020 alone is a clear sign that we are in a crisis. The situation is only getting worse. Suicide rates are up by **30%** since 2000. Combating the issue seems daunting to the individuals who seek to help. There are small simple steps one can take to lower the risk of suicide for yourself and others.

- Advocate for programs to provide ease of access to therapy and counseling to those with a poor economic status.
- Keep firearms unloaded and ammo separate as well as safely storing other dangerous objects.
- Avoid drugs and provide support and groups to assist with addiction.
- Attend counseling, therapy, or online therapy as soon as symptoms surface.
- Promote kindness and positivity to all members of the household and community.
- Train your EQ and keep eyes and ears open to symptoms that could facilitate conversation and provide an opportunity to show your emotional support.
- Ensure that lines of communication are open with all members of your household.
- Support the individual following a suicide attempt and ensure they get proper medical and mental care following it along with your emotional support.

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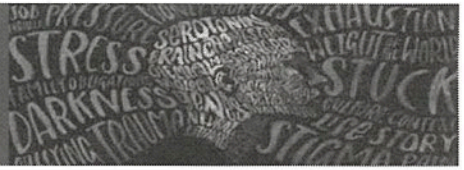
Psychology Research Poster
Duke A. Panagiotis
Suicide, a Threat to National Security



Abstract

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Results

Researching the statistics of how many Americans died to suicide in 2020 alone is a clear sign that we are in a crisis. The situation is only getting worse. Suicide rates are up by **30%** since 2000. Combating the issue seems daunting to the individuals who seek to help. There are small simple steps one can take to lower the risk of suicide for yourself and others.

- In Operation Iraqi Freedom, **4,431** people died in combat
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- There was a decrease in suicides during the pandemic compared to the **47,511** in 2019.

Objectives

The objective of my study is to identify the ways suicide effects America as well as finding ways to reduce the amount of deaths. I examined the ways to reduce suicides on a community level and attempted to convert it to an individual and local community level prevention program to ensure all individuals are going something to reduce the threat to themselves and their loved ones.

Methods

Identifying suicidal tendancies and symptoms of depression are paramount in reducing the number of attempts and casualties.

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- One or more mental health conditions, including substance use disorder
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- Family history of mental or substance use disorder
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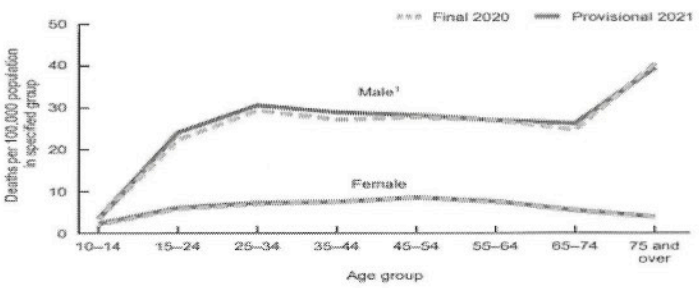

Conclusion

- Advocate for programs to provide ease of access to therapy and counseling to those with a poor economic status.
- Keep firearms unloaded and ammo separate as well as safely storing other dangerous objects.
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Continued…Weekly activities for Duke Panagiotis

(Week 5)

3/1/23

Duke reported:

- He has gathered most of his research information that will support his hypothesis.
- He has started putting information into his power point.
- We discussed some of the questions that will need to be answered.

Duke has agreed to complete the following for our next meeting:

- He will share his screen so that we can look at his research paper.
- He will also ensure that he has addressed all of the questions that he needed to prove or disprove his hypothesis.

We will meet again on Wednesday, 3/8/23 at 3:30pm.

(Week 6)

3/8/23

Duke reported:

- That he has completed his research and shared his screen, so that we could look at his paper.
- The paper looked good. However, there were additional questions that we added for our next meeting.

Duke has agreed to complete the following for our next meeting:

- He will have answered the additional questions.
- He will include the information in his paper.
- We will take another look at his paper.

We will meet again on Wednesday, 3/22/23 at 3:30pm.

Week 7

3/22/23

Duke reported:

- He has answered the following questions.
    - What age group commits suicide the most?
    - Which race or culture commits the most suicides?
    - Which occupations commits suicide the most?
    - How many suicides were committed during the pandemic?
    - What types of services would benefit them the most?
    - We reviewed his paper again this week. It needs a few revisions.

Duke has agreed to complete the following for our final meeting:

- Make the necessary revisions.
- Present the completed paper and power point.

Week 8

3/29/23

Duke reported:

- He has completed his paper and a power point, which included the revisions.
- He has included answers to all the questions that we discussed.

It has been such a pleasure working with Duke. I am very grateful for the opportunity.

Janice Kicklighter

Tuesday, 2/28/23

(Week 4)

Met with Duke by zoom today, (2/28/23) at 3:30pm.

Duke reported:

- That he was a little confused about how I wanted him to complete the power point presentation. He shared that he completed one power point slide, for last year's symposium. I too became a little confused. We discussed the research project instructions that I had given him on 2/8/23. We discussed that the project would need an abstract, hypothesis and so on. I wondered how he could include the required information on one slide.

I asked Duke if he had a copy of the power point that he used last year, and he did. He shared the power point which was for The National Model UN Research Poster. The Information was indeed on one page and contained from the abstract to the references. It was beautifully completed. I agreed to allow him to complete the assignment, using one slide, if it included all his research findings. He has a thorough understanding of when to complete the abstract.

Duke has agreed to complete the following items this week.

- He will finish gathering all of the information that he has found to support his hypothesis.
- He will begin putting information into the power point.

We will meet again on next <u>Tuesday, 3/7/23</u>.

Wednesday, 2/22/23

(Week 3)

Met with Duke by zoom today, (2/22/23), at 3:15pm.

Duke reported:

- He is almost done with gathering his research information and references.
- He will start working on his hypothesis.
- He will utilize the information that I shared with him on the APA writing style and research project instructions.

Plans for our next meeting.

He plans to have the following things started or completed by our next meeting on <u>Tuesday, 2/28/23, at 3:30pm.</u>

- Complete gathering his research information.
- Complete the abstract.
- Start transferring his information into the Power Point.

Duke Panagiotis shared his progress on his research project, as of today's date, 2/22/23. Which can be found below.

Suicide prevention in youth across the country.

What are the leading causes?
Are we in a crisis?
How to reduce it?

What are the warning signs of teen suicide?

Many of the warning signs of suicide are also symptoms of depression. They are:

- Changes in eating and sleeping habits
- Loss of interest in usual activities
- Withdrawal from friends and family members
- Acting-out behaviors and running away
- Alcohol and drug use
- Neglecting one's personal appearance
- Unnecessary risk-taking
- Obsession with death and dying
- More physical complaints often linked to emotional distress, such as stomachaches, headaches, and extreme tiredness (fatigue)
- Loss of interest in school or schoolwork
- Feeling bored
- Problems focusing
- Feeling he or she wants to die
- Lack of response to praise

- Know the warning signs for depression:
  - Feelings of sadness, hopelessness, or loneliness
  - Declining school performance
  - Loss of interest in social and sports activities

- Sleeping too little or too much
- Changes in weight or appetite
- Nervousness, agitation, or irritability

A teen's risk for suicide varies with age, gender, and cultural and social influences. Risk factors may change over time. They are:

- One or more mental health conditions, including substance use disorder
- Impulsive behaviors
- Undesirable life events or recent losses, such as the death of a parent
- Family history of mental or substance use disorder
- Family history of suicide
- Family violence, including physical, sexual, or verbal or emotional abuse
- Past suicide attempt
- Gun in the home
- Imprisonment
- Exposure to the suicidal behavior of others, such as from family or peers, in the news, or in fiction stories

Do you know the warning signs for suicide?

If someone is at risk for suicide, you can watch for warning signs, including:

- Talking about being a burden
- Being isolated
- Increased anxiety
- Talking about feeling trapped or in unbearable pain
- Increased substance use
- Looking for a way to access lethal means
- Increased anger or rage
- Extreme mood swings
- Expressing hopelessness
- Sleeping too little or too much
- Talking or posting about wanting to die
- Making plans for suicide

There were **2,402 United States military deaths** in the War in Afghanistan

- In 2020,
  45,979
  Americans died by suicide

More than 19x the amount of Americans died to suicide in 2020 then the entirety of the War in Iraq.
Suicide rates are up 30% since the year 2000
This is a crisis

Ways to reduce these numbers

Strengthen economic supports

- Strengthen household financial security
- Stabilize housing

Create protective environments

- Reduce access to lethal means among persons at risk of suicide
- Create healthy organizational policies and culture
- Reduce substance use through community-based policies and practices

Improve access and delivery of suicide care

- Cover mental health conditions in health insurance policies
- Increase provider availability in underserved areas
- Provide rapid and remote access to help
- Create safer suicide care through systems change

Promote healthy connections

- Promote healthy peer norms
- Engage community members in shared activities

Teach coping and problem-solving skills

- Support social-emotional learning programs
- Teach parenting skills to improve family relationships
- Support resilience through education programs

Identify and support people at risk

- Train gatekeepers
- Respond to crises

- Plan for safety and follow-up after an attempt
- Provide therapeutic approaches

Lessen harms and prevent future risk

- Intervene after a suicide (postvention)
- Report and message about suicide safely

John Hopkins Medicine. (2023, January 31). *Teen suicide*. Teen Suicide | Johns Hopkins Medicine. Retrieved February 14, 2023, from https://www.hopkinsmedicine.org/health/conditions-and-diseases/teen-suicide#:~:text=Undesirable%20life%20events%20or%20recent,or%20verbal%20or%20emotional%20abuse

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Met with Duke by zoom today, (2/15/23), at 3:15pm.

(Week 2)

Duke has decided on a subject, which is: **"Suicide a threat to National Security"**

Duke shared some of his statistical findings. He shared that in 2020, there were over 19 times more suicides, than casualties from the War in Iraq.

I can tell that Duke is excited about the research and I'm convinced that he is going to do beautiful job.

He plans to continue his research and will report his findings at our next meeting on **Wednesday, 2/22/23**.

Met with Duke face-to-face at the Midtown campus today, (2/8/23), at 3:15pm.

(Week 1)

It was a pleasure meeting Duke. We discussed the project in great detail. Duke is not certain what topic he'd like to research at this point. He has some ideas, but will narrow it down and share his topic at our next meeting on 2/15/23.

I provided Duke with guides on formatting a paper in APA style and detailed instructions on completing a research paper. I asked that he review the documents more once he gets home, and to use them as additional tools as he gets started, which he agreed to do.

Made the initial contact with Duke by phone today, (2/6/23), at 3:07pm.

I reached Duke by phone today. We discussed the research project a little and we scheduled our first meeting. We will meet face-to-face at the Midtown campus on **Wednesday, 2/8/23.**

8-Week Psychology Research Project for Spring Term 2023 (0615)

Student's name Phone # Email address

Duke Panagiotis (212) 300-6701
riseofthetitans273@gmail.com or dpanag2@live.spcollege.edu

Contact Dates and Activities

- On Saturday, 2/4/23 I sent Duke an email, introducing myself and asking that he give me a call.
- On 2/6/23 I spoke to Duke by phone. We scheduled a face-to-face meeting for **Wednesday, 2/8/23 at 3:15pm**

Week 1

2/8/23 Duke met with me in my office at the Midtown campus at 3:15p.m. We discussed various topics that he might be interested in, they were:

1. Cultural Psychology as it pertains to music.
2. Patriotism and different cultures. What are the various beliefs?
3. Different types of Grief Counseling.
4. Suicide Prevention across the country. What types of preventions are being used? How successful have they been?
5. Covid-19, how did it affect today's youth?

Duke agreed to narrow down his interests and will be discuss them at our next meeting on **Wednesday, 2/15/23 at 3:15pm, by Zoom.**

I provided Duke with Research Project Instructions, which will go over in great detail, next week.

Week 2

3/9/23

Good morning, Maggie,

Here is the information that you requested.

1. Duke will conduct a literature review related to **"Suicide a threat to National Security."**
2. Duke will collect data on suicide in America. He will utilize peer reviewed articles, The CDC, and John Hopkins to name a few.
3. Duke will gather statistics on the number of suicides that occurred between 2020-2022. He will then complete an analysis on the materials collected. He will use the following information, to complete a more thorough analysis.

    - What age group commits suicide the most?
    - Which race or culture commits the most suicides?
    - Which occupations commits suicide the most?
    - How many suicides were committed during the pandemic?
    - What types of services would benefit them the most?
4. I expect Duke to complete the following:
    - Duke will use the APA formatting materials and completing a research project information that I have shared with him.
    - He will complete a power point presentation, in the APA format. The power point will include an abstract, the objectives, the method, results, the conclusion, and references.

I meet with Duke weekly, our first meeting was face-to-face, and all other meetings have been by zoom. We also communicate by phone frequently. I am really enjoying working with Duke. He is doing an amazing job; he is very interested in presenting at the symposium.

I am so very grateful for this opportunity.

Warm regards,

Janice

An Investigation of the Stroop Effect

Sofia Lachapelle

St. Petersburg College Undergraduate Research Experience

Supervised by Professor Sharon Olsen

Abstract

The purpose of this study was to investigate automatic and controlled processing of information in college students. This paper was an investigation of the phenomenon known as the Stroop effect, and reviews the basic elements that make up the psychological characteristics of the Stroop Effect through use of the Stroop Color Word Test. Alongside this information, an actual Stroop Color Word Test was conducted on 10 participants, and the difference in reaction time was recorded when they were presented with a congruent (C-Task) versus an incongruent (I-Task) task. It was hypothesized that reaction time would be longer for the I-task than for the C-task. The results of this study were statistically significant and supported our hypothesis and illustrated that on average, it took more time for the participants to complete the I Task than to complete the C Task.

An Investigation of the Stroop Effect

The "Stroop Effect" is a phenomenon discovered in the 1930's and is named after its developer John Ridley Stroop. "...J. R. Stroop published his landmark article on attention and interference, an article more influential now than it was then. Why has the Stroop task continued to fascinate us? Perhaps the task is seen as tapping into the primitive operations of cognition, offering clues to the fundamental process of attention…" (MacLeod, 1990, p. 163). The Stroop Effect is mainly about the difference in reaction time when individuals are presented with either "congruent" or "incongruent" stimuli. The Stroop effect "…is widely considered to be compelling evidence that an acquired skill such as reading is automatic…" (Besner & Stolz, 1999, p. 449). What this signifies is that whenever we as humans are presented with a task that would require an action such as reading, it is instant for us to perform this in our minds. It could even be said that, in a way we do this unconsciously and without giving much thought to it. Other tasks and activities that we perform in our everyday lives with ease such as driving a car, writing, singing along to a song we already know the words of, would all be accomplished with the same type of effortlessness as with reading. However, on the contrary, when we try to perform a task that we would not be as used to normally doing, it would take us a lot more time as well as concentration to complete the task. These tasks that are not a part of our daily routines would overall be slower for us to complete. We do not have that same type of effortlessness that we would usually have when doing our practical and everyday tasks. This is where the Stroop effect comes in; it points out that when individuals practice an act almost constantly, then it ultimately becomes something that is second nature and somewhat automatic. Many theories as to why such a phenomenon exist have been developed. Regarding speed, there is a theory that suggests that "…the cause of the Stroop effect posits we can process written words faster than

we can process colors. Thus, it is difficult to identify the color once we've already read the word" (Anonymous, Lesley University). This is known as the "Speed of Processing Theory. Another theory, that is quite interesting known as "Parallel Distributed Processing", states that "…the brain creates different pathways for different tasks. Therefore, it's the strength of the pathway that plays an important role in which is easier to name, the color or the text" (Anonymous, Lesley University). Cognitive researchers have also been interested in the Stroop effect in relation to individuals that are aging and therefore growing older. Another theory known as the "Inhibition theory" talks about how "...the working memory problems exhibited by older adults find their origin in defective inhibitory mechanisms. According to this theory, defective inhibition either causes irrelevant information to enter into working memory, consequently limiting its functional capacity, or causes irrelevant material within working memory not to be suppressed, resulting in distraction from the task..." (Verhaeghen & De Meersman, 1998, p. 120). The "Stroop Color Word Test" is a test that was created from the observation of the Stroop effect which "…requires participants to identify the ink colors of color words…" where those participant responses are "…typically slower on incongruent trials than on congruent trials…" (Crump et al., 2006, p. 316). In this test, participants are chosen and then are presented with a list of the names of various colors printed out. One part of the list, which would be "congruent", contains color names that match the color of their font or ink that was used to be written in. For example; the color "green" spelled in the same color green. This is congruent since there is a match in the colors. With incongruence, however, it would be the opposite as the colors do not match. The color that is spelled out would not be the same color that it is printed in and such an example of this would be the color "purple" spelled out in yellow ink. This would then be incongruent since there is not a match. The participants of the test are presented with a list of

colors that is congruent and another list that is incongruent. They are then asked to identify the color of the words in both lists out loud while they are timed. Overall, the purpose within this experiment is to find the differences in the reaction time when one reads the congruent list where there are matches, versus when reading the incongruent list where there are not any matches. After having many tests such as this one conducted over the years, what has been found is that the participants will be more prone to make errors and act in a slower way when reading the incongruent list. All of this has to do with what occurs within one's brain neurologically, and when trying to, as previously explained, to separate the color that was first written out, from the actual color that was used for it to be written. Our brains seem to very much work in the way that as soon as we see a word, our very first reaction is to read the word. It gets a little bit more complicated in situations such as in the Stroop Test, where we would actually have to stop and think carefully in order to differentiate the color that is written, from the color of its ink that was used to be written. Some opinions might also point out that the congruency effect is oftentimes more observable when the speed in this experiment is taken into consideration more than the actual accuracy of when they spell the words presented to them out loud (Chen. J, & Johnson, K. M., 1991). An interesting observation within all of this is "…the finding that congruency effects are reduced when trials are mostly incongruent rather than mostly congruent…" can be at times ``context-specific". This would mean that "…if trials are mostly incongruent when presented in one location and mostly congruent when presented in another location, the congruency effect is smaller for the former location…" (Schmidt, 2016, p. 1). Therefore, according to this fact, an external factor such as location in which this experiment is held, can impact how well participants do.

Methods

The Stroop Test is a measure of working memory and attention. In the Stroop task, participants are asked to read a list of color words such as “red”, “green”, and “blue”, for example. Reading is an automatic task, and when the color words are typed in the same corresponding color (congruent task, i.e., “red” is typed in red ink and “blue” is typed in blue ink) the reader is usually able to read through the list quickly and efficiently. However, when the colors and words are conflicting (incongruent task, i.e., “red” is typed in blue ink and “blue” is typed in red ink), the brain must work harder to filter out competing information., and the brain needs to actively inhibit competing information and direct its attention instead to the task of saying the color of the letters. The resulting delay is called the Stroop Effect. When the colors and words match (congruent task) the information reaching the brain does not conflict. So the brain does not have to take time to filter out conflicting information, thus the reader is able to identify the color of the word more quickly. The purpose of this study was to investigate the difference in reaction time between automatic and controlled processing of information when participants were presented with a congruent versus an incongruent task. Specifically, participants were asked to read a list of words written in a certain color of ink. The words on the list were names of colors, but the words themselves were written either in the same color as the written word (the congruent task) or in a different color than the written word (the incongruent task). The task for each participant was to identify the color of the word, and not read the word on the list. It was hypothesized that the names of words would interfere with the ability to name the color of ink used to print the words. In other words, it was hypothesized that reaction time would be longer for the I-task than for the C-task. All lists contained twenty-five words. The I-Task (Incongruent Task) contained words printed in various colors that did not match the actual words printed on the sheet. The C-Task (Congruent Task) contained words printed in congruent

colors. In other words, the printed word matched the color of ink that the word was printed in. A repeated measures design was used, meaning that all participants were exposed to both conditions. The order that the lists were presented to the participants was randomized to control for order effects. The independent variable in this study was the color of ink used to write the word. The dependent variable was the amount of time that it took each participant to read each list of words.

Ten volunteer participants were recruited from the SPC Gibbs Campus.. Each participant was tested independently. Each participant received and signed an informed consent form agreeing to participate in the study. Although there were no known harms associated with the study, each participant was told that if they felt uncomfortable at any time, they could withdraw from the study with no penalty. After each participant completed the study, they were debriefed and given information about the Stroop effect via a QR code that took them to a web link with more information about the Stroop Effect.

After all participants data was collected, the measures of central tendency (mean, median, mode, and standard deviation) were calculated and are reported below
in the results section.

Materials

Informed Consent/Researcher script/standardized instructions

Random order slips

List of congruent colors (C-Task)

List of incongruent colors (I-Task)

Stopwatch (phone)

Debriefing with QR code

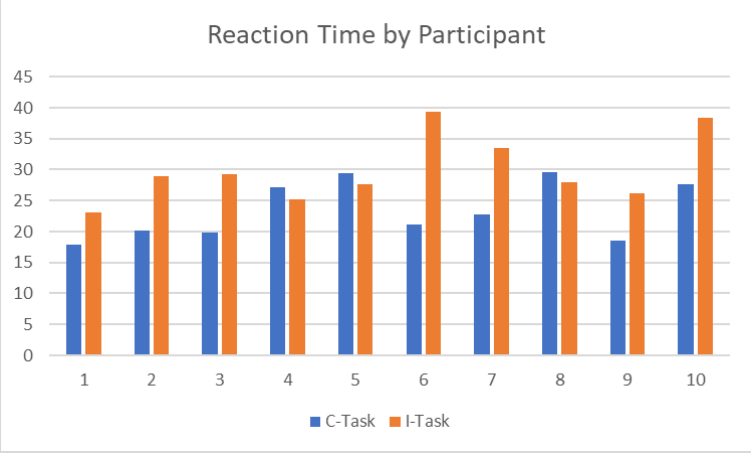
Results

The results of the Congruent Task (C-Task) and Incongruent Task (I-Task) are represented in the Table 1 and Figure 1 below.

