ABSTRACT WRITING AND POSTER DESIGN

SPRING 2019
Key INFO for the Spring Semester

- **Abstracts** are due March 1. All abstracts must have titles. These are submitted online. We will send you the link.

- **Posters** are due April 10 (but people are encouraged to print elsewhere). Posters are submitted online. The Aresty Center has poster templates available for download at [https://aresty.rutgers.edu/resources/students/poster-design-and-printing](https://aresty.rutgers.edu/resources/students/poster-design-and-printing)

- **Symposium** is April 26th in the Livingston Student Center. There are two sessions (AM and PM) and students will select which one they prefer when they submit their abstracts.

- **Group projects** should submit one abstract/poster that lists the name of everyone in the group.

- **Faculty mentors** must be given time to review abstracts and posters. Students who submit posters without faculty approval will not be permitted to present.
Your Symposium Audience is Diverse

Your audience will include:

- **Experts in your field**
  - Your professors
  - Colleagues
  - Students in your major

- **Intelligent non-experts**
  - Professors outside your field
  - Graduate students outside your field
  - Judges

- **Novices**
  - Friends
  - Family
  - Prospective students

Your abstract, poster and presentation itself should be able to balance the demands of each of these groups.
The Parts of a Poster

1. **Abstract or Introduction:** What is the research question and why is it important?
2. **Background or Overview:** How does it relate to previous work and how is your approach different?
3. **Materials and Methods:** What is the method for answering the question?
4. **Results:** What did you find?
5. **Conclusions:** What are the implications for your field, businesses, or individuals?
6. **Citations:** Who influenced this work or made it possible?
What Makes an Effective Poster?

Consider the following posters and discuss these questions:

1. *Where does your eye go first when you view a poster?*

2. *Compare images on the various posters. What purpose do the charts and graphs play? What makes them more or less clear?*

3. *What makes the flow (the arrangement of the sections) easier or harder to follow?*

4. *What do you notice about the amount of text and use of white space on various posters?*

5. *At what point does it become hard to keep reading a poster?*
Obesity propensity differentially alters locus coeruleus norepinephrine neural activity
Chung-Yang Yeh, Amy Walters, and Nicholas T. Bello

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Backgrounds

Obesity is associated with a variety of metabolic and lifestyle disruptions, including reduced mood, lower quality of life scores, and an elevated risk for cardiovascular diseases. It is a widespread health issue in the United States. According to the Center for Disease Control and Prevention, more than one-third (35.7%) of American adults are categorized as obese. Food intake is regulated by several projections to forebrain areas. One of which is the locus coeruleus norepinephrine (LC-NE) system. The LC-NE is an important modulator of affect, stress response, and sympathetic activation. Despite this, little is known of obesity’s influence on the LC-NE system.

Single-unit electrophysiology is a reliable technique to directly characterize neural firing patterns. When utilized in vivo, electrophysiology could be used to investigate sensory, motor, and regulatory neurons in their intact circuitry. Likewise, locus coeruleus neurons demonstrate spontaneous and biphasic responses to painful sensations that can be observed through electrophysiology.

Motivations & Approach

- Given the high number of afflicted Americans, obesity and its propensity are important research topics.
- Novel understandings of obesity's influences on the LC-NE system could provide insights for future treatments.
- Locus coeruleus neurons exhibit reliable biphasic responses that are also sensitive to specific physiological manipulations.
- Previous electrophysiology experiments by the Bello Lab have demonstrated that dietary-induced binge-eating dampens locus coeruleus activation.
- The aim of this experiment is to characterize the effects of obesity propensity on the LC-NE circuitry.

Materials & Methods

- The present study utilizes obesity model animals in Sprague-Dawley rats selectively bred to be obese-prone (OP) or resistant (OR).
- These two strains are further split into groups fed with either high-fat (HF) or low-fat (LD) diets at 10 weeks.
- See table below for groupings.
- Non-invasive cardiovascular data was taken at the 10th week.
- The locus coeruleus neurons of these animals were subsequently recorded through single-unit in vivo electrophysiology under isoflurane anesthesia.
- During each electrophysiology recording, 3 minutes of spontaneous activity was recorded followed by 60 trials of contralateral sciatic nerve stimulations applied at 0.2 Hz.
- 2-10 cells were recorded per rat and the total was compiled into averaged per-stimulus histograms for analysis.

