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**QUEENS COLLEGE**

# **SUMMER UNDERGRADUATE RESEARCH**

**2025 REPORT**



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# EXECUTIVE SUMMARY

The Office of the Associate Provost for Innovation and Student Success in collaboration with The Office of Undergraduate Research (OUGR) at Queens College continues to foster student engagement in research through the 2025 Summer Undergraduate Research Program (SURP). This program provided valuable research opportunities for students across multiple disciplines, culminating in presentations at the summer research symposium.

The 2025 cohort consisted of students, some participating exclusively in the Summer Research Program, while others were part of year-round research initiatives like the Transfer Student Success Program (TS3), CUNY Immersive Research Experience (CIRE), and faculty-funded projects. The summer program directly supported 25 students through three funding sources, including CUNY Immersive Research Experience (CIRE), Coordinated Undergraduate Education (CUE), and the Sherman Fairchild Foundation. Collectively, the funding sources in 2025 covered student stipends, research materials, and mentor summer salaries.

Running from June 30, 2025 to August 22, 2025, QC SURP offered a structured eight-week program in which most students committed 30-35 hours per week to research, attended weekly seminars, and culminated their work by presenting original research posters at the Queens College Summer Undergraduate Research Symposium. The program aimed to enhance student skills in research methodologies, academic writing, and professional development through tailored seminars.

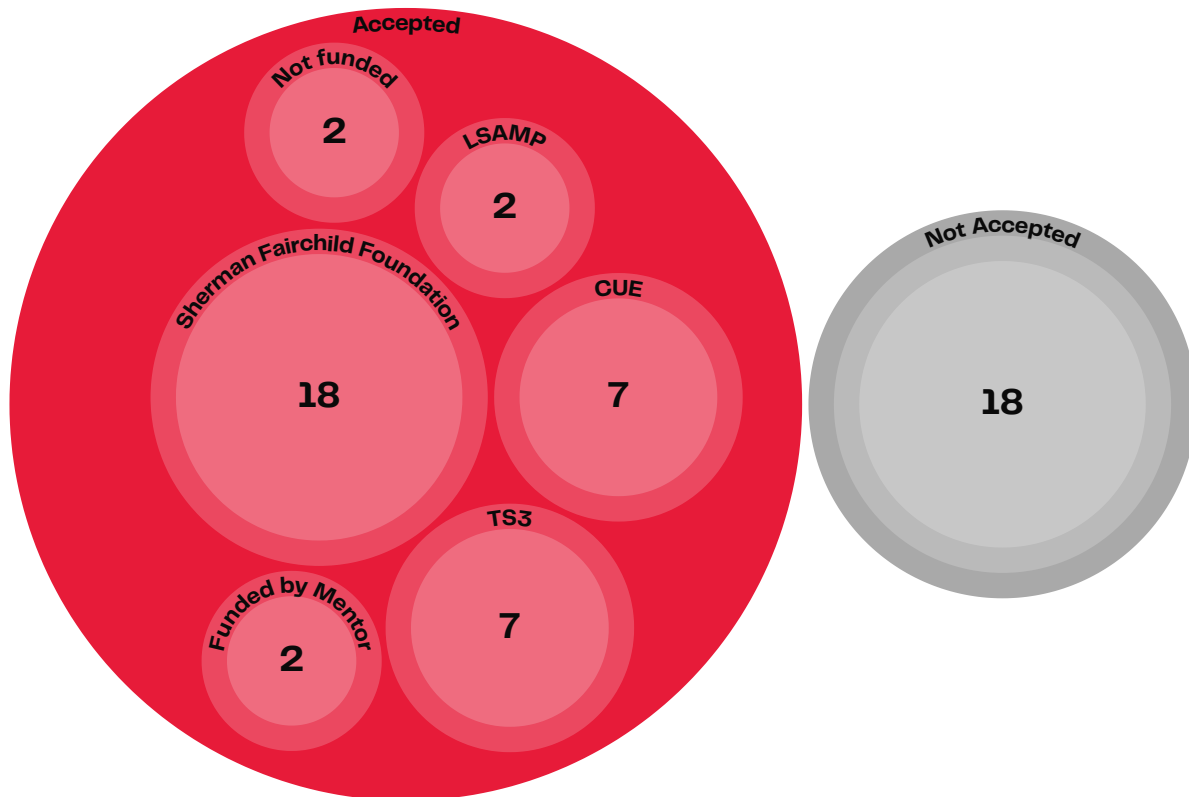
Key highlights from this year's program include high student retention rates, positive feedback on the mandatory seminars, high engagement, and high satisfaction of the program overall.

Recommendations for future iterations include expanding funding to accommodate more participants and creating other incentives for participants. Additionally, we can facilitate optional mid-point check-ins with faculty mentors and the program coordinator.

Overall, the second ongoing year of the Summer Undergraduate Research Program proved to be a valuable high-yield career-related experience for our undergraduates. The program is housed in the Office of the Associate Provost for Innovation and Student Success, with support from the Office of Undergraduate Research.

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# PROGRAM OVERVIEW



## COHORT SELECTION AND MAKEUP

The 2025 cycle was opened exclusively to undergraduate students at Queens College, across all disciplines, who had a research mentor. Students with existing funding were welcome to apply, but were not guaranteed additional funding.

This year, a total of 55 students applied to the Summer Undergraduate Research Program, and 38 students were selected to participate, with 35 students receiving funding for Summer 2025. The 2025 Summer Undergraduate Research Program included a diverse group of students from both STEM and non-STEM disciplines, with the majority coming from the Math and Natural Sciences. Most of the STEM students were funded through the Sherman Fairchild Foundation. At Queens College, the discipline of psychology is included in the School of Math and Natural Sciences, and by extension, is part of STEM.

However, the Sherman Fairchild Foundation considers psychology a social science. Psychology students, along with students in the School of Arts and Humanities and the School of Social Science were funded through the Coordinated Undergraduate Education (CUE) initiative. The Office of the Associate Provost for Innovation and Student Success was able to fund 6 students in non-STEM disciplines with funding from Coordinated Undergraduate Education (CUE). This diverse participation highlights the importance of creating research opportunities across a wide range of academic fields.

This summer, uniquely, we extended participation in our 8-week research seminar series to LaGuardia Community College students through the Q-STEM Academy, allowing them to engage virtually alongside our research cohort.

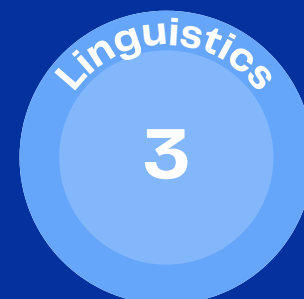
## SCHOOL OF MATH AND NATURAL SCIENCE



## SCHOOL OF SOCIAL SCIENCES



## SCHOOL OF ARTS AND HUMANITIES



## PROGRAM STRUCTURE

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The program structure was designed for students to experience full-time research while receiving support and professional development. Students participated in 30-35 hours of research per week and attended a mandatory weekly seminar with the option of attending an additional seminar meant to support them in preparing for the final symposium presentation and professional development. To assess their progress and address any challenges, students were required to attend a mandatory mid-point check-in. Additionally, optional weekly meetings with the program coordinator were available, offering students an opportunity to discuss their experiences, receive feedback, and stay aligned with their goals. This comprehensive approach ensured that students were well-supported and on track throughout their research journey.



## FUNDING

The 2025 Summer Undergraduate Research Program was supported by a combination of institutional and external funding sources. Funding initiatives, such as CUNY Immersive Research Experience (CIRE), Coordinated Undergraduate Education (CUE), the Sherman Fairchild Foundation (SFF), Transfer to STEM Student Success (TS3), and faculty mentors, provided direct funding for student stipends and research materials. The program allocated over **\$89,000** in stipends, with additional funds designated for research expenses and OTPS for mentors. This financial support enabled the participation of a diverse group of students, offering them opportunities to engage in meaningful research across multiple disciplines, while also covering the costs of program activities such as seminars, orientation, and the final research conference.

### FINANCIAL SUMMARY\*

Funding	Students	Stipend Allocation	Faculty OTPS	Faculty Summer Salary	Conference Travel Fund*
<b>SHERMAN FAIRCHILD FOUNDATION</b>	18	\$72,000	\$18,000	-	\$1,744
<b>CUE</b>	7	\$17,000	-	-	-
<b>Totals</b>	25	\$89,000	\$18,000	-	\$1,744
<b>Total Expenditure</b>					<b>\$108,744</b>

\*Table excludes students funded through LSAMP, TS3, those funded by their mentor.

\*\***Operational Cost:** Funds for refreshments/food, honorariums for guest speakers, and symposium expenses allocated through TS3 and QSTEM Academy Grants (~\$8,000).

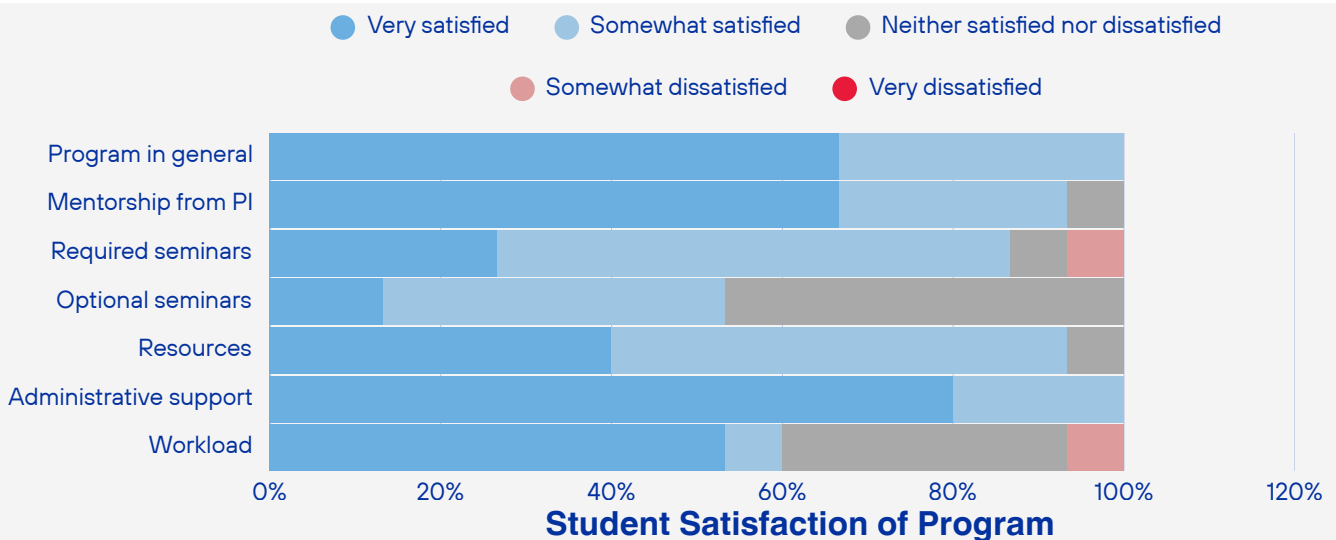
# OUTCOMES

The success of the program was assessed based on retention, engagement, program completion, and participant surveys. All funded students attended the mandatory seminars, with only a few justified absences, and every student successfully submitted a research poster. Out of all participants, only one student left the program early, and two students did not present a poster at a symposium. These measures demonstrate strong overall participation and completion rates, indicating the program's success in maintaining high levels of engagement and commitment from the students.