Table 1: Participant Times

Participant #	C-Task Time	I-Task Time
1	17.89	23.05
2	20.19	28.92
3	19.85	29.27
4	27.17	25.16
5	29.47	27.72
6	21.15	39.28
7	22.83	33.57
8	29.55	27.90
9	18.48	26.13
10	27.70	38.41
Mean	23.428	29.941

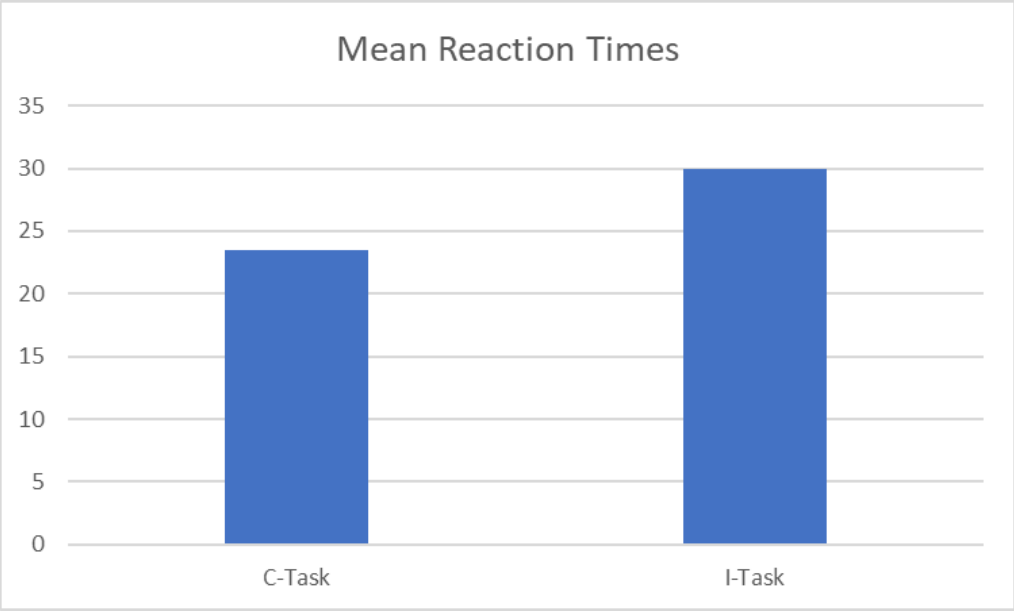
Figure 1: Reaction Time by Participant



The mean time for the C-Task was 23.428. The median time for the C-Task was (21.15+22.83)/2 = 21.99. The range for the C-Task was 11.66. The standard deviation for the C-Task was 4.59738.

The mean time for the I-Task was 29.941. The median time for the I-Task was (27.9+28.92)/2 = 28.41. The range for the I-Task was 16.23. The standard deviation for the I-Task was 4.57274 (See Figure 2).

Figure 2: Mean Reaction Times



A t-test for 2 independent means was calculated. A two-tailed hypothesis was used to predict that the independent variable (Task) would have an effect on the dependent variable (Time) to determine if there is a statistically significant difference between two groups in either direction. The time it took to identify the color of the words in the C-Task (M = 23.428, SD = 4.59738) was significantly less than the time it took to identify the color of the words in the I-Task (M = 29.941, SD = 4.57274). The t-value is -2.88781. The p-value is .0098. The result is significant at $p < .05$. Specifically, on average, it took 1.5 seconds less for the participants to complete the C

Task than to complete the I Task, which was in agreement with our hypothesis that the reaction time would be longer for the I-task than for the C-task.

Discussion

In conclusion, a deep dive into the world of the Stroop effect was conducted for the purpose of this research paper. The Stroop effect is a concept belonging to the universe of everything that is psychology, and therefore not many individuals may have heard of it. However, the Stroop effect is an amazing discovery that truly does show how we as human beings turn our everyday actions that are second nature to us, instinctive. After the Stroop Word Test was carried out specifically for this research, the results proved that in fact, individuals do take more time to stop and process what is not ingrained in them. In this case, the participants that took part in this study showed that they will definitely slow down when it comes to identifying a color, rather than simply reading the written name of that color. The I-Task represented those written names of colors that did not match the color of their font. With the C- Task, where the written colors were the same as the color of their font, participants did proceed with more speed and confidence, too. When it comes to the limitations that this study in particular may have had, the sample size is one. Ten participants in total were used, and for a future study it would be interesting to have an even bigger number of individuals and see what those results would be.

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8 Week Psychology Undergraduate Research Experience (URE)
Supervised by Professor Sharon Olsen

Student Name: Sofia Lachapelle
Date started: 2/6/23

Title of Project:

Weekly Journal:

Please maintain a weekly journal/report of the research/activities done each week (e.g., literature reviewed, assumptions, and/or conclusions, learning achieved). **This journal will be turned in with the final research paper and poster (one PowerPoint slide) at the end of the 8 weeks. ***

☐ **Week 1** *2/6/23*

In this meeting, I was introduced to the overall goal of the research project and went through all its details. I also learned about the Stroop color word test and its concept. Some videos were played in which this experiment was conducted on participants in order to gain a better understanding.

☐ **Week 2** *2/13/23*

In this meeting we went over how to use the library resources and services that are available from SPC, in order to find scholarly articles, and also looked into using Google Scholar too.

☐ **Week 3** *2/27/23*

Professor Olsen and I went through my research paper and the articles that I found while researching to include in it. We discussed how I can improve the paper and add more information to it.

☐ **Week 4** *1/6/23*

Reviewed and practiced for conducting the actual study on participants.

☐ **Week 5**

Met one last time before conducting the experiment and reviewed its guidelines and protocol.

☐ **Week 6**

Reviewed the results from the study.

☐ **Week 7** *4/10*

Discussed data collection and how to apply it to the research paper.

☐ **Week 8** *4/18*

Final discussion on the paper and changes were made.

Gender's Influence on Conformity in an Elevator: Determining the Frequency of Conformity When Violating Social Norms within Gender Groups

George R. Sullivan Professor Sara Gomez

Department of Behavioral and Social Sciences, St. Petersburg College

Undergrad Research Experience Program

Author's Note

George R. Sullivan 

Acknowledgments

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Abstract

A take on the Face the Rear experiment conducted about 60 years ago that was based on Asch's work concerning conformity. Where this research focuses on when there is a more centralized group majority conformity using gender, will it create a more intense feeling of conformism for the opposing gender or the similar gender? Does gender conformity even play a factor when determining conformity rates against social norms? Using two groups, made up of three male confederates and three female confederates, to break the social norms of an elevator by facing the back wall and recording the rates of conformity observed in the participants, categorizing them by observable gender. This paper challenges the previous research done in this field as they primarily focus on the effects that age and ethnicity have on conformity rates, so this experiment's results provides evidence that gender is in fact a factor of conformity rates, with conformity only occurring with group of similar gender and females exhibiting a higher degree towards conformity then males. Conducting a social psychology field experiment having gotten permission from the Institutional Effectiveness Department, this experiment was set to observe uninformed natural participants and informed confederates. With this research the term majority gender conformity will eventually become a more tested subject of study.

Keywords: group majority conformity, social norms, gender conformity, majority gender conformity, social psychology research experiment

Gender's Influence on Conformity in an Elevator: Determining the Frequency of Conformity When Violating Social Norms within Gender Groups.

Social norms are the unwritten rules of society, an unofficial guide of the beliefs and behaviors expected of us in various social situations. These guidelines are ingrained into humanity from their environment to help maintain social order. Norms are important in regard to society as they provide stability within social systems, discourages exploitation in relationships of people with uneven status, and reinforces altruistic acts (Burger et al, 1997). Social norms are powerful determinants of human behavior that are specific to particular groups, as each group creates its own standards for attitudes or behaviors norms are formed (Chekroun & Brauer, 2002). The social factor which keeps ourselves in check and keeps society going is the unsaid agreed upon rules that keeps civilizations developing (Freud, 1930). Without society itself and its rules then it would be either anarchy or an unfair governing system of the strong survive and the weak perish. Such as animals travel in pacts, humans have developed the instinct of conformity.

Conformity itself refers to the act of changing one's behavior subconsciously or consciously to match the reactions of others (Cialdini & Goldstein, 2004). Conformity is not just about the survival of life, but the survival of comfort as well. About seventy years ago information and normative conformity motivations were distinguished. Informational conformity is based on the desire to 'read the room' and behave accordingly, whereas normative conformity's focus is gaining the social approval of others (Deutsch & Gerard, 1955). In the human nature to gain the approval of others, a person may act completely differently depending on the social situations they find themselves in. People will often conform and mimic others simply out of curiosity, as the more interesting something is the greater the positive affective

state is which would result in activity rather than inactivity (Rind, 1997). Such as facing the wrong way in an elevator simply because others are doing it and are wondering if there is a reason unknown to them.

To be the odd one out is often looked down upon consciously or not, so as animals we humans have own version of a herd mentality. Nonconscious mimicry of behaviors demonstrated by others are selective and sensitive to context, however the greater the number of 'included' (the largest group with the same mindset, aka the majority) exceeds the number of 'excluded' (the smaller group or individual with a different mindset aka the minority) the more the excluded will often conscious or not mimic the behavior of the larger group (Lakin et al, 2008). When faced with a majority more often than not the minority will attempt to assimilate, even if in a subtle way. Asch even tests this idea with his line conformity experiment finding. Almost 75% of the participants conform to an answer they ultimately knew was wrong about one-third of the time simply due to the majority picking it and the participant not wanting to stand out (Asch, 1956). If a vote was to occur and there is a clear majority present, one who is in the minority may change their own opinion to match the majority's because they view it futile to vote for what they want anyway and will be closer to the majority as a result. The leniency contract predicts compliance with the influence of a majority's recommendation (Crano & Chen, 1998). Having developed with the majority rules herd mentality people will often conform to a larger groups ideals whether they agree with them or not, just to not be seen as an outsider by the group.

Studies regarding gender influence on conformity are quite lacking in comparison to other similar topics regarding conformity. Some studies explore the impact of sex differences on conformity demonstrating how the use of social information for each sex varies according to the gender stereotype content of the objective (Goldberg, 1975). A meta-analysis of social

psychology literature demonstrate on average that women conform more than men (Bond & Smith, 1996; Cooper, 1979; Eagly & Carli, 1981). An indirect effect of gender on conformity will exist dependent on the general gender difference of confidence when performing a task (Cross et al, 2017). The differences in conformity between genders may be influenced by one's cultural upbringing. In western culture it is thought that men are to have a more independent mindset and women to have an interdependent mindset, even starting this cultivation at a young age as parents are more likely to talk to their daughters about emotions and thinking of others than their sons (Cross & Madson, 1997).

Conforming to the social norm is dependent on the environment aforementioned norm is present in. The terms inside and outside voice are indicators of this. The social norms of everyday locations may be completely overlooked as to how common they are. Human society does not think about how to behave in an elevator, it is simply understood of what 'not' to do. What if conformity was tested against that subconscious knowledge of what 'not' to do. When faced against the majority, the size of three confederates the participants would go with the majorities choice about 32% of the time, however when adding more confederates it would seemingly not add any more social pressure as that number remained constant (Asch, 1955). Social pressure is not an unlimited force, it is as strong as the individual lets it become. The power of silence and isolation is just as strong as the power of communication and connection. When giving someone even a simple hello in the halls it will create a subconscious connection between the greeter and greeted, later on if asked for a favor the greeted will be more likely to do it than if the interaction never occurred earlier (Dolinski et al, 2001). So what thought process would be had if that same person ignored the other every day, would it create a form of negative relations or apathy? The Bethany college after conducting an elevator conformity experiment

based on Asch's previous findings, found that age had played a significant factor as to if the participant would turn around, finding that the youngest conform more than 40% of the time while the oldest likelihood is between 14% and 24% (Tanner, 2011). Even if not the focus of the experiment, it was observed that while in an elevator of mixed gender confederates with it being majority female, men were found more likely to conform fully while women had shown higher levels of conforming partially (Tanner, 2011).

Conformity is a heavily researched topic, but it usually focuses on either age or culture. There have been past research conducted on conformity in an elevator, however these all had different focuses whether it is the number of confederates affecting the data or the age of the observed participants. The purpose of this study is to examine how the type of conformity in this research differs from the rest. It is testing that when there is a more centralized majority using gender, will it create a more intense feeling of conformism for the opposing gender or the similar gender? Does gender even play a factor when determining conformity rates at all?

Materials and Methods

Confederates

Two groups made up of three males and three females participated as confederates in this experiment. In the recruitment of these confederates two faculty in the Social and Behavioral Sciences Department on different campuses shared the opportunity to participate in the study as a confederate with their classes. Extra credit was offered by one of the professors for any students who participated as confederates in the data collection process. No volunteers were obtained through this process, which lead to the identification of students with a dedication to academia being approached with the opportunity to participate in the study. The individuals were identified through previous encounters and academic coursework. They were approached in person by the

experimenter who provided a brief overview of the experiment and expectations and were verbally asked if they wish to participate. If they agreed, they then received an official recruitment email in contrast to the informal offer face to face.

A demographic survey was completed by each confederate. The confederates of the observable male group consisted of a Hispanic male in the 25-34 age group, a White/Caucasian male in the 18-24 age group, and a White/Caucasian male in the 25-34 age group. The confederates of the observable female group consisted of a White/Caucasian female in the 18-24 age group, a Black/Asian female in the 18-24 age group, and a Hispanic female in the 18-24 age group.

Participants

Due to the field experiments design, participants included anyone who approached and utilized the elevator while data was being collected.

Environment

The elevator was located in a three-story building on the college campus, located in the Southeastern United States. The first-floor entrance was located in the café/lobby area with high volumes of traffic. The tests were performed during the busiest periods of traffic when classes began and ended. The building is three stories, with a staircase being the other option for entrance to a higher floor.

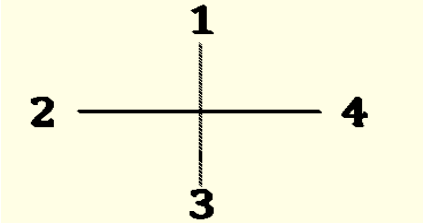
The experiment was meant to record data over the span of three hours with two points of expected higher volume of population. Though due to a complaint, the experiment ended after two hours, experiencing one point of expected higher volume of population.

Survey

Diagram 2 *Location in elevator 1-6.*

		Doors	Buttons
3	2		1
6	5		4

Diagram 1 *Position facing in the elevator 1-4. With 1 being the doors and button.*



The purpose of the survey was to get an accurate representation of data collected in a simple way so as to not overcomplicate what the confederates observational data priorities. The survey consisted of a total of five questions:

1. What observable gender is the observable participant?

2. Where in relation to the elevator was the participant? (Diagram 1)

3. Where did the participant begin facing? (Diagram 2)

4. Where was the participant facing at the end? (Diagram 2)

5. Was anything said by the participant or was a visible reaction shown in the elevator? If so please give a summary.

During the trials if two participants were to occupy the elevator they would be labeled as P1 and P2 throughout the survey.

Procedure

A proposal for this study was submitted to the Institutional Effectiveness Department and approved. One week prior to the data collection process, administration and security on the college campus was notified that the data collection process would be occurring on the specific date and time. The elevator was confirmed to be operational and approval was provided to proceed with the experiment.

It was made clear before, during, and after the experiment to each confederate that if they at any point felt discomfort, be it from the observed participants, fellow confederates, or even

themselves they had the complete right to break the controlled environment stipulations and discontinue from participating in the experiment with no repercussions to themselves.

The confederates were asked to arrive thirty minutes prior to the start of the data collection process to sign informed consent forms and be trained in the experimental procedures. All actions and behaviors permitted were stated, demonstrated, and repeated by the confederates before testing began. Before the experiment began each group of the confederates participated in practice runs with the experimenter twice demonstrating all behavior and the predicable situations properly.

Being an area with a high active population the confederates were given the freedom to choose where they would like to reside when not on the elevator with four stipulations.

- Be sure to have a clear view of the elevator entrance without having to stare at it.
- Be able to pack and go quickly in case someone approaches the elevator during your rotation.
- Refrain from sitting with other participants of the same gender, so as to not appear as if approaching together.
- Be close enough to the elevator so that if the doors immediately open for the observed participant they would not have to run and violate a social norm outside of the elevator.

Both groups were given instructions so that when someone had approached the elevator the confederates would nonchalantly make their way towards the elevator as if not knowing each other. The requirements for approaching the elevator during the experiment were as follows; there must be only 1-2 people waiting for the elevator so as to not give away the majority influence of conformity, it must be the correct groups rotation, all of the group must be present

from bathroom breaks or sneeze/coughing fits, and no action will be taken if the person waiting at the elevator has already had data collected as an observed participant. Upon approaching the elevator they were to display no facial expression except one of neutral blankness, similar to a 'poker face'. If they could not hold one they were told to think about an upcoming exam in their classes that they have to prep for. The body posture permitted were feet apart and the choice of one of three hand positions, crossed over chest, resting in front of the body left hand over right, or hands by sides.

The observable participant is to enter first, then one of the two following options would occur.

1. The observed participant would hit the button and stand near the button panel.
2. The observed participant would enter the elevator without hitting a button of which the same chosen confederate would press the third floor.

Upon entering the elevator each confederate faced the doors of the elevator or "Position 1" (Diagram 2). Once the doors had closed and the confederates saw and heard the metal touch then the signal is given to turn 180 degrees facing the backwall in "Position 3" (Diagram 2).

The confederates were shown a gridded map of the elevator to keep in mind and track the position of the observable participant, labeling "Location 1-6" (Diagram 1). They were instructed to try their best to stay in the same relative spot the best they can for the remainder of the experiment. Explaining that one of the factors of having three in each group is being able to support each other if one of the confederates cannot see too well.

When leaving the elevator, the confederates remained facing the back wall until they heard the sound of the doors opening. They then turned around and walked out towards an associate that was waiting on the third floor to hand out the survey. Once completed they were to

return to the first floor using a route of their choosing be it the stairs or elevator itself. Once they returned they would go to either the same or different spot than before on the first floor and wait for their rotation to come back around. If the observed participant got off the elevator at the second floor then they would simply stay on the elevator facing 'position 1' and press the third floor where they would get off and see the associate for the survey.

The confederates were instructed not to communicate with each other from when they approached the elevator until the completion and submission of the survey. They were allowed to communicate with each other so long as it was not about the project itself or about the already observed participants.

The groups took turns having a constant pattern starting with the group of females. While the female group was in the elevator, the male group prepared for their turn on the elevator.

The initial parameters of this study was to enter the elevator regardless of age, gender, or status of the observed participant, however due to a complaint the last thirty minutes of the experiment focused on those who have the visual age of 40 and under and are not faculty of the school campus.

After the abrupt end of the experiment each confederate received a debriefing statement thanking them for their participation and detailing the necessary contact information for if they at any point have or had negative feelings regarding the experiment. Each confederate was reached out to by the experimenter via email and text within 24 hours and a face-to-face meeting within 48 hours to verify there was no residual harm.

Results

Four of the five trials with the male confederate group contained participants with an observable gender of male. Two of the five trials with the male confederate group contained

participants with an observable gender of female. One of the five trials with the male confederates had more than one observed participants of which their observed genders were one male and one female.

Two of the five trials with the female confederate group contained participants with an observable gender of male. Three of the five trials with the female confederate group contained participants with an observable gender of female. One of the five trials with the female confederates had more than one observed participants of which their observed genders were one female and one female.

The group of three male confederates experienced a 25% rate of partial conformity moving from 'position 1' to 'position 2' when observing male participants. The group of three male confederates experienced a 0% rate of conformity when observing female participants. The group of three female confederates experienced a 0% rate of conformity when observing male students. The group of three female confederates experienced a 25% rate of partial conformity moving from 'position 1' to 'position 4' when observing female participants. The group of three female confederates experienced a 25% rate of full conformity moving from 'position 1' to 'position 3' when observing female participants.

During this experiment, every observed participant ended up pressing the button on the elevator first then asking the others 'what floor they wanted'. Once turned around most males would react with 'what the heck' and laugh, where females usually gasped. An unpredictable action conducted by a female observed participant was to take a selfie right as the elevator approached the third floor, this same participant would ride the elevator three more times. Throughout both male and female groups seven of the eight solo rider trials, the observed participants stood in the 'location 1' spot. Throughout both male and female groups one of the

eight solo rider trials, the observed participant stood on the 'location 4' spot. In both the male and female groups of duo riders, one participant stood on the 'location 1' spot, and the other stood on the 'location 2' spot.

Unfortunately, one of the observed participants in the study had a preexisting mental health condition involving trauma that led the individual to feel the experimental conditions made them feel, "threatened for their life". After getting off the elevator on the second floor selected prior to exposure to the experimental conditions, they returned to the controlled sampling environment of the first floor and confronted the experimenter about the project and identified the confederates in the process. When this did not stop the experiment a formal complaint was made to administration, who ended the data collection process early. Due to the data collection process being terminated early, data on a control group could not be obtained.

Discussion

The purpose of this study was to gain a better understanding of the influence that genders play in research on conformity. The results of the present study support the hypothesis that the gender of majority groups do impact the rate of conformity. The results of this research provide supporting evidence that not only does conformity occur at higher rates when within the same gender group, but that female are more likely to conform in their behaviors than males. There are three key findings of the present research. First the female confederate group experienced at least partial conformity from half of the female participants being observed. Second the male confederate group experienced at least partial conformity from fewer than half of the male participants being observed. Third, conformity from the observed participants only occurred when their gender matched that of the confederate group inside the elevator.

It is interesting that both male participants when in the elevator with the female confederates turned 180 degrees from starting at 'position 3' to ending at 'position 1' (Diagram 2). One interpretation of these findings is that this could be due to the wanting to avoid the stigma they could have faced if seen by a third party of the males looking not at the wall but at the females backs.

There are at least three potential limitations concerning the results of this study. A first limitation concerns the number of trials completed in this experiment. Already facing a set time limit, due to a formal complaint the original time parameters were shortened even further. Additionally, there were no subsequent chances to repeat the experiment on another day and conduct additional trials. The second limitation was the lack of a control group. Due to a formal complaint by one of the participants, the data collection process was terminated and data on a control group could not be obtained. Finally the third limitation was in regard to the experimental setting. The location was a college campus where a majority of the population is assumed to reside in the 18-25 age range. If this experiment was to be replicated, it is advised that a neutral setting be used such as a hospital or apartment complex with no age limitation.