<table>
<thead>
<tr>
<th>DIET</th>
<th>STRAIN</th>
<th>Obese-Prone</th>
<th>Obese-Resistant</th>
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<tr>
<td>High-Fat</td>
<td>OP-HF n=6</td>
<td>OR-HF n=7</td>
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<tr>
<td>Low-Fat</td>
<td>OP-CD n=7</td>
<td>OR-CD n=6</td>
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Results

A) Body weights

Figure A body weight progression of each group across the ten-week time span with their designated data. For week 10, the OP animals demonstrated a roughly 25% higher body weight than the OR animals. HF diet also increased body weight as expected. In a similar extent.

B) Record Body Weight

Figure B, the final recording body weight of each group. Bar indicates average body weight ± SEM. Each group exhibited significantly different body weight ranges.

C) Cardiovascular Data

Figure C cardiovascular data taken on week 10. Bar indicates mean ± SEM. Sympathetic and norepinephrine values demonstrated significant differences between groups. The heart rates of the OR group (122.1 ± 15.5 bpm) was significantly slower than that of the OP group (138.8 ± 12.2 bpm). At the same time, the high-fat group (275 ± 11 bpm) also had significantly slower heart rate than the low-fat group (212.1 ± 15.4 bpm) (p < 0.005). However, no strain diet interactions were detected.

D) Strain

Figure D, the average per-stimulus histogram of strain comparison. X-axis indicates time from stimulation. This histogram unveiled significant strain effects in the evoked and spontaneous activity of the firing pattern. For rate analysis, see Figure F and G below. OP animals also visibly demonstrated a shorter inhibition period indicated by the earlier recovery phase.

E) Diet

Figure E, the average per-stimulus histogram of diet comparison. X-axis indicates time from stimulation. This histogram showed no significant dietary effects.

F) Rate data of spontaneous activity

Figure F, rate data of spontaneous discharge. Bar indicates mean ± SEM. There was a higher spontaneous discharge rate for OP (50 cells, 2.16 ± 0.08 Hz) compared to OR (72 cells, 1.07 ± 0.09 Hz) (*, p < 0.001). Proximal analysis further revealed that the OP-CD spontaneous activity was significantly different lower than the three other groups. Similarly, OP demonstrated heightened tonic activity (200 ms before stimulus onset, 1.67 ± 0.08 Hz, bar graph not shown) than OR (1.33 ± 0.06 Hz) (*, p < 0.001).

G) Rate data of evoked activation firing

Figure G, rate data of evoked activation firing. The OP group (6.45 ± 0.35 Hz) exhibited lower evoked firing rate than the OR group (8.84 ± 0.34 Hz) (*, p < 0.001).

Conclusions

- The obesity rat models sufficiently represented the phenotypes of human obesity by having reached the top 10% of the body weights with food ad lib.
- The OP group expressed significantly dampened evoked activation of the LC-NE system versus the OR group.
- The OP animals also expressed an elevated level in the spontaneous discharge rate of locus coeruleus neurons compared with the OR animals.
- The signal-to-noise ratio revealed that the groups of different obesity propensities responded differently to high- and low-fat diets.

Discussion

The present data are the first evidences for the involvement of the LC-NE in obesity susceptibility. Similarly, these results provide further insights into the chronic influences of obesity on the LC-NE system and, therefore, on mood and sympathetic activity. These findings provide grounds for the LC-NE targeting treatments of obesity and related emotional disturbances.

To complement this experiment, an additional group of non-selected strain of Sprague-Dawley rats will be recorded after appropriate dietary conditioning to represent the theoretical baseline of obesity propensity. Furthermore, the relationship between obesity propensity and the fat-content level in diets is also a topic of interest.

Future research directions look to investigate mechanisms of modulate weight loss drugs such as GLP-1 agonists, in relation with the LC-NE system. Having characterized the obesity propensity models at hand allows us to investigate how these drugs effectively mediate the LC-NE disruption caused by obesity.

Acknowledgements

We would like to thank the Anxiety Research Center for providing the necessary funding for this experiment. Additional thanks go to the members of the Bello Lab who made this project possible.
Are Haspin and Bub1 kinases redundant for female meiotic chromosome segregation in Drosophila?

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The chromosomal passenger complex is required for accurate spindle assembly

- The chromosomal passenger complex (CPC) regulates spindle assembly and chromosome segregation. It is composed of four proteins and localizes in a ring around chromatin to organize the spindle in meiosis [2].

- When CPC member proteins INCENP and Aurora B (Δ47) are knocked down in oocytes, CPC ring localization is not observed and no spindle assemblies [3].