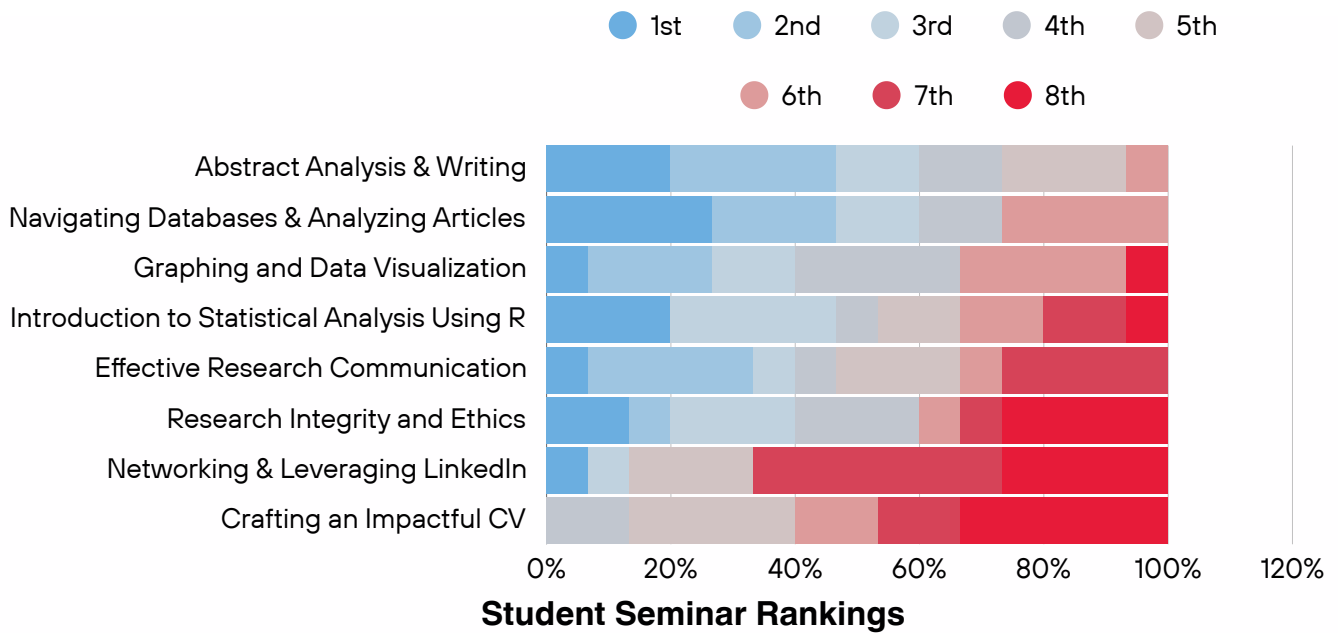


## PARTICIPANT FEEDBACK

Overall, students expressed high satisfaction with the Summer Undergraduate Research Program. Most rated their experiences with the program, mentorship, required seminars, resources, and administrative support as "Very satisfied." The optional seminars received mixed feedback; while some students found them highly beneficial, others felt the topics could be more relevant. This feedback reflects the program's success in providing valuable research experiences and highlights areas for improvement in future iterations.

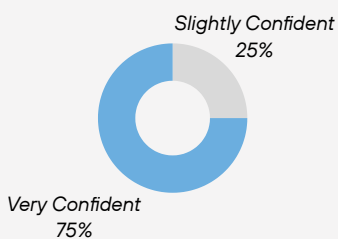


The required seminars were ranked by students, and the results showed that "Abstract Dissections and Writing Abstracts", "Research Databases and Papers", and "Data Visualization" were highly ranked. The results also showed , "Research Ethics" and "Networking and Leveraging LinkedIn" received mixed responses. Overall, the trend indicates that participants prefer seminars where they can learn skills that will enhance their ability to articulate and share their research effectively.

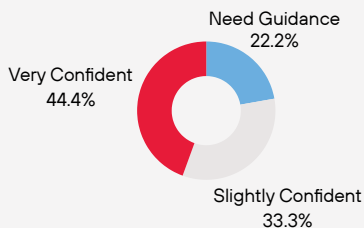


At the end of the program, students self-assessed their research-related skills, which were categorized into presentation & communication, data analysis, lab techniques, and research process. Most participants expressed confidence in their presentation and communication skills, while lab techniques, data analysis, and the research process revealed the need for further support.

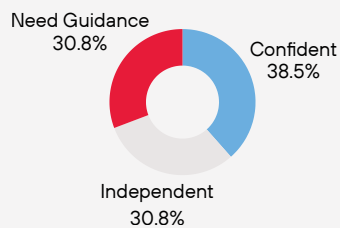
#### Presentation Skills



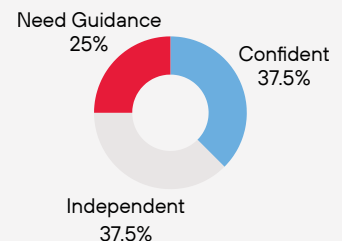
#### Data Analysis



#### Lab Techniques

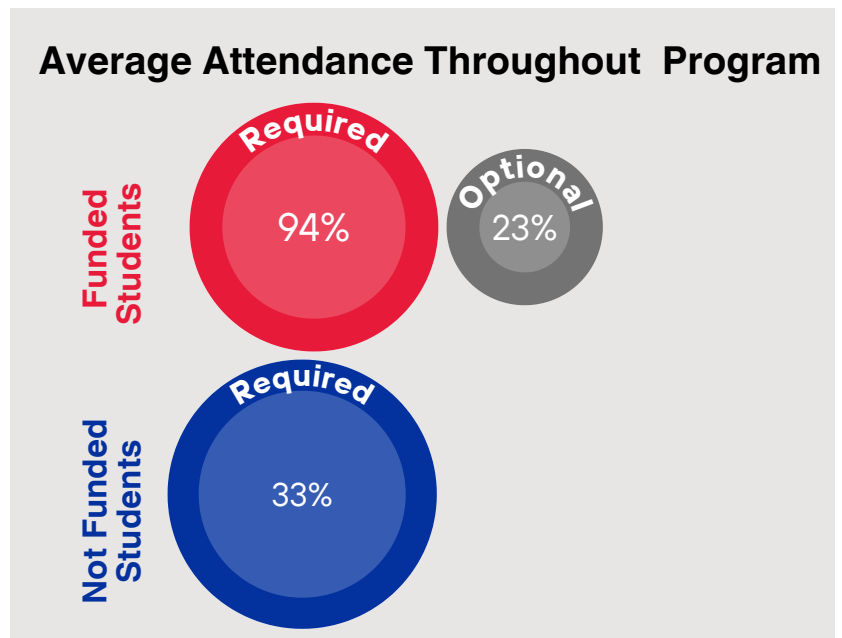
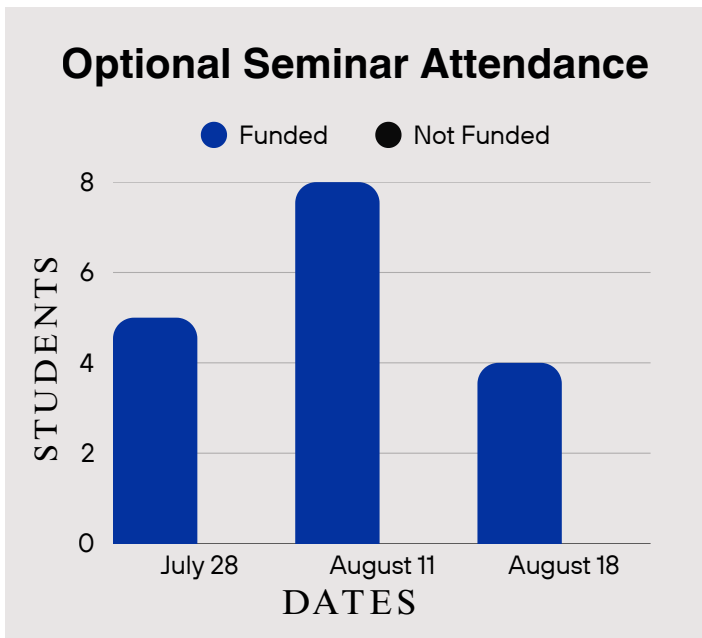
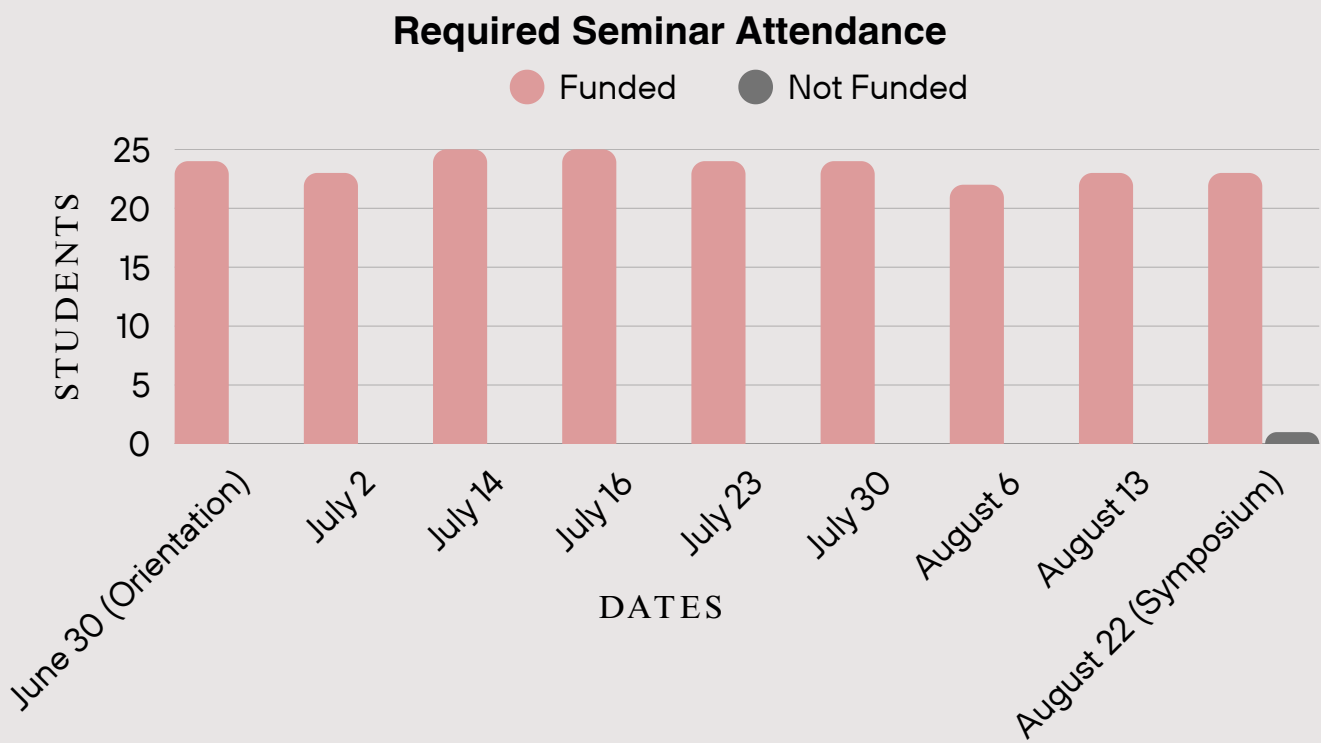