Certain limitations of this study could be addressed in future research. For example, the ethnicity of the confederates participating in the experiment. There is no way to know if the ethnicity of the confederates impacted the rates of conformity as these trials had nonreflecting ethnicity in the gender groups and a lack of proper representation for each ethnic group. Another limitation is the lack of representation of age groups in the confederate groups. There is no way to tell that if the confederates were older there would have been a higher or lower rate of conformity in the elevator. The time limit in the elevator represents an additional constraint or limitation. The elevator used for these trials went to the third floor, there is no way to tell how if

the elevator instead went to the fifth or seventh floor and the participants being exposed to the confederates for a longer time frame would have impacted the conformity rates. An elevator reaching five or more floors would be recommended in recreating this experiment.

This work is consistent with the findings of Eagly and Carli (1981) who have found that females have a higher rate of conformity than males do. Whereas past researchers have found a correlation between age and conformity in an elevator (Tanner, 2011). The present study shows a more dynamic set of data results measuring the impact of gender on conformity rather than age.

Notwithstanding these constraints, these results suggest several theoretical and practical implications. Based on the data gathered the gender grouping while testing for conformity rates are indeed an important factor. The results of these tests demonstrate that conformity only occurs when the genders of the confederate and observed participant matches, as well as how females tend to exhibit a higher degree of conformity compared to males. These data have some potential intervention implications. For example, when trying to sell to a targeted audience, the seller's observable gender reflect that of the targeted audiences. Also, it may be more beneficial to approach a female with a larger group of females when trying to persuade an action.

Much work remains to be done before a full understanding of the extent of psychological impact that field experiments such as these may have on the unknown observed participants. The first step in a field experiment should be obtaining approval from the Institution Review Board, as they have strict guidelines and rules that while may make it difficult to perform an experiment, are there for the health and safety of everyone involved. Permission from the ethics board does not mean that it is ethical itself. When performing experiments with human participants it is important to obtain informed consent for each known participant. Gathering the informed consent was difficult for this project as it would skew the data, since participants would be aware

of the experiment and potentially alter their natural behaviors of conformity. When recruiting confederates, it is important to have a set time and day for the experiment, these factors cannot be made in relation to the confederates unless there is a small group, as that will ultimately create confusion and may cause some to be unavailable post schedule change. It is important that when performing a field experiment where the confederates conduct the actions that the experimenter follows the APA code of ethics guidelines, give a complete summary of what is expected in the informed consent, train and demonstrate just what is expected to the confederates themselves, maintain privacy and confidentiality, identify worst case scenarios, and be sure to state clearly multiple times that if the confederate feels unsafe or uncomfortable at any time they are free to leave the experiment with no repercussions. These rules and regulations have been studied and proven effective, but how would a field experiment prepare observed participants where the objective is to maintain a natural environment without consent necessary. While these participants may not be confederates, they still deserve the forethought and care that would go into keeping them safe. Being naturally observed holds many variables that cannot always be accounted for. It is impossible to guess someone's past so the best that can be done is to set up quick reactive measures. Such as making it clear to the confederates when the experiment should be put on pause for the good of the participant, and being able to identify when a participant is experiencing a form of duress. It is important that researchers designing future field experiments make sure to receive proper approval from research committees, train confederates properly, and take any possible precautions to avoid harm to all participants involved.

Despite these limitations, this research can be seen as a first step towards integrating two lines of research, conformity in numbers of majority versus minority and the genders influence on conformity, that, to our knowledge, have not been directly linked. Although the generality of

the current results must be established by future research, the present study has provided support for the correlation of a majority gender group influencing conformity rates.

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Highlighting the Positive Influence of Community Centers and Community-Based Programs on Local Youth in The United States.

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St. Petersburg College Undergraduate Research Experience

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Chapter 1- Introduction

This research study focuses on the positive influences that community centers and community-based programs have on local youth in the United States. The research in this study aims to accurately highlight which demographics in the United States benefits the most from community-based programs, and which community-based programs have the most significant contributions to positive development in regard to local youth in the United States. The research literature surveyed in this study focuses on community centers that have programming for elementary aged children all the way up to seniors in high school. Specifically, community centers in the Northeast region of the United States. In Highlighting the various community-based programs and their positive influence on youth development, this study hopes to encourage an increase in partnership programs and engagement within other regions of the United States.

Chapter 2

Literature Review on the Positive Influence of Community Centers on Local Youth.

A literature review is a survey of scholarly sources related to a research topic or research question. Literature reviews provide content that can be used to further expand on the research

presented in the future. This review will be composed of multiple scholarly sources that aim to provide a better understanding of the positive influence of community centers and community-based programs. The review will also include the methods of study, a glossary, and an overview of the specific topics that were relevant to the research on community centers and their overall influence. These specific topics include positive youth development and environmental action programs, the link between social-economic status and race, the role of community and community partnership programs, as well as the comparison of differing demographics that community centers serve.

Methods of Searching

In order to gather relevant and accurate information, articles from higher education institutions were sought out and keywords relating to the research question were used. These keywords included, community centers, impact on youth, local communities and resources, and the United States of America. These keywords were used in scholarly databases such as JSTOR, and APA Psycharticles. The research presented in this study was conducted by researchers and institutions who referenced the social science fields as well as the fields of education and psychology. The objective of this study is to highlight and connect the research found in similar studies and apply it to local community centers and their youth. References from local community centers were also used alongside these academic journals.

Glossary for Review

There are several key terms used throughout this review. This glossary contains terms that have been defined by the Merriam-Webster's Collegiate dictionary and further defined in context to this study, to aid in its comprehension. The terms in this glossary will concentrate on the demographics of youth in community centers, as well as community resources and their

effects in local environments. Demographics in the context of this study and defined by the Merriam-Webster's Collegiate Dictionary (2023) is "the statistical characteristics of human populations (such as age or income) used especially to identify markets." Community center is defined as "a building or group of buildings for a community's educational and recreational activities." Environment is defined as "the complex of physical, chemical, and biotic factors (such as climate, soil, and living things) that act upon an organism or an ecological community and ultimately determine its form and survival." Risky behavior in this context is defined as "activities, actions, and/or habits that pose a threat to the person doing them and, potentially, other people as well" (Public Health, 2021).

Review of the literature

This literature review will be constructed of multiple sections that will each highlight a specific contribution to the research topic. The first section will be focusing on positive youth development and environmental action programs. The second section will highlight the role of community centers and the link between social-economic status and communities of color. While the third section will be focusing on the role of community and the influence of after-school hours. Each of these sections and the research that goes along with them all connect together in order to highlight the influences of community centers on local youth.

Positive Youth Development and Environmental Action Programs.

The research found on positive youth development has indicated that an adolescent's relationship with its ecology is the most important aspect of positive youth development. When referring to positive youth development we are referring to the theory that "… assumes that all youth have the capacity to become successful adults, given appropriate support." (Eccles and Gootman 2002; Lerner et al. 2005) Research states that in order for the theory of positive youth

development to come to fruition, then it is imperative that "mutually beneficial relations between the adolescent and his/her ecology…" (Lerner et al. 2011, 6) take place. There are two aspects that go hand in hand when discussing positive youth development, these aspects being an adolescent's ecology and overall engagement. Further research has stated that "thriving youth should be positively engaged with and act to enhance their world." (Lerner et al. 2011, 6) Community centers play a vital role in positive youth development. Especially in the lives of adolescents who are considered to be in the lower socio-economic class. One main approach to positive youth development is what is known as the "Six C's." The "Six C's" consists of competence, confidence, connection, character, caring, and contributions to community and civil society (Lerner et al. 2005). Each of these attributes can be considered a tier. Under the tier of *competence* adolescents are building their social, cognitive, academic, and vocational skill set. This tier will serve as the base for their positive development. Under the second tier of *confidence* adolescents are establishing their self-esteem, as well as their identity and future plans. Under the third tier of *connections* adolescents are building their relationships with their peers, and the institutions they attend, for instance school and their community center. Under the fourth-tier *character,* adolescents are establishing their moral compass and decreasing engagement in health-compromising behaviors. Then under the fifth-tier *caring* adolescents are developing their sense of empathy for the environment around them and the connections in their lives. Under the sixth and last tier *contribution* adolescents are actively participating in civic engagement.

Community centers provide a space for a specific demographic to achieve positive youth development and engage in their community. They also provide positive youth development programs also known as environmental action programs. The goal of environmental education

programs is to enhance a community's overall wellness through collaborative environmental action. For instance, community centers might plant a community garden that is cared for by the adolescents in their education program. This would not only foster positive youth development but also provide a source of fresh produce for their community. Other outdoor activities and programs that are offered through local community centers are also considered environmental action programs. Research suggests that these programs have a substantial impact on low-income communities and communities of color in particular.

The Link between Social-economic Status and Communities of Color

The research found on communities of color and socio-economic status illustrates a substantial link to one another and provides a deeper connection to the community center's core demographic. Community centers serve as a pillar of support for many urban and suburban areas across the United States of America. We will be specifically focused on the impact community centers have on adolescents of color and those of lower socio-economic status (SES). In America a majority of our "at-risk youth" are African American and Hispanic, and come from a lower-socio economic household. This occurrence has linked African American and Hispanic children in urban areas as the prime demographic for a majority of community centers. "Numerous research studies have found that children from low-SES households have lower school readiness and academic competence compared to their higher SES peers. (Zill, Collins, West, & Hausken, 199) In light of this occurrence, "… federal funding of early education programs designed to enhance school readiness among at-risk children (due to race and income) is one-way social policies are working to combat the achievement gap." (e.g., Head Start) For urban areas that are not receiving additional funding in their schools, community centers are there to provide extra support and academic help. Similarly, environmental action programs, after-school education

programs and internship programs are also provided in community centers and can play a huge role in assisting in school readiness in children of color. Further research provides a specific instance of a specific program in New York that creates opportunities for advancement through a community funded program called *the East New York Farms!* urban agriculture internship program. This program provides the youth of this community to develop critical consciousness through posing questions about food security in their low-income community of color, which enables them to perceive, understand, and potentially counter oppressive food systems. (Freire 1973; Delia and Krasny 2018). These types of programs have had a positive influence on the youth in that specific community.

The Role of Community and After-School Hours

This section will be focusing on the role of community and the impact that after-school hours have on local youth. A majority of community centers are able to operate because of community partnerships and sponsors, as well as government funding and grants. The role of the community itself has a direct impact on the influence that a community center can have. In order for the theory of positive youth development to flourish, the community centers have to be equipped with appropriate staffing and extra support and resources. Research suggests that community participation in the form of volunteering and contributing either time, needed essentials or money towards their local centers has a direct impact on the community as a whole. Partnership programs are another vital role in keeping community centers afloat. Partnership programs include businesses and other non-profit organizations who contribute resources or money to local centers in their community. Through their support many centers are able to provide school supplies, food, clothing, and academic help to the youth in their communities who by socio-economic standards need it the most. As of 2001, risky adolescent behavior occurs

most often between the times of 3pm to 6pm. (DeAngelis, 2001) This instance has held steady throughout the last twenty years. This time is referred to as "after-school" time and the prime time for risky experimentation for many adolescents and teens. Psychological research has found that after-school programs that offer environmental action programs during these critical hours, keep adolescents from engaging in risky behavior. This is especially prevalent for adolescents in lower SES households. When these programs are properly funded and able to offer environmental action programs, research indicates a decrease in "at-risk" behavior. (DeAngelis, 2001)

Synthesis of Research Findings

The review of literature that contributed to this study included works by Krasny (2020), Sanders (2001), Dotterer., et al. (2012), DeAngelis (2001), and Davis, (2010). Additional secondary works of note include the Education Director of the Mattie Williams Neighborhood and Family Center. An interview was also conducted with the program director of the St. Petersburg Boys and Girls Club of America.

Each research study that was utilized had similarly concluded that community centers had a significantly positive influence on local youth. The research studies also concluded that youth from lower-socio economic communities of color benefited the most from community centers, especially after-school programs. Beginning with the implementation of positive youth development (Krasny, 2020) which highlights the necessary components needed to foster a successful and well-developed youth population.

Critique of Previous Research Methods

The research methods listed previously in the review of literature assisted in illustrating how community centers and community-based programs have a positive influence on local

youth. Granted, not all community centers are properly funded or able to provide for every needy child in the community that they serve. Considering previous perspectives, proper funding, community engagement, access to community centers, and community run programs have a significant positive impact on the lives of local youth. The current research studies found in the United States on the positive influence of community centers is focused on larger urban populations in the Northeast regions. Similar research is lacking in the Southern region of the United States, and it is possible that the current research studies are not up to date. Consequently, if there were a more recent study on the positive influence of community centers and community-based programs, a more precise connection could be made. Future research that is focused on the Southern region of the United States would provide more context on the overall positive influence of community centers and how they differ regionally.

Summary of Literature Review

The summary for the review of literature on the positive influence of community centers and community-based programs on local youth will briefly summarize each topic and perspective previously mentioned. These topics include positive youth development and environmental action programs, the link between socio-economic status and communities of color, and the role of community and after-school hours. The overall research that took place in this study was committed to comprehending the links between each topic and perspective to fortify our research topic and question thus far, while highlighting the community-based programs and resources that can be implemented in lower socio-economic communities to promote positive youth development in any region in the United States. Through the review of literature and thorough research on positive youth development and various environmental action programs, the research in this study was able to better comprehend the correlation between

community-based programs for local youth and positive development that takes place during after-school hours. The study has provided a better understanding about which communities in the Northeast region of the United States have been benefitting from community-based programs. This allows other regions in the United States to look to them as a reference when implementing their own environmental action programs. Future research is needed in order to accurately state what programs and community engagement will have a positive influence on the Southern regions of the United States. With that being said, this researcher conducted additional research that focused on a central Florida community in order to better understand if the methods and community programs found in previous research studies conducted in the Northeast region of the United States, were also beneficial to the local youth in central Florida as well.

Chapter Three

Data Collection

The data collection for this study consisted of one community-center named the Mattie Williams Neighborhood Family Center that offers an afterschool program, and one youth development program named the Boys and Girls Club of St. Petersburg, that also operates during afterschool hours. The Mattie Williams Neighborhood Family Center serves four zip codes in northern Pinellas County. The zip codes served by this particular center are 34695, 34677, 34759, and 33761, which encompass the cities of Safety Habor, Oldsmar, and a part of Clearwater, all of which are located in northern Pinellas County. The Boys and Girls Club location in St. Petersburg provides youth development programming for a part of the large population of children in St. Petersburg, which is located in the southern part of Pinellas County. The researcher wanted to showcase the demographics and specific programming in both the northern part of Pinellas County, as well as the Southern portion. This study aimed to gather

updated information on the demographic that each program served as well as what resources and programming was offered.

The researcher was able to gather the updated annual calendar from the Mattie Wiliams Neighborhood Family Center and observe a supervised afternoon while the program was in session. The annual calendar includes the percentage of each demographic served in the community, as well as the services provided, and the number of students of each ethnicity enrolled in the after-school program. The researcher was also able to conduct an interview with the program director of the St. Petersburg Boys and Girls Club Northside Richmond Location. The following data was gathered from the Mattie Williams Neighborhood Family Center; of the youth enrolled in the after-school program, 43% reside in Safety Harbor, 30% reside in northern Clearwater, 23% reside in Oldsmar, and 4% is marked as other. The annual report also claims that of all of the youth enrolled in the after-school program, 44% are white, 26% are Hispanic, 15% are African American, 10% are multi-racial, and 5% is marked as other. The after-school program consists of children from kindergarten to eighth grade. When the researcher inquired about the overall cost for child-care and how the center assists low-income families, they were told that the cost for childcare for the entire school year is $200 and can easily be waived if a scholarship form is filled out. The after-school program admits off of a waitlist and prioritizes children from working low-income households in the area.

Additional programming offered during the school year, includes a music program that is provided by the Clearwater Jazz Club, and Girl Scouts is offered as well. The researcher was informed additional third-party programming takes place in the Summer, because the hours of operation are substantially longer than during the school year.

The following data was gathered from the Boys and Girls Club location in St. Petersburg, various programs are offered at this location including visual & digital arts, music & podcast production. S.T.E.A.M. programs, entrepreneurship youth advocacy, career exploration, health & wellness, and field trips. There are four locations total that service the highly populated area of South St. Petersburg.

Outcomes and Observations of Data Collection

The outcomes and observations in this study will provide ample insight into how these programs positively influence their local youth. The researcher reached out to both of the community programs previously mentioned and was met with open arms. Not only was the researcher able to leave with an annual report but also was invited to stay and observe how the program itself was run. Both centers were readily able to provide the researcher with updated information in regard to the demographics that their centers serviced as well as what additional programming was offered.

During the researcher's time at the Mattie Williams Neighborhood Family Center, they were able to observe the program in action under the supervision of the education director at the time. The researcher was able to naturally observe the structure of the after-school program and what accommodations and resources were offered to the youth enrolled in the program. During the researcher's observation, they observed a smaller classroom setting where each age group was divided accordingly and then each child was given a healthy snack upon arrival. Once the children finished their snack, they went right into academic time where a staff member who was in charge of the group observed offered their help to any of the children who needed it. The researcher observed that there were three computers per classroom in the center, which gave each child an opportunity to complete their online schoolwork and grant access to online educational

resources as well. The researcher also noted that the playground was covered, and each age group had an opportunity to have time to socialize and play outside. Though the demographics were mentioned earlier for this center the researched observed that this center had a smaller population than the Boys and Girls Club in St. Petersburg. The researcher observed a very diverse population with an equal amount of Hispanic, African American, and White children while observing. The middle school program at the center was its own entity and separated from the elementary age groups. The researcher was not able to observe the middle school program.

The researcher was also able to get in contact with the program director of The Boys and Girls Club in St. Petersburg. The researcher conducted an interview via email with the program director and had all of their questions answered in a timely fashion. The Boys and Girls Club served a significantly larger population of students than the previous center visited. Within that much larger population the majority of the demographic enrolled in the after-school program consisted of African American children, with a higher concentration of female children.

General Conclusion

In conclusion, this particular study showcased that youth from low-income households that were enrolled in after-school programs where a positive environment as we well as other environmental action programs, resulted in local youth portraying behavior associated with positive development. This study ties in with the second research study referenced, (Dotterer., et al. 2012) which showcases the link between socio-economic status and communities of color. This link provides insight into the largest youth demographic that community centers serve. This study concluded that youth who reside in lower socio-economic communities of color benefit the most from having community centers and positive youth development programs. The next research study referenced focused on partnership programs and community involvement.

(Sanders,2001) This study concluded that community centers with high involvement from their surrounding residents as well as additional funding provided by sponsors and partnerships, resulted in flourishing community centers and increased youth involvement. The next study focused on the psychological aspects of youth development and defined in detail how critical "after school hours" are for adolescents. (DeAngelis, 2001) The final study utilized in the literature review focuses on the impact that additional funding and art programs have on the positive development of local youth. (Davis, 2010)

Given the research reviewed in conjunction with the researchers' own observations and studies, the researcher concludes that community centers and community-based programs do have a substantially positive impact on local youth. The researcher also concludes that as local populations increase and become culturally diverse the need for community engagement and community-based programs is increasing. In conclusion, the researcher recommends an increase in studies done in the Southern Region of the United States with the hope that these studies will lead to an increase in funding and sponsorships for local community centers. The researcher recommends that alongside an increase in funding, continued training and compensation for the community center staff will allow these centers to continue to promote positive youth development within their communities, especially communities in the Southern Region of the United States where research is slim and outdated.

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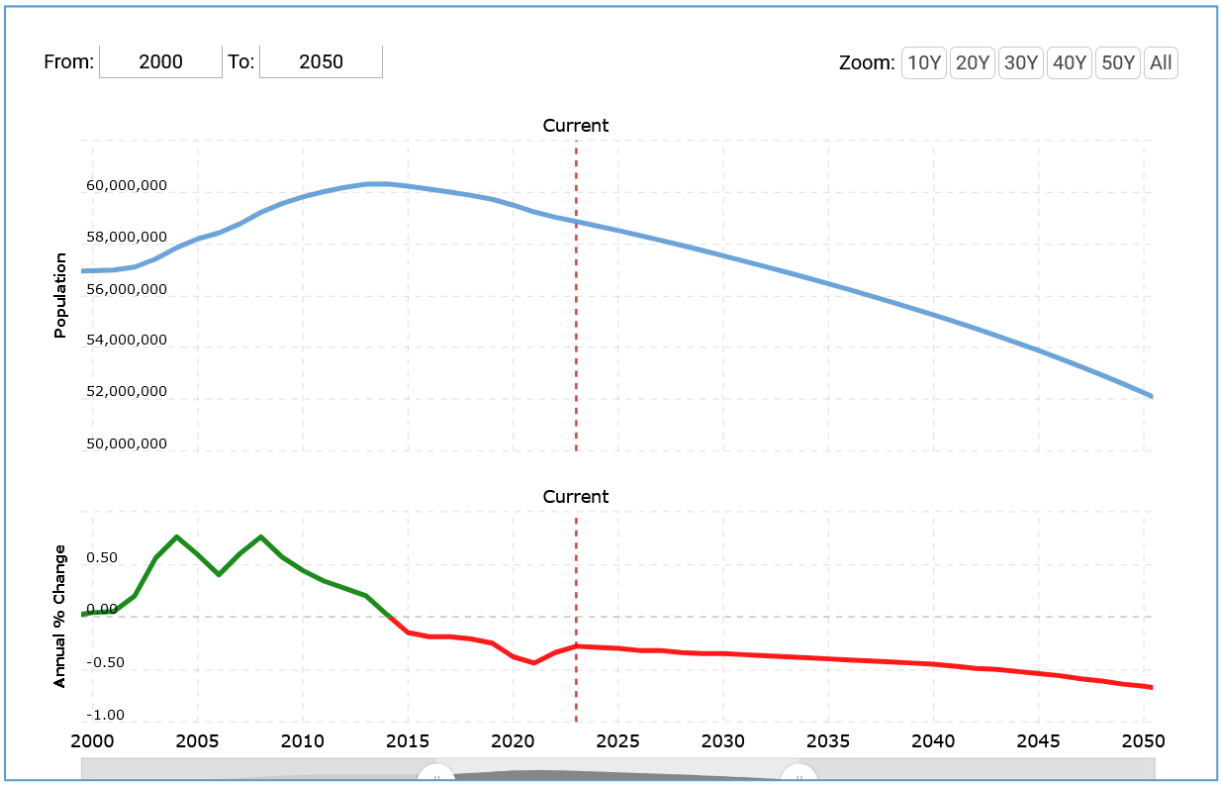

Italy Inflation Rate - Historical Data		
Year	Inflation Rate (%)	Annual Change
2022	8.20%	6.33%
2021	1.87%	2.01%
2020	-0.14%	-0.75%
2019	0.61%	-0.53%
2018	1.14%	-0.09%
2017	1.23%	1.32%
2016	-0.09%	-0.13%
2015	0.04%	-0.20%

Utilizing Philips Curve to Understand Recent Economic Climate

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Abstract

The objective of this research is to illustrate the relationship between inflation and unemployment indicators to the current economic climate as well as in evaluating both sets of data against the Phillips Curve macroeconomic concept. Besides a short literature review of the economic impact of inflation and unemployment to the recent U.S. economy, both inflation and unemployment data is extracted from the Federal Reserve at St. Louise FRED site and the Bureau of Labor Statistics to comprehend their relationship at a national level from 2007 up to 2022. While conducting our research, we found that while the Phillips Curve is still a very useful and applicable model, it is less relevant when assessing abnormal events such as the micro and macro-economic responses to the Covid-19 pandemic.