- There is also evidence for CPC localization at centromeres in early metaphase during female meiotic spindle assembly (S. Radford, personal communication).

Haspin and Bub1 kinases recruit CPC subunits

Through interaction with Pds5, Haspin kinase phosphorylates Histone H3 at Thr3 and recruits the CPC-member protein Survivin, which positions Aurora B at centromeres in mitosis [4].

- The phosphorylation of histone H3a at Thr120 by Bub1 kinase recruits Shugoshin protein MEI-S332 to centromeres, which in turn contributes to the localization of CPC member Borealin and activation of Aurora B [5].

Haspin is not independently essential for chromosome segregation in oocytes

- In order to get a deletion of Haspin, we used a Minos element 418 bp upstream of the coding region to excise the gene. 225 excisions were obtained, but no deletions.

- These data collected using a 95% knockdown of Haspin suggest that Haspin kinase is not required for mitosis or female meiosis.

Bub1 is not essential for female meiotic chromosome segregation

- Expression of Bub1 RNAi in various tissues was performed using a 98% knockdown of Bub1 transcript. These results suggest that Bub1 is not required for mitosis or female meiosis.

- Females expressing Bub1 RNAi in their germline did not have increased nondisjunction events. This indicates that Bub1 is not essential for accurate chromosome segregation in oocytes.

References


Acknowledgements

We would like to thank TRIP at Harvard University for RNAi lines; the Rutgers University Division of Life Sciences and the Arts Research Center for funding; and the members of the McKim lab for all of their assistance and continued support.
Abstract

Mutations in the Axin2 Telangiectasia Mutated (ATM) gene cause a neurodegenerative disorder known as Axin2 Telangiectasia (A-T). When the ATM protein is altered, it leads to the prevention of DNA repair, a weakening of the immune system, and an impairment of movement and coordination, among other symptoms. Our aim is to use human embryonic kidney cells (HEK293) and A-T affected induced pluripotent stem cells (iPSCs) to better understand the mechanisms behind the disease. Through the use of various genome editing techniques, we planned to insert a known sequence surrounded by 2 ‘loxp’ sites into the HEK 293 cells to replace a specific exonic region with A-T so that it will be recognizable with the addition of an enzyme known as Cre recombinase at the loxP sites. These cells have been chosen for their relative hardness and the ease with which they can be manipulated as a positive control for future experiments. We intend on working with the iPSCs in order to learn more about the effects of genome editing and the causative/repair of the problems associated with A-T. Then, cellular function can be assessed by such methods as radiation treatment to see if genome correction can occur in the cells of affected individuals and how it will affect these cells.

Methods

The experiment began with G418 (antibiotic-sensitive) HEK293 cells (pictured below) plated in medium without G418. They were then grown in a monolayer on a plate until they had become confluent (covered most of the plate).

These cells were then transfected using the CRISPR/Cas-9 Genome Editor directed to Exon 6 of the ATM gene by guide RNA. This guide RNA finds the target sequence, which leads to the binding of Cas9 to the target site and a double-strand break (depicted above). This promotes homologous repair of the genome.

![CRISPR/Cas system of double-stranded break followed by homology directed repair (HDR). Adapted from CRISPR Genomics Engineering. AddGene. (www.addgene.org).](image)

The diversity of functional neurons obtained from A-T fibroblast-derived iPSCs gives us a powerful tool for investigating the disease. 1 These iPSCs provide an unlimited supply of patient-specific diseased or non-diseased neuronal/glial cells, as they are derived from somatic cells, usually skin-based ones. Therefore, iPSCs are ideal for understanding underlying genetic mechanisms, as, based on the various different disease-specific cells available, we can research why something happens instead of just what is the correlation.

In order to introduce selectable markers, mutations, and corrections into the ATM gene, there are new technologies being implemented. For example, Zinc Finger Nucleases (ZFN) and TALENs are site-specific endonucleases that promote double-strand breaks in DNA that allow for homologous recombinations. This allows for a broad range of genetic innovation and analysis through sequence insertion, removal, repair, etc. Also along these lines, there are new CRISPR/Cas systems, which are directed to a location in the genome by guide RNA and create a similar double-stranded break at that location with higher fidelity. All these different biotechnologies will combine to help edit any genome and change the way we look at studying and treating genetic diseases.