#### Research Process



## RETENTION AND ENGAGEMENT

The program exhibited a strong retention rate, with only one student withdrawing. Most students remained actively engaged throughout the program, particularly those who were funded. Notably, students who were not funded exhibited lower engagement levels, except for one student who remained actively involved. Attendance at mandatory seminars was consistently high throughout the program, with a peak of 32 attendees at the orientation session and a gradual decrease to 23 participants at the final conference. Optional seminar attendance was lower, with attendance ranging from 4 to 8 participants, suggesting varying levels of interest or availability among students.



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# CONCLUSION

The Summer Undergraduate Research Program was successful in providing research experiences and funding for many students. The program received significant engagement from funded students, all of whom created and submitted a poster. Additionally, almost all of them presented their posters at our summer symposium. This success can be attributed to the selected students, program design, and the support provided throughout the program.

While the program was successful, it faced some challenges that can be addressed for future cycles. One challenge was the differing levels of engagement between funded and non-funded students, with some non-funded students showing lower participation. Offering additional incentives for non-funded students, such as public transportation support, covering food costs, and creating a more inclusive program structure could help increase their engagement. The optional seminars also had lower engagement from students, even with the incentive of providing free lunch. For future cycles, it could be helpful to assess the needs of the cohort and plan a more targeted optional seminar schedule to address this issue. Additionally, making attendance at two to three optional seminars a requirement for students could help increase attendance.

To ensure that all students effectively participated in weekly check-ins and utilized them to address challenges, a mandatory mid-point check-in was implemented. Most students needed guidance in planning their poster presentations based on their progress. This led to many students feeling rushed to complete their projects for the symposium. For future cycles, implementing two mandatory check-ins, one at week two and another at week four, could provide ample time to address any issues and further support students. By addressing these areas, the Summer Undergraduate Research Program can build on its successes and provide an even more impactful research experience for future cohorts.

The program's ability to adapt and evolve based on participant feedback and engagement data is crucial for continuing its ongoing success and maintaining its relevance in supporting undergraduate research.

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MELANIE MEJIA

### Impact of IQ, age, sex, and mutation status on reaction time and accuracy on Attention Network Test

Melanie Mejia<sup>1</sup>, Sonia Soehnle<sup>1,2</sup>, Shira Bavel-Gilber<sup>1</sup>, Eliah Saah<sup>1</sup>, Natalia Mejia<sup>1</sup>, Daniela Rodriguez<sup>1</sup>, Phoebe Macdowell<sup>1</sup>, Shayna Herzog-Feldin<sup>1,2</sup>, Declan Sung<sup>1,2</sup>, Veronica J Hintze<sup>1,2</sup>

1. Department of Psychology, Queens College, City University of New York  
2. Department of Psychology, The Graduate Center, City University of New York

**Objectives:** The Attention Network Test (ANT) is a widely used task to assess attentional control. However, the impact of individual differences on performance is not well understood. This study aims to investigate the impact of IQ, age, sex, and mutation status on ANT performance.

**Introduction:** The ANT is a computerized task that requires participants to respond to visual stimuli based on their location (left or right) or their color (red or green). The task is designed to measure attentional control, which is the ability to focus on relevant information and ignore irrelevant information. Individual differences in attentional control can be influenced by various factors, including IQ, age, sex, and mutation status.

**Participants:** Our sample consists of 141 child participants, ranging from ages 8-13 with the PM allele (n=42, 44.8%) (homozygous) and controls (n=74.3.4.4%), children were identified primarily with molecular markers and controls.

**Results:**

- Age:** Performance improved with age, with older children showing faster reaction times and higher accuracy.
- IQ:** Higher IQ scores were associated with faster reaction times and higher accuracy.
- Sex:** There were no significant differences in performance between males and females.
- Mutation Status:** Children with the PM allele showed faster reaction times and higher accuracy compared to controls.

**Conclusions:** The results of this study suggest that attentional control is influenced by IQ, age, sex, and mutation status. Children with the PM allele showed faster reaction times and higher accuracy, suggesting that this mutation may be associated with enhanced attentional control.

**QUESTIONS & ANSWERS:**

- Will age have an impact on performance?** Yes. Children with an IQ of 100 or above performed faster and more accurately than those with an IQ below 100.
- Will IQ affect performance?** Yes. Children with an IQ of 100 or above performed faster and more accurately than those with an IQ below 100.
- Will sex influence performance?** No. There were no significant differences in performance between males and females.
- Will PM status influence performance?** Yes. Children with the PM allele performed faster and more accurately than controls.

**Acknowledgments:** This work was supported by the National Institute of Mental Health (NIMH) Grant R01MH118414.



SELASSIE MAWUKO

### Brain Extracellular Matrix Plasticity Following Peripheral Neuropathy

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<sup>1</sup>QUEENS COLLEGE, CUNY; <sup>2</sup>THE GRADUATE CENTER, CUNY

**ABSTRACT:**

- Neuropathic pain alters ECM around hippocampal glial cells
- ECM changes in chronic pain
- Loss rigid ECM affects synaptic and cognitive function

**After nerve injury:**

- Mitochondria activate quickly, release inflammatory molecules
- Autophagy delay, mTORC1 long term, inhibiting of autophagy
- Autophagy changes, increased proteins, altered signal
- Modifying ECM can reduce pain and memory loss
- Lowering ECM enzymes may alleviate pain, improve cognition

**AIM:** To investigate extracellular matrix (ECM) remodeling in the brain regions associated with chronic peripheral neuropathy using the open-source many-body (MnB) model. This study will focus these parts of the brain: hippocampus, amygdala, and prefrontal cortex. We aim to:

- Quantify aggrecan expression and distribution around neurons in these regions
- Examine co-localization of aggrecan with neuronal markers
- Explore the temporal dynamics of ECM remodeling during neuropathy progression

**Brain plasticity:**

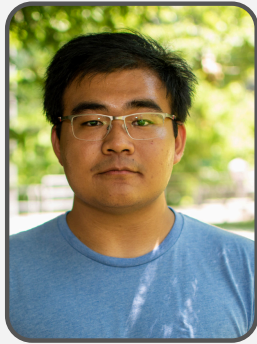
- ECM remodeling facilitates structural changes in neural circuits
- ECM degradation can reopen windows of plasticity in the adult brain
- Changes in ECM composition affect learning and memory processes
- Altered ECM dynamics may contribute to maladaptive plasticity in chronic pain

**Methodology:**

- Quantify aggrecan expression and distribution around neurons in these regions
- Examine co-localization of aggrecan with neuronal markers
- Explore the temporal dynamics of ECM remodeling during neuropathy progression

**Study Plan and Future Directions:**

- Hippocampus:**
  - Examine aggrecan changes in CA1, CA3, and dentate gyrus
  - Compare with memory deficits in chronic pain
- Amygdala:**
  - Analyze aggrecan distribution in basolateral and central nuclei
  - Link to chronic and neuropathic pain
- Prefrontal Cortex:**
  - Assess aggrecan alterations in brain
  - Explore impact on object recognition memory
- Planned analyses:**
  - Quantify aggrecan intensity around neurons
  - Examine co-localization with synaptic markers
  - Compare ECM changes with pain severity
  - Test ECM-targeting interventions for pain relief



SWAN YI HTET

### Characterizing Crowdedness in TESS Images

Swan Yi Htet<sup>1</sup>, Keaton J. Bell<sup>1</sup>, Isabel L. Colman<sup>1</sup>

<sup>1</sup>Queens College Physics Department, <sup>2</sup>American Museum of Natural History

NASA's Transiting Exoplanet Survey Satellite (TESS) captures series of photometric images of nearby bright stars which enables studies of potential orbiting exoplanets & stellar variability.

**Issue:** With a large plate scale of 21 arcseconds per pixel, TESS photometry suffers from crowding issues, introducing contamination to the light curves.

**How accurate is the pipeline correction?** Random errors on the crowdedness estimate will cause systematic errors on signal amplitudes.

Determining the precision of crowdedness corrections applied by the TESS pipeline enables the propagation of this source of uncertainty to measured astrophysical parameters.

**Median Flux Model vs TESS TPF Data:** Comparison of our model of the flux distribution from the stars marked with red circles and the real TESS data (gray). Measure the fraction of light in the photometric aperture (red hatched region) coming from the target star gives the distribution of crowdedness values at right.