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Appendix 17

Utilizing Philips Curve to Understand Recent Economic Climate

By: Ryan Dzialo & Sunita Kumari, Ph.D.

Introduction.

As our understanding of the relationships that facilitate policy, trade, and sustainability from an economic standpoint continually evolve, it would be prudent to revisit the conventional Phillips's curve concept that assists economists in understanding events based off of inflation and unemployment rates. We chose to analyze the period between 2007 to 2022, specifically the Great Recession and post Great Recession, the pre-Covid-19 period and into the pandemic, as well as the recent post-Covid-19 era. These three periods created unprecedented uncertainty and as the world economy shutdown, inflation rates, and unemployment behaved in an unusual manner.

In this analysis, we will be looking at the Phillips Curve, an illustrative tool that is used to show the relationship between unemployment and inflation, and how accurate of a model it is in predicting recent economic climates. The Phillips Curve concept was introduced by A.W. Phillips who was a prominent economist from New Zealand, during the mid-20th century. Much of Phillips early work focused on unemployment and wage rates in the United Kingdom and what he found was that there seemed to be an inverse relationship between unemployment rates and the change in wages over a 90-year period from 1861-1957 (Engemann, 2021). Phillips created a modeling tool known as the "Phillips Curve" to illustrate this relationship, and to better help economists visualize and predict future macro-economic trends.

Literature Review

The Phillips Curve illustrates the inverse relationship between inflation and unemployment and has been an important tool used by economists and policy makers for decades (Trinidad, 2022; Spencer, 1969). It has also been considered a useful tool for policymakers to guide their decisions on macroeconomic monetary policy, as it suggests that policymakers can target either inflation or unemployment, but not both simultaneously to ensure a healthy economic growth of the national output and Gross Domestic Product (St. Louis Fed, 2021). If the economy is facing high inflation, policymakers can implement contractionary monetary policies, such as raising interest rates to reduce inflation, but as a result, may also increase unemployment. On the other hand, if the economy is facing high unemployment, expansionary monetary policies, such as lowering interest rates, may be implemented to reduce unemployment but these measures may increase inflation in return.

The COVID-19 pandemic has significantly impacted both the inflation and unemployment rates (Kumari, 2022). The pandemic caused unprecedented disruptions in global economies, leading to unique challenges in applying traditional economic models like the Phillips Curve. The pandemic-induced supply chain disruptions, changes in consumer behavior, and government interventions, including the early lockdown, stimulus package and increases in interest rates by the Fed. All of these events have altered the dynamics of inflation and unemployment. This has challenged the predictive abilities of the Phillips Curve in the current economic environment (St. Louis Fed, 2015). Some studies have observed that during the pandemic, inflation expectations have become more volatile and uncertain, with significant implications for the Phillips Curve relationship (St. Louis Fed, 2021). The uncertainty surrounding the duration and impact of the pandemic has made it difficult to accurately predict

and measure inflationary pressures (Kumari, 2022). Moreover, the sharp fluctuations in employment statistics due to lockdowns, business closures, and work from home orders have further complicated the dynamics of the Phillips Curve (FRED, 2015). The unprecedented shifts in the labor market, such as widespread job losses followed by a rapid "comeback" in some sectors, have led to non-traditional patterns of inflation and unemployment, further challenging the traditional Phillips Curve relationship.

As a result, policymakers and economists have had to rethink the applicability of the Phillips Curve in the post-pandemic era and reassess their approach to monetary policy (St. Louis Fed, 2010). Some argue that the Phillips Curve may be less relevant in the current environment and may need to be reevaluated in light of the unique challenges posed by the pandemic (St. Louis Fed, 2015). Others suggest that policymakers need to consider a broader range of factors, such as structural changes in the economy, technological advancements, and shifts in consumer preferences, in addition to inflation and unemployment, when formulating monetary policy (Trinidad, 2022).

Data Collection

To analyze the relationship between inflation and unemployment indicators and evaluate the Phillips Curve macroeconomic concept's relevance, data was collected from three sources: the Federal Reserve at St. Louis FRED site, the US Inflation Calculator, and the Bureau of Labor Statistics. The time frame selected was 2007 to 2022, including the Great Recession and post-Great Recession periods, the pre-COVID-19 era, the pandemic period, and the post-COVID-19 era. This period was chosen because it created unprecedented uncertainty, and inflation rates and

unemployment behaved unusually, making the classic Phillips Curve a useful modeling tool for this research.

The Federal Reserve Economic Data (FRED) database and the US inflation calculator provided inflation data (***Figure 1.a***), which was measured using the Consumer Price Index (CPI) for all items.

U.S. Unemployment Rates (2007-2022)

U.S. Unemployment Rates 2007-2022												
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	4.6	4.5	4.4	4.5	4.4	4.6	4.7	4.6	4.7	4.7	4.7	5.0
2008	5.0	4.9	5.1	5.0	5.4	5.6	5.8	6.1	6.1	6.5	6.8	7.3
2009	7.8	8.3	8.7	9.0	9.4	9.5	9.5	9.6	9.8	10.0	9.9	9.9
2010	9.8	9.8	9.9	9.9	9.6	9.4	9.4	9.5	9.5	9.4	9.8	9.3
2011	9.1	9.0	9.0	9.1	9.0	9.1	9.0	9.0	9.0	8.8	8.6	8.5
2012	8.3	8.3	8.2	8.2	8.2	8.2	8.2	8.1	7.8	7.8	7.7	7.9
2013	8.0	7.7	7.5	7.6	7.5	7.5	7.3	7.2	7.2	7.2	6.9	6.7
2014	6.6	6.7	6.7	6.2	6.3	6.1	6.2	6.1	5.9	5.7	5.8	5.6
2015	5.7	5.5	5.4	5.4	5.6	5.3	5.2	5.1	5.0	5.0	5.1	5.0
2016	4.8	4.9	5.0	5.1	4.8	4.9	4.8	4.9	5.0	4.9	4.7	4.7
2017	4.7	4.6	4.4	4.4	4.4	4.3	4.3	4.4	4.3	4.2	4.2	4.1
2018	4.0	4.1	4.0	4.0	3.8	4.0	3.8	3.8	3.7	3.8	3.8	3.9
2019	4.0	3.8	3.8	3.6	3.7	3.6	3.7	3.7	3.5	3.6	3.6	3.6
2020	3.5	3.5	4.4	14.7	13.2	11.0	10.2	8.4	7.9	6.9	6.7	6.7
2021	6.3	6.2	6.1	6.1	5.8	5.9	5.4	5.2	4.8	4.5	4.2	3.9
2022	4.0	3.8	3.6	3.6	3.6	3.6	3.5	3.7	3.5	3.7	3.6	3.5

Figure 1.a. US Unemployment Rates (2007-2002)

The Bureau of Labor Statistics provided the unemployment data (***Figure 1.b***), which was measured using the unemployment rate. The unemployment rate is the percentage of the labor force that is unemployed but actively seeking employment.

U.S. Inflation Rates (2007-2022)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Avg.*
2022	7.5	7.9	8.5	8.3	8.6	9.1	8.5	8.3	8.2	7.7	7.1	6.5	**8**
2021	1.4	1.7	2.6	4.2	5	5.4	5.4	5.3	5.4	6.2	6.8	7	**4.7**
2020	2.5	2.3	1.5	0.3	0.1	0.6	1	1.3	1.4	1.2	1.2	1.4	**1.2**
2019	1.6	1.5	1.9	2	1.8	1.6	1.8	1.7	1.7	1.8	2.1	2.3	**1.8**
2018	2.1	2.2	2.4	2.5	2.8	2.9	2.9	2.7	2.3	2.5	2.2	1.9	**2.4**
2017	2.5	2.7	2.4	2.2	1.9	1.6	1.7	1.9	2.2	2	2.2	2.1	**2.1**
2016	1.4	1	0.9	1.1	1	1	0.8	1.1	1.5	1.6	1.7	2.1	**1.3**
2015	-0.1	0	-0.1	-0.2	0	0.1	0.2	0.2	0	0.2	0.5	0.7	**0.1**
2014	1.6	1.1	1.5	2	2.1	2.1	2	1.7	1.7	1.7	1.3	0.8	**1.6**
2013	1.6	2	1.5	1.1	1.4	1.8	2	1.5	1.2	1	1.2	1.5	**1.5**
2012	2.9	2.9	2.7	2.3	1.7	1.7	1.4	1.7	2	2.2	1.8	1.7	**2.1**
2011	1.6	2.1	2.7	3.2	3.6	3.6	3.6	3.8	3.9	3.5	3.4	3	**3.2**
2010	2.6	2.1	2.3	2.2	2	1.1	1.2	1.1	1.1	1.2	1.1	1.5	**1.6**
2009	0	0.2	-0.4	-0.7	-1.3	-1.4	-2.1	-1.5	-1.3	-0.2	1.8	2.7	**-0.4**
2008	4.3	4	4	3.9	4.2	5	5.6	5.4	4.9	3.7	1.1	0.1	**3.8**
2007	2.1	2.4	2.8	2.6	2.7	2.7	2.4	2	2.8	3.5	4.3	4.1	**2.8**

Figure 1.b, US Inflation Rates (2007-2022)

Both sets of data were collected on a monthly basis from January 2007 to December 2022. The data was collected and imported into an excel spreadsheet for analysis and data illustration purposes. Descriptive statistics, including mean, median, and standard deviation, were computed to summarize the data. The time-series data was then plotted to visualize the trends and patterns over the selected time frame. The data collected from the three sources will be analyzed to investigate the relationship between inflation and unemployment indicators and how they relate to the Phillips Curve macroeconomic concept. The analysis will focus on identifying the trends and patterns in the data and how they have evolved over the selected time frame. The findings will be used to evaluate the relevance of the Phillips Curve macroeconomic concept in predicting recent economic climates.

Data Analysis

Let's take a closer look at how the Phillips Curve behaved during and after the Great Recession, as well as before and after the COVID-19 pandemic. During the Great Recession, which lasted from 2007 to 2009, the Phillips Curve appeared to be less reliable. Unemployment increased significantly, reaching its highest point in 2009 at 10%, while inflation remained relatively low with an average of -0.4% for the same year. This phenomenon was attributed to various factors, such as a decrease in consumer demand, a sluggish economy, and the impact of monetary policy on inflation expectations. The traditional inverse relationship between unemployment and inflation seemed to be weakened, testing the effectiveness of the Phillips Curve during this period. Between 2007 and 2010, the Phillips curve shifted downward, and was relatively flat, due to the global financial crisis, indicating higher unemployment and lower inflation (***Figure 2.a***). In response, monetary policy measures, such as interest rate cuts and liquidity injections, were implemented by central banks. Additionally, fiscal policy interventions involved increased government spending and tax cuts to stimulate economic growth.

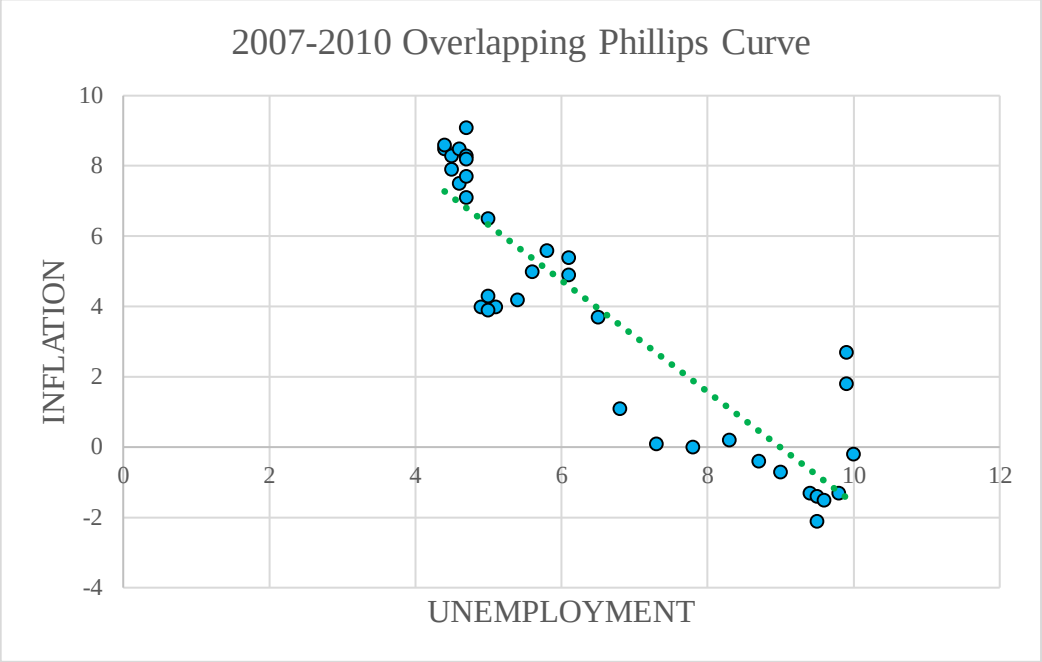

Figure 2.a, 2007-2010 Overlapping Phillips Curve

In the pre-COVID period, which followed the Great Recession, the Phillips Curve appeared to regain some of its relevance. As the economy recovered and unemployment declined, inflation started to pick up gradually. However, the relationship between unemployment and inflation was still not as strong as before the Great Recession, indicating that other factors were also influencing inflation. Between 2011 and 2015, the Phillips curve exhibited an upwards slope, and again remained relatively flat, with low inflation and high unemployment (**Figure 2.b**). Monetary policy during this period involved the use of unconventional measures such as quantitative easing and forward guidance. Fiscal policy included a mix of government spending cuts and tax increases aimed at reducing budget deficits and promoting economic stability.

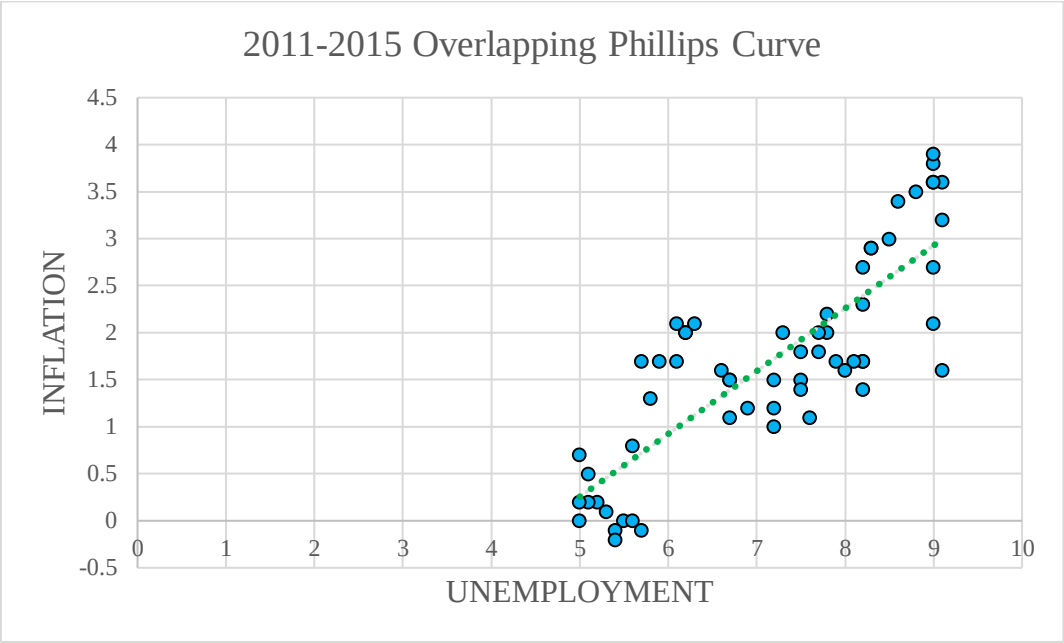

Figure 2.b, 2011-2015 Overlapping Phillips Curve

From 2015 to 2019, the Phillips curve once again remained relatively flat, meaning that changes in unemployment didn't have a strong impact on inflation **(Figure 2.c).** During this period, policymakers implemented a mix of monetary and fiscal policies. Monetary policy involved actions by the central bank, such as adjusting interest rates, to control inflation. Fiscal policy involved government decisions on taxes and spending to stimulate economic growth and employment.

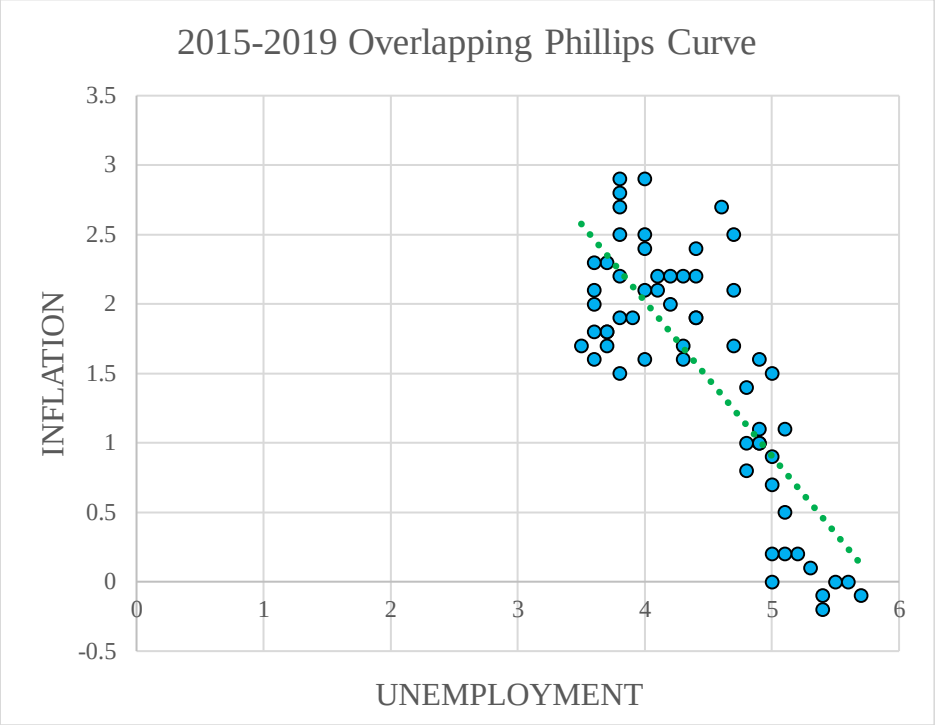

Figure 2.c, 2015-2019 Overlapping Phillips Curve

With the onset of the COVID-19 pandemic in 2020, the global economy experienced unprecedented disruptions, and the Phillips Curve again faced challenges. As governments implemented widespread lockdowns and businesses closed, unemployment rates skyrocketed to 14.7% in April 2020. However, inflation remained relatively low with an average of 0.63%, in March, April, and May 2020, due to reduced consumer demand and supply chain disruptions. The Phillips Curve seemed to demonstrate a weak relationship between unemployment and inflation during this period, suggesting that the pandemic-induced economic shocks had altered the traditional dynamics of the Phillips Curve. The pandemic led to a decrease in overall demand and an increase in unemployment, leading to a widening downward shift in the Phillips curve (**Figure 2.d**). This shift was also influenced by the monetary and fiscal policies enacted during this period, such as stimulus packages and lower interest rates. Additionally, the pandemic forced

many people to work from home, leading to changes in consumer behavior, such as increased online shopping and decreased spending on travel and leisure activities.

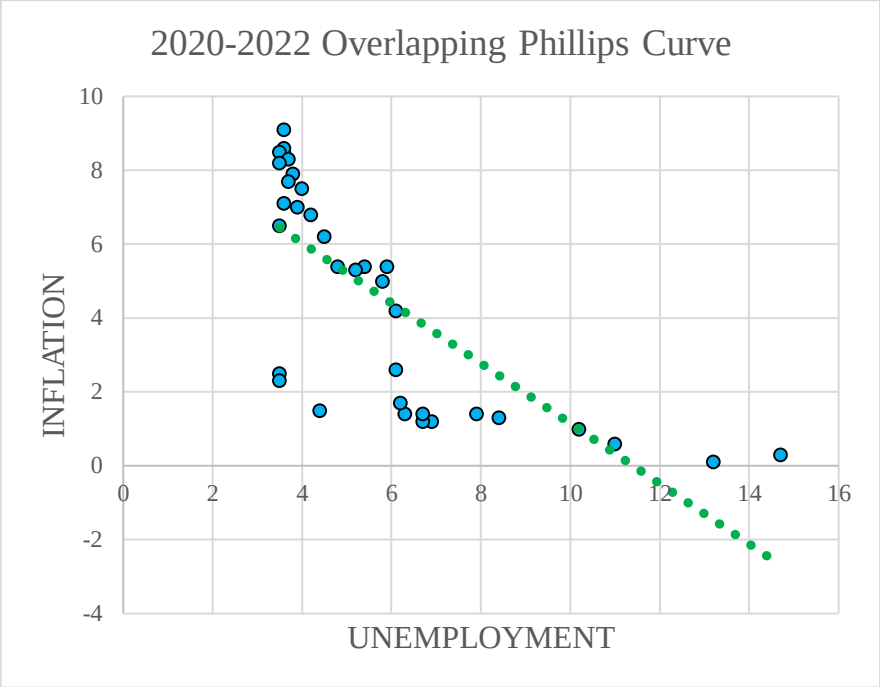

Figure 2.d, 2020-2022 Overlapping Phillips Curve

We will take an expanded look at the relationship between unemployment and inflation during each year in *Figures 3-18 (***Appendix***)* and how market conditions influenced rates, starting with the onset of the Great Recession and into the COVID-19 pandemic. Another illustrative model that was used is the Misery Index. The misery index is a simple economic indicator that combines two important factors: inflation and unemployment. It is used to measure the overall economic well-being and distress of a country's population. The index is calculated by adding the unemployment rate to the inflation rate. The higher the index value, the more "miserable" the economic conditions are considered to be. Essentially, the misery index provides

a snapshot of how difficult it is for people to find jobs and cope with rising prices in a given economy.