Results

![A gel with ladder on the left and 6 different lettered samples from the ones used before. Note the faint band for Sample A next to the white arrow in the ladder. This is located where a fragment for genome + transgene should be (666 bp), proving that the donor DNA inserted into the correct location. The same goes for Samples B-F, which also have the same band. See blue arrows in Fig. 4 for primer location](image)

Fig. 3 A gel with ladder on the left and 6 different lettered samples from the ones used before. Note the faint band for Sample A next to the white arrow in the ladder. This is located where a fragment for genome + transgene should be (666 bp), proving that the donor DNA inserted into the correct location. The same goes for Samples B-F, which also have the same band. See blue arrows in Fig. 4 for primer location.

Combining this DNA with primers of known length and sequence, a Polymerase Chain Reaction (PCR) is started. This allows us to amplify the quantity of the relevant DNA sought out by the primers so that when they later run on a gel, there will be more DNA and thus a stronger band.

After running the gel electrophoresis with this amplified DNA, we expect to see a band in the region corresponding to the primer length, as this would indicate that the donor sequence had inserted into the HEK293 genome.

Fig. 4 Diagram of the region in the genome where the plasmid should have recombined. Primers used started (for Fig. 3) in the left adjacent region (present in HEK293 cells, not in plasmid) and ended in the loxP site (in plasmid, not in non-transfected HEK293 cells), while in Fig. 2 it starts in the left homology region (present in plasmid and cells) and ends after the loxP site (in plasmid, not non-transfected cells.) The fragment obtained from Fig. 3 would thus only be present in correctly recombined HEK293 cells, while Fig. 2 simply tries to show that it is present, not that it is in the correct location.

Conclusions

There are still many more samples left to test, but the positive results seen in Figure 3 show that it is possible to insert the desired neo resistance sequence in the genome at the correct location. We want to expand upon these results and garner further proof of the successful homologous recombination. There were a couple of experiments run with TALENs as well that did not progress as far as this CRISPR one, so it’d be nice to see that work since it has its own benefits, such as greater specificity of targeting. We can use what we have learned and confirmed from this experiment to try to correct mutations in afflicted individuals to see if this can change the observed symptom phenotypes. Since these cells can serve as a positive control, this also allows us to work with the various genome editing techniques and see how effectively and efficiently they work for future studies, especially in iPSCs. Genome editing is the future of biotechnology and has the potential to help the lives of many people with debilitating genetic defects. Having full control of the mutators associated with this disease opens up an array of possibilities in studying and potentially curing A-T.

References


Acknowledgements

Thank you to Dr. Ronald Hart and Dr. Jennifer Moore for providing me with guidance, assistance, training, and the knowledge necessary to complete this project. I’d also like to thank Michael D’Ececlis, Alana Torro-Ramos, and Mavis Swordel for putting up with me and helping me through whatever problems I had even when I may have seemed like a lost cause.
Examining whether CED-3 cleaves RPM-1 to promote neuronal regeneration in *C. elegans*

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Abstract

Neurogenesis in the central nervous system is a regenerative process that occurs in the adult brain to repair injuries such as stroke or spinal cord injury. Currently, effective therapies to treat these injuries are lacking, but researchers are working towards translating the regenerative potential of injured neural tissue. To achieve this goal, it is necessary to remove the extrinsic and intrinsic factors that inhibit regeneration. In recent years, the F-box protein CED-3 has been identified as a critical regulator of cell death in the nervous system. CED-3 cleaves the pro-apoptotic protein RPM-1 to promote regeneration.

24 hour regenerative outgrowth

![Image](image.png)

Figure 1. GFP labeled wild type ALM touch neuron below laser axotomy (I). Immediately after axotomy (II), and then 24 hours later (III). Wild type ALM generates approximately 300 um of regenerative outgrowth during the first 24 hours after axotomy.

Working model for CED-3 regeneration pathway

![Image](image.png)

Figure 2. Neurodegeneration leads to axotomized neurons to enter the cell cycle and die. The cell lyses and the neuronal axon is replaced. The Driscoll lab identifies multiple degeneration pathway components to promote regeneration.

Driscoll lab laser axotomy setup

![Image](image.png)

Figure 3. The Driscoll lab's laser axotomy setup: the C. elegans worm is visualized and laser target is aligned with the worm. Luminiscence is used to detect the laser.

Regenerative outgrowth in ced-3, rpm-1, and fsn-1

![Image](image.png)

Figure 4. Regenerative outgrowth is measured 24 hours after laser axotomy in ced-3, rpm-1, and fsn-1 mutants. Regeneration is significantly reduced in the ced-3, rpm-1, and fsn-1 animals compared to wild-type.

Does CED-3 act through RPM-1/FSN-1 to promote regeneration?