**TESS Catalog Value vs Measured Value:** Histogram showing the distribution of crowdedness values. Mean: 0.74453, Std: 0.00065.

**Demonstration for an example TESS image of TIC 65145453:**

- Catalog the TESS Target Pixel File (TPF) data, sky positions of nearby stars and their expected magnitudes from Gaia and the TESS Input Catalog.
- Using the TESS Pixel Response Function (PRF) models, we perform a Markov Chain Monte Carlo analysis with the `emcee` Python package, sampling distribution of flux vectors for all nearby stars.
- Calculate the crowdedness value in the photometric aperture for every image in the TPF.
- Compare the probability distribution of crowdedness to the value used by the TESS reduction pipeline to determine its precision.

**We incorporated in our analysis:**

- Uncertainty on the background flux
- Intrinsic variability of stars
- TESS photometric zero-point error

**Acknowledgments:**

- PRISM (prism.mtu.edu)
- GAIA (gaia.cosmos.esa.int/archives)
- TESS (tess.gsfc.nasa.gov)
- emcee (emcee.readthedocs.io)
- TESS TPF (tessdata.nasa.gov/tess\_tpf)
- astropy (astropy.org)
- astroquery (astroquery.readthedocs.io)

**What's different about our approach?** We have applied this technique to many TESS TPFs to quantify the overall precision of the contamination corrections applied by the TESS pipeline.



AMRIN KARIM

### Gentrification: The Price to Pay for Affordable Housing and Community Investment in Jamaica, Queens

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Dr. Natalie Vena, Department of Urban Studies, Queens College, CUNY

**Introduction**

Gentrification is a sociological process recognized that has led to many different urbanizations. However, it does not always mean that the housing is becoming more affordable. In fact, it is often the opposite. This paper will explore the process of gentrification in Jamaica, Queens, New York, and how it has affected the local community. The purpose of this research is to understand the impact of gentrification on the local community and to identify ways to address the issues that have arisen.

**Methodology**

This study used a quantitative and qualitative methodology to investigate the present impact of the gentrification process in Jamaica, Queens, New York. The data was collected through a survey of 100 residents and a focus group with 10 residents. This study also used secondary data from the American Community Survey (ACS) and the Census of Housing and Vacancy Survey (CHVS) to provide context for the study.

**Results**

**Community Reinvestment in QIP**

Figure 1: Community Reinvestment in QIP

Figure 2: Responses to QIP by Subdivisor Group

**Percent Distribution of Household Income**

Figure 3: Percent Distribution of Household Income

**New Housing Unit Distribution by QIP**

Figure 4: New Housing Unit Distribution by QIP

**Conclusion**

As shown in Figure 1, both hard goods (lightly reported) and soft goods (heavily reported) are being lost. This loss has been a result of the city's strategy to increase the number of affordable units. The city's strategy is to increase the number of affordable units by increasing the number of units that are affordable to low-income households. This strategy is to increase the number of units that are affordable to low-income households by increasing the number of units that are affordable to low-income households.



DONNA SHAIR

### Lexical effects on vowel quality of /like/ in speakers of NYCE

Donna Shair, Bill Haddican  
Department of Linguistics and Communication Disorders, Queens College, CUNY

**Introduction**

This study examines the lexical effects on the vowel quality of /like/ in speakers of NYCE. The study focuses on the relationship between the lexical environment and the vowel quality of /like/. The study also examines the relationship between the lexical environment and the vowel quality of /like/ in speakers of NYCE.

**Methodology**

The study used a quantitative methodology to investigate the relationship between the lexical environment and the vowel quality of /like/. The data was collected through a survey of 100 speakers of NYCE. The study also used secondary data from the American Community Survey (ACS) and the Census of Housing and Vacancy Survey (CHVS) to provide context for the study.

**Results**

Figure 1: Lexical effects on vowel quality of /like/ in speakers of NYCE

Figure 2: Lexical effects on vowel quality of /like/ in speakers of NYCE

Figure 3: Lexical effects on vowel quality of /like/ in speakers of NYCE

**Conclusion**

The study found that the lexical environment has a significant effect on the vowel quality of /like/ in speakers of NYCE. The study also found that the lexical environment has a significant effect on the vowel quality of /like/ in speakers of NYCE.



ELISSA PATIN

### A Language Learning Tool for Garifuna

Elissa Patin, Daniel Kaufman  
Department of Linguistics and Communication Disorders, Queens College, CUNY

**Background**

Garifuna is an Arawak language spoken by a transnational population of African and Indigenous descent who trace their history to St. Vincent in the Lesser Antilles. Presently, the Kriol and Garifuna creoles with a generation whose exposure to the language is decreasing. This project aims to create a language learning tool for Garifuna. The tool will be used to teach Garifuna to a new generation of learners.

**Methods**

The project used a qualitative methodology to investigate the relationship between the lexical environment and the vowel quality of /like/. The data was collected through a survey of 100 speakers of NYCE. The study also used secondary data from the American Community Survey (ACS) and the Census of Housing and Vacancy Survey (CHVS) to provide context for the study.

**Results**

Figure 1: Prototype A

Figure 2: Prototype B

**Future Work**

The project will be updated according to the user needs and comments. The project will be updated according to the user needs and comments. The project will be updated according to the user needs and comments.



KEVIN BERMEJO

### Using Multimodal Time Series Data to Predict Language Outcomes in Infants at Familial Risk for Autism

Presenter: Kevin Bermejo | Mentor: Dr. Kristina Denbova, PhD  
Queens College, City University of New York, Department of Psychology

**Abstract**  
Recent research suggests that high-frequency vocalizations during the first year of life are predictive of later language outcomes. However, the underlying mechanisms of this relationship remain unclear. This study examines the relationship between early vocalizations and later language outcomes in infants at familial risk for autism spectrum disorder (ASD). We analyze multimodal time series data, including audio recordings of vocalizations and video recordings of facial expressions, to predict language outcomes at 24 months of age. The results show that early vocalizations are a strong predictor of later language outcomes, particularly in the context of familial risk for ASD.

**Methodology**  
The study employed a longitudinal design, collecting data from 100 infants at familial risk for ASD. Data collection included audio recordings of vocalizations and video recordings of facial expressions at 12 and 24 months of age. Language outcomes were assessed using standardized measures at 24 months. The study used a machine learning approach to analyze the multimodal time series data, with a focus on identifying predictive features.

**Results**  
The results show that early vocalizations are a strong predictor of later language outcomes, particularly in the context of familial risk for ASD. The study found that infants with higher rates of early vocalizations had higher language scores at 24 months. The results also showed that facial expressions were a weaker predictor of language outcomes compared to vocalizations.

**Conclusion**  
The findings suggest that early vocalizations are a key indicator of later language outcomes in infants at familial risk for ASD. This study highlights the importance of monitoring early vocalizations as a potential early warning sign for language delays. Further research is needed to explore the underlying mechanisms of this relationship.



NIYA EXIL

### Variation in Interpreting Negative Concord and Double Negation in African American English

Niya Exil, Department of Linguistics and Communication Disorders, Queens College, CUNY  
Dr. Bill Haddican, Department of Linguistics and Communication Disorders, Queens College, CUNY

**Abstract**  
This study examines how African American English (AAE) speakers interpret negation, focusing on *ain't* vs. *ain't no*. Results show a strong preference for Negative Concord (NC) over Double Negation (DN). Participants rated DN consistently low, while *ain't no* and *ain't* vary considerably more naturally. Findings suggest that NC is the default interpretation in AAE, while DN introduces more variability in interpretation.

**Introduction and Background**  
Negative Concord (NC): Multiple negatives = one negation (e.g., *ain't no* = *no*).  
Double Negation (DN): Two negatives cancel to positive (SAE norm).  
Non-strict NC: Allows both single and multiple negatives.  
Negative Polarity Item (NPI): Words like *any*, *ever*, or *yet* that only appear in certain negative or conditional environments.  
Negator variation: *ain't* = reduced *do* v. distribution (lives in islands of *do* within *ain't*).  
Lexical evidence: AAE-speaking children default to negative Concord (NC) in ambiguous cases (Coles-White, 2014).  
Cross-linguistic parallel: AE = non-strict NC; flexible compared to strict NC languages like Bosnian/Serbian (Nikolic, 2008).

**Methodology**  
Participants: AAE speakers (1 per survey).  
Materials: counterbalanced surveys, each with 6 target and 6 filler sentences, and preference tasks.  
Tasks: Rated NC vs. DN interpretations on a 1-7 scale; answered preference question (*ain't no* vs. *ain't*); Analyzed responses compiled across lists; compared NC vs. DN ratings and preferred combinations.

**Stimulus Examples**  
Which sounds better?  
I ain't no in the house in her shoes, but she's got her hair done. *ain't no* and *got*...  
 *ain't* phrase.  
 *ain't* phrase.  
 Both work equally for me.  
 Both work equally for me, but I prefer *ain't*.  
 Both work equally for me, but I prefer *got*.

**Results (cont)**  
Preference for negativity over double negation.  
AAE speakers showed a preference for Negative Concord (NC) over Double Negation (DN). Preferences for DN items were relatively low, with the highest preference for *ain't* and *ain't no*. The variability shows some participants allowed both ratings, but the preference for NC was consistent across the board. These results highlight how AAE speakers differ from standard English, where DN is the norm. Further research should explore the participant pool and test new localizations to determine generalizability.



SAMIHA ZAMAN

### AI Agents for Large Language Model-as-Judge Evaluation: A Use Case in Automated Behavioral Intervention Treatment Plan in Healthcare

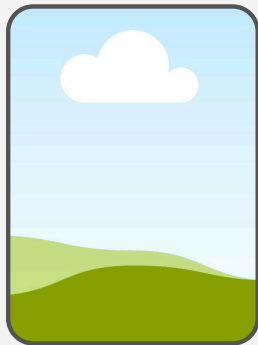
Samiha Zaman, Computer Science, Ron Sy, Computer Science  
CUNY Queens College, Computer Science Department

**Abstract**  
This study explores the use of AI agents to evaluate and generate behavioral intervention treatment plans (BITPs) for children with autism spectrum disorder (ASD). The research focuses on the effectiveness of AI agents in identifying and recommending appropriate interventions based on individualized data. The study compares the performance of AI agents against human experts in terms of accuracy and efficiency. The results show that AI agents can effectively identify and recommend appropriate interventions, demonstrating their potential as a valuable tool in the healthcare industry.