Conclusion

The analysis of the Phillips Curve during and after the Great Recession and the COVID-19 pandemic reveals intriguing dynamics in unemployment and inflation. During the Great Recession (2007-2009), the Phillips Curve showed less reliability, with high unemployment (10%) and low inflation (-0.4%). Factors like reduced consumer demand and monetary policy impact contributed to this phenomenon. In the post-recession period, the Phillips Curve regained some relevance, but the unemployment-inflation relationship remained weaker. With the onset of the COVID-19 pandemic, unemployment surged, reaching 14.7% in April 2020, while inflation remained relatively low, at 0.63% average, due to reduced demand and supply chain disruptions. This suggests that the traditional dynamics of the Phillips Curve were altered by pandemic-induced disruptions. As a result, policymakers and economists have had to reassess their approach to monetary policy and consider a broader range of factors, such as structural changes in the economy, technological advancements, and shifts in consumer behaviors, in addition to inflation and unemployment, when formulating monetary policy. In conclusion, while the Phillips Curve has offered valuable insights, recent events challenge its reliability, alternative frameworks considering a broader range of factors are needed for a comprehensive understanding of the unemployment-inflation relationship in modern economies.

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Appendix

The misery index, which is the sum of the inflation rate and unemployment rate, reached a peak in 2007, indicating an oncoming period of economic distress. (**Figure 3**)

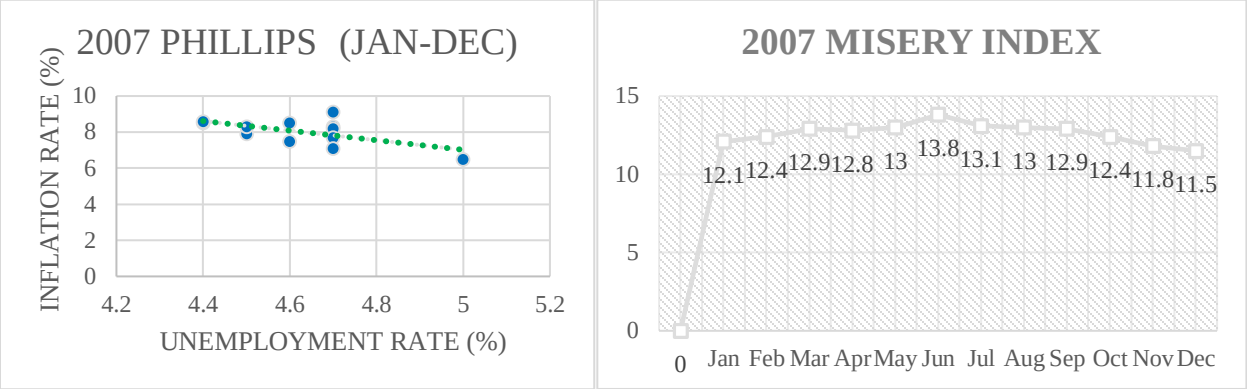

Figure. 3, 2007 Phillips Curve/Misery Index.

During the 2008 financial crisis, the Phillips curve relationship between inflation and unemployment appeared to break down, with high levels of unemployment coexisting with low levels of inflation. This challenged the idea that there was a trade-off between these two metrics. (**Figure 4**)

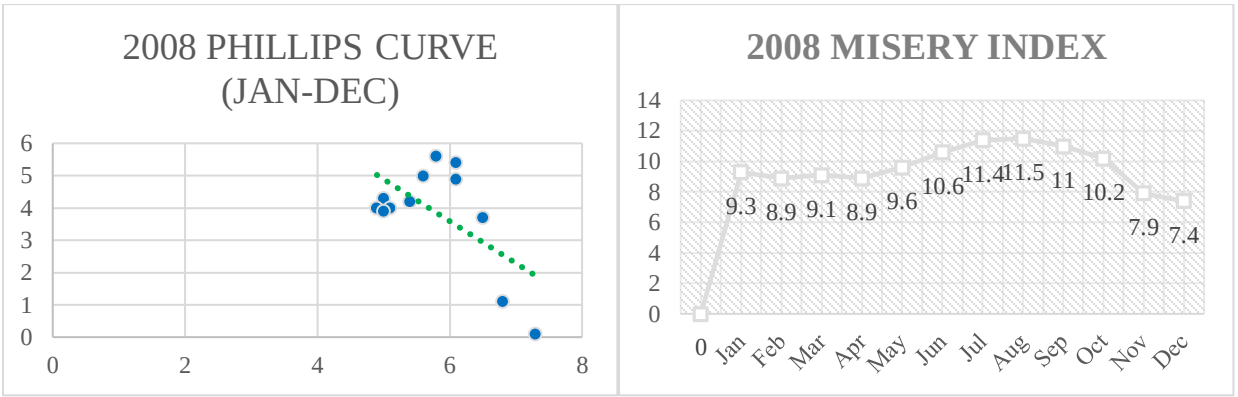

Figure. 4, 2008 Phillips Curve/Misery Index.

During 2009, the Phillips Curve relationship between unemployment and inflation appeared to weaken as high unemployment rates coincided with low levels of inflation.

The Misery Index during 2009 was high due to a combination of high unemployment rates and inflation, due to the continued financial crisis (**Figure 5).**

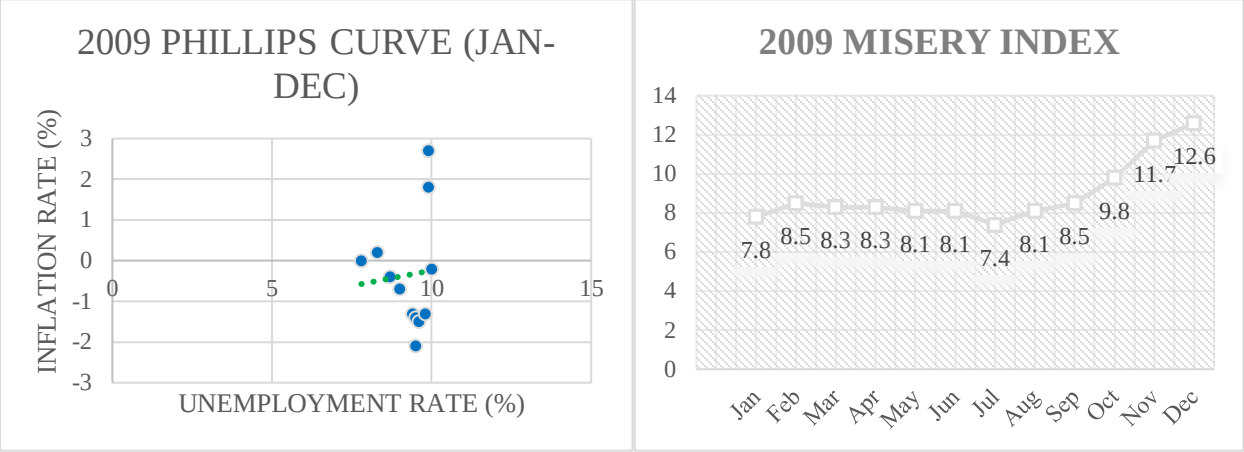

Figure 5, 2009 Phillips Curve/Misery Index.

The 2010 Phillips Curve began to flatten, and the Misery index started to lower, towards the later part of the year. (**Figure 6**)

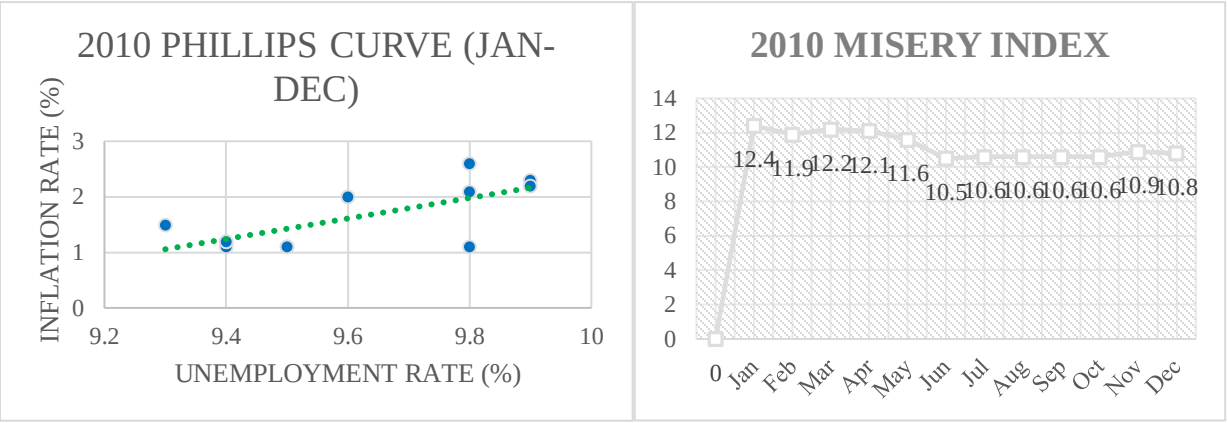

Figure 6, 2010 Phillips Curve/Misery Index.

In 2011, the Phillips curve relationship appeared to weaken as inflation remained low despite declining unemployment rates. the misery index generally increased due to a combination of higher unemployment rates and elevated inflation levels. (**Figure 7**)

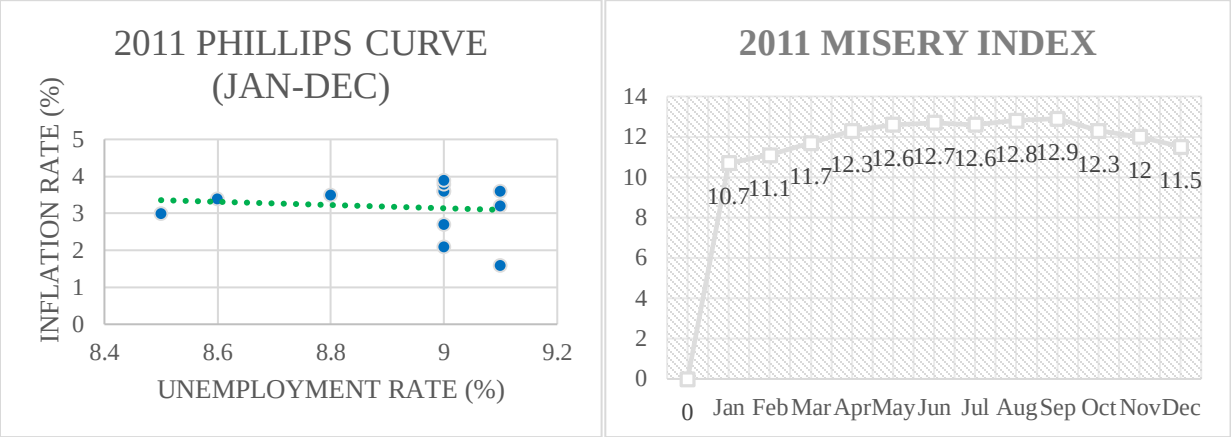

Figure 7, 2011 Phillips Curve/Misery Index.

In 2012, the Phillips Curve experienced a weakening relationship as it became less reliable in predicting inflation based on changes in the unemployment rate. the misery index experienced a decrease as both the unemployment rate and inflation rate declined, indicating a relative improvement in economic conditions. (**Figure 8**)

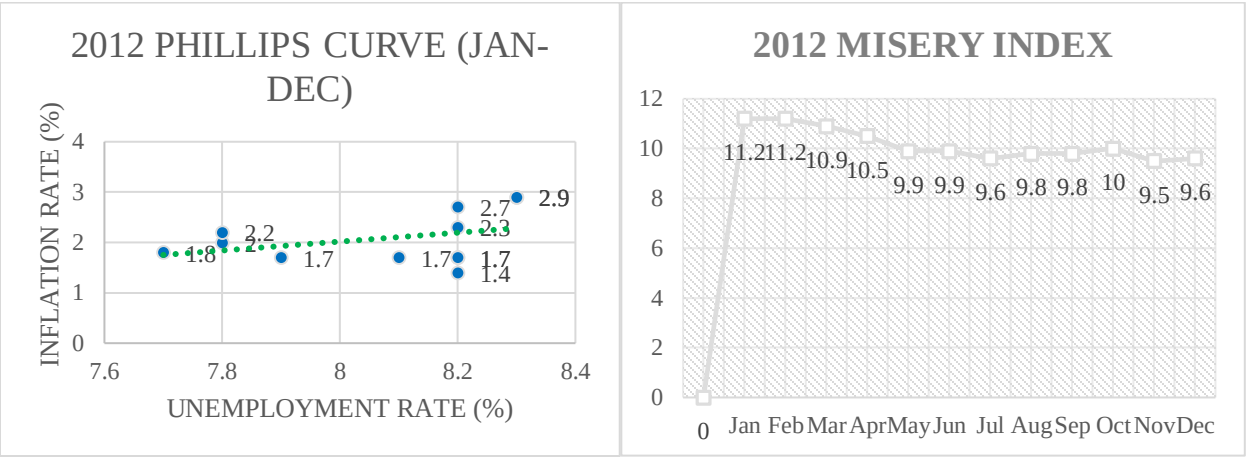

Figure 8, 2012 Phillips Curve/Misery Index.

In 2013, the Phillips Curve experienced a flattening, indicating a weakened relationship between unemployment and inflation. The misery index declined as both the unemployment rate and inflation rate decreased, indicating a reduction in economic hardship. (**Figure 9**)

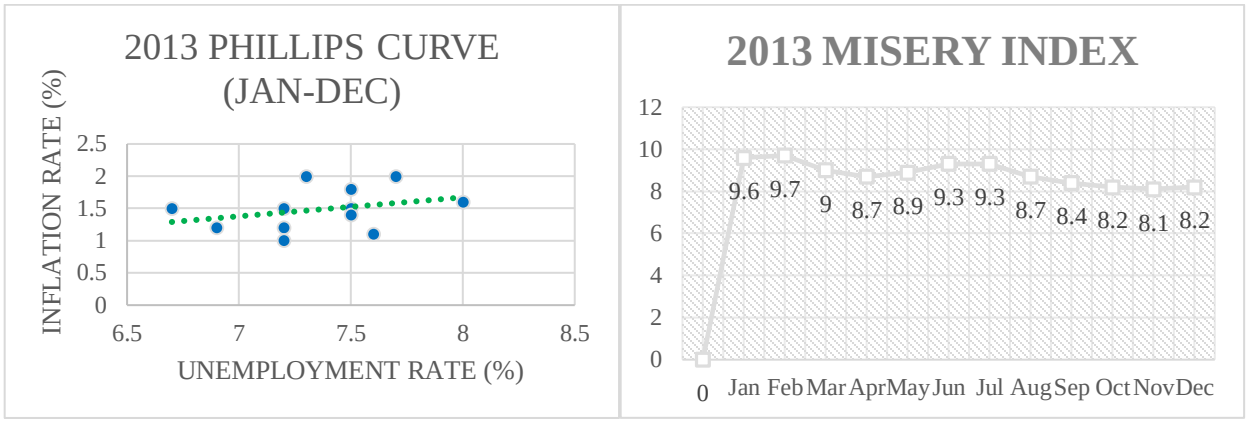

Figure 9, 2013 Phillips Curve/Misery Index.

In 2013, the Phillips curve experienced a flattening or weakening effect, as the relationship between unemployment and inflation became less pronounced, potentially indicating a shift in the dynamics of the labor market and inflationary pressures. (**Figure 10**)

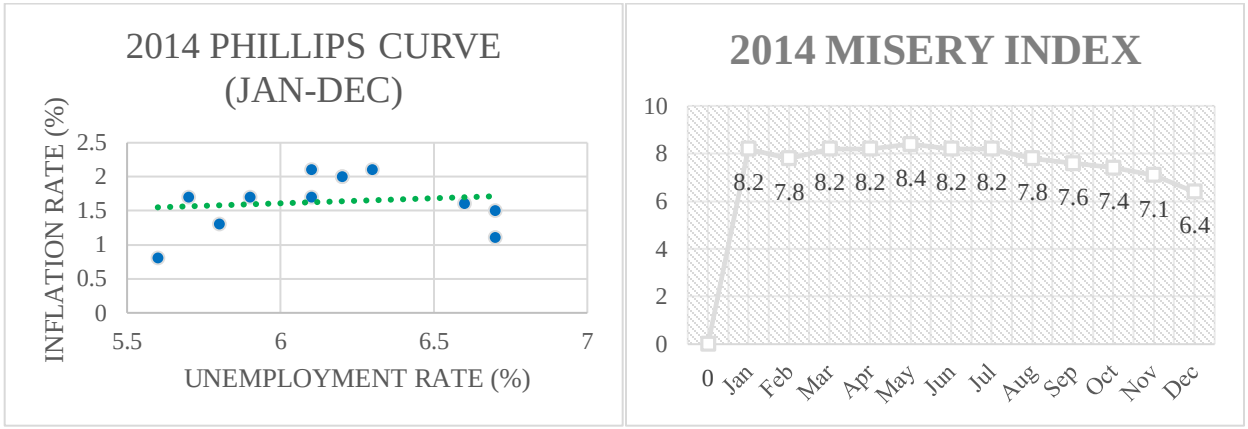

Figure 10, 2014 Phillips Curve/Misery Index.

In 2015, the Phillips curve relationship appeared to weaken as unemployment rates decreased without a corresponding increase in inflation. (**Figure 11**)

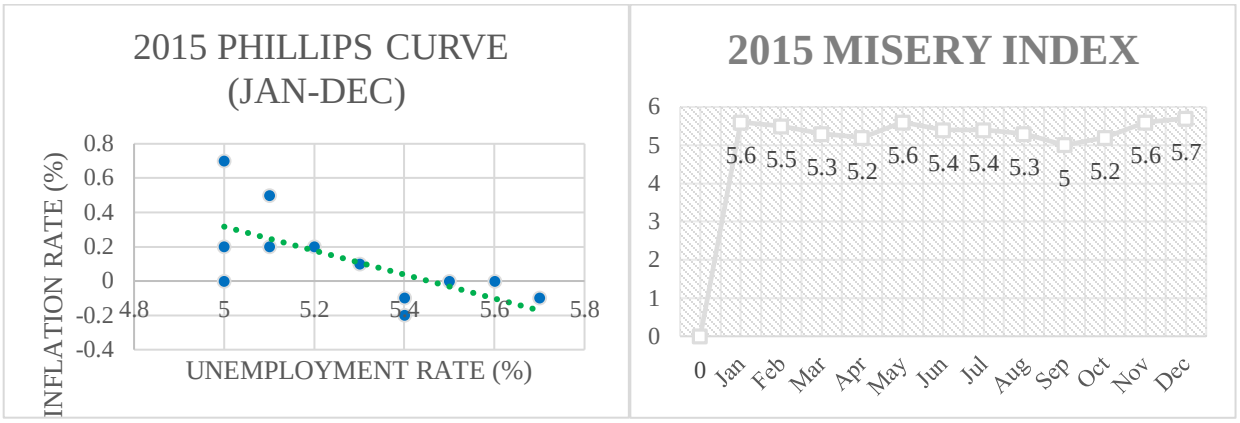

Figure 11, 2015 Phillips Curve/Misery Index.

In 2016, the Phillips curve appeared to exhibit a weaker relationship between unemployment and inflation, as inflation remained relatively low despite declining levels of unemployment. the misery index generally decreased due to improvements in the labor market and a relatively low inflation rate. (**Figure 12**)

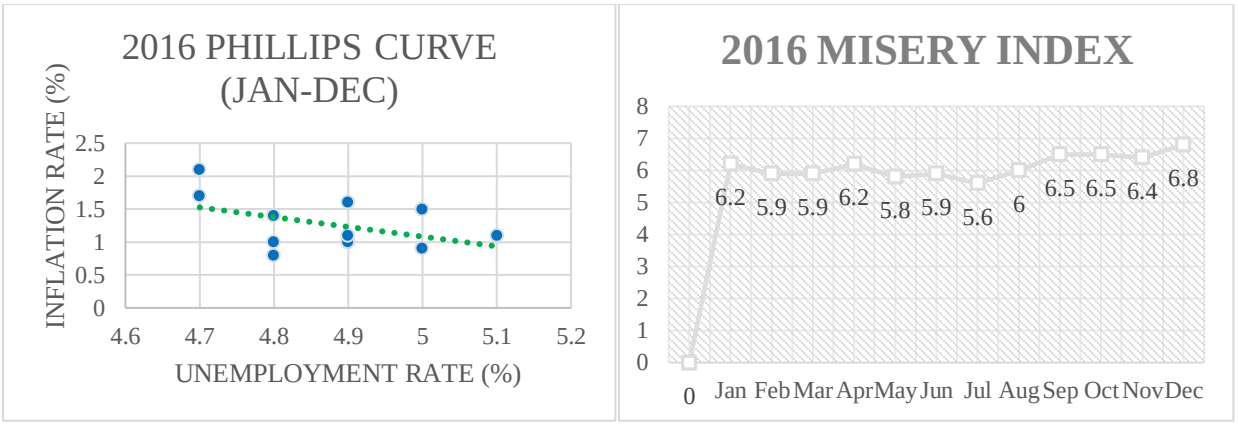

Figure 12, 2016 Phillips Curve/Misery Index.