![Image](image.png)

Figure 5. Wild type ALM touch neurons expressing GFP prior to axotomy (I). Immediately after axotomy (II), and then 24 hours later (III). Mutations in ced-3 decreases 24 hour regeneration (IV), while rpm-1, rpm-1, fsn-1, and ced-3 mutations all decrease regeneration more than wild-type. The rpm-1 and fsn-1 mutations are epistatic to ced-3 suggesting that RPM-1/FSN-1 acts downstream of CED-3.

Summary

The Driscoll lab identifies novel regeneration pathway components to promote regeneration. CED-3, CED-3 cleaves RPM-1 to promote regeneration. CED-3 cleaves RPM-1 to promote regeneration.

References


Relations Between Aerobic Fitness, Trait Anxiety, and Cardiovascular Responses to Stress
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ABSTRACT
Investigations have indicated that aerobic fitness is strongly associated with reduced risk of mortality from both cardiovascular and non-cardiovascular diseases (Sloan et al., 2001). One proposed mechanism for the protective effect of aerobic fitness is that it lowers cardiovascular reactivity to psychological stress and improved recovery from stressors (Sapolsky et al., 2004). In contrast, trait anxiety and hostility have been shown to be important risk factors for coronary heart disease (CHD) (Miller et al., 1996). Therefore, the purpose of this study was to examine the relationship between aerobic fitness and trait anxiety on CVR and recovery from psychological stress. A secondary purpose was to evaluate the moderating influence of stress reactivity on the trait anxiety and stress-related CVR relationship.

HYPOTHESES
1. Greater aerobically fit individuals will exhibit lower levels of CVR and faster recovery in response to psychological stress.
2. Individuals with higher trait anxiety levels will evidence greater cardiovascular responses to psychological stress.
3. Aerobic fitness will moderate the relationship between trait anxiety and cardiovascular stress responses.

INTRODUCTION
Research exists for the cross-sectional association theory, which suggests that adaptations resulting from regular physical activity and aerobic fitness may lead to similar adaptations in response to psychological stressors (Vaage & Ziegler, 1999). For example, regular physical activity has been shown to reduce heart rate, attenuate blood pressure, increase parasympathetic activity and decrease sympathetic activity in response to psychological stressors (Brand et al., 2004; D’Eulian & Dell, 2001).

METHODS

Maximal Aerobic Fitness
• VO2 max

Psychological Stressors
• Modified Stroop test feedback was provided for 30% of correct responses
• Serial Subtraction task: Continuous subtraction of digit number (17, 13, and 11) from 100

Cardiovascular Autonomic Measures
HR and BP were continuously assessed during the stressor tasks. Through impedance cardiography pre-stress period and high frequency (0.05-0.15 Hz) heart rate variability (HF-HRV) were assessed as primary measures of sympathetic and parasympathetic cardiac control, respectively.

RESULTS
A significant rise in DBP was observed in the low-fit group during the Stroop task, p<.05. Greater heart rate variability was observed for individuals at baseline and during the 5 min recovery period, p<.05. Anxiety group displayed higher SBP and DBP for the Stroop task, trending towards significance, p=.05. No significant differences between hostility and CVR or recovery from stress were found, p>.05.

CONCLUSIONS
Greater anxiety is associated with greater CV reactivity and slower DBP recovery from psychological stressors. These results further suggest that aerobic fitness training may increase the ability of cardiovascular systems to tolerate stresses and aid recovery.

ACKNOWLEDGEMENT
We would like to thank Rutgers University, the Anxiety Research Center for Undergraduates, and the School of Arts and Sciences for their funding and assistance with this project.
Walking Through Italian Literature and Film
Mihaela Sanderson, Arestry Center Research Assistant to Professor Andrea Baldi, Ph.D
Rutgers University - School of Arts and Sciences - Department of Italian

Introduction
Engaging in what at first seems like an ordinary fact of life, upon reflection we realize that walking becomes vital in establishing our perception of place. An essential kinesthetic behavior helps us alter our surroundings and use our environment to shape our philosophical thinking. In the moment we start walking, we essentially define the topography and the landscape of the city from an individual perspective. By that very act, as passersby, we become the sole architects of redefining and mapping the city in a new, different way. The common practice of walking not only permits us to geographically elaborate on the countless facets of the outside world, but often leads us to serious thought, consideration, reflection and soul searching.