**Methodology**  
The study employed a mixed-methods approach, combining quantitative data analysis with qualitative insights from interviews and focus groups. The research involved the development of AI agents using large language models (LLMs) and the evaluation of their performance against human experts. The study also included a detailed analysis of the data used to train and evaluate the AI agents, as well as the feedback provided by the human experts.

**Results**  
The results show that AI agents can effectively identify and recommend appropriate interventions, demonstrating their potential as a valuable tool in the healthcare industry. The study found that AI agents were able to identify and recommend interventions that were similar to those recommended by human experts, with a high degree of accuracy. The results also showed that AI agents were able to generate BITPs more efficiently than human experts, reducing the time and resources required to develop these plans.

**Conclusion**  
The findings suggest that AI agents have the potential to revolutionize the healthcare industry by providing a more efficient and accurate way to identify and recommend interventions for children with ASD. This study highlights the importance of continued research and development in this field, as well as the need for collaboration between AI researchers and healthcare professionals.




**SARRA  
MIKHAYLOV**

### Evaluating Pragmatic Language in Children with and without Fragile X Premutation: Associations with Age and Parent Report

Sarra Mikhaylov<sup>1</sup>, Rachel Goldman<sup>1,2</sup> & Veronica J. Hinton<sup>1,2</sup>  
 1. Queens College, City University of New York, Flushing, NY, USA  
 2. The Graduate Center, City University of New York, New York, NY, USA.



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#### Introduction

Human language consists of structural components and the social use of language, known as pragmatics. Language P/L skills involve using language appropriately across different contexts, adapting to partners, and following conversational rules. P/L enhances communication by promoting meaningful interactions, reducing misunderstandings, and potentially influencing behavior and comprehension. P/L skills grow as children get older. For some children, though, it can lag behind in social situations, even if they speak correctly. These problems are often hard to notice and they not become clear until the teenage years, when social and language demands become more complex.

The objective of this study is to examine P/L skills in children, ages 8-13, using both direct assessment and parent report measures. Our goal was to understand the underlying aspects of the measures to help with later analyses.

We examined this in a group of children with and without the fragile X premutation (FX/PM) allele. The PM allele is associated with FX/CDX1 repeats in the FMR1 gene and impacts approximately 1.5 million individuals in the United States, individuals with FX have been shown to have very high intelligence and academic achievement. Among adults, there is increased ability to increase complexity of speech, attention difficulties and executive difficulties. There is a suggestion of P/L difficulties in adults with a FX, but this has not been studied among children.

#### Methodology

**Subjects**  
 Children 8-13 (N = 100) identified primarily as either having a PM or no PM included. The group was of comparable age, grade and IQ.

Group	Age	Mean	SD	Min	Max	z
PM	10.3	1.43	0.79	1.32	0.91	
Control	10.3	0.76	0.36	0.36	0.76	
PM	34	49.3	10	38.3	65.9	
Control	34	50.7	14	40.7	68.7	
PM	10.3	1.43	0.79	1.32	0.91	
Control	10.3	0.76	0.36	0.36	0.76	
PM	34	49.3	10	38.3	65.9	
Control	34	50.7	14	40.7	68.7	

**Measures**

**Comprehensive Assessment of Spoken Language (CASL-2)**  
 Children are presented with scenario-based prompts designed to measure their ability to apply pragmatic language skills in conversational situations. Domains evaluate various aspects of social communication:

- o Interpreting verbal and nonverbal cues in context
- o Responding to speaker's intended meaning

Example: Jason needs help carrying his books and football equipment to school. But he has to wait until he gets to his locker. The ball is being loaded for him if the child understands that this scenario is requesting physical help from a sibling.

**The Social Responsiveness Scale – Second Edition (SRS-2)**  
 A caregiver report measure designed to detect social deficits and gauge their severity. For the purposes of this study, only the Social Communication domain is reported.

- o Parents rate their child on items such as "They communicate through eye contact."
- o Items are rated on a 5-point scale from 1 (very difficult) to 5 (very easy).

**Analysis**  
 Pearson's correlations were run.  
 Hypothesis 1: Age and CASL raw scores were examined.  
 Hypothesis 2: Standardized CASL and SRS scores were examined.

#### Results

##### Strong Association between Age and Raw Scores on CASL PL Subtest

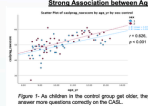


Figure 1: As children in the control group get older, they answer more questions correctly on the CASL.




Figure 2: As children with a PM get older, they also answer more questions correctly on the CASL.

##### No Association between Direct Assessment on CASL PM vs. Parent Report on SRS-2 SC

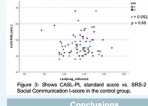


Figure 3: Shows CASL PM raw score vs. SRS-2 SC Social Communication scores in the control group.

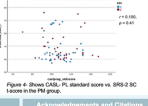



Figure 4: Shows CASL PM standard score vs. SRS-2 SC scores in the PM group.

#### Conclusions

We hypothesized that (1) children's P/L skills would increase with age, and (2) child performance on the CASL would align with caregiver reports on the SRS. Our findings generally support these predictions; age was strongly positively correlated with CASL raw scores, confirming that P/L skills generally develop even within the relatively narrow 8-13 age range. However, contrary to expectations, CASL and SRS scores were not correlated, suggesting the caregiver perspective may not fully measure children's demonstrated social language abilities. These results emphasize the importance of using multiple measures to evaluate P/L and point to the need for future work exploring how caregiver perspectives can be better integrated with standardized assessments.

#### Acknowledgments and Citations

This work was supported by NIH grant #R01MH120202. We thank all participants and community members.



# SHERMAN FAIRCHILD FOUNDATION



**ANDREW  
NAPOLETANO**

### The Effect of Gravid State on Locomotion in *Daphnia magna*: Exploring Speed and Movement

Andrew Napoletano<sup>1</sup>, David Young<sup>1</sup>, Fariba Islam<sup>1,2</sup>, Nuzha Chowdhury<sup>1,3</sup>, Yefim Radomyelsky<sup>1</sup>, Maral Tajarian<sup>1</sup>, Oleg Kogan<sup>1</sup>, Sebastian Alvarado<sup>1</sup>

<sup>1</sup>Queens College CUNY, Flushing, NY, <sup>2</sup>Brooklyn College CUNY, Brooklyn, NY, <sup>3</sup>CUNY Lehman College, Bronx, NY, <sup>4</sup>Queens Gateway to Health Sciences Secondary School, Queens, NY

**Abstract**  
This study measures the average swimming speed of gravid and non-gravid *Daphnia magna* to determine whether gravidity affects their swimming rates. We found that gravid state does have an effect on the speed and movement of *Daphnia*. This provides insight into energy allocation, predator avoidance, and overall fitness of *Daphnia*.

**Background**  
Reproduction takes a lot of energy for animals. In this experiment, we are testing how reproductive activity affects movement in *Daphnia*.  
• *Daphnia magna* are crustaceans that are an essential part of freshwater ecosystems, feeding phytoplankton blooms, color control and acting as a source of food for various larger organisms.  
• Their behavior is influenced by various factors, amongst which is reproductive status.  
• While it is known that swimming velocity of *Daphnia* is dependent on its body size, it is unknown how gravid state may affect speed.  
• Understanding the difference in mobility between gravid and non-gravid *Daphnia* provides insight into energy allocation, predator avoidance strategies, and dynamics within an ecosystem.

**Methods and Materials**  
Select individual *Daphnia* (gravid and non-gravid) and place them in a horizontal recording (5 minutes).  
Track the movement of *Daphnia* using a tracking software (5 minutes).

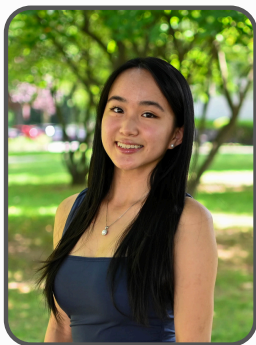
**Results**  
Gravid *Daphnia* are on average faster than non-gravid *Daphnia*.  
Gravid *Daphnia* are less likely to remain still, as shown by lower probabilities at near-zero speeds (Figure 2).  
Gravid *Daphnia* are more likely to move in the result of <math>0.05</math>, suggesting that these differences should persist even with a larger sample size.  
These findings align with a previous study<sup>1</sup>, showing that the differences might be due to predators.

**Discussion**  
Gravid *Daphnia* on average move faster than non-gravid *Daphnia*.  
Gravid *Daphnia* are less likely to remain still, as shown by lower probabilities at near-zero speeds (Figure 2).  
Gravid *Daphnia* are more likely to move in the result of <math>0.05</math>, suggesting that these differences should persist even with a larger sample size.  
These findings align with a previous study<sup>1</sup>, showing that the differences might be due to predators.

**Future Directions**  
• Explore different developmental stages of gravid *Daphnia*.  
• Test differences between females that reproduce asexually vs sexually.  
• Use more ditches in the experiment.

**Relevance to Aquatic Ecosystems**  
• *Daphnia* are a keystone species, their mobility corresponds to survival, influencing the entire aquatic food web.

**Acknowledgments & References**  
This work was supported by Queens College and SURF and the college non-research academy.



**ASHLEY  
JEW**

### The Advantages of Continuous Sensors for Understanding Mechanisms of Dissolved Oxygen Depletion in Urban Embayments.

Ashley Jew and Gregory O'Mullan  
School of Earth and Environmental Science, Queens College, City University of New York

**Abstract**  
Dissolved oxygen (DO) is a critical parameter for aquatic ecosystems. In urban embayments, DO depletion is a significant problem. This study compares continuous and discrete sensors for monitoring DO levels in an urban embayment. Continuous sensors provide real-time data, while discrete sensors provide periodic snapshots. The study shows that continuous sensors are more effective at capturing short-term fluctuations in DO levels, which are often missed by discrete sensors. This information is crucial for understanding the mechanisms of DO depletion and for developing effective management strategies.

**Continuous Sensor Data Collection**  
The continuous sensor data collection system was installed in the embayment. The sensor recorded DO levels continuously over a period of several weeks. The data shows that DO levels fluctuate significantly throughout the day and across different locations in the embayment.

**Discrete vs. Continuous Sensor Monitoring**  
Discrete sensors provide periodic snapshots of DO levels, while continuous sensors provide real-time data. The study shows that continuous sensors are more effective at capturing short-term fluctuations in DO levels, which are often missed by discrete sensors.