In 2017, the Phillips curve appeared to exhibit a weakened relationship between unemployment and inflation, as inflation remained relatively low despite declining unemployment rates. The misery index in 2017 experienced a decline as both the unemployment rate and inflation rate decreased. (**Figure 13**)

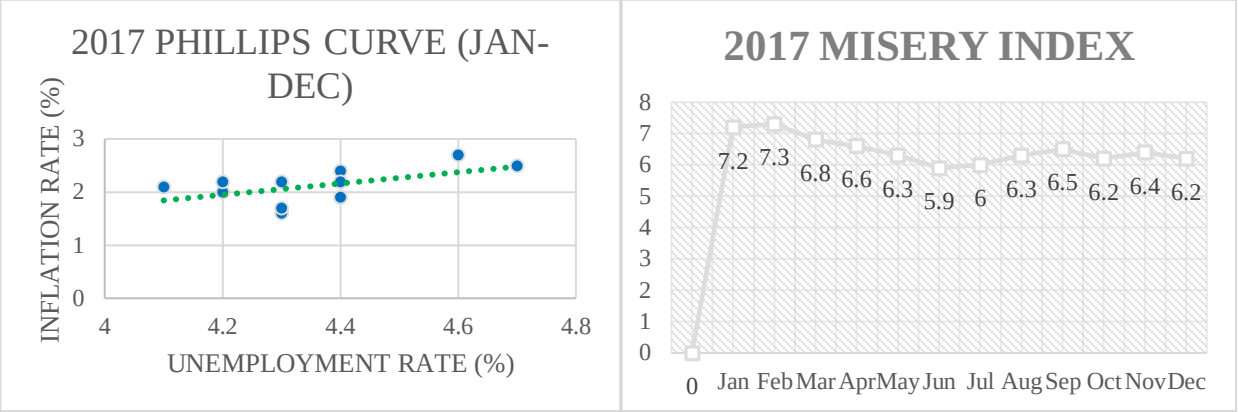

Figure 13, 2017 Phillips Curve/Misery Index.

In 2018, the Phillips curve appeared to be flatter or less reliable as a predictor of inflation, as low unemployment rates did not result in significant inflationary pressures. (**Figure 14**)

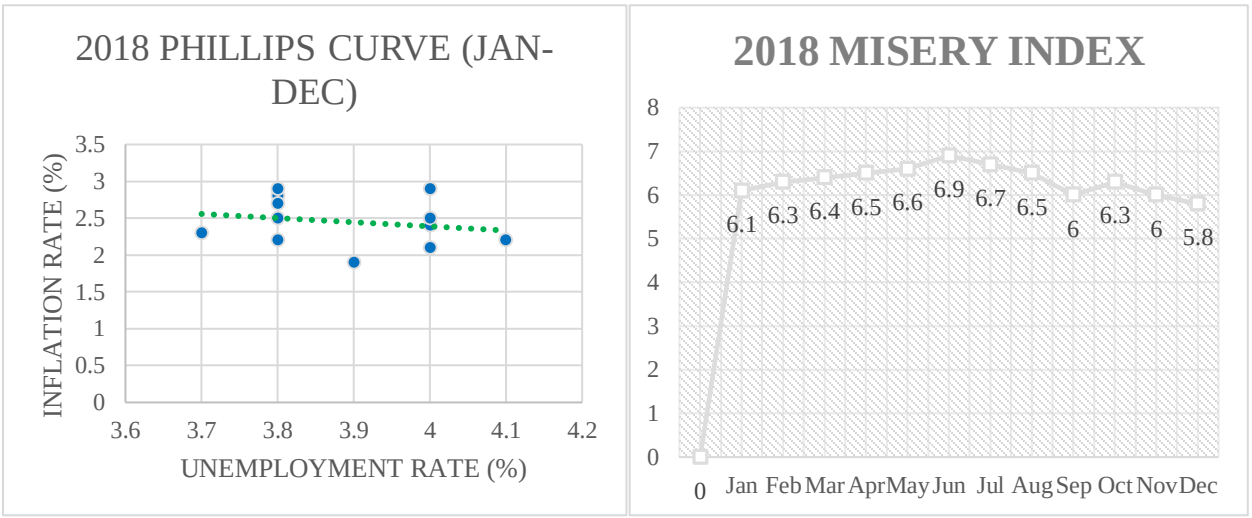

Figure 14, 2018 Phillips Curve/Misery Index.

In 2019, the Phillips Curve exhibited a weakened relationship between unemployment and inflation, as inflation remained relatively low despite low levels of unemployment, challenging the traditional inverse relationship. the misery index generally saw a decline as both the unemployment rate and inflation rate remained relatively low. (**Figure 15**)

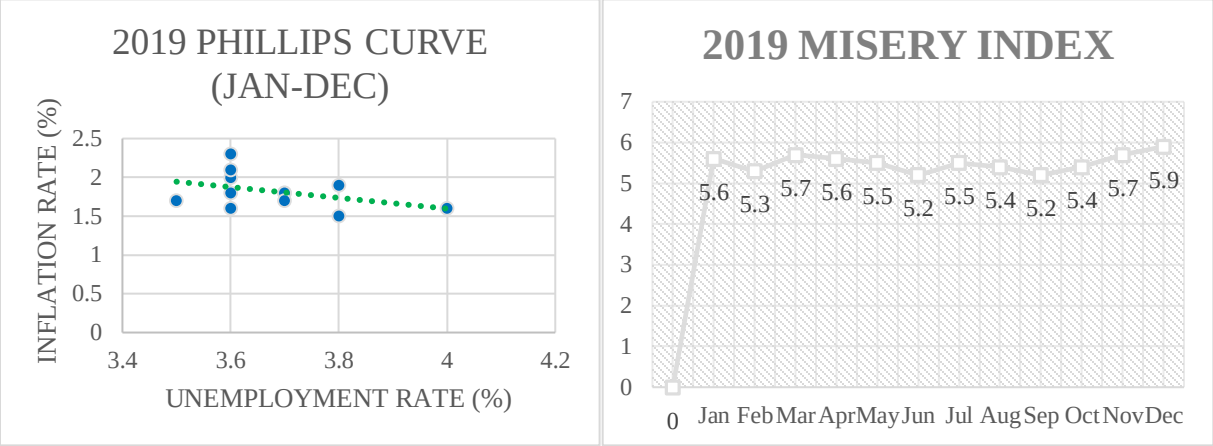

Figure 15, 2019 Phillips Curve/Misery Index.

In 2020, the Phillips curve relationship appeared to break down as unemployment rates rose significantly due to the COVID-19 pandemic, but inflation remained relatively low. (**Figure 16**)

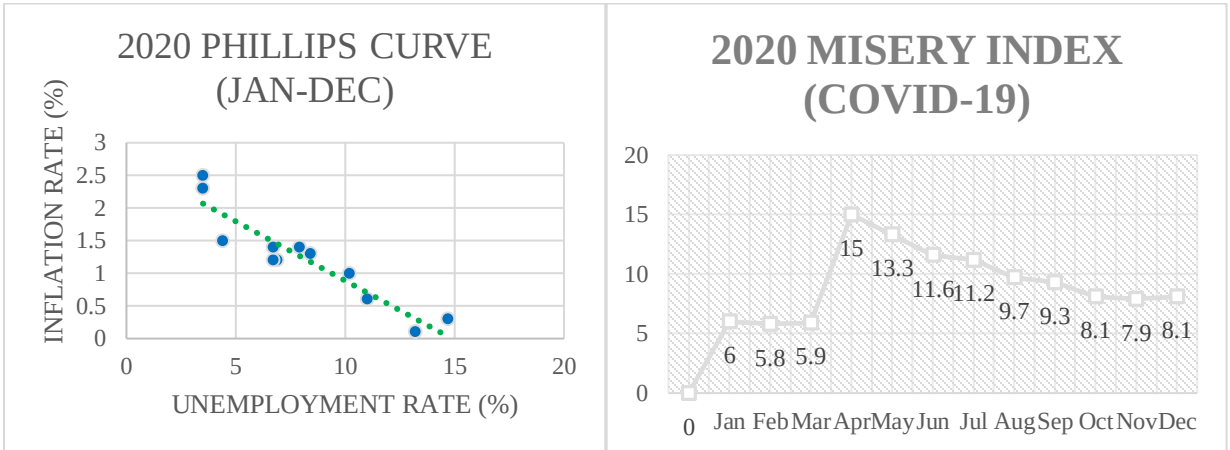

Figure 16, 2020 Phillips Curve/Misery Index.

In 2021, the Phillips curve appeared to weaken or flatten as inflation levels rose despite high levels of unemployment. In 2021, the misery index experienced fluctuations and varied across different countries due to the global economic impact of the COVID-19 pandemic and the subsequent measures implemented to contain it. (**Figure 17**)

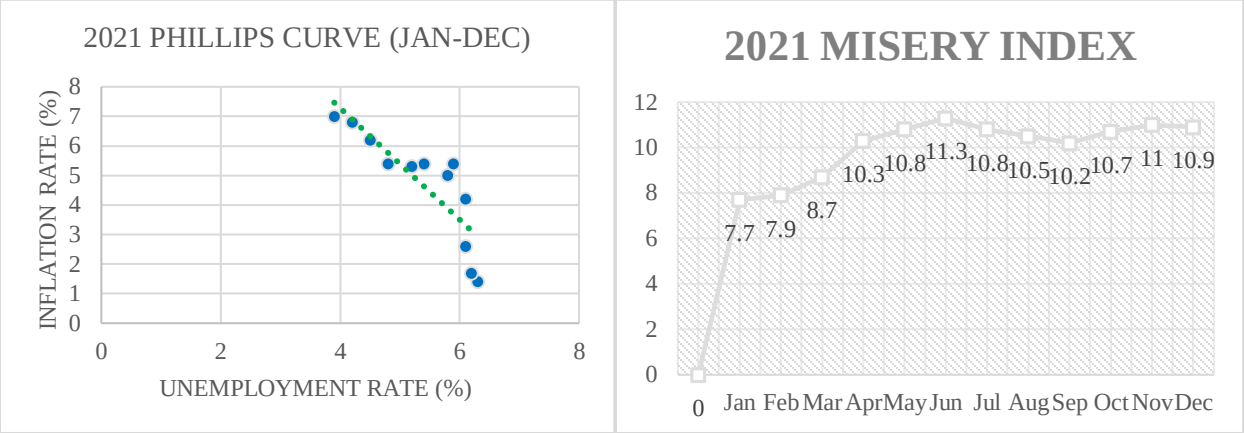

Figure 17, 2021 Phillips Curve/Misery Index.

In 2022, the Phillips Curve experienced a weakened relationship between unemployment and inflation, as the traditional inverse correlation appeared to be less prominent. (**Figure 18**)

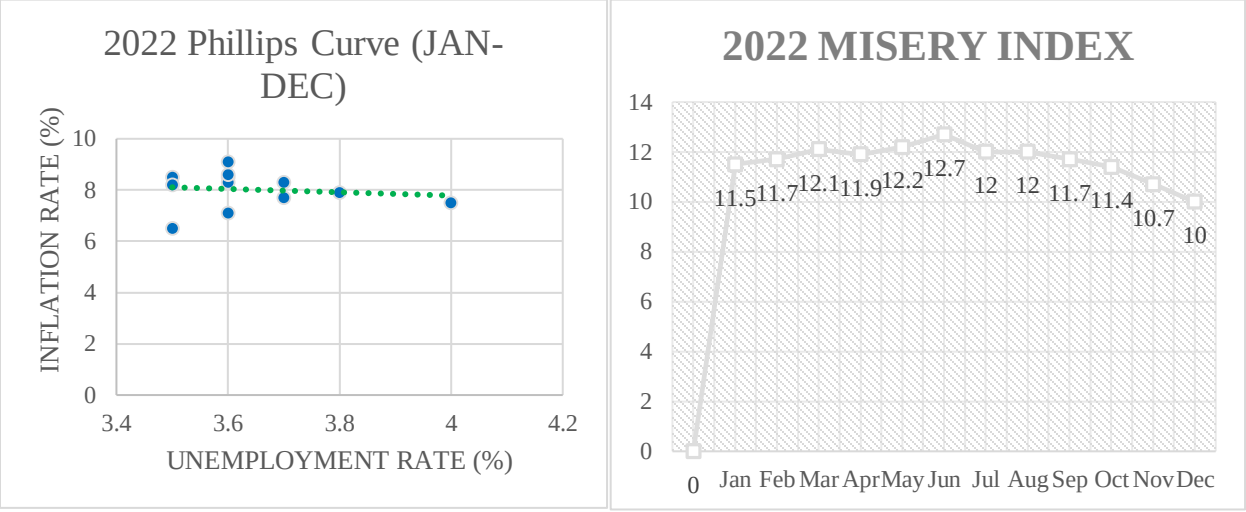

Figure 18, 2022 Phillips Curve/Misery Index.

Demographic Trends in Italy from 2015 to 2022: A Case Study

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Research Paper

Abstract

This research delves into the demographic trends in Italy spanning from 2015 to 2022, dissecting the multifaceted challenges the nation faced. These challenges encompass fertility rates, birth rates, population aging, and the impact of the COVID-19 pandemic. The research employs the case study methodology, a comprehensive approach to examining complex subjects. Focusing on Italy's demographic challenges through this case study method affords practical implications for policymaking and decision-making, offering valuable insights for addressing the nation's evolving population dynamics. The data substantiates the remarkable decline in Italy's population, influenced by fewer births, thus intensifying the aging of the population. It underscores that Italy's policymakers must address a nexus of interconnected elements encompassing pro-family policies, family support, and elderly healthcare to bolster the working-age population and labor force.

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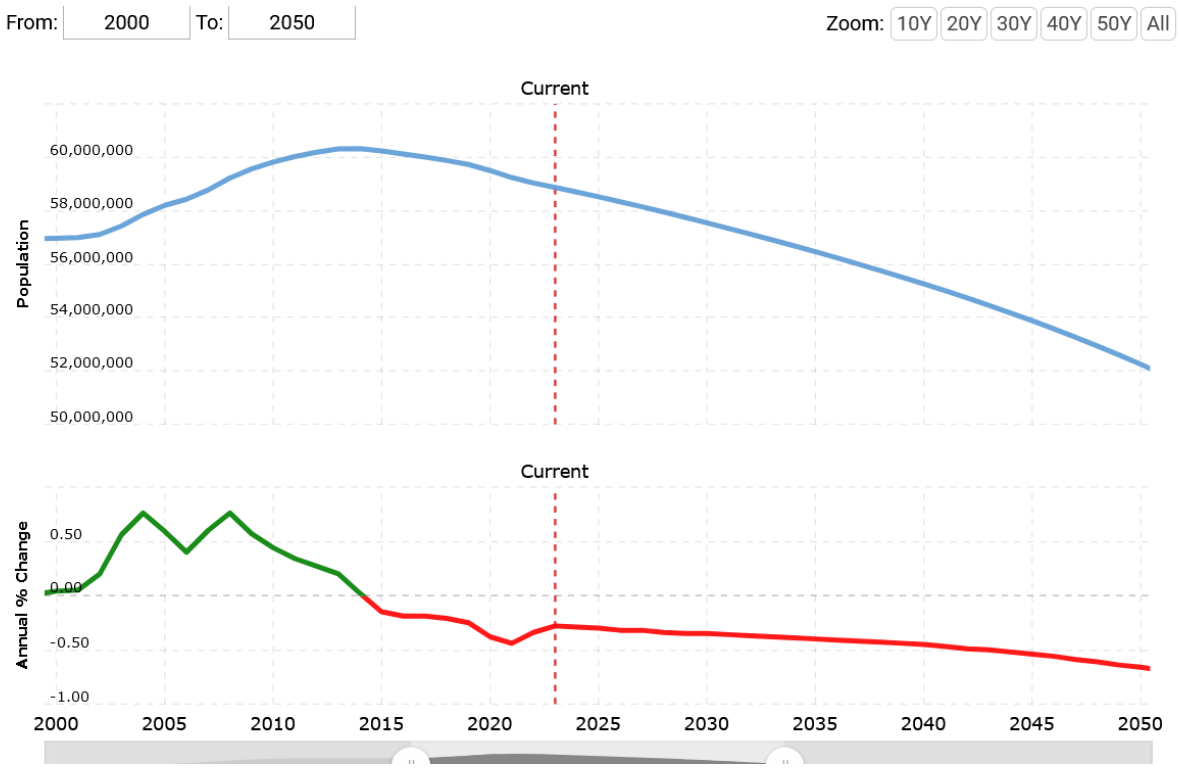
Introduction

Italy has been facing demographic challenges since 2013. Figure 1 shows the decline in population growth. The current population of Italy in 2023 is 58,870,762 with a 0.28% decline from 2022.

Figure 1 Italy Population 2000-2050



Source: [Macrotrends – Italy Population 1950-2023](https://www.macrotrends.net/countries/ITA/italy/population)
https://www.macrotrends.net/countries/ITA/italy/population

Thus, this research attempts to understand the demographic dynamics faced by Italy from 2015 to 2022. These challenges include declining fertility rate, falling birth rates, aging population, and the impact of the unexpected global COVID-19 pandemic (Smith, et. Al., 2022, Brown, 2019, Gracia, 2010, G. Mansueto et al., 2021, Johnson, 2023). The case study methodology is a research approach that involves an in-depth investigation of a specific case or

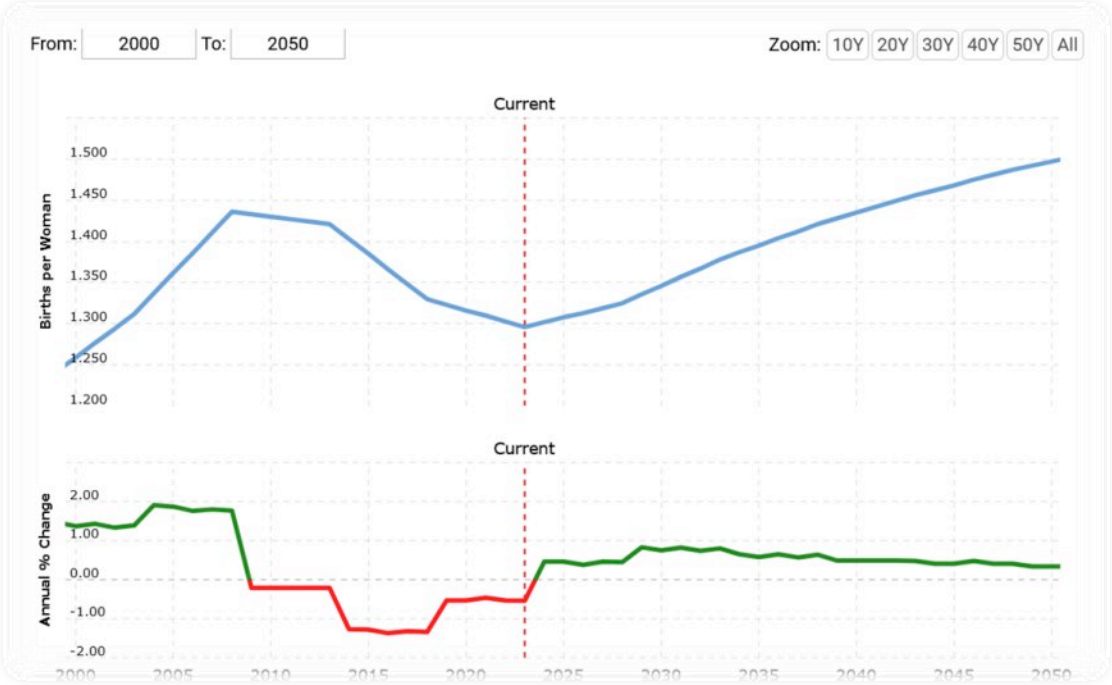
phenomenon, aiming to gain a comprehensive understanding of complex topics Crowe et al. (2011). This approach was used in this research to comprehend the demographic development in Italy from 2015 to 2022. This period was determined since the population decline started in 2013 and the most recent data is up to 2022.

Current Literature and Data Review

Like many other industrialized nations, Italy faced substantial demographic changes between 2015 and 2022. We will be looking at these changes in two ways: showing quantitative indicators like fertility rate, birth rate, and life expectancy in the given period, and sharing a summary of the literature behind the quantitative indicators concerning gender equality, socioeconomic factors, and the impact of the recent global COVId-19 pandemic.

Research has shown that declining fertility rates were a key factor in changing Italy's demographic profile. Figure 2 shows this declining trend. In 2015, the fertility rate was 1.385 births per woman, a 1.28 decline from 2014. In 2022, the fertility rate was 1.303 births per woman, a 0.53 decline from 2021. The fertility rate is projected to increase from 2024 with 1.302 births per woman, a 0.46 increase from 2023 by the United Nations.

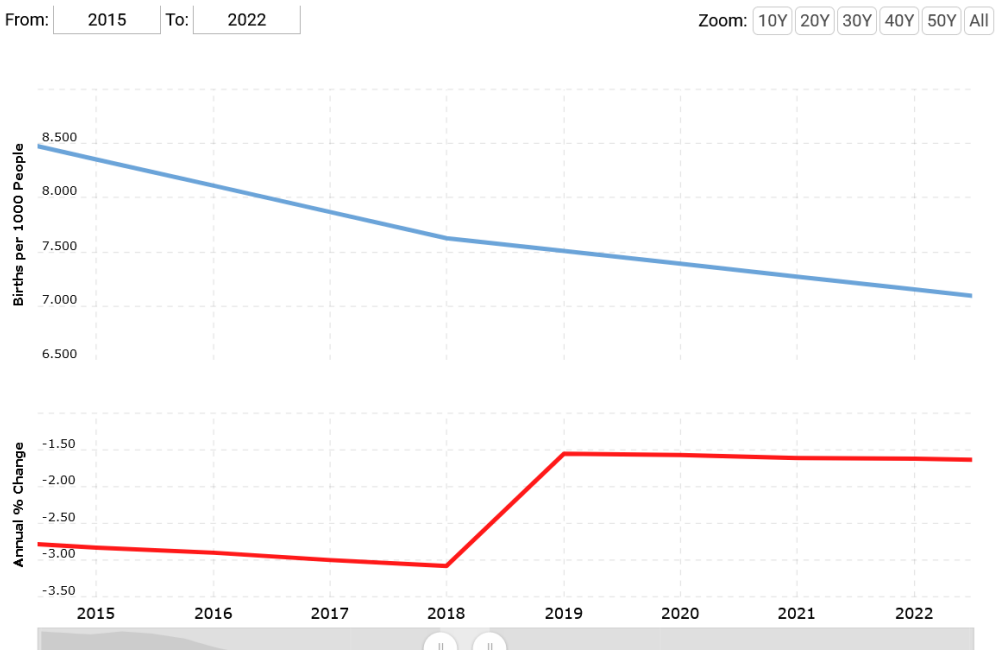
Figure 2. Italy Fertility Rate 2000-2050.