Background
The Walking Through Italian Literature and Film research project originated from the larger concept of flânerie. The objective of this research project is to supplement the base for a new course designed to examine different literary texts and films, all bound by a common theme i.e. the practice of walking. Through the practice of walking we are engaging in defining not only the geography of the space, but we are projecting new dimensions of cultural memory, the prioritization of individual freedom in relation to an ever-changing socio-economic framework, marked by the constant scientific and technological progress of the modernity. Among such literary texts, Marilce Serao’s realist short story entitled Una Fiorita is perfectly detecting such dynamics. In this short story Serao not only reveals the practice of walking and the mapping of the city from an individual perspective, but also exposes the cultural practices and different characteristics pertaining to the social dimensions of that time.

Glossary
Kinesthetic: the use of the body and senses to learn about the world around you.

Methods
My research aimed to study the representation of walking in the Italian Literature and Film of the 19th and 20th century. I have solely worked on the short story Una Fiorita written by Matilde Serao. The first step in my research was to break down and organize the protagonist’s journey into four main sections. Two documents found at the New York Public Library were essential. After carefully studying a map of the city of Naples dating 1899, the document entitled ‘Risanamento della Città di Napoli del 1899’ which I translated from Italian into English, I reconstructed and captured in digital maps (Google Maps) the main character’s journey in order to reach a deeper understanding of the relationship between the protagonist and her urban environment. Such relationships shed light on historical intricacies, social and cultural dynamics of that period.

Discussion
The main character’s meandering experience on the streets of Naples is strictly delimited by specific geographical parameters and in conformity with the reality of her social dimension. Serao’s story sets the stage of a broken Naples, in which the cityscape is minutely observed through the visual, auditory and olfactory senses, thus revealing the spatial relationship within the city as bounded to two distinct spheres: the bright, dominant squares anchoring luxurious shops, and the dark slums of the city marked by the lack of sanitation, the accumulation of sewage, high rates of disease, crime and poverty.

While working on the short story I have come across two particular details which influenced my research and at the same time guided its outcome. Such findings are closely connected to Naples’ major urban intervention started in 1885 as a result of a serious cholera outbreak, and later on, the intense destruction of World War II. Both events radically changed the architecture of the most historic districts of the city. However, it was Naples’ urban rehabilitation that enabled extensively the replacement of pre-existing structures with new buildings, roads and squares. In reality, instead of solving the problems, it created a facade meant to conceal the poverty and the degradation of those areas. As a result, I have created a map that exposes the changes brought by the rehabilitation, which helps us appreciate the city as it was then, as well as the struggles of the Neapolitan people.

Serino’s use of the practice of walking within the city space is an important tool that highlights much larger issues of social injustice and economic disparities, universal themes that calls for further research in order to better understand the past in relation to today’s social and cultural practices.

Acknowledgements
I would like to express my gratitude to Professor Baldi for giving me this extraordinary opportunity to learn and grow; for his encouragement, continued support and guidance throughout the year. Many thanks to Francesca Gianetti, Digital Humanities Librarian Research at Archibald S. Alexander Library for providing me with a crash course in digital mapping. I cannot express enough thanks to the Arestry Research Center, the School of Arts and Sciences, and to my friends Nicoleria Romano and Carol Cofone for their invaluable advice. I would also like to acknowledge the New York Public Library staff, especially the map division for their patience and help provided during my week long stay while doing research.
Abstracts are Microcosms of Posters

- **Title** – A succinct description of the study or its findings. This is also the title of the poster.

- **Introduction** – What is the research question and why is it important?

- **Background** – How is your specific approach unique?

- **Methods or mode of analysis** – What is the method for addressing your question?

- **Results** – What did you find?

- **Conclusions** – What are the implications? Why should we care?
An Abstract In pieces

**Title**

*The Relationship between Undergraduate Research Participation and Subsequent Research Performance of Early Career STEM Graduate Students*

**Intro**

Undergraduate research experiences have been adopted across higher education institutions.

However, most studies examining benefits derived from undergraduate research rely on self-report of skill development.

**Background**

This study used an empirical assessment of research skills to investigate associations between undergraduate research experiences and research skill performance in graduate school. Research experience characteristics including duration, autonomy, collaboration, and motivation were also examined.

Undergraduate research experience was linked to heightened graduate school performance in all research skills assessed. While autonomy and collaboration were highlighted in student interviews, duration was most strongly correlated to significant increases in research skill performance.

**Results**

Based on these findings, we advocate for the inclusion of research experiences into the undergraduate science curriculum coupled with the creation of centralized offices of undergraduate research and faculty incentives for involving undergraduates in their research.

**Conclusions**

Questions/Contact us!

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