**2024 Discrete vs. Continuous Dissolved Oxygen Measurements**  
The study compares the performance of discrete and continuous sensors in measuring DO levels. The results show that continuous sensors provide more accurate and detailed data, especially during periods of rapid change in DO levels.

**Impact of Bank Flow Height on Dissolved Oxygen Response**  
The study investigates the relationship between bank flow height and DO response. The results show that higher bank flow heights are associated with higher DO levels, suggesting that flow height is an important factor in determining DO concentrations.

**Dissolved Oxygen Level Fluctuations in a 24-hour period**  
The study shows that DO levels fluctuate significantly throughout the day. The highest DO levels are typically observed during the day, while the lowest levels are observed at night. This diurnal cycle is driven by photosynthesis and respiration.

**Continuous Dissolved Oxygen Record**  
The continuous record shows that DO levels fluctuate rapidly and frequently. The data is essential for understanding the mechanisms of DO depletion and for developing effective management strategies.



**BESSIE  
VELASQUEZ  
GALDAMEZ**

### Characterization of Shea, a *Pseudomonas aeruginosa* virus

Bessie Velasquez, Crystal Motos, Profs. Monica Trujillo and John Dennehy  
Biology Department, Queens College

**Abstract**  
*Pseudomonas aeruginosa* is a major opportunistic pathogen that causes severe healthcare-associated infections. Bacteriophages, viruses that infect only bacteria, offer a promising complementary strategy to fight antibiotic-resistant bacteria. Phage therapy is an ancient practice that has been revived in modern medicine. This study characterizes Shea, a novel bacteriophage that infects *P. aeruginosa*. The phage is shown to have a high specificity for *P. aeruginosa* and to be stable under various environmental conditions. The phage is shown to be effective in reducing bacterial load in a laboratory setting. This information is crucial for understanding the mechanisms of phage therapy and for developing effective management strategies.

**Introduction**  
*Pseudomonas aeruginosa* is a Gram-negative, opportunistic pathogen that causes severe healthcare-associated infections. Bacteriophages, viruses that infect only bacteria, offer a promising complementary strategy to fight antibiotic-resistant bacteria. Phage therapy is an ancient practice that has been revived in modern medicine. This study characterizes Shea, a novel bacteriophage that infects *P. aeruginosa*. The phage is shown to have a high specificity for *P. aeruginosa* and to be stable under various environmental conditions. The phage is shown to be effective in reducing bacterial load in a laboratory setting. This information is crucial for understanding the mechanisms of phage therapy and for developing effective management strategies.

**Methods & Results**  
Preparation & Titration of Phage: The phage was prepared and titrated to determine its concentration. The results show that the phage is stable and effective in infecting *P. aeruginosa*.  
Lysis Curve Studies: The lysis curve studies show that the phage has a high specificity for *P. aeruginosa* and that it is effective in reducing bacterial load in a laboratory setting.  
Single Cells Visualization of Lysis: The single cells visualization of lysis shows that the phage is effective in reducing bacterial load in a laboratory setting.  
PCR of Shea FS11 Colonies: The PCR results show that the phage is effective in reducing bacterial load in a laboratory setting.

**Conclusion/Discussion**  
Additional experiments are needed to fully characterize Shea. The sequence data, with no insertions, suggests the phage is 100%. However, the PCR results show the phage DNA was detected from the Shea-resistant bacterial cells. The single-cell visualization experiment shows a high specificity for the phage. We will explore the resistance mechanism we have observed for the phage in future studies. In a complementary approach, we will explore via PCR that Shea has a higher level of host specificity.

**Acknowledgements**  
We thank all members of the lab for their support in setting the microscopes, the necessary, and the phage. We also thank the SURF program for their support in funding this project.



**DEVORAH  
MOADAB**

### Iodine Catalyzed Preparation of 2,3-dihydrofurans and cyclopropanes

Devorah Moadab<sup>1</sup>, Ethan Choi<sup>1</sup>, Samuel Hee<sup>1,2</sup>, and Dr. Yu Chen<sup>1,2</sup>

<sup>1</sup>Queens College, Department of Chemistry, City University of New York, Flushing, NY, USA, <sup>2</sup>The Graduate Center, City University of New York, New York, NY, USA

**Abstract**  
Iodine catalyzed oxidative coupling reactions between heterocyclic and alkenes are being investigated, as they can either produce 2,3-dihydrofurans or cyclopropanes. It has been observed that the use of a catalytic amount of iodine can lead to a significant yield of 2,3-dihydrofurans. This study explores the mechanism of this reaction and the effect of various factors on the yield of the product. The results show that the reaction is highly sensitive to the concentration of iodine and the temperature. This information is crucial for understanding the mechanisms of iodine catalyzed reactions and for developing effective management strategies.

**Introduction**  
Iodine catalyzed oxidative coupling reactions between heterocyclic and alkenes are being investigated, as they can either produce 2,3-dihydrofurans or cyclopropanes. It has been observed that the use of a catalytic amount of iodine can lead to a significant yield of 2,3-dihydrofurans. This study explores the mechanism of this reaction and the effect of various factors on the yield of the product. The results show that the reaction is highly sensitive to the concentration of iodine and the temperature. This information is crucial for understanding the mechanisms of iodine catalyzed reactions and for developing effective management strategies.

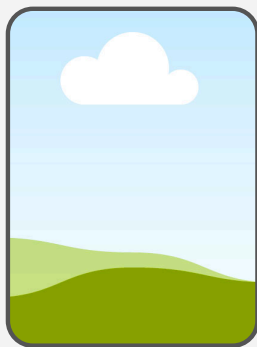
**Methods**  
The reaction was carried out in a round-bottom flask equipped with a magnetic stirrer. The reaction mixture was stirred at room temperature for a period of 24 hours. The product was isolated and purified by column chromatography. The yield of the product was determined by weighing the isolated product.

**Results**  
The results show that the reaction is highly sensitive to the concentration of iodine and the temperature. The yield of the product increases with increasing iodine concentration and decreasing temperature. This information is crucial for understanding the mechanisms of iodine catalyzed reactions and for developing effective management strategies.

**Conclusion**  
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**Acknowledgements**  
We thank the SURF program for their support in funding this project.

# SHERMAN FAIRCHILD FOUNDATION



**HANAN LATIFF**

### Effect of Gabapentin on Neuropathic Pain in Prxrl1-KO Mice

Hanan Latiff<sup>1</sup>, Gaschen Liu<sup>1,2</sup>, Giuseppe Calado<sup>1,4</sup>

<sup>1</sup>Neuroscience Program, QC, CUNY <sup>2</sup>Master's in Behavioral Neuroscience, QC, CUNY <sup>3</sup>Transfer for Stem Student Success, CUNY <sup>4</sup>CUNY Graduate Center

**Background**

- Prxrl1-KO (DRG1-KO) mice lack somatogenic patterns in the barrel pathway and peripheral connections
- Neuropathy → increased trigeminal pain, decreased rear and body sensation
- Potential neuropathic pain model
- Excessive grooming, facial/ear for less, lasting injuries
- Care control theory of pain → fine touch evokes pain

**Questions**

- Does Gabapentin (a GABA, neuroepathic pain inhibitor) reduce pain in Prxrl1-KO mice?
- Do Prxrl1-KO mice groom differently than wild-type C57BL/6 mice?
- Does phenotype in Prxrl1-KO predict pain behavior?

**Methods**

- Pre and Post Gabapentin injection recordings
- Subcutaneous therapeutic dose of Gabapentin, 1 hour waiting time, 40 minutes recording in novel environment
- Behavior recorded in home cage
- Tracking done with DeepLabCut & SimBA
- Behavior → grooming frequency, movement patterns
- Rating → lesions and fur matting in front and rear

**Results**

- Carotenoid does not reduce grooming in Prxrl1-KO mice, but does reduce face withdrawal frequency
- Prxrl1-KO do not groom more than WT in novel environments, but groom differently
- Suggests carotenoid inhibits evoked but not neuropathic pain in Prxrl1-KO, and exploration potentially inhibits pain behavior
- Decrease in path length does not translate directly to grooming time
- Lesion severity on the rear correlates with grooming time, but not the face

**Conclusions**

- Treatment may introduce other behaviors
- Implies Prxrl1-KO overgroom rear
- Difference demonstrated between peripheral pain and neuropathic pain
- Follow-up experiment aims to use gabapentin, a GABA agonist that targets neuropathic pain
- Shows importance of habituation in pain research, and sensitivity of pain behaviors to inhibition
- Further work needed to investigate link between grooming, pain, and phenotype expression in Prxrl1-KO

**Acknowledgements**

Special thanks to Dr. Steven Strittmatter for providing Prxrl1-KO mice and Dr. David Katz for providing carotenoid. We also thank Dr. David Katz for providing carotenoid. We also thank Dr. David Katz for providing carotenoid.



**HECTOR CORDOVA**

### A Language Learning Tool for Garifuna

Elissa Patin, Daniel Kaufman

Department of Linguistics and Communication Disorders  
Queens College, CUNY

**Background**

Garifuna is an African language spoken by a transatlantic population of African and Indigenous descent who trace their history to St. Vincent in the Lesser Antilles. Presently, the focus of Garifuna research is on the language's status in the diaspora. One of the major research goals is to create a language learning tool for Garifuna speakers in the United States and Canada. The project aims to create a language learning tool for teaching the complex grammar of Garifuna.

**Methods**

Two popular computer-assisted language learning (CALL) tools were compared in this study: Duolingo and a similar, adaptive language learning tool we made up of smaller units (referred to as 'mini-units').

**Results**

Overall, Prototype A performed better than Prototype B. It can be inferred that for complex languages like Garifuna, learners gain more from seeing less information, which is best for an overwriting code-learning system. Based on the survey comments, it seems that users are sensitive to being in the user experience, where there could be 'off' or error messages just to make the application feel alive throughout.

**Future Work**

Prototype A will be updated according to the user results and comments. Ultimately it will be adapted for a web tool. It is successful, this program could be adopted to teach other endangered indigenous languages whose communities face a similar struggle.

**Conclusions**

Some words include a 'pop up' and others do not. Hiding the generate button should always produce something (error messages included). Some words generate without selecting an object. Instead of depending on the generate button, words could change as different components are selected. More dynamic terms and definitions.