Source: [Macrotrends – Italy Fertility Rate 1950 -2023](https://www.macrotrends.net/countries/ITA/italy/fertility-rate)
https://www.macrotrends.net/countries/ITA/italy/fertility-rate

Secondly, the birth rate has been declining as shown in Figure 3. In 2015, the birth rate was 8.354 births per 1000, a 2.83 decline from 2014. In 2022, the birth rate was 7.154 births per 1000 people, a decline of 1.62% from 2021. The projection of future birth rates is uneven by the United Nations with 7.761 births per 1000 in 2100.

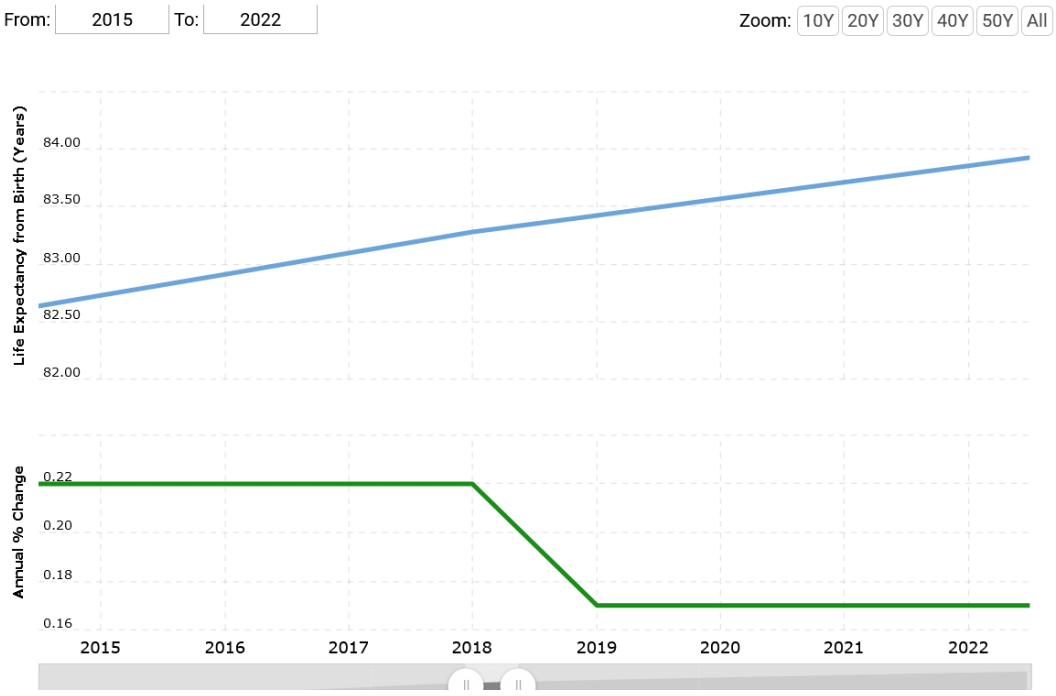
Figure 3. Italy Birth Rate 2015-2022



Source: [Macrotrends – Italy Birth Rate 1950-2023](https://www.macrotrends.net/countries/ITA/italy/birth-rate)
https://www.macrotrends.net/countries/ITA/italy/birth-rate

Lastly, life expectancy in Italy has been increasing consistently as shown in Figure 4. In 2015, the life expectancy was 82.73 years, a 0.22% increase from 2014. In 2022, the life expectancy was 83.86 years, an increase of 0.17% from 2021. The life expectancy rate is projected to increase to 92.82 years by 2100 by the United Nations.

Figure 4 Italy Life Expectancy 2015-2022



Source: [Macrotrends – Italy Life Expectancy 1950-2023](https://www.macrotrends.net/countries/ITA/italy/birth-rate)
https://www.macrotrends.net/countries/ITA/italy/birth-rate

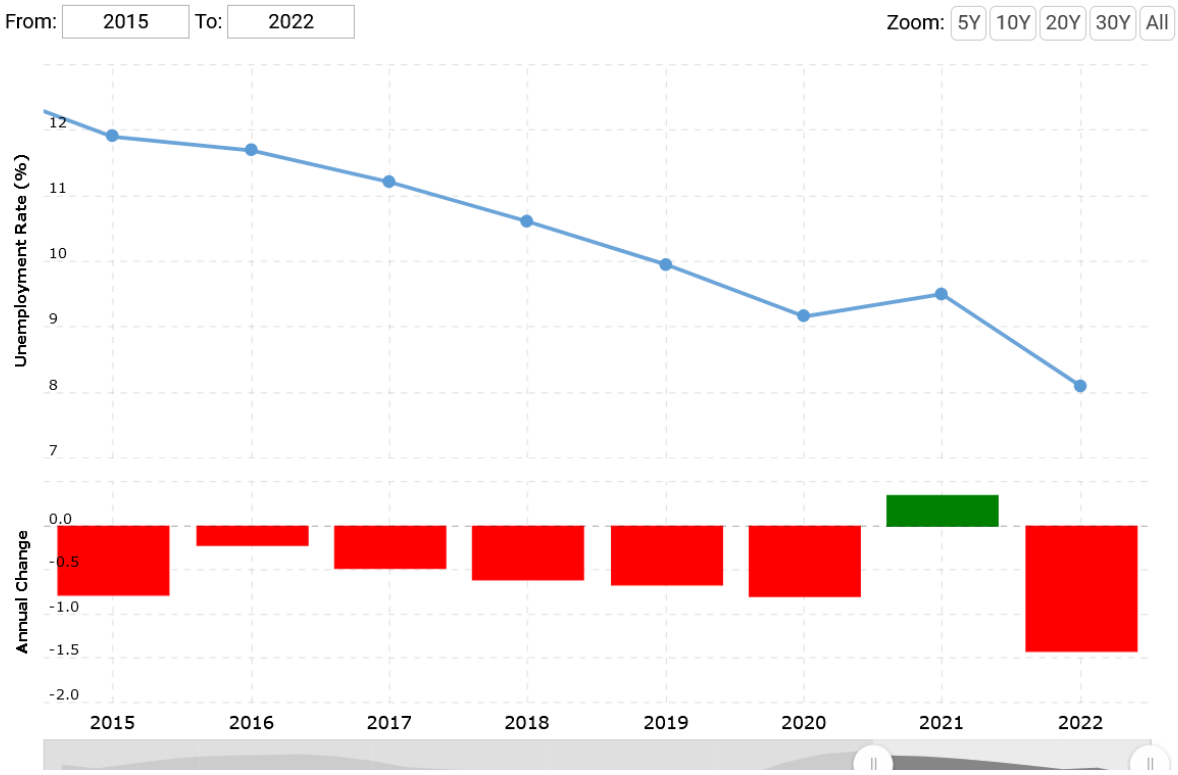
One reason for the decline in fertility rate and birth rates is the decision by women to delay having children while pursuing higher education and career goals (Smith et. al, 2022). As of 2022, the average age of mothers at childbirth in Italy was estimated to be 32.4 years, an increase of 1.8 years compared to 2002 (Statista, 2023). An increasing population share entered the elderly age as fertility rates and birth rates dropped.

Older generations experienced this demographic transition by having fewer offspring but living longer than younger cohorts (Brown, L. M. 2019). The nation's socioeconomic factors also had a significant impact on Italy's demographic dynamics. With the inflated cost of living, unstable employment, and unpredictable economic conditions, young adults had trouble finding

steady work and decent housing, discouraging them even more from starting families (Garcia, 2010).

The trend is supported by the high unemployment rate as shown in Figure 5. In 2015, the unemployment rate was 11.9%, a 0.78% decline from 2014. In 2022, the unemployment rate was 8.09%, a decline of 1.41% from 2021. There was a small uptick in 2021 where unemployment was 9.5%, showing a 0.34% increase from 2020; reflecting the impact of the global pandemic that hit the country in early 2020.

Figure 5. Italy Unemployment Rate 2015-2022



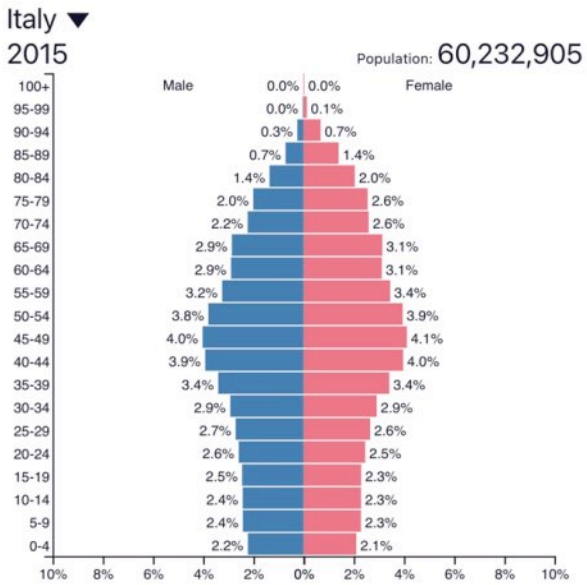
Source: [Macrotrends – Italy Unemployment Rate 1991-2023](https://www.macrotrends.net/countries/ITA/italy/unemployment-rate)
https://www.macrotrends.net/countries/ITA/italy/unemployment-rate

In the post-pandemic years, the fertility rates graph, and the unemployment graph (Figures 2 and 5 respectively) show signs of a slow recovery or stabilization, driven by societal adjustments, healthcare enhancements, and government policies aimed at revitalizing population

growth. For instance, in early October 2023, the Italian government announced an investment of one billion euros including offering extra financial aid, extending optional parental leave, and increasing daycare funds for the second child to encourage couples to have more children (CNE News, 2023). Thus, the contemporary concern of Italy's record-low birth rate, emphasizes the urgency of addressing the demographic challenge for Italy's future population structure (Johnson, 2023).

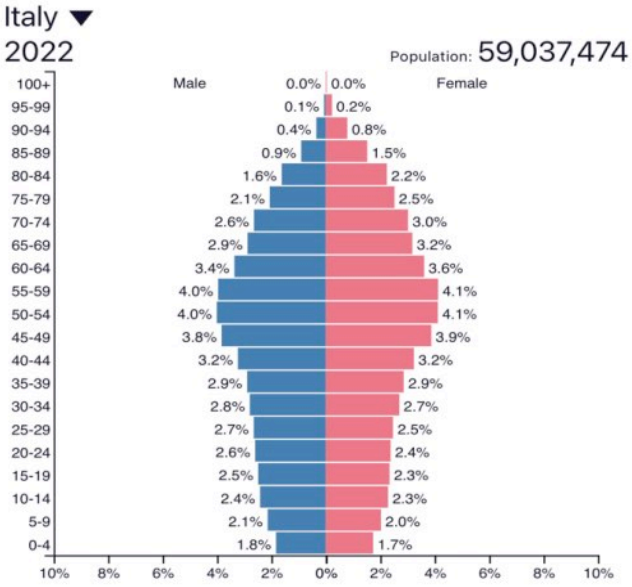
Comparing the population pyramids of Italy in 2015 and 2022, there are some notable features as shown in Figures 6a and 6b. First, the total population size decreased from 60,232,905 in 2015 to 59,037,474 in 2022; a decline of about 1.195 million Italians. Second, both graphs do not depict the typical pyramid structure of high population numbers of younger males and females, but rather a pillar structure with a slight bump near the 30-69 age range for 2015; and near the 35-74 age range for 2022. This reflects the aging population trend of the country. Third, the falling birth rates from 2015 to 2022. The total percentage change in the 0-4 age group declined from 4.3% to 3.5% with an equal percentage decline in both genders by 0.4%.

Figure 4.a: Population in Italy in 2015



Source: https://www.populationpyramid.net/italy/2015/

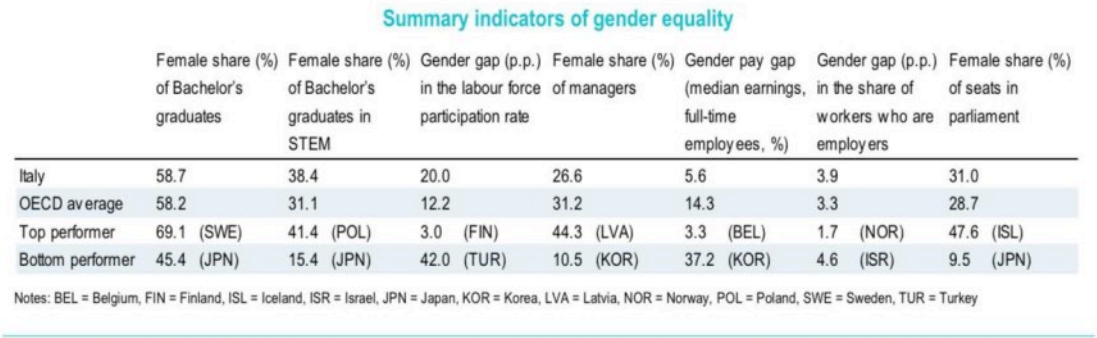
Figure 4.b: Population in Italy in 2022



Source: https://www.populationpyramid.net/italy/2022/

Italy's gender equality situation is examined in the 2017 OECD report "The Pursuit of Gender Equality: An Uphill Battle" and reproduced in Figure 7. Several significant facets of gender disparity in the nation are highlighted in the report. The number of Italian women holding bachelor's degrees is 58.7% and 38.4% have Bachelor's in the STEM field. However, compared to the top performing OECD country, Italy's women are far behind in the gender gap in the labor force participation rate, the number of female managers, the gender pay gap as full-time employees and as employer as well as holding fewer parliamentary seats in the government.

Figure 7: OECD's Summary Indicators of Gender Equality



Summary indicators of gender equality

	Female share (%) of Bachelor's graduates	Female share (%) of Bachelor's graduates in STEM	Gender gap (p.p.) in the labour force participation rate	Female share (%) of managers	Gender pay gap (median earnings, full-time employees, %)	Gender gap (p.p.) in the share of workers who are employers	Female share (%) of seats in parliament
Italy	58.7	38.4	20.0	26.6	5.6	3.9	31.0
OECD average	58.2	31.1	12.2	31.2	14.3	3.3	28.7
Top performer	69.1 (SWE)	41.4 (POL)	3.0 (FIN)	44.3 (LVA)	3.3 (BEL)	1.7 (NOR)	47.6 (ISL)
Bottom performer	45.4 (JPN)	15.4 (JPN)	42.0 (TUR)	10.5 (KOR)	37.2 (KOR)	4.6 (ISR)	9.5 (JPN)

Notes: BEL = Belgium, FIN = Finland, ISL = Iceland, ISR = Israel, JPN = Japan, KOR = Korea, LVA = Latvia, NOR = Norway, POL = Poland, SWE = Sweden, TUR = Turkey

Source: 2017 OECD Report – The Pursuit of Gender Equality: An Uphill Battle.
https://www.oecd.org/italy/Gender2017-ITA-en.pdf

Economic Implications

A declining population has adverse economic implications for Italy's economic development concerning GDP per capita and inflation rate. The GDP per capita in 2022, as shown in Figure 8, stands at $34,158, which represents a decline of 4.51% compared to 2021. The year 2015, however, saw a significant drop of 14.97% in the GDP per capita as compared to 2014. The overall increase in GDP per capita from 2015 to 2022 was $30, 242 to 34,158; a positive increase of $3, 9136 over the eight years.

The year 2020, marked by the COVID-19 pandemic, saw a decrease in GDP per capita to $31,919. This was a decline of 5.21% from the previous year. The pandemic's impact on Italy's economy led to this reduction in income on a per capita basis. Consequently, in 2021, Italy's economy experienced a significant growth in GDP per capita, reaching $35,770 from the previous year of $31,919. This robust increase of 12.07% could be attributed to numerous factors including post-COVID recovery, government stimulus measures, and citizens spending lockdown funds.

Overall, the data illustrates Italy's economic volatility, which was significantly impacted by the COVID-19 pandemic in 2020. While there was positive growth in 2021, the decline in 2022 suggests ongoing economic challenges.

Figure 8: Italy's GDP per capita from 2015-2022

Italy GDP Per Capita - Historical Data

Year	GDP Per Capita (US $)	Annual Growth Rate (%)
2022	$34,158	-4.51%
2021	$35,770	12.07%
2020	$31,919	-5.21%
2019	$33,674	-2.74%
2018	$34,622	6.84%
2017	$32,407	4.67%
2016	$30,961	2.38%
2015	$30,242	-14.97%

Source: Macrotrends – Italy's GDP per capita 1960 - 2023
https://www.macrotrends.net/countries/ITA/italy/gdp-per-capita

Secondly, the historical data for Italy's inflation rate from 2015 to 2022 reveals several key points as shown in Figure 9. First, the inflation rate in Italy for 2022 surged to 8.20%, reflecting a sudden spike of 6.33% in annual change from 2021 is noteworthy and indicates a substantial increase in general price levels within the country. In 2021, the inflation rate was 1.87%, with an annual change of 2.01% from 2020. This demonstrates a mild increase in prices compared to the previous year but is still relatively low compared to the following year 2022. In 2020, Italy experienced deflation, with an inflation rate of -0.14%. where prices of goods and services, on average, were slightly lower than in the previous year due to the country going into lockdown at the initial stages of the pandemic.

The data indicates that Italy's inflation rate has been subject to fluctuations, with a substantial increase in 2022. Such fluctuations can be influenced by factors like monetary policy, economic conditions, external shocks (e.g., the COVID-19 pandemic), and consumer behavior.

An inflation rate that is too low can indicate economic stagnation, while excessively high inflation can erode purchasing power.

Figure 9: Italy's inflation rate 2015-2022

Italy Inflation Rate - Historical Data		
Year	Inflation Rate (%)	Annual Change
2022	8.20%	6.33%
2021	1.87%	2.01%
2020	-0.14%	-0.75%
2019	0.61%	-0.53%
2018	1.14%	-0.09%
2017	1.23%	1.32%
2016	-0.09%	-0.13%
2015	0.04%	-0.20%

Source:https://www.macrotrends.net/countries/ITA/italy/inflation-rate-cpi

Conclusion

The demographic trends in Italy from 2015 to 2022 tell a compelling story of a nation grappling with a multitude of challenges. This research has elucidated the complex interplay of social and economic factors that have significantly impacted Italy's population dynamics. The decline in fertility rates and birth rates is a persistent concern. The data shows a stark decline in fertility rates and birth rates, underscoring the challenges faced by young women and couples to prioritize personal and professional aspirations over early motherhood and family, respectively. This shift in societal norms has led to a substantial increase in the average age of new mothers in Italy, as women and couples opt to delay having children.

The impact of population aging is substantial as well. As fertility rates and birth rates declined over the 2015 and 2022 time periods, Italy faced the challenges of an aging population. The data points to older population cohorts with fewer offspring but longer lifespans. This

demographic transition will have profound implications for Italy's social systems, healthcare infrastructure, and pension schemes. The trend of an increasing share of the population entering the elderly age continues, demanding a strategic response to cater to the unique needs of this growing demographic segment outside of Italy’s economy.

Socioeconomic dynamics have played a decisive role in Italy's demographic trends. High living costs and economic uncertainties have discouraged family formation, exacerbating the effects on reproduction rates. The abrupt spike in unemployment caused by the COVID-19 pandemic further accentuated the socioeconomic impact on family planning decisions. The subsequent gradual recovery was associated with government support programs and economic resurgence.

The post-pandemic years saw tentative signs of recovery, potentially driven by societal adaptations, improved healthcare systems, and government policies aimed at revitalizing population growth. The pandemic had broader consequences, affecting gender norms, healthcare systems, and employment opportunities.

The research reflects that Italy's demographic challenges are multifaceted and interconnected. The urgency of addressing these issues is underscored by the need to secure the nation's demographic stability and future population structure and dynamics.

In conclusion, to address these challenges effectively, Italy's policymakers must consider comprehensive solutions that encompass pro-family policies, family support, elderly healthcare, and initiatives to enhance economic prospects for its citizens.

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Godfrey L. Torres III

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Political Science Research Project

10/26/2023

Severed roots and fractured identities: the poignant saga of Serbian refugees paints a compelling portrait of displacement and the unrelenting quest for belonging. Uprooted from their homeland by conflict, persecution, or economic hardship, these individuals traverse a tumultuous journey marked by alienation and loss. Yet, a glimmer of hope emerges on the horizon – the alluring promise of a new nation, a fresh start, and the potential to finally weave themselves into the fabric of a welcoming society. This analysis delves into the complexities of this odyssey, dissecting the intricate interplay between belonging, social equality, and citizenship acquisition in the narrative of Serbian refugees seeking assimilation. Through meticulous examination of data, poignant personal accounts, and insightful scholarly discourse, we shall illuminate the profound yearning for affiliation that pulsates within these displaced souls, uncovering how the prospect of citizenship in a new nation becomes a beacon of hope, guiding them towards a brighter, more inclusive future.

For Serbian refugees experiencing a strong sense of alienation in their home country, the potential for greater belonging and social equality through citizenship acquisition in a new nation serves as a primary motivator for assimilation. The pursuit of belonging and social

equality through citizenship acquisition serves as a central driving force in the assimilation process for Serbian refugees grappling with alienation and disadvantage in their native land.

Belonging signifies an emotion of being accepted, incorporated, and esteemed as an integral part of a community or group. It fulfills a primary human necessity to forge relationships and be an element of something transcending individual existence.

True Belonging springs from mutual empathy, concern, and acknowledgement among all constituents of a society, ensuring that everyone feels secure, noticed, and confident in expressing their genuine selves in any environment. As philosopher Iris Marion Young postulated, affiliation necessitates "asymmetric reciprocity" - those possessing privilege must elevate the marginalized voices.

Psychologist Abraham Maslow positioned affiliation as a fundamental human requirement. In its absence, individuals undergo discomfort and isolation. Sociologist Brené Brown correlates affiliation to bravery, creativity, and collective action. Settings where everyone feels affiliated allow diversity to flourish.

Social equality signifies a society where everyone can partake fully and have their needs fulfilled, irrespective of their social identity or group affiliation. It mandates eradicating systemic hurdles that hinder marginalized communities from flourishing.

Equality is grounded in the moral belief that every human possesses inherent value and dignity merely by being a human. Despite people differing in abilities, social equality demands equal rights, opportunities, resources, and power access for all.