**HEMLATA GOCOL**

### Genetic Transformation of *Ceratopteris richardii* to Evaluate Phytochrome I Photoreceptor Function

Hehlata Gocool, May Myat Moe, Kelly Tatiana Garcés Trujillo, Dr. Timothy W. Short

Biology Department, Queens College, CUNY

**Abstract**

Light-mediated signaling pathways are essential for plant growth and development with individual photoreceptors responsible for specific roles within the process. The phylogenetic position of ferns provides unique opportunities to study the evolution of these photoreceptors. *Ceratopteris richardii* is a model fern that produces phytochromes—phytochromes, cryptochromes and phototropins—which are conserved across lower and vascular plants. It can only be genetically transformed with a clover growth period compared to other ferns. The focus of this study, full-length phytochrome 1A cDNA, was cloned into an entry vector and sequenced. Alongside a negative control phytochrome 1A construct with early stop codons, they were transformed into compatible destination vector pMDC3 and pMDC35. Plasmid amplification and maintenance in *E. coli* is conventionally tested using microscopy and gel electrophoresis. In contrast, they were transformed into *C. richardii* callus tissue via particle bombardment. The phenotypic results due to transforming lines of the transformed fern will be monitored to aid in determining the role of phytochrome 1A within the signaling pathway and inform the evolutionary history of the gene itself.

**Introduction**

A plant's ability to thrive in its environment is highly dependent on its ability to detect light for all aspects of growth. Ferns are phylogenetically unique and can be used to provide insight on the evolution of light signaling pathways within plants. *Ceratopteris richardii* is a model fern due to ease of genetic manipulation and phytochromes (PHY), cryptochromes (CRY) and phototropins (PT) that are consistent in complex light response. Specifically, PHY receptors are responsive to the presence of red (R) and far red (FR) light, with CRY1 and CRY2 receptors. The role of the evolution of phytochromes and overexpression using particle bombardment to observe the resulting phenotypic occurrence due to the modified pathway.

**Methodology**

**C. richardii genetic transformation and maintenance: *C. richardii* sporophytes were obtained from CUNY. The sporophytes were transformed to plants containing pMDC3 and pMDC35 using particle bombardment. The sporophytes were transformed to plants containing pMDC3 and pMDC35 using particle bombardment. The sporophytes were transformed to plants containing pMDC3 and pMDC35 using particle bombardment.**

**Results**

Figure 1: Inhibitory Vector Control of Early...  
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Figure 675

# SHERMAN FAIRCHILD FOUNDATION



**KRISTEN SOSA**

### Movement Patterns of Live *Daphnia* Within the Presence of *Daphnia* Carcasses

Kristen Sosa<sup>1</sup>, Higin Tan<sup>1</sup>, Zaylin Brown<sup>1</sup>, David Young<sup>1</sup>, Oleg Kogan<sup>1</sup>, Yefim Babomyskiy<sup>1</sup>, Maril Tajarot<sup>1</sup>, Sebastian Alvarado<sup>1</sup>  
<sup>1</sup>Queens College Summer Undergraduate Research Program, CUNY STEM Research Academy, Queens College CUNY, Flushing, NY

**Abstract**  
 Collecting natural behavior data from single individual organisms, and the rate of mortality can create noise in freshwater ecosystems. *Daphnia* plays a key role in linking producers to higher trophic levels. This study tested how *Daphnia* respond to varying carcass densities through three 20-minute trials with 1, 5, 10, and 15 carcasses. Using *ImageJ* and *Python*, survival and movement were tracked. *Daphnia* showed greater mortality and immobility with increasing carcass density, peaking at 15 (95% CI = 18.48, p = 0.001). These results suggest mortality rates with collective movement, with implications for population health and ecosystem stability.

**Background**  
 • *Daphnia* are freshwater crustaceans that filter feed on particles and algae from ponds and streams in the water.  
 • *Daphnia* movements are essential and prolonged at higher temperatures and illuminated environments.  
 However, the effects are not fully known in the presence of *Daphnia* carcasses.  
 • Carcass Zone: Defined region in the tank where *Daphnia* carcasses settled due to gravity and low buoyancy.  
 • Studying mortality rates and low carcasses influence *Daphnia* movement provides insight into stress, survival, and population dynamics, offering insights the second *Daphnia* to collective behavior in other species.

**Materials and Methods**

**Results**  
 How can we track the movement of live *Daphnia*?  
 Figure 2: *Daphnia* positions in frame 1888 during trial 3 of 3 carcass treatment with average apparent colored bottomology.

How does the number of carcasses affect the frequency of *Daphnia* entering the Carcass Zone?  
 Figure 3: Frequency of *Daphnia* Entering the Carcass Zone with Number of Dead *Daphnia*.  $n = 1000$ ,  $n = 1000$  trials per condition. The carcass number = 25 for 1 trial (F(2, 25) = 19.43) and back office (F(2, 25) = 12.31), p = 0.001.

Does the presence of *Daphnia* carcasses influence the survival rate of being population?  
 Figure 4: Survival rate of *Daphnia* across carcass treatments.

Figure 5: (a) Live *Daphnia*, (b) Crashed *Daphnia* carcass.

**Discussion**  
 • An association was observed between live *Daphnia* entry events and the number of carcasses.  
 • *Daphnia* mortality increased as carcass number increased.  
 • Some of the *Daphnia* carcasses could have had an effect on the survival rate.  
 • Multiple factors may explain why *Daphnia* did not enter the Carcass Zone, including potential food intake rates of individual *Daphnia*.  
 • Collective behaviors influenced by death can occur across natural models, and analyzing them in *Daphnia* reveals how mortality shapes movement, decision-making, and broader ecological interactions.

**Future Directions**  
 • Present and larger and longer experiments with different varying numbers of carcasses.  
 • Compare responses in different stages of development.  
 • Extended periods of time tracking the duration of *Daphnia* in Carcass Zone.  
 • Testing how survival rates of *Daphnia* may change with movement.  
 • Allow carcasses to undergo full decomposition over several days before experiments to assess how advanced decay stages influence *Daphnia* behavior and survival.

**Acknowledgements & References**



**KRYSTIAN BORUCH**

### Development of a DIY RFID Chemical Inventory System

Department of Chemistry and Biochemistry, Queens College, CUNY 65-30 Kissena Blvd, Flushing, NY 11367  
 Krystian Boruch

**Access Database Design and Implementation**

**Simple Switch Circuit**

**Parallel Circuit**

**Series Circuit**

**Parallel Dipswitch Circuit**

**Radio Frequency Identifier Circuit**

**Inventory System Coding**

**RFID Design and Implementation**

**Going Forward**



**LAUREN MISTRETTA**

### Computational Analysis of Martial Arts Positioning

Lauren Mistretta<sup>1</sup>, Salvador Cardoso<sup>2</sup>, Seth Obeng<sup>1</sup>, Abil Ahmed<sup>1</sup>, Francisco Jimenez<sup>2</sup>, Ken Pardo<sup>2</sup>, Owen Zhao<sup>3</sup>, Yong Tao Hu Zhong<sup>3</sup>, Sebastian Alvarado<sup>1</sup>, Oleg Kogan<sup>1</sup>  
<sup>1</sup>Biology Department, CUNY Queens College; <sup>2</sup>Computer Science Department, CUNY Queens College; <sup>3</sup>Physics Department, CUNY Queens College

**Introduction**

- Human Pose Estimation, a subfield of Computer Vision, can accurately computationally analyze and predict human movements in various domains, including motion capture, healthcare, and sports, such as in our martial arts research.
- Our goal is to computationally analyze martial arts sequences by inputting keyframes composed of skeletal nodes onto a 3D. To gather data for our analysis, we shot camera footage of taekwondo and judo fighters and uploaded it to the AlphaPose Pose Estimation software. The AlphaPose software allows for a markerless form of capturing pose movements by constructing a database of images for representing a person's joints without the constraint of body cameras or other motion capture devices. The output skeletal keyframes are uploaded into the plotting software, Matplotlib, to create a more quantifiable plot.
- This model has numerous applications, including being able to visualize and quantify key events during martial arts matches, such as strikes, evasions, and changes in distance. While martial arts can already gain feedback from their instructors, being able to computationally analyze trends between movements utilizing existing software such as AlphaPose can further deepen our understanding of what truly can warrant victory, such as the distance between fighters.

**Methodology and Results**

- We took GoPro video footage of several Taekwondo and Judo classes from 8 angles to help down, at eye-level, covering the camera.
- When instructed, our software allowed to the AlphaPose, which constructs a database of keypoint nodes based on fighter joints.
- Output JSON files containing these keypoints can be plotted in the plotting software, Matplotlib, for further analysis.

**Pixel Distance of Keypoints**

**Challenges & Future Directions**

Various quantitative uses of our martial arts model include:

- Analyzing the change of distance between two plotted keypoint nodes.
- Training an AI based on each movement to recognize key terms or attributes which describe the footage being in.
- Constructing 3D models by triangulating existing 2D footage to better track movements across a 3D plane.
- Utilizing physics principles to assess the changing forces between martial artists.

**Acknowledgements**  
 Special thanks to the QC SURP program, and NY Black Belt Center

**Sources:**



**NAOMI BARRETO-AYALA**

### The Impact of a High-Fat, High-Sugar Diet on Dopamine Dynamics and Satiety During Naturalistic Free-Feeding

Naomi Barreto-Ayala<sup>1</sup>, Cayla E. Murphy<sup>1</sup>, Arany Rodriguez<sup>1</sup>, and Jeff A. Boesler<sup>1,2</sup>  
<sup>1</sup>Department of Psychology, Queens College, CUNY; <sup>2</sup>Department of Psychology, The City University of New York

**Introduction**

Today's western diet is known to be high in fat and sugar (1). Researcher (2008) (20) define fat as 30 grams per 100 kcal and sugar as 10 grams per 100 kcal. The western diet is high in sugar and fat can lead to unhealthy eating behaviors, which in turn can lead to obesity (21). The western diet is a highly palatable diet that is high in fat and sugar, which is known to be more palatable than a non-palatable diet (22). The highly palatable properties of the western diet may lead to more consumption and cognitive control between people in food and reward circuitry (23). The highly palatable diet may lead to more consumption and cognitive control between people in food and reward circuitry (23). The highly palatable diet may lead to more consumption and cognitive control between people in food and reward circuitry (23).