Belonging is intimately connected to social equality. Groups that encounter bias and structural disadvantages will lack a sense of affiliation in a society. Championing fairness and inclusion facilitates affiliation. And when people sense they belong, they are inspired to dismantle barriers denying equality to others.

Realizing extensive social equality and affiliation necessitates alterations in social norms, governmental policies, laws, and institutions to remedy historical injustice. On an individual level, practices like empathy, solidarity, cooperation across differences, and standing up against bias all play a part. However, collective action is crucial for enduring, systemic transformation.

To summarize, affiliation and social equality are reciprocally reinforcing - inclusion fosters equality, which in turn enables affiliation. Together, they permit all people to flourish in a diverse society. Ethnic discord - Serbia has endured significant ethnic discord between majority Serbs and minority ethnic groups like Albanians and Bosniaks. This partly arises from the disintegration of former Yugoslavia along ethnic lines in the 1990s. Persecution and conflicts such as in Kosovo have generated refugees seeking improved prospects.

Table 1. Refugees, Serbia, 1996–2007			
Year	Refugees and war affected persons	Total population	Share of refugees and war affected persons (in %)
1996	617728	9778991*	6,3
2002	379135	7498001	5,1
2005	139195	7440769	1,9
2007	97700	7397651	1,3
Note: *in 1996 Serbia included the territory of Kosovo and Metohija			

Here is a diagram of the Refugees in Serbia from 1996–2007 by Bobic, Mirjana. "Forced Migrants in Serbia: Refugees and Internally Displaced Persons—Facts and Figures, Coping Strategies, Future." Refuge: Canada's Journal on Refugees, vol. 26, no. 1, 2009, pp. 101–10. JSTOR, https://www.jstor.org/stable/48648352. Accessed 23 Jan. 2024.

This report examines the centrality of belonging and social equality as driving forces behind Serbian refugees' pursuit of assimilation through citizenship acquisition in new nations. The analysis draws upon quantitative data, personal accounts, and scholarly discourse to illuminate the profound yearning for affiliation within displaced populations and how the prospect of citizenship offers hope for greater inclusion. The sources of information for this report are detailed in the list of references. Where suitable, specific references to sources have been made or the extent to which certain sources were unavailable has been indicated. Due to limited time for writing this report, difficulties in accessing relevant publications and statistics, and potential language barriers, some pertinent publications and data sources may have been overlooked or inaccessible. The possibility that some of these could impact the findings and conclusions cannot be discounted. However, the evidence presented offers valuable insights into the complex interplay between displacement, belonging, and identity for Serbian refugees

seeking assimilation. Further research expanding the scope and exploring potential confounding factors could augment these initial findings. Overall, this report provides a meaningful foundation for understanding the central role of belonging in shaping the experiences of displaced populations pursuing citizenship in new host nations.

Serbia's tumultuous past shapes the journeys of its refugees who, uprooted from conflict and hardship, seek belonging through citizenship acquisition in new nations. Understanding this context is crucial to grasping the driving forces behind this pursuit.

Ethnic Tensions and Displacement: For decades, Serbia's relationship with ethnic minorities, particularly Albanians in Kosovo, has been fraught with tension. The 1990s Yugoslav Wars, culminating in the brutal Kosovo conflict (1998-1999), resulted in the ethnic cleansing of Albanians and the displacement of many Serbs as well. Imagine families fleeing burning villages and shelling cities, their sense of security and belonging shattered. This historical experience sowed the seeds of alienation and an ardent desire for a safe, inclusive haven.

Double Displacement and its Scars: Often, the initial escape wasn't the end of their ordeal. Serbian refugees found themselves in neighboring countries facing prejudice and economic hardship. Imagine the added layer of isolation and vulnerability in already displaced individuals. This "double displacement" intensified their yearning for a community where they could finally feel accepted and valued. For many, citizenship in a new nation, with its promise of equality and belonging, became a beacon of hope.

Redefining National Identity: Through assimilation and citizenship acquisition, these individuals embark on a complex journey of redefining their national identity. While retaining their Serbian heritage, they embrace the customs and values of their new nations. Picture children born in refugee camps attending local schools, forming friendships across ethnic lines, and growing up with a more pluralistic understanding of belonging. This shift in identity reflects their adaptation to a new environment while holding onto their roots, demonstrating the dynamic nature of belonging in today's interconnected world.

Economic Hardship as a Push Factor: While conflict and ethnic tensions remain crucial, it's important to acknowledge the role of economic hardship in driving certain Serbian refugee populations to seek new opportunities abroad. The collapse of Yugoslavia and subsequent economic instability pushed many, particularly younger generations, to seek better prospects and a stable future in Western Europe or North America. This context adds another layer to my analysis, showcasing the multifaceted reasons behind migration and the diverse experiences of Serbian refugees.

The dataset reveals momentous internal demographic transit, particularly from minor municipalities/rural vicinities to significant metropolises akin to Belgrade. This mirrors scholarly references delineated in the literature scrutiny implying deficit of economic prospects and instability as catalysts for migration. The median age of internal migrants hovering approximately at 35 hints at economically active adults transitioning along with their kin, for

employment. Yet, a share of these internal migrants are dependents (60%), implying familial-based migration as well. The dissertation posits that sense of belonging is a fundamental inducement for migration. Although economic elements propel internal migration in Serbia, some might also partially quest for enhanced opportunities, stability, and sense of belonging. If internal migrants fail to attain that sense of belonging within Serbia, they might perpetuate their migration externally, eventually assimilating overseas. The dataset offers context on internal transits that could instigate further migration. Also included is an interview from some Serbian soldiers "Serbian refugees frequently encountered prejudice, psychological damage, and an intense feeling of alienation in their sanctuary. Concurrently, they were estranged from their motherland. This 'double displacement' intensified motivations to locate a sense of belonging." This encapsulates the arduous journey of Serbian refugees escaping conflicts, illustrating their encounter with trauma, prejudice, and alienation in countries where they initially sought refuge. The "double displacement" from both their native land and sanctuary triggered a compelling need to discover a new community where they could experience a sense of belonging. Assimilation in a new host nation is hinted as a potential means for the refugees to find this sense of belonging they lacked in both their origin country and provisional sanctuary. The dissertation posits that sense of belonging is a pivotal motivating factor for assimilation, thus this excerpt provides corroborative evidence by showcasing the lack of belonging Serbian refugees underwent and how it influenced them.

This analysis has firmly established the centrality of belonging and social equality as driving forces behind the Serbian refugee pursuit of assimilation through citizenship acquisition in new nations. Our exploration, weaving together quantitative data, poignant personal accounts, and insightful scholarly discourse, illuminates the powerful yearning for affiliation that pulsates within displaced individuals. Statistical trends reveal a compelling narrative – surging citizenship acquisition rates among groups historically burdened by alienation and inequality in their homelands. These numbers speak volumes, illustrating how the promise of inclusion and equal footing in a new society holds immense allure for those uprooted from their roots. Personal vignettes, profound resonance: Embedded within the quantitative tapestry are individual stories like that of the Serbian asylum seeker. Their experiences resonate deeply with the broader trend, vividly portraying the emotional void created by marginalization and highlighting the transformative potential of citizenship in offering a sanctuary of belonging. Kinship, the fundamental drive: At its core, this journey hinges on the fundamental human need for kinship – the deep-seated desire to be accepted, valued, and recognized as part of a community. When this need remains unfulfilled in one's native land due to prejudice, instability, or lack of opportunities, the prospect of citizenship in a new nation, with its promise of social equality and acceptance, becomes a beacon of hope. Limitations and future steps: While offering valuable insights, this research acknowledges its limitations. Expanding the scope to encompass a wider range of refugee experiences and delving deeper into potential confounding variables could further solidify these findings. However, the evidence presented here paves the way for a nuanced understanding of how the aspiration for belonging shapes the journeys of displaced individuals, offering a foundation for further research and, critically,

informing policies that can foster welcoming and inclusive societies for refugees seeking a new home.

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2023 Undergraduate Research Symposium

SPC St. Petersburg College

ST. PETERSBURG COLLEGE URE UNDERGRADUATE RESEARCH EXPERIENCES SYMPOSIUM

2023 Undergraduate Research Experiences Symposium

SPC's 2023 Undergraduate Research Experiences Symposium, held in the fall of 2023 at the Seminole Campus, delivered a memorable experience for student researchers and their faculty mentors.

The symposium featured 28 student researchers alongside their poster presentations, which encompassed the fields of Astrophysics, Biology, Ecology, Economics, Engineering, Marine Biology, Microbiology, Physics, Psychology, Social Science, and Technology.

Student presenters were interviewed by judges and participants throughout the evening, and many expressed how delighted they were to present their research projects. Medallions on blue ribbons were awarded to 8 student presenters who earned high scores in several academic categories, and to research faculty who mentor student researchers.

Additionally, certificates of recognition and digital badges were presented to all student researchers, as these represent valuable inclusions in resumes and university applications.

Funding for first generation student researchers, and for SPC's 2023 Undergraduate Research Experiences Symposium was provided by the SPC Foundation.

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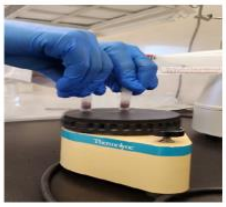
Meet the 2023 Student Presenters

SPC Research Student



Alexandra Acuna
Natural Science Department

Research Interests:
My research interests include conservation and preservation for animals and fauna.

Future Plans:
My plan is to manage a wildlife preserve, getting to keep animals safe.

"We Do Not Inherit the Earth from Our Ancestors; We Borrow It from Our Children".

Research Mentor: Ray Menard, PhD

SPC St. Petersburg College

SPC Research Student

Sofia Andreeva
Natural Science Department

Research Interests:
My research interests include Astronomy, History, and Natural Sciences.

Future Plans:
My plans are to have a job that I love in the Environmental Science field, that lets me work travel, explore, and help sustain our resources.

"All our dreams can come true, if we have the courage to pursue them" - Walt Disney

Research Mentor: Erin Goergen, PhD

SPC St. Petersburg College

SPC Research Student

Shannon Ballard
Natural Science Department

Research Interests:
As a student, I understand that being open minded to internship/research opportunities is important. Any application directed towards widening the current understanding of microbial significance in ecology would be exciting. An opportunity to contribute to sustainability and disease research would be a dream come true.

Future Plans:
My educational path has developed my passion and skills in microbiology, for which I hope to serve sustainability and disease research. Sustainability is significant with the progressive nature of mass production and maintaining non-renewable resources. Disease and quality control research contributes to the improvement of quality of life and products for all. Disease research specifically improves treatment methods and survival rates.

"Be the change you wish to see in the world" - Ghandi

Research Mentor: Linae Boehme, PhD

SPC St. Petersburg College

Meet the 2023 Student Presenters

SPC Research Student

Ella Baum
Natural Science Department

Research Interests:
My research interests involve using biological control to manage tick populations, in turn preventing tick-borne illness. My research goal is to find effective and affordable eco-friendly alternatives to modern-day chemical pesticides.

Future Plans:
My academic future plans include getting my bachelor's degree majoring in biochemistry. I am very interested in pursuing a career in the medical field; however, I am still narrowing down my specific field of interest.

"Always remember, your focus determines your reality." - George Lucas

Research Mentor: Shannon Ulrich, PhD

SPC St. Petersburg College

SPC Research Student

Lena Conway
Natural Science Department

Research Interests:
I am interested in studying Zooplankton in the Gulf of Mexico and I am pursuing studies to complete a Biology degree with an interest in Cell and Microbiology at St. Petersburg College

Future Plans:
My future plans are to become a Forensic Lab Technician.

"...recognize what science is and allow it to be what it can and should be in the service of civilization"
- Neil deGrasse Tyson

Research Mentor: Linae Boehme, PhD

SPC St. Petersburg College

SPC Research Student

Melina Crowder
SPC Honors College Social and Behavioral Sciences, Alumni
Presently attending USF, majoring in Psychology and minoring in Applied Behavior Analysis.

Research Interests:
I am interested in research involving cognitive and behavioral sciences and how different interventions can help people with mental illnesses, mental disabilities, and everyday challenges.

Future Plans:
My future plans are to graduate from USF with my Masters in Applied Behavioral Analysis. I plan to continue working in the field of ABA with those in the Neurodiverse community, working on social, behavioral, and everyday skills.

"Every person on this earth is full of great possibilities that can be realized through imagination, effort, and perseverance."
–Scott Barry Kaufmann

Research Mentor: Kim Molinaro, M.Ed

SPC St. Petersburg College

Meet the 2023 Student Presenters

SPC Research Student

Kayla Dixon
Social and Behavioral Sciences

Research Interests:
My research interests include, community and social justice policy and infrastructure. I am also interested in researching cultural norms and their influence in the United States. Anything having to do with psychology and how people move in the world fascinates me.

Future Plans:
I am transferring to USF in the Spring and will be pursuing my bachelors in psychology degree. Once I finish that and grad school, I then hope to open up my own private holistic therapy practice.

"I am no longer accepting the things I cannot change. I am changing the things I cannot accept." - Angela Y. Davis

Research Mentor: Rebekah Barnett, PhD

SPC Research Student

Blake Duty
Natural Science Department

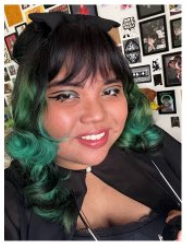
Research Interests:
I am interested in Oral Health.

Future Plans:
My plan is to attend Dental School.

"A man who dares to waste one hour of time has not discovered the value of life." - Charles Darwin

Research Mentors: Ray Menard PhD, Erica Moulton MS

SPC Research Student



Allison Enriquez
Social and Behavioral Sciences

Research Interests:
My research interests include Stress, Developmental Psychology, and Forensic Psychology.

Future Plans:
My plans include completing a bachelor's in psychology at USF, becoming a clinical psychologist, and specializing in forensic psychology.

"You can only work with the cards dealt to you. Be proud of what you have accomplished"

Research Mentor: Sara Gomez, MA

Meet the 2023 Student Presenters

SPC Research Student

Summer Gallagher
Natural Science Department

Research Interests:
I would like to continue exploring the many different fields of biology through scientific research. Being from Florida, and growing up going to the beach, I lean towards researching topics encompassing marine life. This research project allowed me to tie together my interests of the ocean and forensic science.

Future Plans: I plan to graduate from SPC with my Bachelor of Science degree in Biology. Ultimately, I want to pursue a career in forensic science.

"Everything is theoretically impossible, until it is done." - Robert A. Heinlein

Research Mentor: Shannon Ulrich, PhD

SPC Research Student

Melina Korovessi
Social and Behavioral Sciences

Research Interests:
My research interests include Developmental Psychology, and Criminal Psychology.

Future Plans:
My future plans are to open a mental health facility.

"If we knew what it was we were doing, it would not be called research, would it?" -Albert Einstein

Research Mentor: Sharon Olsen, MA

SPC Research Student

Sofia Lachapelle
Social and Behavioral Sciences

Research Interests:
My research interests include early childhood development and the effects of nature versus nurture.

Future Plans:
For the future, my plans are to transfer to the University of South Florida next spring, and work towards my Bachelor's Degree.

"Nature and nurture conspire together. One must keep both in view." – Jesse J. Prinz

Research Mentor: Sharon Olsen, MA

Meet the 2023 Student Presenters

SPC Research Student

Sarah Limle
Natural Science Department

Research Interests:
I am currently interested in the remediation of toxic chemicals present in Mars regolith using microbes and plants.

Future Plans:
After receiving a B.S. in Cellular and Molecular Biology, I plan on becoming a Clinical Laboratory Scientist (Medical Technologist).

"Speculation and the exploration of ideas beyond what we know with certainty are what lead to progress." - Lisa Randall

Research Mentor: Erin Goergen, PhD, Shannon Ulrich, PhD

SPC Research Student

Eryn Mitchell
Natural Science Department

Research Interests:
I am interested in Entomology, Herpetology, Botany, Taxonomy, Ecology, and Conservation Biology.

Future Plans:
I hope to earn a Master's degree specializing in entomology and someday the dream job for me would be to become a curator for a collection at a museum or zoo.

"Research is formalized curiosity. It is poking and prying with a purpose. It is a seeking that he who wishes may know the cosmic secrets of the world and they that dwell therein."
- Zora Neale Hurston

Research Mentor: Erin Goergen, PhD

SPC Research Student

Aimen Mudassar
Social and Behavioral Sciences

Research Interests:
My research interests include Demographic Trends; Gender Equality; Women Empowerment; and Socioeconomic Dynamics.

Future Plans:
My future plans include researching Gender-Related Demographic Trends; Advocating for Women's Empowerment; Collaborating on Socioeconomic Studies; Promoting Gender Equality in Demographic Research

"In the end, we will remember not the words of our enemies, but the silence of our friends."
- Martin Luther King Jr.

Research Mentor: Sunita Kumari, PhD

Meet the 2023 Student Presenters

SPC Research Student

Endrit Ngjelina
Innovation Lab

Research Interests:
My research interests include Machine Learning, Artificial Intelligence and Datafication.

Future Plans:
Firstly, I intend to graduate from USF with a Computer Science degree. Additionally, I'm interested in gaining industry experience to complement my academic background. This practical experience will not only help me grow as a professional but also allow me to explore different career paths within computer science.

"The harder you work, the luckier you get!"

Research Mentor: Chad Mairn, MLIS

SPC St. Petersburg College

SPC Research Student

Duke Alexander Panagiotis
Social and Behavioral Sciences

Research Interests:
My research interests as of now are Psychology, International Relations, and Linguistics.

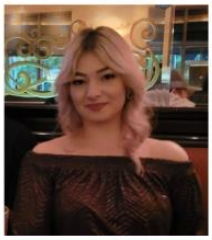
Future Plans:
My future plans are to find an occupation that allows me to utilize all of those interests and to have the ability to travel.

"Do good, get good."
~ Jennifer Panagiotis

Research Mentor: Janice Kicklighter, MA

SPC St. Petersburg College

SPC Research Student



Faith Parlapiano
Natural Science Department

Research Interests:

Future Plans:
My future plans are to complete Bachelor's degree in Biology at St. Petersburg College and applying to Medical School thereafter.

"What screws us up the most in life is the picture in our head of what it's supposed to be." - Jeremy Binns

Research Mentor: Ray Menard PhD

SPC St. Petersburg College

Meet the 2023 Student Presenters

SPC Research Student

Jean Carlos Vega Peguero
Natural Sciences Department

Research Interests:
I would like to explore more of the astrophysics field and learn more about solar systems. Specifically, how each planet interacts with one another as well as individually. Specifically, how each planet interacts with one another as well as individually.

Future Plans:
To continue doing more research and work under a physicist to become a physicist.

"Never. I do not ever give up. I would have to be dead or completely incapacitated." – Elon Musk

Research Mentor: Kristin Simunac, PhD

SPC St. Petersburg College

SPC Research Student

Olivia Rehberger
Natural Sciences Department

Research Interests:
I am interested in water quality, human toxicology, urban sustainability as well as environmental law and policy.

Future Plans:
I plan to pursue my master's degree in economics and continue working in sustainable urbanism. As cities continue to grow, it is important to lead with practices that focus on efficiency, long term viability, overall health of residents and the environment.

"Bee the change you wish to sea."

Research Mentor: Erin Goergen, PhD

SPC St. Petersburg College

SPC Research Student

Stella Robinson
Natural Science Department

Research Interests:
I am interested in anything to do with Cell Biology or Pathology. Currently, I am very interested in tau protein research regarding their links to tauopathies and breast cancer.

Future Plans:
I plan on getting my M.D.- PhD from USF in Cell Biology and Pathology and hopefully working at Moffitt one day.

"We must believe that we are gifted for something, and that this thing must be attained." - Marie Curie

Research Mentor: Linda Gingerich , PhD

SPC St. Petersburg College

Meet the 2023 Student Presenters

SPC Research Student

George Sullivan
Social and Behavioral Sciences

Research Interests:
My research interests include the clinical psychology of ADHD, substance abuse, depression, and suicide. The social psychology of behavior in relation to social norms and how they impact development.

Future Plans:
I plan to go to a prestigious graduate school for my Ph.D. in clinical psychology, and open a private practice focusing on helping ADHD, substance abuse, depression, and suicide. My goal is to then be employed by a university and conduct field experiments such as the one I have done for the URE. It is my hope to help nurture the next generation of psychology students like SPC has done for me. It is my dream to have my published research cited in textbooks and taught in psychology courses across the United States.

"I know you won't believe me, but the highest form of Human Excellence is to question oneself and others." – Socrates

Research Mentor: Sara Gomez, MA

Contact Information

Please address any questions or comments regarding this report to:

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Co-Principal Investigator NSF LSAMP TB-B2B Grant
Institutional Effectiveness Director
St. Petersburg College, P.O. Box 13489, St. Petersburg, FL 33733
(727) 341-3195
Tymms.magaly@spcollege.edu

Appendix A

Undergraduate Research Experience Commitment and Agreement

SPC St. Petersburg College

Congratulations! You have been offered an Undergraduate Research Experience (URE) opportunity!

Timeline: 8-week session

Upon completing the learning activities listed below you will receive a $250 stipend.

- Performing primary literature review on …
- After the literature review portion, performing data collection on …
- The student will be analyzing data on…, and documenting the results of the study, forming conclusions…
- Meeting with professor individually in person or online on a weekly basis, for a minimum of 1 hour each week, for mentoring, status updates and determination of goals for the following week
- Completing a compiled report of the research/activities completed each week including literature review, data collection/analyses, results, assumptions, conclusions, learning achieved, etc.
- Completing a URE Survey to assist us in continually improving URE opportunities for students

Note that the stipend may be subject to taxes, and student financial aid may be affected.

Do you work at SPC? ____Yes ____No

Do you wish to "**Accept**" or "**Decline**" this opportunity?

[X] Accept

[ ] Decline

I fully understand that to receive the $250 stipend, I must complete the activities listed above during th 8-week period. If I am unable to be present for any mandatory activity, I will alert the professor as soor as I am aware.

Please sign below attesting to your understanding and agreement of these requirements.

_____ _____

Student Signature Professor Signature

St. Petersburg College is committed to equal access/equal opportunity in its programs, activities, and employment. For additional information visit www.spcollege.edu/eaeo/. St. Petersburg College is an Equal Opportunity Employer.