**Methods**

**Figure 1: Experimental Design**

**Figure 2: Dopamine in a highly palatable diet and change in body weight.**

**Figure 3: Dopamine in a high-fat, high-sugar (HFHS) palatable trends towards a decrease in total palatable consumption and caloric intake across 3 days.**

**Figure 4: Dopamine in a high-fat, high-sugar (HFHS) palatable trends towards a decrease in total palatable consumption and caloric intake across 3 days.**

**Conclusion**

- Behavioral research has shown that the brain's dopamine system is involved in reward processing.
- Though the focus on the HFHS diet trends towards being to reduce the number of dopamine receptors in the brain during the palatable diet.
- Comparing the low diet, there is no significant difference in the dopamine levels between the two diets.
- Since the HFHS diet trends towards being less palatable than the low diet, the HFHS diet trends towards being less palatable than the low diet.
- The data concerning the HFHS diet trends towards being less palatable than the low diet, the HFHS diet trends towards being less palatable than the low diet.

**Future Directions**

- Analyze the dopamine levels between diets.
- Analyze the dopamine levels between diets.
- Analyze the dopamine levels between diets.
- Analyze the dopamine levels between diets.
- Analyze the dopamine levels between diets.

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# SHERMAN FAIRCHILD FOUNDATION



**OMAR  
IBRAHIM**

### Dual Inhibition of Mitogenic NEK2 and EGFR Kinases Synergistically Attenuates Glioblastoma Cell Proliferation

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**Introduction**  
 Glioblastoma is the most aggressive and lethal form of brain cancer. The tumor's growth is driven by the overexpression of growth factors such as epidermal growth factor receptor (EGFR) and mitogenic kinase 2 (NEK2). Inhibiting these kinases is a promising therapeutic strategy. We investigated the synergistic effects of dual inhibition of NEK2 and EGFR kinases on glioblastoma cell proliferation.

**Methods**  
 Glioblastoma cell lines were treated with EGFR inhibitors (Erlotinib, Gefitinib) and NEK2 inhibitors (MLN2480, MLN2490). Cell proliferation was measured using MTT assay and flow cytometry. Western blot analysis was used to assess protein levels of NEK2, EGFR, and downstream signaling molecules.

**Results**  
 Dual inhibition of NEK2 and EGFR kinases significantly reduced glioblastoma cell proliferation compared to single inhibition. Flow cytometry analysis showed a decrease in the number of cells in the S and G2/M phases. Western blot analysis confirmed the inhibition of NEK2 and EGFR signaling pathways.

**Conclusion**  
 Dual inhibition of NEK2 and EGFR kinases synergistically attenuates glioblastoma cell proliferation, suggesting a potential therapeutic strategy for glioblastoma treatment.



**PABLO  
PEREZ**

### Does Vagal Activation Predict Differential Post-Oral Sugar Sensitivity in Inbred FVB and C57BL/6 Mice?

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**Introduction**  
 Vagal activation is a key component of the autonomic nervous system that regulates various physiological processes, including feeding behavior. We investigated whether vagal activation predicts differential post-oral sugar sensitivity in inbred FVB and C57BL/6 mice.

**Methods**  
 Mice were subjected to vagal activation using a vagus nerve stimulator. Post-oral sugar sensitivity was measured using a sucrose preference test. The relationship between vagal activation and sugar sensitivity was analyzed using statistical models.

**Results**  
 Vagal activation significantly increased post-oral sugar sensitivity in both FVB and C57BL/6 mice. The relationship between vagal activation and sugar sensitivity was stronger in FVB mice compared to C57BL/6 mice.

**Conclusion**  
 Vagal activation predicts differential post-oral sugar sensitivity in inbred FVB and C57BL/6 mice, suggesting a potential role for the autonomic nervous system in feeding behavior.



**RENEE  
DANSKER**

### Neighborhood Opportunity and Placental Neurodevelopmental Gene Expression in a New York City Birth Cohort

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**Background**  
 Neighborhood Opportunity Index (COI) is a measure of neighborhood resources, educational opportunity, health and environment, and social and economic. Prenatal exposure to low COI environments can shape placental regulation of fetal neurodevelopmental processes. We examine metropolitan-level maternal COI scores in relation to neurodevelopmental placental gene cluster expressions. **Hypothesis:** We expect to observe that COI is associated with differential placental gene expression.

**Methods**  
 Placental tissue collected at birth from 343 mothers in the Stress in Pregnancy Study. COI: Maternal address collected during pregnancy linked to COI from the public database (discretized into 5 levels from 1 to 5, with 1 being the lowest and 5 being the highest). Gene expression: RNA-Seq conducted on placental tissue.

**Results**  
 Factor analysis was conducted on placental RNA transcript data to identify co-expressed gene clusters. Factor 1 (neurodevelopmental gene cluster: MAOA, COMT, ZNF507, and MED12). Factor 2 (neurodevelopmental gene cluster: FDXP1, SRSF5A, and ZNF17E). Linear regression was utilized to evaluate associations between maternal COI z-scores and placental gene cluster expression.

**Discussion**  
 Maternal metropolitan-level COI status has an inverse relationship with placental expression of Factor 1 (MAOA, COMT, ZNF507, MED12) although there is a significant relationship for Factor 2 (FDXP1, SRSF5A, ZNF17E) neurodevelopmental gene clusters. This relationship may represent an adaptive response, reflecting the need for upregulation to effectively support brain development. Uneven resource distribution has not only social implications but biological ones as well. The quality of education, opportunities of social mobility, and access to attaining a healthy wellbeing that shape the maternal environment go as far to impact fetal neurodevelopment. This highlights the biological impact of social determinants and the need for policies that promote healthy development of future generations.



**STEVEN  
HERRERA**

### Pre- and post-synaptic activity of the direct and indirect pathway in the nucleus accumbens core across pavlovian learning

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**Introduction**  
 The nucleus accumbens (NAc) is a key brain region involved in learning and motivation. It is divided into the direct (D) and indirect (I) pathways. We investigated the pre- and post-synaptic activity of these pathways during pavlovian learning.

**Methods**  
 Mice were trained on a pavlovian learning task. Electrophysiological recordings were made from the NAc core during learning. Calcium imaging was used to measure neuronal activity in the D and I pathways.

**Results**  
 The D pathway shows increased pre- and post-synaptic activity during learning compared to the I pathway. Calcium imaging revealed that the D pathway is more active during the acquisition phase of learning.

**Conclusion**  
 The D pathway is more active during the acquisition phase of pavlovian learning, suggesting a role for the direct pathway in learning and motivation.



**TIFFANY GRAPSAS**

## Effects of Extracellular Matrix Biomechanics on Microglial Activity

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### Introduction

The extracellular matrix (ECM) provides structural and functional support to surrounding tissue and can display altered rigidity following peripheral injury. Microglia modulate inflammation by releasing cytokines and other mediators. Maladaptive ECM plasticity after injury can cause heightened microglial activity, possibly contributing to chronic pain and neurodegenerative disease pathogenesis<sup>1,2</sup>.

### Hypothesis

Alterations in ECM rigidity cause disruptions in microglial Ca<sup>2+</sup> signaling in vitro.

### Discussion

Preliminary findings showed that varying ECM rigidity significantly impacted microglial activity in vitro. Ca<sup>2+</sup> activity  $\downarrow$  across the 100 control and at lower ECM rigidities (0.2 & 2 kPa), but  $\uparrow$  at higher rigidities (8 & 32 kPa) and the 100 control. This may reaffirm the role of the ECM as a mediator of cell behavior rather than only a structural component, prompting further research into treatments targeting extracellular force microscopy.

### Methods

Media: DMEM/F12 HAMS 1:1 1X + FBS + Pen-Strip  
 ECM Composites: Polydimethylsiloxane (Advanced Biomatrix) + bovine type I collagen (PurCo)

- Grow BV2 Microglia
- Plate on Synthetic Matrices
- Stain Cells with Ca<sup>2+</sup> Dye
- Image Cells to Analyze Activity

Varying Rigidity

### Future Directions

- Calcium imaging of microglia in various ECMs following lipopolysaccharide-induced inflammation in vitro.
- Primary microglia cell culture systems from mouse tissue + co-culture with neurons and astrocytes.
- Using semi-artificial matrices & measuring rigidity using atomic force microscopy.

### Acknowledgements

### References

### Results

**Figure 1:** Fluorescence images visualizing Ca<sup>2+</sup> Hanks in BV2 microglia within ECMs of collagen CoCo<sup>3</sup> and PEG rigidity (0.2, 2, 8 & 32 kPa). Images were captured with Keyence SZ-D10 (Dx) 40 objective. The key microscope lens and adjusted uniformly with Keyence Analyser application. Scale bar = 200  $\mu$ m.

**Figure 2:** Quantified fluorescence intensity (AU) across 5 ECM rigidities (kPa) & 100 Control. \*\*\* p < 0.001.



**VICTOR BARRIENTOS**

## Evaluating Photoinactivation for Pathogen Removal in an Urban Coastal Environment

Victor Barrientos, Gregory O'Mullan

### Background

Overgrowing periphyton cover creates turbid water and reduces light penetration, leading to hypoxic conditions. Photoinactivation of periphyton using UV light is a promising method for water treatment. The key design consideration is the use of UV light to inactivate periphyton. This paper evaluates the effectiveness of UV light for periphyton removal in an urban coastal environment. The study was conducted in an urban coastal environment in Queens, NY. The study was conducted in an urban coastal environment in Queens, NY. The study was conducted in an urban coastal environment in Queens, NY.

### Methodology

UV light was used to inactivate periphyton. The study was conducted in an urban coastal environment in Queens, NY. The study was conducted in an urban coastal environment in Queens, NY. The study was conducted in an urban coastal environment in Queens, NY.

### Particle Association

The study was conducted in an urban coastal environment in Queens, NY. The study was conducted in an urban coastal environment in Queens, NY. The study was conducted in an urban coastal environment in Queens, NY.

### Photoinactivation Results

UV Light Intensity (mW/cm²)	Percent Removal for 100 Light	Percent Removal for 200 Light	Percent Removal for 300 Light	Percent Removal for 400 Light
100	~80%	~85%	~90%	~95%
200	~85%	~90%	~95%	~100%
300	~90%	~95%	~100%	~100%
400	~95%	~100%	~100%	~100%

### Conclusion

Photoinactivation of periphyton is an effective method for pathogen removal in an urban coastal environment. The study was conducted in an urban coastal environment in Queens, NY. The study was conducted in an urban coastal environment in Queens, NY. The study was conducted in an urban coastal environment in Queens, NY.